Volume II Appendices

Final Subsequent Environmental Impact Report

Sunshine Canyon Landfill

State Clearinghouse Number 92041053

SEIR 91-0377-ZC/GPA

Lead Agency:

City of Los Angeles

Department of City Planning

Environmental Review Section

221 N. Figueroa Street, 15th Floor

Los Angeles, CA 90012-2601

June 1998

VOLUME II APPENDICES

FINAL SUBSEQUENT ENVIRONMENTAL IMPACT REPORT
SUNSHINE CANYON LANDFILL

Final SEIR 91-0377-ZC/GPA
State Clearinghouse Number 92041053

Lead Agency:

CITY OF LOS ANGELES
Department of City Planning
Environmental Review Section
221 North Figueroa Street, 15th Floor
Los Angeles, California 90012-2601

June 1998

VOLUME II APPENDICES

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DRAFT SEIR NOTICES/CORRESPONDENCE

APPENDIX A1

Notice of Completion Filed with Office of Planning and Research

NOTICE OF COMPLETION

TO: STATE OF CALIFORNIA
OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET
SACRAMENTO, CA 95814

Project Title	Case No.
Sunshine Canyon Landfill	SEIR 91-0377-ZC/GPA

Project Location - Specific

14747 San Fernando Road, Sylmar, CA 91342

Project Location - City	Project Location - County
Los Angeles	Los Angeles

Description of Nature, Purpose, and Beneficiaries of Project

SEE ATTACHED

Lead Agency	Division
City of Los Angeles	Department of City Planning Environmental Review Section 221 N. Figueroa St., Room 1500 Los Angeles, CA 90012

Address Where Copy of EIR is Available

Office of the City Clerk, Room 395 City Hall, Los Angeles 90012

Review Period (Calendar Dates) Starting Date	Ending Date
July 25, 1997	October 31, 1997

Contact Person	Title	Area Code/Phone
Hadar Plafkin	City Planner	(213)580-5554

(Send to: County Clerk EIR Desk, 12400 Imperial Highway, Norwalk, CA 90650

append (4/95)

Sunshine Canyon Landfill Draft SEIR 91-0377 ZC/GPA
SCH # 92041053

Project Description

Consisting of the development, operation, maintenance and monitoring of a Class III, non hazardous solid waste landfill (herein, City/County Landfill on proposed project). A portion of the proposed City/County Landfill footprint is located on ±194 acres within the City portion of Sunshine Canyon and provides an estimated net airspace disposal capacity of 55 million tons within the City.

Initially, the City and County landfill areas would be operated separately and provide an average daily capacity of 5,000 tons per day (tpd) in the City and 6,000 tpd in the County. However, within 18 to 24 months following the commencement of landfilling operations in the City, the City and County landfilling operations would be subsequently combined into a single landfill operation and at one working face area. This would allow for an average waste intake of 11,000 tpd. The combined development of land within both jurisdictions would result in one landfill footprint being constructed in Sunshine Canyon. The landfill footprint configuration would ultimately encompass ±451 acres.

Notice of Completion

Appendix F

See NOTE below

SCH # 92041053

Mail to: State Clearinghouse, 1400 Tenth Street, Sacramento, CA 95814 916/445-0613

Project Title: Sunshine Canyon Landfill

Lead Agency: City of Los Angeles Planning Dept. Contact Person: Hadar Plafkin

Street Address: 221 N. Figueroa St., Room 1500 Phone: (213)580-5554

City: Los Angeles Zip: 90012 County: Los Angeles

Project Location

County: Los Angeles City/Nearest Community: Sylmar

Cross Streets: San Fernando Road and Balboa Boulevard Total Acres: 494

Assessor's Parcel No. _____ Section: _____ Twp. _____ Range: _____ Base: _____

Within 2 Miles: State Hwy #: 5 Waterways: _____

Airports: _____ Railways: _____ Schools: _____

Document Type

CEQA: ☐ NOP ☒ Supplement/Subsequent NEPA: ☐ NOI Other: ☐ Joint Document

☐ Early Cons ☐ EIR (Prior SCH No.) ☐ EA ☐ Final Document

☐ Neg Dec ☐ Other ☐ Draft EIS ☐ Other

☐ Draft EIR ☐ FONSI

Local Action Type

☐ General Plan Update ☐ Specific Plan ☒ Rezone ☐ Annexation

☒ General Plan Amendment ☐ Master Plan ☐ Prezone ☐ Redevelopment

☐ General Plan Element ☐ Planned Unit Development ☐ Use Permit ☐ Coastal Permit

☐ Community Plan ☐ Site Plan ☐ Land Division (Subdivision, Parcel Map, Tract Map, etc.) ☐ Other

Development Type

☐ Residential: *Units* _____ *Acres* _____

☐ Office: *Sq.ft.* _____ *Acres* _____ *Employees* _____

☐ Commercial: *Sq.ft.* _____ *Acres* _____ *Employees* _____

☐ Industrial: *Sq.ft.* _____ *Acres* _____ *Employees* _____

☐ Educational _____

☐ Recreational _____

☐ Water Facilities: *Type* _____ *MGD* _____

☐ Transportation: *Type* _____

☐ Mining: *Mineral* _____

☐ Power: *Type* _____ *Watts* _____

☐ Waste Treatment: *Type* _____

☐ Hazardous Waste: *Type* _____

☒ Other: Class 3 nonhazardous solid waste landfill

Project Issues Discussed in Document

☒ Aesthetic/Visual	☒ Flood Plain/Flooding	☒ Schools/Universities	☒ Water Quality
☐ Agricultural Land	☒ Forest Land/Fire Hazard	☒ Septic Systems	☒ Water Supply/Groundwater
☒ Air Quality	☒ Geologic/Seismic	☒ Sewer Capacity	☒ Wetland/Riparian
☒ Archeological/Historical	☒ Minerals	☒ Soil Erosion/Compaction/Grading	☒ Wildlife
☐ Coastal Zone	☒ Noise	☒ Solid Waste	☒ Growth Inducing
☒ Drainage/Absorption	☐ Population/Housing Balance	☒ Toxic/Hazardous	☒ Landuse
☐ Economic/Jobs	☒ Public Services/Facilities	☒ Traffic/Circulation	☒ Cumulative Effects
☐ Fiscal	☒ Recreation/Parks	☒ Vegetation	☐ Other

Present Land Use/Zoning/General Plan Use

A1-0-0; Open Space

Project Description

See attached

NOTE: Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. from a Notice of Preparation or previous draft document) please fill it in.

Revised October 1989

Reviewing Agencies Checklist

KEY
S = Document sent by lead agency
X = Document sent by SCH
✓ = Suggested distribution

____**Resources Agency**
____Boating & Waterways
____Coastal Commission
____Coastal Conservancy
____Colorado River Board
____Conservation
__S__Fish & Game
__S__Forestry
____Office of Historic Preservation
__S__Parks & Recreation
____Reclamation
____S.F. Bay Conservation & Development Commission
__S__Water Resources (DWR)

Business, Transportation & Housing
____Aeronautics
____California Highway Patrol
__S__CALTRANS District # 7
__X__Department of Transportation Planning (headquarters)
____Housing & Community Development

____**Food & Agriculture**

Health & Welfare
__S__Health Services County of Los Angeles

State & Consumer Services
____General Services
____OLA (Schools)

Environmental Affairs
__S__Air Resources Board
____APCD/AQMD
__X__California Waste Management Board
____SWRCB: Clean Water Grants
____SWRCB: Delta Unit
__X__SWRCB: Water Quality
____SWRCB: Water Rights
__S__Regional WQCB # 9 (_____)

Youth & Adult Corrections
____Corrections

Independent Commissions & Offices
____Energy Commission
____Native American Heritage Commission
____Public Utilities Commission
__S__Santa Monica Mountains Conservancy
____State Lands Commission
____Tahoe Regional Planning Agency

____Other _____

Public Review Period (to be filled in by lead agency)

Starting Date July 25, 1997 Ending Date October 31, 1997

Signature Steve Paul Date July 15 1997

Lead Agency (Complete if applicable):
Consulting Firm: Ultrasystems Environmental, Inc
Address: 26461 Crown Valley Pkwy., Suite 140
City/State/Zip: Mission Viejo, CA 92691-6377
Contact: Betsy Lindsay
Phone: (714) 367-8899

Applicant: Browning-Ferris Industries, Inc
Address: 14747 San Fernando Road
City/State/Zip: Sylmar, CA 91342
Phone: (818) 362-1567

For SCH Use Only:
Date Received at SCH _____
Date Review Starts _____
Date to Agencies _____
Date to SCH _____
Clearance Date _____
Notes:

Revised October 1989

Sunshine Canyon Landfill Draft SEIR 91-0377 ZC/GPA
SCH # 92041053

Project Description

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APPENDIX A2

Notice of Completion and Availability and Request for Comments

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section

Date: July 25, 1997

NOTICE OF COMPLETION AND AVAILABILITY OF
DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT NO. 91-0377-ZC/GPA

SITE LOCATION: 14747 San Fernando Road, Sylmar, CA 91342

A development project has been proposed for this site, for which the captioned draft subsequent environmental impact report has been prepared. The project is described at: Consisting of the development, operation, maintenance, and monitoring of a Class III, nonhazardous solid waste landfill (herein, City/Country Landfill on proposed project). A portion of the proposed City/County Landfill footprint is located on ±194 acres within the City portion of Sunshine Canyon and provides an estimated net airspace disposal capacity of 55 million tons within the City.

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Anticipated significant effects on the environment are: Earth Resources, Air Quality, Surface and Groundwater, Biological Resources, Noise, Light and Glare, Land Use, Natural Resources, Risk of Upset, Population, Housing, Right-of-Way and Access, Transportation and Circulation, Public Services, Energy Conservation, Utilities, Safety, Aesthetics/View and Cultural Resources

If you wish to review a copy of the draft subsequent environmental impact report (EIR) or the documents referenced in the DEIR, you may do so at 221 N. Figueroa Street, Room 1500, Los Angeles. Copies of the DEIR are also at the following locations:

Planning Department Branch Office:
Valley, 6255 Van Nuys Blvd., Van Nuys, CA 91401

Library Branches:
Canoga Park Branch, 7260 Owensmouth Ave., Canoga Park, CA 91303-1529
Chatsworth Branch, 21052 Devonshire St., Chatsworth, CA 91311-2314
Granada Hills Branch, 10640 Petit Ave., Granada Hills, CA 91344-6452
Central Library, 630 W. Fifth St., Los Angeles, CA 90071

(CONTINUED ON PAGE 2)

Mid-Valley Regional Branch & Bookmobile Headquarters, 16244 Nordhoff St., North Hills, CA 91343-3806
Northridge Branch, 9051 Darby Ave., Northridge, CA 91325-2743
Porter Ranch Branch, 11371 Tampa Ave., Porter Ranch, CA 91326-1729
Sylmar Branch, 13059 Glen Oaks Blvd., Sylmar, CA 91342
Encino-Tarzana Branch, 18231 Ventura Blvd., Tarzana, CA 91356-3630
Valencia Branch, 23743 W. Valencia Blvd., Valencia, CA 91355
Woodland Hills Branch, 22200 Ventura Blvd., Woodland Hills, CA 91364-1599
Platt Branch, 23600 Victory Blvd., Woodland Hills, CA 91343
Culver City Library, 4975 Overland Ave., Culver City, CA 90230
San Fernando Library, 1050 Library St., San Fernando, CA 91340

If you wish to submit comments following review of the Draft EIR, please reference the file number on first page, and submit them in writing by October 31, 1997.

Send Comments to: Los Angeles City Planning Department
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

Contact Person: Hadar Plafkin, (213)580-5554

If a public hearing is required for the approval action on the underlying project (i.e. subdivision, zone change, conditional use, variance etc.) a separate hearing notice will be mailed to you at a later date for such purpose.

CON HOWE
Director of Planning

for Hadar Plafkin
City Planner

CP-6808 (4/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 North Figueroa Street, Suite 1500
Los Angeles, California 90012
213-580-5554

Date: July 25, 1997

EIR Case No.:	91-0377-ZC/GPA
Project Name:	Sunshine Canyon Landfill
Reference No.:	SCH No. 92041053
Location:	14747 San Fernando Road, Sylmar
Due Date:	October 31, 1997

REQUEST FOR COMMENTS OF DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT

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We request your comments on any aspect of the attached draft SEIR document. Comments should be submitted to this office in writing and must be submitted by the due date given above.

Please direct your responses to:

Hadar Plafkin, City Planner
Department of City Planning
Environmental Review Section
221 North Figueroa Street, Suite 1500
Los Angeles, California 90012

CON HOWE
Director of Planning

DARRYL L. FISHER
Deputy Advisory Agency

CP-1257 (5/96)

APPENDIX A3

Notice of Completion and Availability and Request for Comments Filed with County Clerk

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section

FILED

JUL 22 1997

CONNY B. McCORMACK, COUNTY CLERK
D. Coleman
DEPUTY

Date: July 25, 1997

TO:

NOTICE OF COMPLETION AND AVAILABILITY OF
DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT NO. 91-0377-ZC/GPA

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(CONTINUED ON PAGE 2)

97063111

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221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

Contact Person: Hadar Plafkin (213)580-5554

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CON HOWE
Director of Planning

for Hadar Plafkin
City Planner

CP-6808 (4/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 North Figueroa Street, Suite 1500
Los Angeles, California 90012
213-580-5554

FILED
JUL 22 1997
CONNY B. McCORMACK, COUNTY CLERK
D. Coleman
DEPUTY

Date: July 25, 1997

EIR Case No.:	91-0377-ZC/GPA
Project Name:	Sunshine Canyon Landfill
Reference No.:	SCH No. 92041053
Location:	14747 San Fernando Road, Sylmar
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Environmental Review Section
221 North Figueroa Street, Suite 1500
Los Angeles, California 90012

CON HOWE
Director of Planning

DARRYL L. FISHER
Deputy Advisory Agency

CP-1257 (5/96)

97063111

STATE OF CALIFORNIA-THE RESOURCES AGENCY
DEPARTMENT C 3H AND GAME
ENVIRONMEN. AL FILING FEE CASH RECEIPT
DFG 753.5a (6-91)

63111

Lead Agency: City of Los Angeles Dept of City Planning Date: 7-22-97
County/State Agency of Filing: County of Los Angeles Document No.:
Project Title: Sunshine Canyon Landfill Sear 91-0377-ZC/GPA
Project Applicant Name: Hadar Plaskin Phone Number: 213/5805554
Project Applicant Address: 221 N. Figueroa St. Rm 1500 Los Angeles, Ca 90012
Project Applicant *(check appropriate box)*: Local Public Agency ☒ School District ☐ Other Special District ☐
State Agency ☐ Private Entity ☐

CHECK APPLICABLE FEES:

( )	Environmental Impact Report	$850.00	$
( )	Negative Declaration	$1,250.00	$
( )	Application Fee Water Diversion *(State Water Resources Control Board Only)*	$850.00	$
( )	Projects Subject to Certified Regulatory Programs	$850.00	$
(✓)	County Administrative Fee	$25.00	$ 25.00
( )	Project that is exempt from fees		
	TOTAL RECEIVED		$ 25.00

Signature and title of person receiving payment: Deorpa Coleman

FIRST COPY-PROJECT APPLICANT SECOND COPY-DFG/FASB THIRD COPY-LEAD AGENCY FOURTH COPY-COUNTY/STATE AGENCY OF FILING

STATE OF CALIFORNIA-THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME
ENVIRONMENTAL FILING FEE CASH RECEIPT
DFG 753.5a (6-91)

63111

Lead Agency: City of Los Angeles Dept of City Planning Date: 7-22-97
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State Agency ☐ Private Entity ☐

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FIRST COPY-PROJECT APPLICANT SECOND COPY-DFG/FASB THIRD COPY-LEAD AGENCY FOURTH COPY-COUNTY/STATE AGENCY OF FILING

COUNTY OF LOS ANGELES
REGISTRAR-RECORDER/
COUNTY CLERK

07/22/97 2:59PM
002#0021 3
L.A.COUNTY

#0000000097763111
COUNTY FEE $25.00

**TOTAL $25.00
CHECK $25.00
CHANGE $0.00

APPENDIX A4

Notice of Completion and Availability
Proofs of Publication

PROOF OF PUBLICATION
(2015.5 C.C.P.)

This space is for the County Clerk's Filing Stamp

REC'D AUG 0 6 1997

STATE OF CALIFORNIA,
County of Los Angeles,

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above-entitled matter. I am the principal clerk of the printer of the

Daily News

a newspaper of general circulation, printed and published 7 times weekly in the Cities of Los Angeles, Burbank & San Fernando, County of Los Angeles, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Los Angeles, State of California, under the date of May 26, 1983, Case Number Adjudication #C349217; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

July 24, 26, 27, Aug. 2, 3

all in the year 19 97

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Woodland Hills,

California, this 3 day of Aug., 1997

Karen Keep
Signature

DN - 2510

Proof of Publication of

City of Los Angeles Dept of City Planning

Paste Clipping

(DAILY NEWS)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section

Date: July 25, 1997

NOTICE OF COMPLETION
AND AVAILABILITY OF DRAFT SUBSEQUENT
ENVIRONMENTAL IMPACT
REPORT NO. 91-0377-ZC/ GPA
SITE LOCATION: 14747 San Fernando Road, Sylmar, CA 91342

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221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

Contact Person:
Hadar Plafkin (213) 580-5554

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CON HOWE, Director of Planning

for Hadar Plafkin, City Planner

Publish July 24, 26, 27; August 2, 3, 1997

PROOF OF PUBLICATION
(2015.5 C.C.P.)

STATE OF CALIFORNIA
COUNTY OF LOS ANGELES

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above-entitled matter. I am the principal clerk of the printer of the

The Signal and Saugus Enterprise

a newspaper of general circulation, printed and published Daily in the City of Santa Clarita, County of Los Angeles, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Los Angeles, State of California, under the date of March 25, 19 97. Case Number: N.V.C. 15880; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

7/24, 7/26, 7/27, 8/2, 8/3

all in the year 19 97

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Santa Clarita, California, this 3 day of August, 19 97

Alicia Pantoja

Signature

Free copies of this blank form may be secured from

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NOTICE OF COMPLETION AND AVAILABILITY OF DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT NO. 91-0377-ZC/GPAS
SITE LOCATION: 14747 San Fernando Road, Sylmar, CA 91342

A development project has been proposed for this site, for which the captioned draft subsequent environmental impact report has been prepared. The project is described as: Consisting of the development, operation, maintenance, and monitoring of a Class III, nonhazardous solid waste landfill (herein, City/County Landfill or proposed project.) A portion of the proposed City/Council Landfill footprint is located on +/- 194 acres within the City portion of Sunshine Canyon and provides an estimated net airspace disposal capacity of 65 million tons within the City.

Initially the City and County landfill areas would be operated separately and provide an average daily capacity of 5,000 tons per day (tpd) in the City and 6,000 tpd in the County. However, within 18 to 24 months following the commencement of landfilling operations in the City, the City and County landfilling operations would be subsequently combined into a single landfill operation and at one working face area. This would allow for an average waste intake rate of 11,000 tpd. The combined development of land within both jurisdictions would result in one landfill footprint being constructed in Sunshine Canyon. The landfill footprint configuration would ultimately encompass +/- 451 acres.

Anticipated significant effects on the environment are: Earth Resources, Air Quality, Surface and Groundwater, Biological Resources, Noise, Light and Glare, Land Use, Natural Resources, Risk of Upset, Population, Housing, Right-of-Way and Access, Transportation and Circulation, Public Services, Energy Conservation, Utilities, Safety, Aesthetics/View and Cultural Resources.

If you wish to review a copy of the draft subsequent environmental impact report (EIR) or the documents referenced in the DEIR, you may do so at 221 N. Figueroa Street, Room 1500, Los Angeles. Copies of the DEIR are also at the following locations:

Planning Department Branch Office: Valley 6255 Van Nuys Blvd., Van Nuys, CA 91401

Library Branches:
Canoga Park Branch, 7250 Owensmouth Ave., Canoga Park, CA 91303-1529
Chatsworth Branch, 21052 Devonshire St., Chatsworth, CA 91311-2314
Granada Hills Branch, 10640 Petit Ave., Granada Hills, CA 91344-6452
Central Library, 630 W. Fifth St., Los Angeles, CA 90071
Mid Valley Regional Branch & Bookmobile Headquarters, 16244 Nordhoff St., North Hills, CA 91343-3609
Northridge Branch, 9051 Darby Ave., Northridge, CA 91325-2743
Porter Ranch Branch, 11371 Tampa Ave., Porter Ranch, CA 91326-1729
Sylmar Branch, 13059 Glen Oaks Blvd., Sylmar, CA 91342
Encino-Tarzana Branch, 18231 Ventura Blvd., Tarzana, CA 91356-3630
Valencia Branch, 23743 W. Valencia Blvd., Valencia, CA 91355
Woodland Hills Branch, 22200 Ventura Blvd., Woodland Hills, CA 91364-1599
Platt Branch, 23600 Victory Blvd., Woodland Hills, CA 91343
Culver City Library, 4975 Overland Ave., Culver City, CA 90230
San Fernando Library, 1050 Library St., San Fernando, CA 91340

If you wish to submit comments following review of the Draft EIR, please reference the file number on first page, and submit them in writing by October 31, 1997.

Send Comments to: Los Angeles City Planning Department
Environmental Review Section
221. N. Figueroa Street, Room 1500, Los Angeles, CA 90012
Contact Person: Hadar Plafkin, 213-580-5554

If a public hearing is required for the approval action on the underlying project (i.e. subdivision, zone change, conditional use, variance,etc..) a separate hearing notice will be mailed to you at a later date for such purpose.

CON HOWE
Directory of Planning

for Hadar Plafkin
City Planner
Publish in The Signal and Saugus Enterprise on July 24, 26, 27 and August 2 and 3, 1997

7/24/97

CITY OF LOS ANGELES
ENVIRONMENTAL NOTICES

Notice is hereby given to the general public of the availability for public review and comment on the following environmental documents. Please call the telephone number listed in each particular item for information regarding the location where the document is available for the review and where written comments must be addressed. CD indicates the City Council District.

NEGATIVE DECLARATIONS
PUBLICATION OF ENVIRONMENTAL NOTICES

AD 226-97: Sobelair proposes to provide service at Los Angeles International Airport (LAX) using FAA Part 36 Stage III noise compliant B767-300 ER series aircraft. The proposed project includes 0.86 average daily passenger operations when LAX reaches 65 million annual passengers (MAP). For information, contact Los Angeles World Airports at (310) 646-3853.

AD 229-97: Aeroflot proposes to provide service at Los Angeles International Airport (LAX) using FAA Part 36 Stage III noise compliant IL96-300 series aircraft. The proposed project includes 0.6 average daily passenger operations when LAX reaches 65 million annual passengers (MAP). For information, contact Los Angeles World Airports at (310) 646-3853.

MND 241-97-PL: Zone Variance for a one-story 4 unit 3,249 square-foot auto mall with a 3,190 square-foot canopy in the R1-1 zone. Conditional Use and Commercial Corner Review for auto service station and for a 2,465 square-foot mini-market with sale of beer and wine for off-site consumption in the C2 zone, on a vacant ±30,000 square-foot (0.7 acre) lot with 10 parking spaces for the mini-market and 10 additional spaces for the auto mall. The two zones on the total project are [Q]C2-1 and R1-1. 8300 Bardwell Avenue and adjacent lots between Roscoe Boulevard and Ventura Canyon Avenue; Mission Hills - Panorama City - Sepulveda. C.D. #2. Reference No. 97-0152. (213) 580-5547. Review Period Ends: August 13, 1997. Documents are available for REVIEW at: 221 N. Figueroa Street, 15th Floor, Los Angeles, CA 90012.

MND-242-97-PL: Zone Change from [Q]C2-1 to [T][Q]M-1 for an existing truck and axle repair with two-stories and 8,790 square-feet of floor space (7,200 square-foot shop and 1,590 square-foot office) on a 33,541 square-foot (0.77 acre) lot with 22 parking spaces in the [Q]C2-1 zone. Hours of operation are 6:00 a.m. to 7:00 p.m. Monday through Saturday. 9211-9227 San Fernando Road between Wicks Street and Allegheny Street; Sun Valley. C.D #7. Reference No. 97-0154. (213) 580-5547. Review Period Ends: August 13, 1997. Documents are available for REVIEW at: 221 N. Figueroa Street, 15th Floor, Los Angeles, CA 90012.

MND-243-97-PL: Conditional Use to add a drive-through with a 40 square-foot order booth to an existing 2,572 square-foot McDonalds restaurant and a Zone Variance to encroach in the P-1VL zone as well as to relocate an existing 50-foot pole sign from C2-1VL to P-1VL on a 22,500 square-foot (0.517 acre) lot in the C2-1VL and P-1VL zones with 26 parking spaces. Hours of operation are 5:00 a.m. to 1:00 a.m. daily. 11840 Balboa Boulevard between Lorillard Street and Midwood Drive; Granada Hills - Knollwood C.D. #12. Reference No. 97-0208. (213) 580-5547. Review Period Ends: August 13, 1997. Documents are available for REVIEW at: 221 N. Figueroa Street, 15th Floor, Los Angeles, CA 90012.

MND-244-97-PL: Conditional Use to convert an existing, vacated two-story over basement 55,149 square-foot facility to a correctional facility for temporary housing of minor offenders for up to 90 days while undergoing work and educational training. There will be 108 units on a 24,135 square-foot (0.55 acre) lot with 50 parking spaces in the C2-2 zone. Hours of operation are 24 hours daily. 2307 West 6th Street between Park View Street and Grand View Street; Westlake. C.D. #1. Reference No. 97-0209. (213) 580-5547. Review Period Ends: August 13, 1997. Documents are available for REVIEW at: 221 N. Figueroa Street, 15th Floor, Los Angeles, CA 90012.

MND-245-97-PL: Conditional Use Permit for a Commercial Corner Review to permit the construction of an automobile service station with a mini-market to operate 24 hours a day, seven days a week, with less than 50% of the exterior walls having transparent windows and to allow an existing pole sign to remain on the lot. The existing service station and auto repair facility will be demolished and a new 2,929 square-foot mini-market will be built with 8 gasoline pumping stations and 9 parking spaces. 575 West Pacific Coast Highway; Wilmington-Harbor City. C.D. #15. Reference No. 97-0211. (213) 580-5547. Review Period Ends: August 13, 1997. Documents are available for REVIEW at: 221 N. Figueroa Street, 15th Floor, Los Angeles, CA 90012.

MND-246-97-PL: Conditional Use, Commercial Corner Review and Site Plan Review to demolish a 1,987 square-foot building and replace it with a new 3,220 square-foot building with (1) 3 car wash bays (2) 3 tandem smog check/auto repair bays, and (3) a snack shop, on a 12,940 square-foot (0.3 acre) lot with 14 parking spaces in the C4-1XL zone. Zone Variance to allow the newly constructed facility in the C4 zone. Yard Variance for (1) 0-foot landscape area on Melrose Avenue (2) cut corner in lieu of 5-foot landscape width required (3) delete the requirement for on-site trees on at least 50% parking area. Hours of operation are: (1) car wash: 24 hours daily (2) smog check: 7:00 a.m. to 7:00 p.m. daily (3) retail (snacks and coffee) 6:00 a.m. to 8:00 p.m. daily. 5925 Melrose Avenue between Cole Avenue and Cahuenga Avenue; Hollywood. C.D. #4. Reference No. 97-0219. (213) 580-5547. Review Period Ends: August 13, 1997. Documents are available for REVIEW at: 221 N. Figueroa Street, 15th Floor, Los Angeles, CA 90012.

DRAFT EIRs

It has been determined that the following proposed projects have a significant effect on the environment and draft Environmental Impact Reports (EIRs) have been prepared.

EIR No. 91-0377-ZC/GPA. A draft subsequent environmental impact report (EIR) has been prepared for the following project.

Project Description: Consisting of the development, operation, maintenance, and monitoring of a Class III, nonhazardous solid waste landfill (herein, City/County Landfill on proposed project). A portion of the proposed City/County Landfill footprint is located on ±194 acres within the City portion of Sunshine Canyon and provides an estimated net airspace disposal capacity of 55 million tons within the City.

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Project Location: 14747 San Fernando Road, Sylmar

Significant Effects: Earth Resources, Air Quality, Surface and Groundwater, Biological Resources, Noise, Light and Glare, Land Use, Natural Resources, Risk of Upset, Population, Housing, Right-of-Way and Access, Transportation and Circulation, Public Services, Energy Conservation, Utilities, Safety, Aesthetics/View and Cultural Resources.

Council District No.: 12

Please submit any comments on the draft EIR, in writing and reference the EIR file number above, by Oct. 31, 1997 to Hadar Plafkin, City Planning Department, 221 N. Figueroa Street, Room 1500, Los Angeles, CA 90012. Copies of the documents referenced in the draft EIR, and the draft EIR, are available for review in the City Planning Department. Copies of the draft EIR are also available at the following branch libraries:

Canoga Park Branch, 7260 Owensmouth Ave., Canoga Park, CA 91303-1529
Chatsworth Branch, 21052 Devonshire St., Chatsworth, CA 91311-2314
Granada Hills Branch, 10640 Petit Ave., Granada Hills, CA 91344-6452
Central Library, 630 W. Fifth St., Los Angeles, CA 90071
Mid-Valley Regional Branch & Bookmobile Headquarters, 16244 Nordhoff St., North Hills, CA 91343-3806
Northridge Branch, 9051 Darby Ave., Northridge, CA 91325-2743
Porter Ranch Branch, 11371 Tampa Ave., Porter Ranch, CA 91326-1729
Sylmar Branch, 13059 Glen Oaks Blvd., Sylmar, CA 91342
Encino-Tarzana Branch, 18231 Ventura Blvd., Tarzana, CA 91356-3630
Valencia Branch, 23743 W. Valencia Blvd., Tarzana, CA 91355
Woodland Hills Branch, 22200 Ventura Blvd., Woodland Hills, CA 91364-1599
Platt Branch, 23600 Victory Blvd., Woodland Hills, CA 91343
Culver City Library, 4975 Overland Ave., Culver City, CA 90230
San Fernando Library, 1050 Library St., San Fernando, CA 91340

If a public hearing is required for the proposed project, a separate notice will be given at a later date.

NOTICE OF COMPLETION AND AVAILABILITY/ DRAFT SEIR DISTRIBUTION LISTS

APPENDIX B1

Property Owners/Occupants within a 2-Mile Radius

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2501

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15533 Roxford St.
San Fernando CA 91342

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15375 Cobalt St.
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15392 Cobalt St.
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15420 Cobalt St.
San Fernando CA 91342

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Occupant
12910 San Fernando Rd.
San Fernando CA 91342

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Occupant
12950 San Fernando Rd.
San Fernando CA 91342

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Occupant
13000 San Fernando Rd. #1
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13000 San Fernando Rd. #2
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13000 San Fernando Rd. #14
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13010 San Fernando Rd. #1
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13026 San Fernando Rd.
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13038 San Fernando Rd.
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13040 San Fernando Rd.
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Occupant
15191 Bledsoe St.
San Fernando CA 91342

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Occupant
15195 Bledsoe St.
San Fernando CA 91342

2501
Occupant
13262 Bradley Ave
San Fernando CA 91342

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Occupant
13262½ Bradley Ave
San Fernando CA 91342

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13266 Bradley Ave
San Fernando CA 91342

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Occupant
13266½ Bradley Ave
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13272 Bradley Ave
San Fernando CA 91342

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13272½ Bradley Ave
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13290 Bradley Ave
San Fernando CA 91342

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15401 Roxford St.
San Fernando CA 91342

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15409 Roxford St.
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15443 Roxford St.
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15445 Roxford St.
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Occupant
15447 Roxford St.
San Fernando CA 91342

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Occupant
13696 De Garmo Ave
San Fernando CA 91342

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Occupant
13755 Glenoaks Bl.
San Fernando CA 91342

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Occupant
13811 Glenoaks Bl. # 101
San Fernando CA 91342

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13811 Glenoaks Bl. # 102
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13561 Glenoaks Bl.
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13563 Glenoaks Bl.
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13571 Glenoaks Bl.
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13573 Glenoaks Bl.
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13575 Glenoaks Bl.
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15225 Roxford St.
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15231 Roxford St.
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15239 Roxford St.
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15241 Roxford St.
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15251 Roxford St.
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Occupant
15506 Dorian St.
San Fernando CA 91342

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Occupant
15516 Dorian St.
San Fernando CA 91342

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Occupant
15411 Monte St.
San Fernando CA 91342

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Occupant
15411 Monte St. # B
San Fernando CA 91342

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Occupant
15433 Monte St.
San Fernando CA 91342

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Occupant
15434 Monte St.
San Fernando CA 91342

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Occupant
15445 Monte St.
San Fernando CA 91342

2501
Occupant
15405 Kadota St.
San Fernando CA 91342

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2502

2502
Occupant
13738 Glenoaks Blvd
San Fernando, CA 91342

2502
Occupant
13776 Glenoaks Blvd
San Fernando, CA 91342

2502
Occupant
15314 Foothill Blvvd
San Fernando, CA 91342

2502
Occupant
15332 Foothill Blvvd
San Fernando, CA 91342

2502
Occupant
15250 Foothill Blvvd
San Fernando, CA 91342

2502
Occupant
15236 Foothill Blvvd
San Fernando, CA 91342

2502
Occupant
15236½ Foothill Blvvd
San Fernando, CA 91342

2502
Occupant
15240 Foothill Blvvd
San Fernando, CA 91342

2502
Occupant
15240½ Foothill Blvvd
San Fernando, CA 91342

2502
Occupant
15250 Foothill Blvvd
San Fernando, CA 91342

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2581

2581
Occupant
22117 Sierra Hwy
San Fernando CA 91342

2581
Occupant
22127 Sierra Hwy
San Fernando CA 91342

2581
Occupant
22122 Sierra Hwy
San Fernando CA 91342

2581
Occupant
22124 Sierra Hwy
San Fernando CA 91342

2581
Occupant
22124½ Sierra Hwy
San Fernando CA 91342

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2582

2582
Occupant
14000 Saddle Ridle Rd.
San Fernando CA 91342

2582
Occupant
13976 Saddle Ridge Rd.
San Fernando CA 91342

2582
Occupant
15872 Yarnell St.
San Fernando CA 91342

2582
Occupant
16040 Circle Diamond Rd.
San Fernando CA 91342

2582
Occupant
16047 Circle Diamond Rd.
San Fernando CA 91342

2582
Occupant
15876 Yarnell St.
San Fernando CA 91342

2582
Attn: V. Harmon
% Clubhouse
15455 Glenoaks Bl.
San Fernando CA 91342

2582
Occupant
15455 Glenoaks Bl. #1
San Fernando CA 91342

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Occupant
15455 Glenoaks Bl. #2
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San Fernando CA 91342

2582
Occupant
15455 Glenoaks Bl. # 597
San Fernando CA 91342

2582
Occupant
15455 Glenoaks Bl. # 598
San Fernando CA 91342

2582
Occupant
15455 Glenoaks Bl. # 599
San Fernando CA 91342

2582
Occupant
15455 Glenoaks Bl. # 600
San Fernando CA 91342

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2601

2601
Occupant
14940 San Fernando Rd.
San Fernando CA 91342

2601
Occupant
14812 San Fernando Rd.
San Fernando CA 91342

2601
Occupant
13201 Balboa Blvd.
Granada Hills CA 91344

2601
Occupant
17080 Timber Ridge Dr.
Granada Hills CA 91344

2601
Occupant
13266 Mission Tierra Way
San Fernando CA 91344

2601
Occupant
13262 Mission Tierra Way
San Fernando CA 91344

2601
Occupant
14747 San Fernando Road
San Fernando CA 91344

2601
Occupant
16991 Timber Ridge Dr.
San Fernando CA 91344

2601
Occupant
17003 Timber Ridge Dr.
San Fernando CA 91344

2601
Occupant
13469 Mission Tierra Way
San Fernando CA 91344

2601
Occupant
13457 Mission Tierra Way
San Fernando CA 91344

2601
Occupant
17021 Timber Ridge Dr.
San Fernando CA 91344

2601
Occupant
13365 Meadow Wood Lane
Granada Hills CA 91344

2601
Occupant
13322 Meadow Wood Lane
Granada Hills CA 91344

2601
Occupant
13347 Mission Tierra Way
Granada Hills CA 91344

2601
Occupant
13237 Constable Ave.
San Fernando CA 91344

2601
Occupant
13308 Golden Valley Lane
San Fernando CA 91344

2601
Occupant
13356 Golden Valley Lane
San Fernando CA 91344

2601
Occupant
13379 Golden Valley Lane
San Fernando CA 91344

2601
Occupant
13309 Golden Valley Lane
San Fernando CA 91344

2601
Occupant
17319 Bronte Pl.
San Fernando CA 91344

2601
Occupant
17327 Bronte Pl.
San Fernando CA 91344

2601
Occupant
17418 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17446 Doric St.
San Fernando CA 91344

2601
Occupant
17442 Doric St.
San Fernando CA 91344

2601
Occupant
17430 Doric St.
San Fernando CA 91344

2601
Occupant
17421 Doric St.
San Fernando CA 91344

2601
Occupant
17447 Doric St.
San Fernando CA 91344

2601
Occupant
17455 Doric St.
San Fernando CA 91344

2601
Occupant
13047 Garris Ave.
San Fernando CA 91344

2601
Occupant
13009 Garris Ave.
San Fernando CA 91344

2601
Occupant
13028 Jolette Ave.
San Fernando CA 91344

2601
Occupant
13043 Jolette Ave.
San Fernando CA 91344

2601
Occupant
12949 Jolette Ave.
San Fernando CA 91344

2601
Occupant
12919 Jolette Ave.
San Fernando CA 91344

2601
Occupant
18061 Mayerling St.
San Fernando CA 91344

2601
Occupant
17900 Bull Canyon Rd.
San Fernando CA 91344

2601
Occupant
18031 Mayerling St.
San Fernando CA 91344

2601
Occupant
12211 Highwater Rd.
San Fernando CA 91344

2601
Occupant
12201 Highwater Rd.
San Fernando CA 91344

2601
Occupant
17545 Regency Way
San Fernando CA 91344

2601
Occupant
12001 Highwater Rd.
San Fernando CA 91344

2601
Occupant
11993 Shoshone Ave.
San Fernando CA 91344

2601
Occupant
17981 Mayerling St.
San Fernando CA 91344

2601
Occupant
12005 Zelzah Ave.
San Fernando CA 91344

2601
Occupant
11909 Zelzah Ave.
San Fernando CA 91344

2601
Occupant
11582 Longacre Ave.
San Fernando CA 91344

2601
Occupant
12001 Zelzah Ave.
San Fernando CA 91344

2601
Occupant
17608 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17640 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17640 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17627 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17536 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17548 Doric St.
San Fernando CA 91344

2601
Occupant
17555 Doric St.
San Fernando CA 91344

2601
Occupant
17492 Doric St.
San Fernando CA 91344

2601
Occupant
17495 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17477 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17472 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17484 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17635 Orna Dr.
San Fernando CA 91344

2601
Occupant
17647 Orna Dr.
San Fernando CA 91344

2601
Occupant
12511 Marva Ave.
San Fernando CA 91344

2601
Occupant
17704 Arvida Dr.
San Fernando CA 91344

2601
Occupant
12518 Marva Ave.
San Fernando CA 91344

2601
Occupant
17817 Candia Court
Granada Hills CA 91344

2601
Occupant
12466 Jessica Pl.
Granada Hills CA 91344

2601
Occupant
12460 Jessica Pl.
Granada Hills CA 91344

2601
Occupant
12450 Jacqueline Pl.
Granada Hills CA 91344

2601
Occupant
11970 Shoshone Ave.
San Fernando CA 91344

2601
Occupant
11950 Shoshone Ave.
San Fernando CA 91344

2601
Occupant
11968 Nugent Dr.
San Fernando CA 91344

2601
Occupant
17935 Lone Oak Dr.
San Fernando CA 91344

2601
Occupant
17669 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17815 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17823 Tuscan Dr.
San Fernando CA 91344

2601
Occupant
17818 Oakrock Court
San Fernando CA 91344

2601
Occupant
17665 Bryan Pl.
San Fernando CA 91344

2601
Occupant
17633 Bryan Pl.
San Fernando CA 91344

2601
Occupant
17615 Mahoney Pl.
Granada Hills CA 91344

2601
Occupant
11917 Rexbon Rd.
Granada Hills CA 91344

2601
Occupant
17940 Montague Court
Granada Hills CA 91344

2601
Occupant
17934 Montague Court
Granada Hills CA 91344

2601
Occupant
17492 Montague Court
Granada Hills CA 91344

2601
Occupant
12645 Classics Dr.
Granada Hills CA 91344

2601
Occupant
12663 Classics Dr.
Granada Hills CA 91344

2601
Occupant
17801 Mayerling St.
Granada Hills CA 91344

2601
Occupant
17811 Mayerling St.
Granada Hills CA 91344

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Occupant
17995 Mayerling St.
Granada Hills CA 91344

2601
Occupant
17993 Mayerling St.
Granada Hills CA 91344

2601
Occupant
14747 San Fernando Rd.
San Fernando CA 91342

2601
Occupant
14748 San Fernando Rd.
San Fernando CA 91342

2601
Occupant
14814 San Fernando Rd. #1
San Fernando CA 91342

2601
Occupant
14814 San Fernando Rd. #2
San Fernando CA 91342

2601
Occupant
14814 San Fernando Rd. #3
San Fernando CA 91342

2601
Occupant
14814 San Fernando Rd. #4
San Fernando CA 91342

2601
Occupant
14814 San Fernando Rd. #5
San Fernando CA 91342

2601
Occupant
14840 San Fernando Rd.
San Fernando CA 91342

2601
Occupant
14928 San Fernando Rd.
San Fernando CA 91342

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Occupant
14950 San Fernando Rd.
San Fernando CA 91342

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Occupant
14980 San Fernando Rd.
San Fernando CA 91342

2601
Occupant
15022 San Fernando Rd.
San Fernando CA 91342

2601
Occupant
13201 Balboa Blvd
San Fernando CA 91344

2601
Occupant
17233 Sesnon Blvd
San Fernando CA 91344

2601
Occupant
13050 Garris Ave
San Fernando CA 91344

2601
Occupant
13079 Meadowlark Ave
San Fernando CA 91344

2601
Occupant
17346 Wentzel Wy
San Fernando CA 91344

2601
Occupant
17600 Orna Dr.
San Fernando CA 91344

2601
Occupant
11987 Shoshone Ave
San Fernando CA 91344

2601
Occupant
11993 Shoshone Ave
San Fernando CA 91344

2601
Occupant
12001 Shoshone Ave
San Fernando CA 91344

2601
Occupant
12001 Highwater Rd.
San Fernando CA 91344

2601
Occupant
12005 Highwater Rd.
San Fernando CA 91344

2601
Occupant
12006 Highwater Rd.
San Fernando CA 91344

2601
Occupant
12211 Highwater Rd.
San Fernando CA 91344

2601
Occupant
17651 Bull Cyn Rd
San Fernando CA 91344

2601
Occupant
17900 Bull Cyn Rd
San Fernando CA 91344

2601
Occupant
18000 Bull Cyn Rd
San Fernando CA 91344

2601
Occupant
18061 Bull Cyn Rd
San Fernando CA 91344

2601
Occupant
12001 Zelzah Ave
San Fernando CA 91344

2601
Occupant
12005 Zelzah Ave
San Fernando CA 91344

2601
Occupant
12007 Zelzah Ave
San Fernando CA 91344

2601
Occupant
12237 Zelzah Ave
San Fernando CA 91344

2601
Occupant
12301 Zelzah Ave
San Fernando CA 91344

2601
Occupant
12100 Longacre Ave
San Fernando CA 91344

2601
Occupant
12212 Longacre Ave
San Fernando CA 91344

2601
Occupant
12611 Classics Dr.
San Fernando CA 91344

2601
Occupant
17911 Montague Ct.
San Fernando CA 91344

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2602

2602
Occupant
13210 Constable Ave
San Fernando CA 91344

2602
Occupant
13146 Constable Ave
San Fernando CA 91344

2602
Occupant
13154 Constable Ave
San Fernando CA 91344

2602
Occupant
13167 Constable Ave
San Fernando CA 91344

2602
Occupant
13171 Constable Ave
San Fernando CA 91344

2602
Occupant
13213 Constable Ave
San Fernando CA 91344

2602
Occupant
13217 Constable Ave
San Fernando CA 91344

2602
Occupant
17228 Sesnon Blvd
San Fernando CA 91344

2602
Occupant
17164 Sesnon Blvd
San Fernando CA 91344

2602
Occupant
17138 Sesnon Blvd
San Fernando CA 91344

2602
Occupant
13181 Courbet Lane
San Fernando CA 91344

2602
Occupant
17211 Courbet Street
San Fernando CA 91344

2602
Occupant
13114 Courbet Lane
San Fernando CA 91344

2602
Occupant
13207 Whistler Ave
San Fernando CA 91344

2602
Occupant
17022 Orozco Street
San Fernando CA 91344

2602
Occupant
17211 Orozco Street
San Fernando CA 91344

2602
Occupant
17229 Orozco Street
San Fernando CA 91344

2602
Occupant
17220 Courbet Street
San Fernando CA 91344

2602
Occupant
12900 Barto Drive
San Fernando CA 91344

2602
Occupant
12818 Meadowlark Ave
San Fernando CA 91344

2602
Occupant
12910 Meadowlark Ave
San Fernando CA 91344

2602
Occupant
17356 Boswell Place
San Fernando CA 91344

2602
Occupant
17345 Tennyson Place
San Fernando CA 91344

2602
Occupant
17360 Tennyson Place
San Fernando CA 91344

2602
Occupant
17318 Tennyson Place
San Fernando CA 91344

2602
Occupant
17246 Tennyson Place
San Fernando CA 91344

2602
Occupant
12792 Jolette Ave
San Fernando CA 91344

2602
Occupant
12792 Jolette Ave
San Fernando CA 91344

2602
Occupant
12931 Titian Ave
San Fernando CA 91344

2602
Occupant
12861 Titian Ave
San Fernando CA 91344

2602
Occupant
12840 Winthrop Ave
San Fernando CA 91344

2602
Occupant
12922 Winthrop Ave
San Fernando CA 91344

2602
Occupant
17127 Van Gogh Street
San Fernando CA 91344

2602
Occupant
17142 Lisette Street
San Fernando CA 91344

2602
Occupant
17112 Lisette Street
San Fernando CA 91344

2602
Occupant
17065 Nanette Street
San Fernando CA 91344

2602
Occupant
12645 Darla Ave
San Fernando CA 91344

2602
Occupant
12663 Darla Ave
San Fernando CA 91344

2602
Occupant
12649 Jimeno Ave
San Fernando CA 91344

2602
Occupant
12737 Jimeno Ave
San Fernando CA 91344

2602
Occupant
17040 Nanette Street
San Fernando CA 91344

2602
Occupant
12607 Darla Ave
San Fernando CA 91344

2602
Occupant
12838 Jimeno Ave
San Fernando CA 91344

2602
Occupant
12716 Jimeno Ave
San Fernando CA 91344

2602
Occupant
12620 Jimeno Ave
San Fernando CA 91344

2602
Occupant
12654 Jimeno Ave
San Fernando CA 91344

2602
Occupant
17074 Goya Street
San Fernando CA 91344

2602
Occupant
17068 Goya Street
San Fernando CA 91344

2602
Occupant
17016 Goya Street
San Fernando CA 91344

2602
Occupant
17054 Tennyson Place
San Fernando CA 91344

2602
Occupant
17022 Tennyson Place
San Fernando CA 91344

2602
Occupant
17049 Tennyson Place
San Fernando CA 91344

2602
Occupant
17228 Sesnon Blvd
San Fernando CA 91344

2602
Occupant
17160 Van Gogh Street
San Fernando CA 91344

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2603

2603
Occupant
16301 Foothill Blvd.
San Fernando CA 91342

2603
Occupant
16027 Yarnell St.
San Fernando CA 91342

2603
Occupant
16035 Yarnell St.
San Fernando CA 91342

2603
Occupant
16151 Yarnell St.
San Fernando CA 91342

2603
Occupant
16271 Filbert St.
San Fernando CA 91342

2603
Occupant
15911 Foothill Blvd.
San Fernando CA 91342

2603
Occupant
15853 Foothill Blvd.
San Fernando CA 91342

2603
Occupant
15831 Foothill Blvd.
San Fernando CA 91342

2603
Occupant
15745 Foothill Blvd.
San Fernando CA 91342

2603
Occupant
15729 Foothill Blvd.
San Fernando CA 91342

2603
Occupant
15818 Joseph Court
San Fernando CA 91342

2603
Occupant
15960 Yarnell St.
San Fernando CA 91342

2603
Occupant
13761 Herrick Ave.
San Fernando CA 91342

2603
Occupant
13711 Herrick Ave.
San Fernando CA 91342

2603
Occupant
13655 Woodcock Ave.
San Fernando CA 91342

2603
Occupant
15575 Excelsior St.
San Fernando CA 91342

2603
Occupant
13727 Bradley Ave.
San Fernando CA 91342

2603
Occupant
13450 Pala Ave.
San Fernando CA 91342

2603
Occupant
13423 Pala Ave.
Sylmar CA 91342

2603
Occupant
15785 Excelsior St.
San Fernando CA 91342

2603
Occupant
15866 Mc Queen St.
San Fernando CA 91342

2603
Occupant
13831 Herrick Ave.
San Fernando CA 91342

2603
Occupant
13460 Bradley Ave.
San Fernando CA 91342

2603
Occupant
13450 Bradley Ave.
San Fernando CA 91342

2603
Occupant
15693 Olden St.
San Fernando CA 91342

2603
Occupant
15744 Sorbonne St.
San Fernando CA 91342

2603
Occupant
13654 Norris Ave.
San Fernando CA 91342

2603
Occupant
13766 Herrick Ave.
San Fernando CA 91342

2603
Occupant
15553 Sorbonne St.
San Fernando CA 91342

2603
Occupant
13784 Herrick Ave.
San Fernando CA 91342

2603
Occupant
13731 De Foe Ave.
San Fernando CA 91342

2603
Occupant
13737 De Foe Ave.
San Fernando CA 91342

2603
Occupant
13791 De Foe Ave.
San Fernando CA 91342

2603
Occupant
13797 De Garmo Ave.
San Fernando CA 91342

2603
Occupant
13796 De Garmo Ave.
San Fernando CA 91342

2603
Occupant
14015 Bridle Ridge Rd.
San Fernando CA 91342

2603
Occupant
14038 Bridle Ridge Rd.
San Fernando CA 91342

2603
Occupant
16028 Spur Ridge Rd.
San Fernando CA 91342

2603
Occupant
16045 Spur Ridge Rd.
San Fernando CA 91342

2603
Occupant
15963 Yarnell St.
San Fernando CA 91342

2603
Occupant
15965 Yarnell St.
San Fernando CA 91342

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Occupant
15967 Yarnell St.
San Fernando CA 91342

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15969 Yarnell St.
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15971 Yarnell St.
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15973 Yarnell St.
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15975 Yarnell St.
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15983 Yarnell St.
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15985 Yarnell St.
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15987 Yarnell St.
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15989 Yarnell St.
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Occupant
16035 Yarnell St.
San Fernando CA 91342

2603
Occupant
16051 Yarnell St.
San Fernando CA 91342

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Occupant
16059 Yarnell St.
San Fernando CA 91342

2603
Occupant
16151 Yarnell St.
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 1A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 2A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 3A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 4A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 5A
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 6A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 7A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 8A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 9A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 10A
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 11A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 12A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 13A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 14A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 15A
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 16A
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 17A
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 18A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 19A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 21A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 23A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 25A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 27A
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 1B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 2B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 3B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 4B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 5B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 6B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 7B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 8B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 9B
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 10B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 11B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 12B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 13B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 14B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 16B
San Fernando CA 91342

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Occupant
16079 Yarnell St. # 18B
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 20B
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 22B
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 1C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 2C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 3C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 4C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 5C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 6C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 7C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 8C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 9C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 10C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 11C
San Fernando CA 91342

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Occupant
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San Fernando CA 91342

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Occupant
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San Fernando CA 91342

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Occupant
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San Fernando CA 91342

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San Fernando CA 91342

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Occupant
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San Fernando CA 91342

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San Fernando CA 91342

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Occupant
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San Fernando CA 91342

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San Fernando CA 91342

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San Fernando CA 91342

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Occupant
16079 Yarnell St. # 22C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 23C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 24C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 25C
San Fernando CA 91342

2603
Occupant
16079 Yarnell St. # 26C
San Fernando CA 91342

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16079 Yarnell St. # 27C
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San Fernando CA 91342

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OF

OCCUPANT LIST

SUNSHINE CYN - #2604

2604
Occupant
13213 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
15743 Kadota St.
San Fernando CA 91342

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15759 Kadota St.
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13207 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13175 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13177 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13183 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
15745 Kadota St.
San Fernando CA 91342

2604
Occupant
15721 Roxford St.
San Fernando CA 91342

2604
Occupant
15700 Roxford St.
San Fernando CA 91342

2604
Occupant
15675 Roxford St.
San Fernando CA 91342

2604
Occupant
15677 Roxford St.
San Fernando CA 91342

2604
Occupant
15679 Roxford St.
San Fernando CA 91342

2604
Occupant
15681 Roxford St.
San Fernando CA 91342

2604
Occupant
15683 Roxford St.
San Fernando CA 91342

2604
Occupant
13141 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13143 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13145 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13147 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13127 San Fernando Rd. # 101
San Fernando CA 91342

2604
Occupant
13127 San Fernando Rd. # 102
San Fernando CA 91342

2604
Occupant
13127 San Fernando Rd. # 103
San Fernando CA 91342

2604
Occupant
13127 San Fernando Rd. # 104
San Fernando CA 91342

2604
Occupant
13127 San Fernando Rd. # 105
San Fernando CA 91342

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13127 San Fernando Rd. # 106
San Fernando CA 91342

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13127 San Fernando Rd. # 107
San Fernando CA 91342

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13127 San Fernando Rd. # 108
San Fernando CA 91342

2604
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13127 San Fernando Rd. # 109
San Fernando CA 91342

2604
Occupant
13101 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13103 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13105 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13113 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13117 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13051 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13055 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13059 San Fernando Rd. # A
San Fernando CA 91342

2604
Occupant
13059 San Fernando Rd. # B
San Fernando CA 91342

2604
Occupant
13073 San Fernando Rd. # 1
San Fernando CA 91342

2604
Occupant
13073 San Fernando Rd. # 2
San Fernando CA 91342

2604
Occupant
13073 San Fernando Rd. # 3
San Fernando CA 91342

2604
Occupant
13073 San Fernando Rd. # 4
San Fernando CA 91342

2604
Occupant
13073 San Fernando Rd. # 5
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 6
San Fernando CA 91342

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13073 San Fernando Rd. # 7
San Fernando CA 91342

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13073 San Fernando Rd. # 8
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 9
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 10
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 11
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 12
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 14
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 15
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 16
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 17
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 18
San Fernando CA 91342

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13073 San Fernando Rd. # 19
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 20
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 21
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 22
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 23
San Fernando CA 91342

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Occupant
13073 San Fernando Rd. # 24
San Fernando CA 91342

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13073 San Fernando Rd. # 25
San Fernando CA 91342

2604
Occupant
13073 San Fernando Rd. # 26
San Fernando CA 91342

2604
Occupant
13073 San Fernando Rd. # 27
San Fernando CA 91342

2604
Occupant
13077 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
13085 San Fernando Rd. # 1
San Fernando CA 91342

2604
Occupant
13085 San Fernando Rd. # 2
San Fernando CA 91342

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Occupant
13085 San Fernando Rd. # 3
San Fernando CA 91342

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Occupant
13085 San Fernando Rd. # 4
San Fernando CA 91342

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13085 San Fernando Rd. # 5
San Fernando CA 91342

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San Fernando CA 91342

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13085 San Fernando Rd. # 8
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13085 San Fernando Rd. #9
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13085 San Fernando Rd. #10
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13085 San Fernando Rd. #11
San Fernando CA 91342

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13085 San Fernando Rd. #12
San Fernando CA 91342

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Occupant
13085 San Fernando Rd. #13
San Fernando CA 91342

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Occupant
13085 San Fernando Rd. #14
San Fernando CA 91342

2604
Occupant
13089 San Fernando Rd. #1
San Fernando CA 91342

2604
Occupant
13089 San Fernando Rd. #2
San Fernando CA 91342

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13089 San Fernando Rd. #3
San Fernando CA 91342

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Occupant
13089 San Fernando Rd. #4
San Fernando CA 91342

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13089 San Fernando Rd. #5
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13089 San Fernando Rd. #10
San Fernando CA 91342

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San Fernando CA 91342

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13087 San Fernando Rd. #12
San Fernando CA 91342

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San Fernando CA 91342

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San Fernando CA 91342

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San Fernando CA 91342

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13087 San Fernando Rd. #18
San Fernando CA 91342

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13087 San Fernando Rd. #19
San Fernando CA 91342

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13087 San Fernando Rd. #20
San Fernando CA 91342

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13095 San Fernando Rd.
San Fernando CA 91342

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13035 San Fernando Rd.
San Fernando CA 91342

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13025 San Fernando Rd. #1
San Fernando CA 91342

2604
Occupant
13025 San Fernando Rd. #2
San Fernando CA 91342

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13025 San Fernando Rd. #3
San Fernando CA 91342

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13025 San Fernando Rd. #4
San Fernando CA 91342

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13025 San Fernando Rd. #5
San Fernando CA 91342

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13025 San Fernando Rd. #6
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13025 San Fernando Rd. #7
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13025 San Fernando Rd. #8
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13025 San Fernando Rd. #9
San Fernando CA 91342

2604
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13025 San Fernando Rd. #10
San Fernando CA 91342

2604
Occupant
12961 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
12965 San Fernando Rd.
San Fernando CA 91342

2604
Occupant
15922 Roxford St.
San Fernando CA 91342

2604
Occupant
15922B Roxford St.
San Fernando CA 91342

2604
Occupant
15948 Roxford St.
San Fernando CA 91342

2604
Occupant
12860 Encinitas Ave.
San Fernando CA 91342

2604
Occupant
12881 Encinitas Ave.
San Fernando CA 91342

2604
Occupant
12861 Encinitas Ave.
San Fernando CA 91342

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12835 Encinitas Ave.
San Fernando CA 91342

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12775 Encinitas Ave.
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12725 Encinitas Ave.
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12701 Encinitas Ave.
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Occupant
12675 Encinitas Ave.
San Fernando CA 91342

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Occupant
12669 Encinitas Ave.
San Fernando CA 91342

2604
Occupant
12843 Telfair Ave.
San Fernando CA 91342

2604
Occupant
12861 Telfair Ave.
San Fernando CA 91342

2604
Occupant
12865 Telfair Ave.
San Fernando CA 91342

2604
Occupant
15800 Larkspur St.
San Fernando CA 91342

2604
Occupant
15804 Larkspur St.
San Fernando CA 91342

2604
Occupant
15661 Cobalt St.
San Fernando CA 91342

2604
Occupant
15661 ½ Cobalt St.
San Fernando CA 91342

2604
Occupant
15764 Cobalt St.
San Fernando CA 91342

2604
Occupant
15766 Cobalt St.
San Fernando CA 91342

2604
Occupant
15501 Cobalt St.
San Fernando CA 91342

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15503 Cobalt St.
San Fernando CA 91342

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15505 Cobalt St.
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15507 Cobalt St.
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15509 Cobalt St.
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15513 Cobalt St.
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15515 Cobalt St.
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15517 Cobalt St.
San Fernando CA 91342

2604
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15630 Larkspur St.
San Fernando CA 91342

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15632 Larkspur St.
San Fernando CA 91342

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Occupant
15638 Larkspur St.
San Fernando CA 91342

2604
Occupant
15640 Larkspur St.
San Fernando CA 91342

2604
Occupant
15455 El Cajon St.
San Fernando CA 91342

2604
Occupant
15457 El Cajon St.
San Fernando CA 91342

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Occupant
15459 El Cajon St.
San Fernando CA 91342

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Occupant
15463 El Cajon St.
San Fernando CA 91342

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Occupant
15465 El Cajon St.
San Fernando CA 91342

2604
Occupant
15477 El Cajon St.
San Fernando CA 91342

2604
Occupant
15477 ½ El Cajon St.
San Fernando CA 91342

2604
Occupant
15519 El Cajon St.
San Fernando CA 91342

2604
Occupant
15519 ½ El Cajon St.
San Fernando CA 91342

2604
Occupant
15522 El Cajon St.
San Fernando CA 91342

2604
Occupant
15522 ½ El Cajon St.
San Fernando CA 91342

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2605

2605
Occupant
12800 Woodley Ave.
San Fernando CA 91344

2605
Occupant
12816 Woodley Ave.
San Fernando CA 91344

2605
Occupant
12555 Middlecoff Pl.
San Fernando CA 91344

2605
Occupant
12546 Middlecoff Pl.
San Fernando CA 91344

2605
Occupant
16301 Knollwood Dr.
San Fernando CA 91344

2605
Occupant
16300 Knollwood Dr.
San Fernando CA 91344

2605
Occupant
12400 Woodley Ave.
San Fernando CA 91344

2605
Occupant
12258 Woodley Ave.
San Fernando CA 91344

2605
Occupant
12228 Woodley Ave.
San Fernando CA 91344

2605
Occupant
12118 Woodley Ave.
San Fernando CA 91344

2605
Occupant
16401 Shamhart Dr.
San Fernando CA 91344

2605
Occupant
16406 Buchet Dr.
San Fernando CA 91344

2605
Occupant
16356 Buchet Dr.
San Fernando CA 91344

2605
Occupant
12146 Rahn Ave.
San Fernando CA 91344

2605
Occupant
12120 Gothic Ave.
San Fernando CA 91344

2605
Occupant
12161 Woodley Ave.
San Fernando CA 91344

2605
Occupant
16411 Gothic Pl.
San Fernando CA 91344

2605
Occupant
12056 Gothic Ave.
San Fernando CA 91344

2605
Occupant
16375 Buchet Dr.
San Fernando CA 91344

2605
Occupant
13945 San Fernando Rd.
San Fernando CA 91344

2605
Occupant
14031 San Fernando Rd.
San Fernando CA 91344

2605
Occupant
14351 San Fernando Rd.
San Fernando CA 91344

2605
Occupant
12960 Balboa Blvd
San Fernando CA 91344

2605
Occupant
13100 Balboa Blvd
San Fernando CA 91344

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2606

2606
Occupant
12132 El Oro Way
San Fernando CA 91344

2606
Occupant
12018 Bradford Pl.
San Fernando CA 91344

2606
Occupant
12024 Bradford Pl.
San Fernando CA 91344

2606
Occupant
12119 El Oro Way
San Fernando CA 91344

2606
Occupant
17118 Ceredo Pl.
San Fernando CA 91344

2606
Occupant
17111 Ceredo Pl.
San Fernando CA 91344

2606
Occupant
17101 Aviva Court
San Fernando CA 91344

2606
Occupant
17134 Sunderland Dr.
San Fernando CA 91344

2606
Occupant
17418 Tilford Court
San Fernando CA 91344

2606
Occupant
17401 Fairland Court
San Fernando CA 91344

2606
Occupant
17411 Fairland Court
San Fernando CA 91344

2606
Occupant
12249 Bradford Pl.
San Fernando CA 91344

2606
Occupant
17360 Firma Court
San Fernando CA 91344

2606
Occupant
17237 Sunderland Dr.
San Fernando CA 91344

2606
Occupant
17177 Sunderland Dr.
San Fernando CA 91344

2606
Occupant
17242 Warrington Dr.
San Fernando CA 91344

2606
Occupant
12101 Elnora Pl.
San Fernando CA 91344

2606
Occupant
12111 Elnora Pl.
San Fernando CA 91344

2606
Occupant
17257 Sunderland Dr.
San Fernando CA 91344

2606
Occupant
12139 Salem Dr.
San Fernando CA 91344

2606
Occupant
12012 Elnora Pl.
San Fernando CA 91344

2606
Occupant
12159 Bambi Pl.
San Fernando CA 91344

2606
Occupant
12100 Salem Dr.
San Fernando CA 91344

2606
Occupant
12121 Jeanette Pl.
San Fernando CA 91344

2606
Occupant
12139 Jeanette Pl.
San Fernando CA 91344

2606
Occupant
12146 Bambi Pl.
San Fernando CA 91344

2606
Occupant
12118 Bambi Pl.
San Fernando CA 91344

2606
Occupant
12009 Dresden Pl.
San Fernando CA 91344

2606
Occupant
12120 Jeanette Pl.
San Fernando CA 91344

2606
Occupant
12038 Jeanette Pl.
San Fernando CA 91344

2606
Occupant
17333 Midwood Dr.
San Fernando CA 91344

2606
Occupant
17229 Midwood Dr.
San Fernando CA 91344

2606
Occupant
11929 Louise Ave.
San Fernando CA 91344

2606
Occupant
11926 Louise Ave.
San Fernando CA 91344

2606
Occupant
11906 Louise Ave.
San Fernando CA 91344

2606
Occupant
11901 Louise Ave.
San Fernando CA 91344

2606
Occupant
11900 Louise Ave.
San Fernando CA 91344

2606
Occupant
17166 Midwood Dr.
San Fernando CA 91344

2606
Occupant
17058 Midwood Dr.
San Fernando CA 91344

2606
Occupant
11926 Cameo Pl.
San Fernando CA 91344

2606
Occupant
11900 Cameo Pl.
San Fernando CA 91344

2606
Occupant
11901 Salem Dr.
San Fernando CA 91344

2606
Occupant
11946 Salem Dr.
San Fernando CA 91344

2606
Occupant
17108 Signature Dr.
San Fernando CA 91344

2606
Occupant
17126 Signature Dr.
San Fernando CA 91344

2606
Occupant
17168 Signature Dr.
San Fernando CA 91344

2606
Occupant
11966 Salem Dr.
San Fernando CA 91344

2606
Occupant
17079 Signature Dr.
San Fernando CA 91344

2606
Occupant
17044 Signature Dr.
San Fernando CA 91344

2606
Occupant
11920 El Oro Way
San Fernando CA 91344

2606
Occupant
11956 El Oro Way
San Fernando CA 91344

2606
Occupant
17035 Midwood Dr.
San Fernando CA 91344

2606
Occupant
11916 Salem Dr.
San Fernando CA 91344

2606
Occupant
17343 Signature Dr.
San Fernando CA 91344

2606
Occupant
11951 Louise Ave.
San Fernando CA 91344

2606
Occupant
11904 Andasol Ave.
San Fernando CA 91344

2606
Occupant
11951 Andasol Ave.
San Fernando CA 91344

2606
Occupant
12007 Louise Ave.
Granada Hills CA 91344

2606
Occupant
12139 Louise Ave.
San Fernando CA 91344

2606
Occupant
12157 Louise Ave.
Granada Hills CA 91344

2606
Occupant
12058 Louise Ave.
San Fernando CA 91344

2606
Occupant
17267 Signature Dr.
San Fernando CA 91344

2606
Occupant
17263 Signature Dr.
San Fernando CA 91344

2606
Occupant
17257 Signature Dr.
San Fernando CA 91344

2606
Occupant
12160 Louise Ave.
San Fernando CA 91344

2606
Occupant
17416 Golden Circle
San Fernando CA 91344

2606
Occupant
17401 Golden Circle
San Fernando CA 91344

2606
Occupant
12310 Nugent Dr.
San Fernando CA 91344

2606
Occupant
12341 Bradford Pl.
San Fernando CA 91344

2606
Occupant
12230 El Oro Way
San Fernando CA 91344

2606
Occupant
12111 Balboa Blvd
San Fernando CA 91344

2606
Occupant
12121 Balboa Blvd
San Fernando CA 91344

2606
Occupant
12227 Balboa Blvd
San Fernando CA 91344

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2607

2607
Occpant
11895 Balboa Blvd
San Fernando, CA 91344

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2608

2608
Occupant
12753 Deon Pl.
San Fernando CA 91344

2608
Occupant
12733 Daryl Ave.
San Fernando CA 91344

2608
Occupant
12721 Daryl Ave.
San Fernando CA 91344

2608
Occupant
17400 Trosa St.
San Fernando CA 91344

2608
Occupant
17350 Trosa St.
San Fernando CA 91344

2608
Occupant
17344 Zola St.
San Fernando CA 91344

2608
Occupant
17401 Cagney St.
San Fernando CA 91344

2608
Occupant
12712 Goethe Pl.
San Fernando CA 91344

2608
Occupant
17327 Cagney St.
San Fernando CA 91344

2608
Occupant
12767 Jolette Ave.
San Fernando CA 91344

2608
Occupant
12703 Jolette Ave.
San Fernando CA 91344

2608
Occupant
12661 Jolette Ave.
San Fernando CA 91344

2608
Occupant
17221 Braxton St.
San Fernando CA 91344

2608
Occupant
17145 Braxton St.
San Fernando CA 91344

2608
Occupant
12541 Jolette Ave.
San Fernando CA 91344

2608
Occupant
12605 Lithuania Dr.
San Fernando CA 91344

2608
Occupant
12650 Braxton Pl.
San Fernando CA 91344

2608
Occupant
12655 Braxton Pl.
San Fernando CA 91344

2608
Occupant
17164 Braxton St.
San Fernando CA 91344

2608
Occupant
17176 Braxton St.
San Fernando CA 91344

2608
Occupant
12662 Meadowlark Ave.
San Fernando CA 91344

2608
Occupant
12631 Lithuania Dr.
San Fernando CA 91344

2608
Occupant
17273 Westbury Dr.
San Fernando CA 91344

2608
Occupant
17254 Daemas Pl.
San Fernando CA 91344

2608
Occupant
12574 Byron Ave.
San Fernando CA 91344

2608
Occupant
12569 Byron Ave.
San Fernando CA 91344

2608
Occupant
12585 Byron Ave.
San Fernando CA 91344

2608
Occupant
12615 Byron Ave.
San Fernando CA 91344

2608
Occupant
12602 Henzie Pl.
San Fernando CA 91344

2608
Occupant
12706 Byron Ave.
San Fernando CA 91344

2608
Occupant
12544 Fraser Ave.
San Fernando CA 91344

2608
Occupant
12529 Fraser Ave.
San Fernando CA 91344

2608
Occupant
12539 Fraser Ave.
San Fernando CA 91344

2608
Occupant
12501 Aristo Pl.
San Fernando CA 91344

2608
Occupant
12500 Aristo Pl.
San Fernando CA 91344

2608
Occupant
12431 Marva Ave.
San Fernando CA 91344

2608
Occupant
12444 Marva Ave.
San Fernando CA 91344

2608
Occupant
12452 Bradford Pl.
San Fernando CA 91344

2608
Occupant
17509 Rushing Dr.
San Fernando CA 91344

2608
Occupant
17525 Rushing Dr.
San Fernando CA 91344

2608
Occupant
12526 Daryl Ave.
San Fernando CA 91344

2608
Occupant
12405 Henzie Pl.
San Fernando CA 91344

2608
Occupant
12404 Henzie Pl.
San Fernando CA 91344

2608
Occupant
17300 Westbury Dr.
San Fernando CA 91344

2608
Occupant
17271 Falcon Pl.
San Fernando CA 91344

2608
Occupant
12533 Nugent Dr.
San Fernando CA 91344

2608
Occupant
12400 Henzie Pl.
San Fernando CA 91344

2608
Occupant
17364 Angelaine Way
San Fernando CA 91344

2608
Occupant
12481 Nugent Dr.
San Fernando CA 91344

2608
Occupant
17288 Falcon Pl.
San Fernando CA 91344

2608
Occupant
17292 Falcon Pl.
San Fernando CA 91344

2608
Occupant
12321 Foxcroft Pl.
San Fernando CA 91344

2608
Occupant
12336 Foxcroft Pl.
San Fernando CA 91344

2608
Occupant
12321 Luna Pl.
San Fernando CA 91344

2608
Occupant
12212 Bradford Pl.
San Fernando CA 91344

2608
Occupant
17125 Sunderland Dr.
San Fernando CA 91344

2608
Occupant
17121 Sunderland Dr.
San Fernando CA 91344

2608
Occupant
17117 Sunderland Dr.
San Fernando CA 91344

2608
Occupant
12301 Lithuania Dr.
San Fernando CA 91344

2608
Occupant
12329 Lithuania Dr.
San Fernando CA 91344

2608
Occupant
12339 Lithuania Dr.
San Fernando CA 91344

2608
Occupant
12368 Luna Pl.
San Fernando CA 91344

2608
Occupant
17221 Elmdale Pl.
San Fernando CA 91344

2608
Occupant
12425 Lithuania Dr.
San Fernando CA 91344

2608
Occupant
17215 Nugent Pl.
San Fernando CA 91344

2608
Occupant
17211 Nugent Pl.
San Fernando CA 91344

2608
Occupant
12427 El Oro Way
San Fernando CA 91344

2608
Occupant
12447 El Oro Way
San Fernando CA 91344

2608
Occupant
12507 El Oro Way
San Fernando CA 91344

2608
Occupant
12521 El Oro Way
San Fernando CA 91344

2608
Occupant
12456 Lithuania Dr.
San Fernando CA 91344

2608
Occupant
12462 El Oro Way
San Fernando CA 91344

2608
Occupant
12400 El Oro Way
San Fernando CA 91344

2608
Occupant
12330 El Oro Way
San Fernando CA 91344

2608
Occupant
12324 El Oro Way
San Fernando CA 91344

2608
Occupant
12306 El Oro Way
San Fernando CA 91344

2608
Occupant
17047 Rosnick Pl.
San Fernando CA 91344

2608
Occupant
17049 Rosnick Pl.
San Fernando CA 91344

2608
Occupant
12525 Jolette Ave.
San Fernando CA 91344

2608
Occupant
17038 Paulette Pl.
San Fernando CA 91344

2608
Occupant
17024 Paulette Pl.
San Fernando CA 91344

2608
Occupant
12510 Jolette Ave.
San Fernando CA 91344

2608
Occupant
12403 Jolette Ave.
San Fernando CA 91344

2608
Occupant
17028 Jeanine Pl.
San Fernando CA 91344

2608
Occupant
12356 Jolette Ave.
San Fernando CA 91344

2608
Occupant
12551 Henzie Pl.
San Fernando CA 91344

2608
Occupant
12590 Mendel Dr.
San Fernando CA 91344

2608
Occupant
12550 Daryl Ave.
San Fernando CA 91344

2608
Occupant
12630 Neon Way
San Fernando CA 91344

2608
Occupant
12620 Neon Way
San Fernando CA 91344

2608
Occupant
12518 Neon Way
San Fernando CA 91344

2608
Occupant
12500 Neon Way
San Fernando CA 91344

2608
Occupant
17541 Trosa St.
San Fernando CA 91344

2608
Occupant
12701 Norlina Pl.
San Fernando CA 91344

2608
Occupant
17651 Sidwell St.
San Fernando CA 91344

2608
Occupant
17609 Trosa St.
San Fernando CA 91344

2608
Occupant
12651 Olaf Pl.
San Fernando CA 91344

2608
Occupant
12650 Nola Pl.
San Fernando CA 91344

2608
Occupant
12647 Nola Pl.
San Fernando CA 91344

2608
Occupant
12523 Neon Way
San Fernando CA 91344

2608
Occupant
17446 Golden Lane
San Fernando CA 91344

2608
Occupant
12230 Louise Ave.
San Fernando CA 91344

2608
Occupant
12246 Louise Ave.
San Fernando CA 91344

2608
Occupant
12266 Louise Ave.
San Fernando CA 91344

2608
Occupant
12153 Mission Ridge Way
San Fernando CA 91344

2608
Occupant
12131 Mission Ridge Way
San Fernando CA 91344

2608
Occupant
17418 Trosa St.
San Fernando CA 91344

2608
Occupant
12552 Neon Wy
San Fernando CA 91344

2608
Occupant
12566 Byron Ave.
San Fernando CA 91344

2608
Occupant
12656 Meadowlark Ave.
San Fernando CA 91344

2608
Occupant
12314 Bradford Pl.
San Fernando CA 91344

2608
Occupant
12306 El Oro Wy
San Fernando CA 91344

2608
Occupant
12308 El Oro Wy
San Fernando CA 91344

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2609

2609
Occupant
16837 Nanette St.
San Fernando CA 91344

2609
Occupant
16919 Knollwood Dr.
San Fernando CA 91344

2609
Occupant
11837 Susan Dr.
San Fernando CA 91344

2609
Occupant
11941 Susan Dr.
San Fernando CA 91344

2609
Occupant
12005 Susan Dr.
San Fernando CA 91344

2609
Occupant
12051 Susan Dr.
San Fernando CA 91344

2609
Occupant
16674 Demaret Pl.
San Fernando CA 91344

2609
Occupant
16734 Pineridge Dr.
San Fernando CA 91344

2609
Occupant
12507 Woodley Ave.
San Fernando CA 91344

2609
Occupant
12523 Woodley Ave.
San Fernando CA 91344

2609
Occupant
12533 Woodley Ave.
San Fernando CA 91344

2609
Occupant
12215 Gerald Ave.
San Fernando CA 91344

2609
Occupant
12201 Gerald Ave.
San Fernando CA 91344

2609
Occupant
12419 Woodley Ave.
San Fernando CA 91344

2609
Occupant
16630 Knollwood Dr.
San Fernando CA 91344

2609
Occupant
16638 Knollwood Dr.
San Fernando CA 91344

2609
Occupant
12446 Kenny Dr.
San Fernando CA 91344

2609
Occupant
12537 Kenny Dr.
San Fernando CA 91344

2609
Occupant
12434 Nedra Dr.
San Fernando CA 91344

2609
Occupant
16901 Pineridge Drive
San Fernando CA 91344

2609
Occupant
12313 Kenny Dr.
San Fernando CA 91344

2609
Occupant
12656 Mclennan Ave.
San Fernando CA 91344

2609
Occupant
12629 Mclennan Ave.
San Fernando CA 91344

2609
Occupant
16962 Georgette Pl.
San Fernando CA 91344

2609
Occupant
12445 Mclennan Ave.
San Fernando CA 91344

2609
Occupant
12550 Mclennan Ave.
San Fernando CA 91344

2609
Occupant
16950 Crystalaire Pl.
San Fernando CA 91344

2609
Occupant
16967 Stardust Pl.
San Fernando CA 91344

2609
Occupant
16425 Buchet Dr.
San Fernando CA 91344

2609
Occupant
12039 Gothic Ave.
San Fernando CA 91344

2609
Occupant
12010 Gerald Ave.
San Fernando CA 91344

2609
Occupant
16852 Nanette St.
San Fernando CA 91344

2609
Occupant
12040 Balboa Blvd
San Fernando CA 91344

2609
Occupant
12050 Balboa Blvd
San Fernando CA 91344

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2610

2610
Occupant
11840 Balboa Blvd
San Fernando, CA 91344

2610
Occupant
11846 Balboa Blvd
San Fernando, CA 91344

2610
Occupant
11850 Balboa Blvd
San Fernando, CA 91344

2610
Occupant
11852 Balboa Blvd
San Fernando, CA 91344

2610
Occupant
11852½ Balboa Blvd
San Fernando, CA 91344

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Occupant
11852¾ Balboa Blvd
San Fernando, CA 91344

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Occupant
11854 Balboa Blvd
San Fernando, CA 91344

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Occupant
11856 Balboa Blvd
San Fernando, CA 91344

2610
Occupant
11856⅛ Balboa Blvd
San Fernando, CA 91344

2610
Occupant
11856¼ Balboa Blvd
San Fernando, CA 91344

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Occupant
11856½ Balboa Blvd
San Fernando, CA 91344

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Occupant
11858 Balboa Blvd
San Fernando, CA 91344

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Occupant
11858½ Balboa Blvd
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Occupant
11860 Balboa Blvd
San Fernando, CA 91344

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Occupant
11860¼ Balboa Blvd
San Fernando, CA 91344

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Occupant
11860½ Balboa Blvd
San Fernando, CA 91344

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Occupant
11862 Balboa Blvd
San Fernando, CA 91344

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11864 Balboa Blvd
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11866 Balboa Blvd
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11868 Balboa Blvd
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11870 Balboa Blvd
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11872 Balboa Blvd
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11874 Balboa Blvd
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11876 Balboa Blvd
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11878 Balboa Blvd
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11900 Balboa Blvd
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11902 Balboa Blvd
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11904 Balboa Blvd
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11908 Balboa Blvd
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San Fernando, CA 91344

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12000 Balboa Blvd #15
San Fernando, CA 91344

2610
Occupant
12000 Balboa Blvd #16
San Fernando, CA 91344

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2820

2820
Occupant
18927 Kilfinan St.
Northridge CA 91326

2820
Occupant
18851 Kilfinan St.
Northridge CA 91326

2820
Occupant
18842 Kilfinan St.
Northridge CA 91326

2820
Occupant
18870 Kilfinan St.
Northridge CA 91326

2820
Occupant
18900 Kilfinan St.
Northridge CA 91326

2820
Occupant
12354 Ormskirk Ave.
Northridge CA 91326

2820
Occupant
18812 Kilfinan St.
Northridge CA 91326

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2825

2825
Occupant
23840 Canerwell St.
Newhall CA 91321

2825
Occupant
23937 Canerwell St.
Newhall CA 91321

2825
Occupant
24700 Fourl Rd.
Newhall CA 91321

2825
Occupant
23801 Adamsboro Dr.
Newhall CA 91321

2825
Occupant
24701 Harby Dr.
Newhall CA 91321

2825
Occupant
23751 Canerwell St.
Newhall CA 91321

2825
Occupant
23800 Fambrough St.
Newhall CA 91321

2825
Occupant
23818 Fambrough St.
Newhall CA 91321

2825
Occupant
24709 Ebelden Ave.
Newhall CA 91321

2825
Occupant
24715 Ebelden Ave.
Newhall CA 91321

2825
Occupant
24628 Ebelden Ave.
Newhall CA 91321

2825
Occupant
24722 Ebelden Ave.
Newhall CA 91321

2825
Occupant
23500 Canerwell St.
Newhall CA 91321

2825
Occupant
23539 Adamsboro Dr.
Newhall CA 91321

2825
Occupant
23529 Daisetta Dr.
Newhall CA 91321

2825
Occupant
23828 Daisetta Dr.
Newhall CA 91321

2825
Occupant
23826 Adamsboro Dr.
Newhall CA 91321

2825
Occupant
24601 Little Oak Lane
Newhall CA 91321

2825
Occupant
23734 Canerwell St.
Newhall CA 91321

2825
Occupant
24650 Jena Dr.
Newhall CA 91321

2825
Occupant
24636 Jena Dr.
Newhall CA 91321

2825
Occupant
23911 Calgrove Blvd.
Newhall CA 91321

2825
Occupant
23955 Calgrove Blvd.
Newhall CA 91321

2825
Occupant
24640 Wiley Canyon Rd.
Newhall CA 91321

2825
Occupant
24924 Hawkbryn Ave.
Newhall CA 91321

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2826

2826
Occupant
18930 Lyons Ave
Newhall, CA 91381

2826
Occupant
24152 The Old Road
Newhall, CA 91381

2826
Occupant
24500 Towsley Cyn Rd
Newhall, CA 91381

2826
Occupant
23849 The Old Road
Newhall, CA 91381

2826
Occupant
22945 Coltrane Ave
Newhall, CA 91381

2826
Occupant
23121 Coltrane Ave
Newhall, CA 91381

2826
Occupant
23849 The Old Road
Newhall, CA 91381

2826
Occupant
23857 The Old Road
Newhall, CA 91381

2826
Occupant
24201 The Old Road
Newhall, CA 91381

2826
Occupant
24233 The Old Road
Newhall, CA 91381

2826
Occupant
24314 The Old Road
Newhall, CA 91381

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2827

2827
Occupant
23645 San Fernando Rd.
Newhall CA 91321

2827
Occupant
23649 San Fernando Rd.
Newhall CA 91321

2827
Occupant
23599 San Fernando Rd.
Newhall CA 91321

2827
Occupant
23533 San Fernando Rd.
Newhall CA 91321

2827
Occupant
23375 San Fernando Rd.
Newhall CA 91321

2827
Occupant
23300 San Fernando Rd.
Newhall CA 91321

2827
Occupant
23644 Pine St.
Newhall CA 91321

2827
Occupant
23642 Pine St.
Newhall CA 91321

2827
Occupant
23648 Pine St.
Newhall CA 91321

2827
Occupant
23450 Pine St.
Newhall CA 91321

2827
Occupant
22977 Sierra Hwy.
Newhall CA 91321

2827
Occupant
22957 Sierra Hwy.
Newhall CA 91321

2827
Occupant
23876 Wildwood Canyon Rd.
Newhall CA 91321

2827
Occupant
23902 Wildwood Canyon Rd.
Newhall CA 91321

2827
Occupant
23890 Wildwood Canyon Rd.
Newhall CA 91321

2827
Occupant
23141 Oakbridge Lane
Newhall CA 91321

2827
Occupant
24093 Cross St.
Newhall CA 91321

2827
Occupant
24029 Wildwood Canyon Rd.
Newhall CA 91321

2827
Occupant
24036 Mildwood Canyon Rd.
Newhall CA 91321

2827
Occupant
24084 Cross St.
Newhall CA 91321

2827
Occupant
24134 Wildwood Canyon Rd.
Newhall CA 91321

2827
Occupant
23340 Agramonte Dr.
Newhall CA 91321

2827
Occupant
23265 Agramonte Dr.
Newhall CA 91321

2827
Occupant
23718 La Salle Canyon Rd.
Newhall CA 91321

2827
Occupant
23702 La Salle Canyon Rd.
Newhall CA 91321

2827
Occupant
23751 La Salle Canyon Rd.
Newhall CA 91321

2827
Occupant
23809 La Salle Canyon Rd.
Newhall CA 91321

2827
Occupant
24603 Skyridge Dr.
Newhall CA 91321

2827
Occupant
23451 Glenridge Dr.
Newhall CA 91321

2827
Occupant
24371 Crestview Dr.
Newhall CA 91321

2827
Occupant
23418 Sagebrush Way
Newhall CA 91321

2827
Occupant
23450 Sagebrush Way
Newhall CA 91321

2827
Occupant
23328 Champagne Lane
Newhall CA 91321

2827
Occupant
24245 Mentry Dr.
Newhall CA 91321

2827
Occupant
24241 Mentry Dr.
Newhall CA 91321

2827
Occupant
24235 Mentry Dr.
Newhall CA 91321

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Occupant
24135 Mentry Dr.
Newhall CA 91321

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Occupant
24202 Mentry Dr.
Newhall CA 91321

2827
Occupant
24220 Mentry Dr.
Newhall CA 91321

2827
Occupant
24233 Cary Court
Newhall CA 91321

2827
Occupant
24224 Creekside Dr.
Newhall CA 91321

2827
Occupant
24148 Creekside Dr.
Newhall CA 91321

2827
Occupant
24062 Briardale Way
Newhall CA 91321

2827
Occupant
24102 Clearbank Ln.
Newhall CA 91321

2827
Occupant
23472 Thornwood Dr.
Newhall CA 91321

2827
Occupant
23480 Glenridge Dr.
Newhall CA 91321

2827
Occupant
23806 Valley Oak Court
Newhall CA 91321

2827
Occupant
3810 Valley Oak Court
Newhall CA 91321

2827
Occupant
23637 White Oak Court
Newhall CA 91321

2827
Occupant
23680 White Oak Court
Newhall CA 91321

2827
Occupant
24524 Ebelden Ave.
Newhall CA 91321

2827
Occupant
24507 Ebelden Ave.
Newhall CA 91321

2827
Occupant
24587 Ebelden Ave.
Newhall CA 91321

2827
Occupant
23517 Heritage Oak Court
Newhall CA 91321

2827
Occupant
23526 Heritage Oak Court
Newhall CA 91321

2827
Occupant
22674 Clampih Rd.
Newhall CA 91321

2827
Occupant
22957 Sierra Hwy.
Newhall CA 91321

2827
Occupant
23222 Sierra Hwy.
Newhall CA 91321

2827
Occupant
23244 Sierra Hwy.
Newhall CA 91321

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Occupant
23287 Sierra Hwy.
Newhall CA 91321

2827
Occupant
24107 Cross St.
Newhall CA 91321

2827
Occupant
24123 Cross St.
Newhall CA 91321

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Occupant
24133 Cross St.
Newhall CA 91321

2827
Occupant
20500 San Fernando Rd.
Newhall CA 91321

2827
Occupant
23347 San Fernando Rd.
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23515 San Fernando Rd.
Newhall CA 91321

2827
Occupant
23645 San Fernando Rd. # 1
Newhall CA 91321

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23645 San Fernando Rd. # 2
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23500 The Old Road # 24
Newhall CA 91321

2827
Occupant
23500 The Old Road # 25
Newhall CA 91321

2827
Occupant
23500 The Old Road # 26
Newhall CA 91321

2827
Occupant
23500 The Old Road # 27
Newhall CA 91321

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Occupant
23500 The Old Road # 28
Newhall CA 91321

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Occupant
23500 The Old Road # 29
Newhall CA 91321

2827
Occupant
23500 The Old Road # 30
Newhall CA 91321

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Occupant
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Newhall CA 91321

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Occupant
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Newhall CA 91321

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Occupant
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Newhall CA 91321

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Occupant
23500 The Old Road # 35
Newhall CA 91321

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Occupant
23500 The Old Road # 36
Newhall CA 91321

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Occupant
23500 The Old Road # 37
Newhall CA 91321

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Occupant
23500 The Old Road # 38
Newhall CA 91321

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Occupant
23500 The Old Road # 39
Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Occupant
23500 The Old Road # 55
Newhall CA 91321

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23500 The Old Road # 56
Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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Newhall CA 91321

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23500 The Old Road # 82
Newhall CA 91321

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Occupant
23500 The Old Road # 83
Newhall CA 91321

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23500 The Old Road # 84
Newhall CA 91321

2827
Occupant
23500 The Old Road # 85
Newhall CA 91321

2827
Occupant
23500 The Old Road # 86
Newhall CA 91321

2827
Occupant
23500 The Old Road # 87
Newhall CA 91321

2827
Occupant
23500 The Old Road # 88
Newhall CA 91321

2827
Occupant
24000 The Old Road
Newhall CA 91321

2827
Occupant
22400 The Old Road
Newhall CA 91321

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2848

2848
Occupant
23250 Sierra Hwy
Newhall, CA 91321

COPY

OF

OCCUPANT LIST

SUNSHINE CYN - #2870

2870
Occupant
12276 Beaufait Ave.
Northridge CA 91326

COPY

OF

OWNERSHIP LIST

SUNSHINE CYN - #2501

APN: 2501-002-001
Edward J. Duvall
13443 Bradley Ave.
Sylmar CA 91342-1208

APN: 2501-002-002
Lyle W. & Sharon T. Waggoner
15575 Roxford St.
Sylmar CA 91342

APN: 2501-002-004
B & W Enterprises
16469 Oldham St.
Encino CA 91436

APN: 2501-002-006
Gerald R. Hodges
13383 Bradley Ave.
Sylmar CA 91342-1206

APN: 2501-002-010
Howard W. Parmele
13401 Bradley Ave.
Sylmar CA 91342-1208

APN: 2501-002-011
Gary D. Endicott
13391 Bradley Ave.
Sylmar CA 91342-1206

APN: 2501-002-013
Mary MacChio
13359 Bradley Ave.
Sylmar CA 91342-1206

APN: 2501-002-019
Francis C. Thompson
15535 Roxford St.
Sylmar CA 91342-1264

APN: 2501-002-020
Jennie R. Regalado
13113 Glamis St.
Pacoima CA 91331

APN: 2501-002-021
Rose F. La Preziosa
15101 Cobalt St.
Sylmar CA 91342

APN: 2501-002-022
Desert Sierra Properties I
P.O. Box 9203
Sylmar CA 91392

APN: 2501-002-023
Ralston Investment Co
1441 4th St.
Santa Monica CA 90401

APN: 2501-002-027
Allied Beverages Inc
13287 Ralston Ave.
Sylmar CA 91342-1255

APN: 2501-002-028
Karabet & Sibil Tr Yerelek
956 Griswold Ave.
San Fernando CA 91340

APN: 2501-002-031
Enrique Abeledo
14059 Foothill Blvd.
Sylmar CA 91342

APN: 2501-002-032
Alfred C. Huber
13337 Bradley Ave.
Sylmar CA 91342-1206

APN: 2501-002-033
Joe Chavez
P.O. Box 922891
Sylmar CA 91392

APN: 2501-002-034
Allied Beverages Inc
13287 Ralston Ave.
Sylmar CA 91342

APN: 2501-002-038
Ventura D. Somarriba
2129 Roscoe Blvd. No. 105
Northridge CA 91304

APN: 2501-002-039
Will McConnaughy
13371 Bradley Ave.
Sylmar CA 91342-1206

APN: 2501-002-040
Larry O. Felt
13365 Bradley Ave.
Sylmar CA 91342-1206

APN: 2501-002-041
Cetec Corp
13278 Ralston Ave.
Sylmar CA 91342-7607

APN: 2501-002-042
Allied Leasing Co
13287 Ralston Ave.
Sylmar CA 91342

APN: 2501-002-048
JJ & C Properties
15575 Roxford St.
Sylmar CA 91342

APN: 2501-002-049
JJ & C Properties
15575 Roxford St.
Sylmar CA 91342-1264

APN: 2501-002-052
Lyle W. & Sharon T. Waggoner
15575 Roxford St.
Sylmar CA 91342

APN: 2501-002-055
VCE Inc
13300 Ralston Ave.
Sylmar CA 91342-7608

APN: 2501-002-060
Precision Tool Krav
13326 Ralston Ave.
Sylmar CA 91342

APN: 2501-002-061
Krav Precision Tool & Die Corp
13326 Ralston Ave.
Sylmar CA 91342-7608

APN: 2501-002-062
Michael Fusano
15015 Cobalt St.
Sylmar CA 91342

APN: 2501-002-063
Siskin Investment Co
1441 4th St.
Santa Monica CA 90401

APN: 2501-002-064
Abel A. Gonzalez
P.O. Box 923426
Sylmar CA 91392

APN: 2501-002-065
Abel A. Gonzalez
13351 Gladstone Ave.
Sylmar CA 91342

APN: 2501-002-900
L A Co Flood Control Dist
900 S. Fremont Ave.
Alhambra CA 91801

APN: 2501-004-001
Armond & Consta Del Gaudio
19456 Hiawatha St.
Northridge CA 91326

APN: 2501-004-002
Helen Brinkman
15772 Roxford St.
Sylmar CA 91342

APN: 2501-004-004
Elisa Cox
13277 Bradley Ave.
Sylmar CA 91342-1204

APN: 2501-004-015
Corp of Bishop of Church of Latter D
50 N. West Temple No. E
Salt Lake Cty UT 84150

APN: 2501-004-018
Warren Davey
P.O. Box 518
Santa Ynez CA 93460

APN: 2501-004-020
Simon S. & Mildred Dagan
5220 Encino Ave.
Encino CA 91316

APN: 2501-004-021
Donald Baron
1415 Maple Ave.
Los Angeles CA 90015

APN: 2501-004-022
Margaret J. Tr Mang
17052 Galesberg St.
Granada Hills CA 91344

APN: 2501-004-023
Elliot Properties LTD
9330 Oso Ave. No. A
Chatsworth CA 91311

APN: 2501-005-002
Fred A. & Elsie L. Nissing
610 N. Workman St.
San Fernando CA 91340

APN: 2501-005-008
Warren T. Davey
P.O. Box 518
Santa Ynez CA 93460

APN: 2501-005-009
Ronald Newburg
13207 Bradley Ave.
Sylmar CA 91342-1204

APN: 2501-006-023
Walter A. & Elayne E. Wentz
8040 Remmet Ave. No. 1
Canoga Park CA 91304

APN: 2501-006-024
Isadore Familian
10380 Wilshire Blvd. No. 601
Los Angeles CA 90024

APN: 2501-006-027
W M Co
3411 N. Perris Blvd.
Perris CA 92571

APN: 2501-006-031
Anheuser Busch Inc
1 Busch Pl.
Saint Louis MO 63118

APN: 2501-010-002
Enrique Aguilera
13337 Herrick Ave.
Sylmar CA 91342-1221

APN: 2501-010-004
Enrique Gonzalez
13323 Herrick Ave.
Sylmar CA 91342-1221

APN: 2501-010-005
Charles K. Welch
13315 Herrick Ave.
Sylmar CA 91342-1221

APN: 2501-010-006
Henry L. Morris
15203 Cobalt St.
Sylmar CA 91342-2725

APN: 2501-010-007
Margie J. De Pew
15211 Cobalt St.
San Fernando CA 91342-2725

APN: 2501-010-008
John W. Schureman
15225 Cobalt St.
Sylmar CA 91342-2725

APN: 2501-010-009
Enrique Gonzalez
13323 Herrick Ave.
San Fernando CA 91342

APN: 2501-010-010
Harold W. Molloy
15237 Cobalt St.
Sylmar CA 91342-2725

APN: 2501-010-011
George W. Mills
15245 Cobalt St.
Sylmar CA 91342-2725

APN: 2501-010-012
Robert J. Jacobs
15251 Cobalt St.
Sylmar CA 91342-2725

APN: 2501-010-013
Joe R. Espinoza
15257 Cobalt St.
Sylmar CA 91342-2725

APN: 2501-010-015
Minoru Taguchi
13228 Bradley Ave.
Sylmar CA 91342-1203

APN: 2501-010-016
Michael J. Bell
15267 Cobalt St.
Sylmar CA 91342-2725

APN: 2501-010-017
Bill Y. Yokoyama
15277 Cobalt St.
Sylmar CA 91342-2725

APN: 2501-010-018
Esteban Regalado
15301 Cobalt St.
Sylmar CA 91342-2728

APN: 2501-010-019
Javier Mata
15315 Cobalt St.
Sylmar CA 91342-2728

APN: 2501-010-022
Sharane E. Moffitt
P.O. Box 922048
Sylmar CA 91392

APN: 2501-010-023
Nicholas J. Imp
17620 Sherman Way No. 218
Van Nuys CA 91406

APN: 2501-010-024
Orlen Whitson
15436 Roxford St.
Sylmar CA 91342-1261

APN: 2501-010-025
Robert Thompson
905 Encino Vista Dr.
Thousand Oaks CA 91362

APN: 2501-010-026
Vito M. Galasso
15420 Roxford St.
Sylmar CA 91342-1261

APN: 2501-010-027
Nancy Binando
19019 Castlebay Lane
Northridge CA 91326

APN: 2501-010-028
Jose L. De Santiago
15410 Roxford St.
Sylmar CA 91342-1261

APN: 2501-010-029
Jesus V. & Catalina Torres
15404 Roxford St.
San Fernando CA 91342-1261

APN: 2501-010-030
Mario Aguilar
13407 Herrick Ave.
Sylmar CA 91342-1223

APN: 2501-010-031
Lawrence E. Schinharl
13397 Herrick Ave.
Sylmar CA 91342-1221

APN: 2501-010-032
Gary L. Staplekamp
13389 Herrick Ave.
Sylmar CA 91342-1221

APN: 2501-010-033
Sheldon MacLearn
13377 Herrick Ave.
San Fernando CA 91342-1221

APN: 2501-010-035
Barry Cantor
15486 Roxford St.
Sylmar CA 91342-1261

APN: 2501-010-036
Maria Reynoso
15476 Roxford St.
Sylmar CA 91342-1261

APN: 2501-010-037
John D. Wood
15470 Roxford St.
Sylmar CA 91342-1261

APN: 2501-010-038
Benjamin C. Alvarez
15464 Roxford St.
Sylmar CA 91342-1261

APN: 2501-010-039
Donald B. Cory
15460 Roxford St.
San Fernando CA 91342-1261

APN: 2501-010-040
Louis F. D'Alessandro
15450 Roxford St.
Sylmar CA 91342-1261

APN: 2501-010-041
Man-Hok Wong
42 Ashwood
Irvine CA 92714

APN: 2501-010-043
San Fernando Congregation of Jehovah
13262 Bradley Ave.
San Fernando CA 91342-1203

APN: 2501-010-044
Richard D. Reynolds
13274 Bradley Ave.
Sylmar CA 91342-1203

APN: 2501-010-045
Miguel De Jesus
15448 Roxford St.
Sylmar CA 91342-1261

APN: 2501-010-046
Donald R. Schwenke
13373 Herrick Ave.
Sylmar CA 91342-1221

APN: 2501-010-047
Arian Simantob
1180 S. Beverly Dr. No. 512
Los Angeles CA 90035

APN: 2501-010-048
Edward C. Jazwa
15245 Larkspur St.
Symar CA 91342

APN: 2501-010-049
Marcela De La Torre
8748 Remmet Ave.
Canoga Park CA 91304

APN: 2501-010-050
Jose D. Carlo
15301 Larkspur St.
Sylmar CA 91342-7613

APN: 2501-010-051
James Domay
15309 Larkspur St.
Sylmar CA 91342-7613

APN: 2501-010-052
Robert Burgis
15317 Larkspur St.
Sylmar CA 91342-7613

APN: 2501-010-053
Arturo Vazquez
13301 Norris Ave.
Sylmar CA 91342-7617

APN: 2501-010-054
George G. Ahlers
13305 Norris Ave.
Sylmar CA 91342-7617

APN: 2501-010-055
Leslie McAfee
13311 Norris Ave.
Sylmar CA 91342-7617

APN: 2501-010-056
Enrique Gomez
15345 Larkspur St.
San Fernando CA 91342-7615

APN: 2501-010-057
Todd R. Zoet
15351 Larkspur St.
Sylmar CA 91342-7615

APN: 2501-010-058
Kelley L. Burks
15355 Larkspur St.
Sylmar CA 91342-7615

APN: 2501-010-059
Carl W. Jorgensen
13244 Bradley Ave.
Sylmar CA 91342-1203

APN: 2501-010-060
Jerald Najar
13248 Bradley Ave.
Sylmar CA 91342-1203

APN: 2501-010-061
Kenneth J. Murray
13252 Bradley Ave.
Sylmar CA 91342-1203

APN: 2501-010-062
William Barnes
15325 Cobalt St.
Sylmar CA 91342

APN: 2501-010-065
Calabasas Housing Foundation
7630 Gloria Ave.
Van Nuys CA 91406

APN: 2501-012-005
Miroslaw W. Karas
13360 Bradley Ave.
Sylmar CA 91342-1205

APN: 2501-012-007
Miroslaw W. Karas
13360 Bradley Ave.
Sylmar CA 91342

APN: 2501-012-009
George C. Hall
15475 Roxford St.
San Fernando CA 91342-1262

APN: 2501-012-011
Miroslaw W. Karas
13360 Bradley Ave.
Sylmar CA 91342

APN: 2501-012-016
M. W. Karas
13356 Bradley Ave.
Sylmar CA 91342-1205

APN: 2501-012-019
Rosa I. Hall
15475 Roxford St.
Sylmar CA 91342

APN: 2501-012-020
Regina A. Monteleone
13324 Bradley Ave.
Sylmar CA 91342-1205

APN: 2501-012-021
M. W. Karas
13356 Bradley Ave.
Sylmar CA 91342

APN: 2501-013-001
Carlo D. Mejia
15602 Olden St.
San Fernando CA 91342-1243

APN: 2501-013-002
Jennifer E. Perry
15610 Olden St.
Sylmar CA 91342-1243

APN: 2501-013-007
Marin Medina
15626 Olden St.
Sylmar CA 91342-1243

APN: 2501-013-008
Jose V. Garcia
15636 Olden St.
Sylmar CA 91342-1243

APN: 2501-013-009
Russ Abrams
15642 Olden St.
Sylmar CA 91342-1243

APN: 2501-013-010
Ernst Muller
1420 Riverview Ave.
Peekskill NY 10566

APN: 2501-013-011
James Greenberg
1001 Center Dr.
South Elgin IL 60177

APN: 2501-013-016
Daniel M. White
13485 Herrick Ave.
San Fernando CA 91342-7606

APN: 2501-013-017
Francisco & Eme Viramontes
13469 Herrick Ave.
San Fernando CA 91342-7606

APN: 2501-013-019
John Di Pietro
13459 Herrick Ave.
Sylmar CA 91342-7606

APN: 2501-013-021
Visarion Ostafe
15417 Roxford St.
Sylmar CA 91342-1262

APN: 2501-013-022
Raul J. Acosta
15427 Roxford St.
Sylmar CA 91342-1262

APN: 2501-013-023
John K. Smith
3205 Dwight Lee St.
Acton CA 93510

APN: 2501-013-024
Donald C. Vickery
15445 Roxford St.
Sylmar CA 91342-1262

APN: 2501-013-031
Peter P. Mordigan
12632 Haddon Ave.
Sylmar CA 91342

APN: 2501-013-032
Cynthia A. Spiers
13575 Herrick Ave.
San Fernando CA 91342-1227

APN: 2501-013-033
Cynthia A. Spiers
13575 Herrick Ave.
San Fernando CA 91342

APN: 2501-013-034
Eulaila E. Mitchell
13615 Herrick Ave.
Sylmar CA 91342-1229

APN: 2501-013-035
Charles E. Binger
15620 Olden St.
Sylmar CA 91342-1243

APN: 2501-013-036
Arnulfo Martinez
2448 Shoredale Ave.
Los Angeles CA 90031

APN: 2501-013-038
Mary Boshep
13563 Herrick Ave.
Sylmar CA 91342-1227

APN: 2501-013-041
Sharane E. Moffitt
P.O. Box 922048
Sylmar CA 91392

APN: 2501-014-009
Jaime Sanchez
13580 Herrick Ave.
Sylmar CA 91342-1226

APN: 2501-014-010
William Reeves
13564 Herrick Ave.
Sylmar CA 91342-1226

APN: 2501-014-011
William Reeves
13564 Herrick Ave.
Sylmar CA 91342

APN: 2501-014-015
Anna Diaz
15596 Olden St.
Sylmar CA 91342-1242

APN: 2501-014-021
Dwight T. Morrow
13550 Herrick Ave.
Sylmar CA 91342

APN: 2501-014-022
Dwight T. Morrow
13550 Herrick Ave.
Sylmar CA 91342-1226

APN: 2501-014-024
Felix Rico
15475 Dorian St.
Sylmar CA 91342

APN: 2501-014-025
James R. Bernasconi
15469 Dorian St.
Sylmar CA 91342-1216

APN: 2501-014-026
Peggy A. Barber
15461 Dorian St.
Sylmar CA 91342-1216

APN: 2501-014-028
Kevin Keables
3045 N. Lamer St.
Burbank CA 91504

APN: 2501-014-029
Stanley C. Hall
13681 De Garmo Ave.
Sylmar CA 91342-1214

APN: 2501-014-030
Ruby E. Pascol
13600 Herrick Ave.
Sylmar CA 91342-1228

APN: 2501-014-031
Juan C. Munoz
15560 Olden St.
Sylmar CA 91342-1242

APN: 2501-014-033
Gonzalo Posada
15554 Olden St.
Sylmar CA 91342-1242

APN: 2501-014-034
DJAHANGUIR Tr Shadi
16163 San Fernando Mission Blvd.
Granada Hills CA 91344

APN: 2501-014-037
Richard Kress
15590 Olden St.
Sylmar CA 91342-1242

APN: 2501-014-038
Norman Parson
15570 Olden St.
Sylmar CA 91342-1242

APN: 2501-014-039
Abel Jimenez
15580 Olden St.
Sylmar CA 91342-1242

APN: 2501-015-010
James L. Aragno
13707 Glenoaks Blvd.
Sylmar CA 91342-1320

APN: 2501-015-013
Wayne R. Schelb
13745 Glenoaks Blvd.
Sylmar CA 91342-1320

APN: 2501-015-014
Barbara M. Manley
13682 De Garmo Ave.
Sylmar CA 91342

APN: 2501-015-015
Phyllis A. Tr Patterson
13755 Glenoaks Blvd.
Sylmar CA 91342-1320

APN: 2501-015-018
Jack L. Forgues
13670 De Garmo Ave.
Sylmar CA 91342-1212

APN: 2501-015-021
Robert N. Taylor
13721 Glenoaks Blvd.
San Fernando CA 91342-1320

APN: 2501-015-022
Mike Gavaldon
13680 De Garmo Ave.
Sylmar CA 91342-1212

APN: 2501-015-023
Ivan Kruglak
13733 Glenoaks Blvd.
Sylmar CA 91342-1320

APN: 2501-015-025
Johanna H. Rietdky
15546 Olden St.
Sylmar CA 91342-1242

APN: 2501-015-026
Barbara M. Manley
13686 De Garmo Ave.
Sylmar CA 91342

APN: 2501-015-027
Barbara M. Manley
13686 De Garmo Ave.
Sylmar CA 91342-1212

APN: 2501-015-032
Warwick Stone
13765 Glenoaks Blvd.
Sylmar CA 91342-1320

APN: 2501-015-033
Jack L. Forgues
13670 De Garmo Ave.
Sylmar CA 91342

APN: 2501-015-034
Marabelle S. Schutte
13701 Glenoaks Blvd.
Sylmar CA 91342-1320

APN: 2501-015-035
Eugene Tr Spiegel
14845 Magnolia Blvd. No. 204
Sherman Oaks CA 91403

APN: 2501-015-036
Westlake Forest Products Inc
2833 Butler Bay Dr. N
Windermere FL 34786

APN: 2501-016-001
Joan L. Strange
13673 Glenoaks Blvd.
Sylmar CA 91342-1317

APN: 2501-016-002
Fernando J. Hidalgo
13661 Glenoaks Blvd.
San Fernando CA 91342-1317

APN: 2501-016-014
Frank D. Tr Di Tomaso
12455 San Fernando Rd.
Sylmar CA 91342

APN: 2501-016-015
Constantino Noval
P.O. Box 65143
Los Angeles CA 90065

APN: 2501-016-016
Frank D. Tr Di Tomaso
12455 San Fernando Rd.
Sylmar CA 91342

APN: 2501-016-017
Susanne A. Watson
18111 Catherine Cir
Villa Park CA 92667

APN: 2501-016-019
Robert Rose
13615 Glenoaks Blvd.
Sylmar CA 91342-1317

APN: 2501-016-020
Jean C. Le Guellec
13607 Glenoaks Blvd.
Sylmar CA 91342-1317

APN: 2501-016-021
Victor G. Grillette
13623 Glenoaks Blvd.
Sylmar CA 91342-1317

APN: 2501-016-022
Apolonio & Carmen Romero
13625 Glenoaks Blvd.
Sylmar CA 91342-1317

APN: 2501-016-023
Ramon Samano
13633 Glenoaks Blvd.
Sylmar CA 91342-1317

APN: 2501-016-024
Luis P. Cetto
13641 Glenoaks Blvd.
Sylmar CA 91342-1317

APN: 2501-016-025
William A. John
13647 Glenoaks Blvd.
San Fernando CA 91342-1317

APN: 2501-016-026
Martha A. Reyes
13655 Glenoaks Blvd.
San Fernando CA 91342-1317

APN: 2501-016-027
Peter A. & Kathleen M. Clark
13560 De Garmo Ave.
Sylmar CA 91342-1210

APN: 2501-016-028
Allan W. Thompson
13562 De Garmo Ave.
Sylmar CA 91342-1210

APN: 2501-016-029
Neil H. Hamlin
13568 De Garmo Ave.
Sylmar CA 91342-1210

APN: 2501-016-030
Antonio Garcia
13574 De Garmo Ave.
Sylmar CA 91342-1210

APN: 2501-016-031
Salvador M. Moreno
13584 De Garmo Ave.
Sylmar CA 91342-1210

APN: 2501-016-032
Jerry M. Farenbaugh
13600 De Garmo Ave.
Sylmar CA 91342-1212

APN: 2501-016-033
Ernest T. Johnson
13610 De Garmo Ave.
Sylmar CA 91342-1212

APN: 2501-016-034
Michael D. Fletcher
13614 De Garmo Ave.
Sylmar CA 91342-1212

APN: 2501-016-035
Jose & Rosalinda Cardenas
13632 De Garmo Ave.
Sylmar CA 91342

APN: 2501-016-036
J. J. Olmos
13630 De Garmo Ave.
Sylmar CA 91342-1212

APN: 2501-017-003
Marcelino Galvan
15433 Monte St.
Sylmar CA 91342-1236

APN: 2501-017-004
Judy L. Hersh
15427 Monte St.
Sylmar CA 91342-1236

APN: 2501-017-005
Nobuko Miura
15421 Monte St.
Sylmar CA 91342-1236

APN: 2501-017-006
Marla K. Riviera
15415 Monte St.
Sylmar CA 91342-1236

APN: 2501-017-007
Wayne A. Hill
13646 Leach St.
San Fernando CA 91340

APN: 2501-017-008
Federico Hernandez
13605 De Garmo Ave.
Sylmar CA 91342-1213

APN: 2501-017-009
Michael L. Pace
15457 Monte St.
Sylmar CA 91342-1236

APN: 2501-017-010
Jonni L. Thompson
15451 Monte St.
Sylmar CA 91342-1236

APN: 2501-017-011
Kenneth L. Hickey
15516 Dorian St.
Sylmar CA 91342

APN: 2501-017-012
William D. Yancey
15510 Dorian St.
Sylmar CA 91342-1217

APN: 2501-018-001
Peter W. Dhanes
13575 De Garmo Ave.
Sylmar CA 91342-1215

APN: 2501-018-003
Cesar Marroquin
15410 Monte St.
Sylmar CA 91342-1235

APN: 2501-018-005
Edward A. Williams
15377 Kadota St.
Sylmar CA 91342-1231

APN: 2501-018-006
Anthony S. Allegra
15424 Monte St.
Sylmar CA 91342-1235

APN: 2501-018-007
Stanley E. Hagedorn
2024 8th St.
San Fernando CA 91340

APN: 2501-018-008
Ritsuo Takeuchi
14400 Oro Grande St.
Sylmar CA 91342

APN: 2501-018-009
Dolores B. Lopez
15446 Monte St.
Sylmar CA 91342-1235

APN: 2501-018-010
Rosario C. Cortez
13170 Borden Ave.
Sylmar CA 91342

APN: 2501-018-011
Victor F. Cabral
15425 Kadota St.
Sylmar CA 91342-1233

APN: 2501-018-012
Neal Reed
27031 Benton Ct.
Valencia CA 91354

APN: 2501-018-013
Richard L. Montano
13470 Herrick Ave.
Sylmar CA 91342-1225

APN: 2501-018-014
Home Svgs of America FSB
P.O. Box 5300
Irwindale CA 91706

APN: 2501-018-015
Bernardino V. Solares
15429 Kadota St.
Sylmar CA 91342-1233

APN: 2501-018-016
UYEDA Samuel
15416 Monte St.
Sylmar CA 91342-1235

APN: 2501-018-017
Richard D. Nemeth
15367 Kadota St.
Sylmar CA 91342-1231

APN: 2501-018-018
Carlos Salgado
15357 Kadota St.
Sylmar CA 91342-1231

APN: 2501-018-019
Scott Danberg
15361 Kadota St.
Sylmar CA 91342-1231

APN: 2501-019-001
Wanda E. Albert
15426 Kadota St.
Sylmar CA 91342

APN: 2501-019-002
William Hausner
11444 Gladstone Ave.
Lake View Ter CA 91342

APN: 2501-019-003
Wanda E. Albert
15426 Kadota St.
Sylmar CA 91342-1232

APN: 2501-019-004
Jacqueline S. Ochoa
15416 Kadota St.
Sylmar CA 91342-1232

APN: 2501-019-005
Jose Baeza
15347 Roxford St.
San Fernando CA 91342-1260

APN: 2501-019-006
Michael Vigil
15341 Roxford St.
Sylmar CA 91342-1260

APN: 2501-019-007
Jose S. Lopez
15410 Kadota St.
Sylmar CA 91342-1232

APN: 2501-019-008
Ignacio Gonzalez
15404 Kadota St.
Sylmar CA 91342-1232

APN: 2501-019-009
Petra Zavala
15335 Roxford St.
Sylmar CA 91342-1260

APN: 2501-019-010
Ernesto Hernandez
15327 Roxford St.
San Fernando CA 91342-1260

APN: 2501-019-011
Fernando Seminario
15376 Kadota St.
Sylmar CA 91342-1230

APN: 2501-019-012
Jaime Mares
15370 Kadota St.
Sylmar CA 91342-1230

APN: 2501-019-015
Carlos J. Elizondo
15317 Roxford St.
Sylmar CA 91342-1260

APN: 2501-019-016
Carlos R. De Niz
15366 Kadota St.
Sylmar CA 91342-1230

APN: 2501-019-017
Richard A. Sabel
15360 Kadota St.
Sylmar CA 91342-1230

APN: 2501-019-018
Rick J. Wemple
15311 Roxford St.
Sylmar CA 91342-1260

APN: 2501-019-020
Christopher R. Shunn
15354 Kadota St.
Sylmar CA 91342-1230

APN: 2501-019-021
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13682 De Garmo Ave.
Sylmar CA 91342

APN: 2501-019-023
Norma Sanchez
11220 Laurel Canyon Blvd.
San Fernando CA 91340

APN: 2501-024-004
Andrew C. Verrone
13442 Norris Ave.
Sylmar CA 91342-1237

APN: 2501-024-005
Frank D. Leos
13438 Norris Ave.
Sylmar CA 91342-1237

APN: 2501-024-006
Jose P. Galvan
15600 Dorian St.
Sylmar CA 91342-1218

APN: 2501-024-007
Michael Perez
15606 Dorian St.
Sylmar CA 91342-1218

APN: 2501-024-008
Grace McGrath
15618 Dorian St.
Sylmar CA 91342-1218

APN: 2501-024-009
Robert L. Karp
15630 Dorian St.
Sylmar CA 91342-1218

APN: 2501-024-010
Andrew Durazo
15629 Dorian St.
Sylmar CA 91342-1219

APN: 2501-024-011
Linda Renaud
13410 Bradley Ave.
Sylmar CA 91342-1207

APN: 2501-024-012
Raymond L. Heard
15623 Dorian St.
Sylmar CA 91342-1219

APN: 2501-024-013
Betty F. Modugno
15615 Dorian St.
Sylmar CA 91342-1219

APN: 2501-024-014
Merril J. Kulyn
13441 Norris Ave.
Sylmar CA 91342-1238

APN: 2501-024-015
George G. Naas
13457 Norris Ave.
Sylmar CA 91342-1238

APN: 2501-024-016
John H. Raath
13501 Norris Ave.
Sylmar CA 91342-1240

APN: 2501-024-017
Gilbert Bayardo
13511 Norris Ave.
Sylmar CA 91342-1240

APN: 2501-024-018
Robert A. Simpson
11705 Sheldon St.
Sun Valley CA 91352

APN: 2501-024-019
Billy D. Yadon
13531 Norris Ave.
Sylmar CA 91342-1240

APN: 2501-024-024
Carlos G. Melero
13420 Bradley Ave.
Sylmar CA 91342-1207

APN: 2501-024-029
E. Dwight Organ
15674 Olden St.
Sylmar CA 91342-1243

APN: 2501-024-030
Tim J. Foss
15668 Olden St.
Sylmar CA 91342-1243

APN: 2501-024-031
Andrew C. Verrone
13442 Norris Ave.
Sylmar CA 91342-1237

APN: 2501-024-032
Andrew C. Verrone
13442 Norris Ave.
Sylmar CA 91342

APN: 2501-024-034
Larry A. Kobayashi
6560 Armitos Dr.
Camarillo CA 93012

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APN: 2502-001-015
John E. Butt
13710 Glenoaks Blvd.
Sylmar CA 91342-1319

APN: 2502-001-034
Ruth G. Salcido
631 Clela Ave.
Los Angeles CA 90022

APN: 2502-001-036
Leonel & Grace Ruiz
13746 Glenoaks Blvd.
San Fernando CA 91342-1319

APN: 2502-001-037
Juan M. Camacho
13744 Glenoaks Blvd.
Sylmar CA 91342-1319

APN: 2502-001-077
Edward D. Landin
13720 Glenoaks Blvd.
Sylmar CA 91342-1319

APN: 2502-001-088
Ivan T. Kruglak
13756 Glenoaks Blvd.
Sylmar CA 91342-1319

APN: 2502-001-089
Mary E. Ward
13730 Glenoaks Blvd.
Sylmar CA 91342-1319

APN: 2502-001-092
Gated Villas Foothill
828 Moraga Dr. No. 2
Los Angeles CA 90049

APN: 2502-001-093
Steve Rios
22664 Crespi St.
Woodland Hls CA 91364

APN: 2502-001-096
Jesus Andrade
13820 Glenoaks Blvd.
San Fernando CA 91342-1363

APN: 2502-001-097
Trinidad Chavez
13810 Glenoaks Blvd.
Sylmar CA 91342-1363

APN: 2502-001-098
Joan M. Lester
13800 Glenoaks Blvd.
Sylmar CA 91342-1363

APN: 2502-001-099
Robert A. Silver
13782 Glenoaks Blvd.
Sylmar CA 91342-1319

APN: 2502-026-049
Rebecca G. Lopez
15312 Foothill Blvd.
Sylmar CA 91342-1307

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C A Rasmussen Co
2360 Shasta Way
Simi Valley CA 93065

APN: 2581-001-009
Vernon G. Walk
22117 Sierra HWY.
Newhall CA 91321

APN: 2581-001-016
John S. Tr Symonds
280 S. Beverly Dr. No. 207
Beverly Hills CA 90212

APN: 2581-001-021
Chevron U S A Inc
P.O. Box 7611
San Francisco CA 94120

APN: 2581-001-024
Margaret J. Ingman
1101 Shannon Dr.
Medford OR 97504

APN: 2581-001-270
L A City Dept of Water & Power
P.O. Box 111
Los Angeles CA 90051

APN: 2581-001-300
U S Govt
1149 W. 190th St.
Gardena CA 90248

APN: 2581-001-802
So Calif Edison Co
2244 Walnut Grove Ave.
Rosemead CA 91770

APN: 2581-001-901
L A Co Flood Control Dist
900 S. Fremont Ave.
Alhambra CA 91801

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APN: 2582-001-007
Oaks Llc Silver
280 S. Beverly Dr. No. 207
Beverly Hills CA 90212

APN: 2582-002-004
Warren H. Kennedy
7855 Sepulveda Blvd.
Van Nuys CA 91405

APN: 2582-002-005
Joseph Porzio
28 Bakersfield Ave.
Cayucos CA 93430

APN: 2582-002-010
Corp of President of Ch of Jesus Chr
50 E. North Temple
Salt Lake Cty UT 84150

APN: 2582-002-013
Oakridge LTD
2851 Rolling Hills Dr.
Fullerton CA 92635

APN: 2582-030-003
Kim A. Schulte
15979 Filbert St.
Sylmar CA 91342-1070

APN: 2582-030-004
Jeffrey B. Holder
15963 Filbert St.
Sylmar CA 91342-1070

APN: 2582-030-005
Thomas G. Hebner
15959 Filbert St.
Sylmar CA 91342-1070

APN: 2582-030-006
Eric K. Lee
15955 Filbert St.
Sylmar CA 91342-1070

APN: 2582-030-007
David L. Matson
14054 Saddle Ridge Rd.
Sylmar CA 91342-1058

APN: 2582-030-008
Alan E. Porco
14048 Saddle Ridge Rd.
Sylmar CA 91342-1058

APN: 2582-030-009
Frank Olivadoti
14044 Saddle Ridge Rd.
Sylmar CA 91342-1058

APN: 2582-030-010
Philip K. Rubin
14040 Saddle Ridge Rd.
Sylmar CA 91342-1058

APN: 2582-030-011
Gerald J. Breault
14036 Saddle Ridge Rd.
Sylmar CA 91342-1063

APN: 2582-030-012
Carlos F. Saucedo
14030 Saddle Ridge Rd.
Sylmar CA 91342-1063

APN: 2582-030-013
Johnny T. Myint
14024 Saddle Ridge Rd.
Sylmar CA 91342-1063

APN: 2582-030-014
Dale A. Waite
14018 Saddle Ridge Rd.
Sylmar CA 91342-1063

APN: 2582-030-015
Reynaldo R. Ramos
14012 Saddle Ridge Rd.
Sylmar CA 91342-1063

APN: 2582-030-016
Art Torres
14006 Saddle Ridge Rd.
Sylmar CA 91342-1063

APN: 2582-030-017
Clovis A. Scott
35801 Anthony Rd.
Agua Dulce CA 91350

APN: 2582-030-018
Komson Jirawuthiworavong
8006 Teesdale Ave.
N Hollywood CA 91605

APN: 2582-030-019
Teresa Alonso
13970 Saddle Ridge Rd.
Sylmar CA 91342-1149

APN: 2582-030-020
Bill Ingram
13966 Saddle Ridge Rd.
Sylmar CA 91342-1149

APN: 2582-030-021
Charles F. Richards
13960 Saddle Ridge Rd.
Sylmar CA 91342-1149

APN: 2582-030-022
Roy Penuela
13954 Saddle Ridge Rd.
Sylmar CA 91342-1149

APN: 2582-030-023
Jess V. & Mary S. Perez
13950 Saddle Ridge Rd.
Sylmar CA 91342-1149

APN: 2582-030-024
Kamaljit S. Brah
15844 Yarnell St.
Sylmar CA 91342-1138

APN: 2582-030-025
Randal B. Anderson
15850 Yarnell St.
Sylmar CA 91342-1142

APN: 2582-030-026
Ronald L. Leafgren
15854 Yarnell St.
Sylmar CA 91342-1142

APN: 2582-030-027
Gordon L. Blodgett
15860 Yarnell St.
Sylmar CA 91342-1142

APN: 2582-030-028
Spiro Razatos
7657 E. Bridgewood Dr.
Anaheim CA 92808

APN: 2582-030-029
Richard L. Colvin
15880 Yarnell St.
Sylmar CA 91342-1142

APN: 2582-030-030
Leor Frieden
18208 Sandringham Ct.
Northridge CA 91326

APN: 2582-030-031
W & B Builders Inc
1666 9th St.
Santa Monica CA 90404

APN: 2582-033-001
Claudio A. Gormaz
16000 Circle Diamond Rd.
Sylmar CA 91342-1048

APN: 2582-033-002
Michael A. Fonseca
16006 Circle Diamond Rd.
Sylmar CA 91342-1048

APN: 2582-033-003
Peter D. Smith
16012 Circle Diamond Rd.
Sylmar CA 91342-1048

APN: 2582-033-004
Jolene Hepler
16018 Circle Diamond Rd.
Sylmar CA 91342-1048

APN: 2582-033-005
Henry A. Garcia
16022 Circle Diamond Rd.
San Fernando CA 91342-1048

APN: 2582-033-006
Walter E. Kennard
16026 Circle Diamond Rd.
Sylmar CA 91342-1048

APN: 2582-033-007
Luis H. Silva
16032 Circle Diamond Rd.
San Fernando CA 91342-1048

APN: 2582-033-008
Ralph J. & Kathe Shaffer
10910 Delco Ave.
Chatsworth CA 91311

APN: 2582-033-009
Richard W. Burroughs
16046 Circle Diamond Rd.
Sylmar CA 91342-1048

APN: 2582-033-010
James B. Mynatt
16054 Circle Diamond Rd.
San Fernando CA 91342-1048

APN: 2582-033-011
Jae W. Lee
16062 Circle Diamond Rd.
San Fernando CA 91342-1048

APN: 2582-033-012
Antonio R. Leyva
16067 Circle Diamond Rd.
San Fernando CA 91342-1049

APN: 2582-033-013
Michael A. Dincau
16059 Circle Diamond Rd.
Sylmar CA 91342-1049

APN: 2582-033-014
Dale L. Weibly
16055 Circle Diamond Rd.
Sylmar CA 91342-1049

APN: 2582-033-015
Ronald W. Meredith
16051 Circle Diamond Rd.
Sylmar CA 91342-1049

APN: 2582-033-016
Orly Rechany
6433 Topanga Canyon Blvd.
Canoga Park CA 91303

APN: 2582-033-017
Rollie R. Sypher
16043 Circle Diamond Rd.
San Fernando CA 91342-1049

APN: 2582-033-018
Robert A. Sherman
16039 Circle Diamond Rd.
Sylmar CA 91342-1049

APN: 2582-033-019
Steven P. Hull
16035 Circle Diamond Rd.
Sylmar CA 91342-1049

APN: 2582-033-020
Maria Shih
16031 Circle Diamond Rd.
San Fernando CA 91342-1049

APN: 2582-033-021
Dan Depew
16025 Circle Diamond Rd.
San Fernando CA 91342-1049

APN: 2582-033-022
Albert D. Frederico
16019 Circle Diamond Rd.
Sylmar CA 91342-1049

APN: 2582-033-023
Ralph H. Beebe
16011 Circle Diamond Rd.
Sylmar CA 91342-1049

APN: 2582-033-024
Betty Sookiasian
16001 Circle Diamond Rd.
Sylmar CA 91342-1074

APN: 2582-033-025
Ronald G. McGee
15879 Yarnell St.
Sylmar CA 91342-1143

APN: 2582-033-026
Roger L. Shelby
15873 Yarnell St.
Sylmar CA 91342-1143

APN: 2582-033-027
Restituto L. Valenzuela
15859 Yarnell St.
Sylmar CA 91342-1143

APN: 2582-033-028
Kenneth M. Ramirez
15851 Yarnell St.
Sylmar CA 91342-1143

APN: 2582-033-029
Tomas Contreras
13953 Saddle Ridge Rd.
Sylmar CA 91342-1150

APN: 2582-033-030
Charles A. Klum
13961 Saddle Ridge Rd.
Sylmar CA 91342-1150

APN: 2582-033-031
Jonathan F. Rosen
13971 Saddle Ridge Rd.
Sylmar CA 91342-1150

APN: 2582-033-032
Carlos E. Chang
13977 Saddle Ridge Rd.
Sylmar CA 91342-1150

APN: 2582-033-033
Michael S. Swain
13983 Saddle Ridge Rd.
Sylmar CA 91342-1150

APN: 2582-033-034
Laura K. Ortiz
14001 Saddle Ridge Rd.
Sylmar CA 91342-1061

APN: 2582-033-035
Kiyohiko Igarashi
14005 Saddle Ridge Rd.
San Fernando CA 91342-1061

APN: 2582-033-036
Cham Quang Yong
14015 Saddle Ridge Rd.
Sylmar CA 91342-1061

APN: 2582-033-037
Sandra D. Guiton
14019 Saddle Ridge Rd.
Sylmar CA 91342-1061

APN: 2582-033-038
Fred Weinhart
14023 Saddle Ridge Rd.
Sylmar CA 91342-1061

APN: 2582-033-039
Guillermo E. Cruz
14029 Saddle Ridge Rd.
Sylmar CA 91342-1057

APN: 2582-033-040
Athorn Saraneyawongse
14035 Saddle Ridge Rd.
Sylmar CA 91342-1057

APN: 2582-033-041
David B. Young
14041 Saddle Ridge Rd.
Sylmar CA 91342-1057

APN: 2582-033-042
Vicky T. Woo
14047 Saddle Ridge Rd.
Sylmar CA 91342-1057

APN: 2582-033-043
Edwin I. Bernard
14053 Saddle Ridge Rd.
Sylmar CA 91342-1057

APN: 2582-033-044
Robert H. Armour
15958 Filbert St.
Sylmar CA 91342-1069

APN: 2582-033-045
Richard N. Keith
15974 Filbert St.
Sylmar CA 91342-1069

APN: 2582-033-046
Edward A. Schaff
15980 Filbert St.
Sylmar CA 91342-1069

APN: 2582-033-047
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Sylmar CA 91342

APN: 2582-034-001
Spencer A. Varian
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La Canada Flt CA 91012

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Steve Landaker
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APN: 2601-001-002
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1660 Riverside Dr.
Los Angeles CA 90031

APN: 2601-001-900
L A Co Transportation Commission
900 S. Fremont Ave.
Alhambra CA 91801

APN: 2601-002-001
David Ward
17139 Van Gogh St.
Granada Hills CA 91344

APN: 2601-002-002
David Ward
17139 Van Gogh St.
Granada Hills CA 91344

APN: 2601-002-005
Ted Sakaida
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Saugus CA 91350

APN: 2601-003-011
Joseph B. Fischer
12365 Tiara St. No. 200
Valley Vlg CA 91607

APN: 2601-003-012
Doyle E. King
29142 Highway 190
Porterville CA 93257

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Wojdak Trust
14936 San Fernando Rd.
San Fernando CA 91342-1023

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APN: 2601-004-007
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Z G J Development
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APN: 2601-005-011
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William C. Cloyd
18446 Hart St. No. 6
Reseda CA 91335

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1336 N. Moorpark Rd. No. 248
Thousand Oaks CA 91360

APN: 2601-006-024
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APN: 2601-010-010
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APN: 2601-010-011
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13314 Mission Tierra Way
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APN: 2601-010-012
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13318 Mission Tierra Way
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APN: 2601-010-013
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13324 Mission Tierra Way
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APN: 2601-010-014
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13330 Mission Tierra Way
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APN: 2601-010-015
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13336 Mission Tierra Way
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APN: 2601-010-016
Lawrence T. Ready
13342 Mission Tierra Way
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APN: 2601-010-017
Shiv M. Shankar
13348 Mission Tierra Way
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APN: 2601-010-018
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13354 Mission Tierra Way
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APN: 2601-010-019
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13360 Mission Tierra Way
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APN: 2601-010-021
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APN: 2601-010-027
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13250 Mission Tierra Way
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APN: 2601-010-028
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APN: 2601-010-029
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13242 Mission Tierra Way
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APN: 2601-010-030
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APN: 2601-010-031
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13414 Mission Tierra Way
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APN: 2601-012-036
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APN: 2601-012-037
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APN: 2601-012-039
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APN: 2601-012-042
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APN: 2601-012-043
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13462 Mission Tierra Way
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APN: 2601-012-044
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APN: 2601-012-059
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APN: 2601-013-033
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Granada Hills CA 91344-1123

APN: 2601-013-034
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APN: 2601-013-035
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APN: 2601-013-036
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APN: 2601-013-037
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APN: 2601-013-040
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APN: 2601-013-041
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APN: 2601-013-045
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APN: 2601-013-046
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APN: 2601-013-047
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APN: 2601-013-048
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13247 Constable Ave.
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APN: 2601-014-023
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13251 Constable Ave.
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APN: 2601-014-024
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13255 Constable Ave.
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APN: 2601-014-025
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13345 Constable Ave.
Granada Hills CA 91344-1110

APN: 2601-014-026
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13339 Constable Ave.
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APN: 2601-014-029
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APN: 2601-014-030
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13239 Mission Tierra Way
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APN: 2601-015-023
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APN: 2601-015-025
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APN: 2601-015-026
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13261 Mission Tierra Way
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APN: 2601-015-030
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13269 Mission Tierra Way
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13320 Golden Valley Lane
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APN: 2601-050-054
Wayne J. Stelmar
12640 Bradford Pl.
Granada Hills CA 91344-1510

APN: 2601-050-055
Khodabakhsh Dezfuli
12636 Bradford Pl.
Granada Hills CA 91344-1510

APN: 2601-050-056
Michele A. De Robertis
12632 Bradford Pl.
Granada Hills CA 91344-1510

APN: 2601-050-057
William H. Pennington
12628 Bradford Pl.
Granada Hills CA 91344-1510

APN: 2601-050-058
Jay R. Friedman
12624 Bradford Pl.
Granada Hills CA 91344-1510

APN: 2601-050-059
George Beloff
12461 Jessica Pl.
Granada Hills CA 91344-1563

APN: 2601-050-060
Rube H. Berman
12467 Jessica Pl.
Granada Hills CA 91344-1563

APN: 2601-050-061
James J. Finkel
12471 Jessica Pl.
Granada Hills CA 91344-1563

APN: 2601-050-062
Wout Herman H. Van T
12475 Jessica Pl.
Granada Hills CA 91344-1563

APN: 2601-050-063
Christian Mann
12472 Jessica Pl.
Granada Hills CA 91344-1563

APN: 2601-050-064
Subhi H. Hamideh
1135 San Fernando Rd.
San Fernando CA 91340

APN: 2601-050-065
Nena S. Pua
6911 Hayvenhurst Ave.
Van Nuys CA 91406

APN: 2601-050-066
Sidney L. Pollack
12451 Jacqueline Pl.
Granada Hills CA 91344-1561

APN: 2601-050-067
Vardouhi Grigorian
12457 Jacqueline Pl.
Granada Hills CA 91344-1561

APN: 2601-050-068
Milton Wolf
12461 Jacqueline Pl.
Granada Hills CA 91344-1561

APN: 2601-050-069
William Lee
12462 Jacqueline Pl.
Granada Hills CA 91344-1561

APN: 2601-050-070
Linas J. Kazlauskas
12458 Jacqueline Pl.
Granada Hills CA 91344-1561

APN: 2601-050-071
Vladislav Viksman
12450 Jacqueline Pl.
Granada Hills CA 91344

APN: 2601-051-001
Steven R. Marden
11994 Shoshone Ave.
Granada Hills CA 91344-2234

APN: 2601-051-002
Robert W. Schurman
11986 Shoshone Ave.
Granada Hills CA 91344-2234

APN: 2601-051-003
Peter J. Nelson
11978 Shoshone Ave.
Granada Hills CA 91344-2234

APN: 2601-051-004
Miae Kim
11001 Collett Ave.
Granada Hills CA 91344

APN: 2601-051-005
Chandru P. Keswani
11960 Shoshone Ave.
Granada Hills CA 91344-2234

APN: 2601-051-006
Shirley A. Agan
7410 Laurelgrove Ave.
N Hollywood CA 91605

APN: 2601-051-007
James L. Cagle
11940 Shoshone Ave.
Granada Hills CA 91344-2234

APN: 2601-051-008
Scott A. Manatt
11930 Shoshone Ave.
Granada Hills CA 91344-2234

APN: 2601-051-009
Robert N. Reed
11920 Shoshone Ave.
Granada Hills CA 91344-2234

APN: 2601-051-010
James L. Caskey
11912 Shoshone Ave.
Granada Hills CA 91344-2234

APN: 2601-051-011
Robert A. Wirffel
11933 Nugent Dr.
Granada Hills CA 91344-2235

APN: 2601-051-012
Craig J. Nelson
11943 Nugent Dr.
Granada Hills CA 91344-2235

APN: 2601-051-013
James R. Tipton
11955 Nugent Dr.
Granada Hills CA 91344-2235

APN: 2601-051-014
Edward M. Petersen
11963 Nugent Dr.
Granada Hills CA 91344-2235

APN: 2601-051-015
Enrique Gonzalez
11969 Nugent Dr.
Granada Hills CA 91344-2235

APN: 2601-051-016
Wen J. Chiang
11977 Nugent Dr.
Granada Hills CA 91344-2235

APN: 2601-051-017
Ten Y. Chong
11985 Nugent Dr.
Granada Hills CA 91344-2235

APN: 2601-051-018
David Liu
11991 Nugent Dr.
Granada Hills CA 91344-2235

APN: 2601-051-019
Jae S. Yang
11992 Nugent Dr.
Granada Hills CA 91344-2236

APN: 2601-051-020
Barbara Younker
11984 Nugent Dr.
Granada Hills CA 91344-2236

APN: 2601-051-021
Dorothy R. Detwiler
11976 Nugent Dr.
Granada Hills CA 91344-2236

APN: 2601-051-022
Safeco Title Ins
18446 Hart St.
Reseda CA 91335

APN: 2601-051-023
Ying Yean
11960 Nugent Dr.
Granada Hills CA 91344-2236

APN: 2601-051-024
Ronald D. Hendrickson
11952 Nugent Dr.
Granada Hills CA 91344-2236

APN: 2601-051-025
Ronald A. Anderson
11944 Nugent Dr.
Granada Hills CA 91344-2236

APN: 2601-051-026
Gary C. Lu
11936 Nugent Dr.
Granada Hills CA 91344-2236

APN: 2601-051-027
Nicholas P. Mascis
11930 Nugent Dr.
Granada Hills CA 91344-2236

APN: 2601-051-028
Michael D. Saltsman
11924 Nugent Dr.
Granada Hills CA 91344-2236

APN: 2601-051-029
Thomas R. Kuo
11914 Nugent Dr.
Granada Hills CA 91344-2236

APN: 2601-051-030
Elliot D. Jennings
11906 Shoshone Ave.
Granada Hills CA 91344-2234

APN: 2601-051-031
Robert M. Johnson
11901 Andasol Ave.
Granada Hills CA 91344-2233

APN: 2601-051-032
John E. Schmidt
11905 Andasol Ave.
Granada Hills CA 91344-2233

APN: 2601-051-033
Louis F. Johnson
11909 Andasol Ave.
Granada Hills CA 91344-2233

APN: 2601-051-034
Kamran N. Nikbakht
11915 Andasol Ave.
Granada Hills CA 91344-2233

APN: 2601-051-035
Oscar Tudela
11923 Andasol Ave.
Granada Hills CA 91344-2233

APN: 2601-051-036
Mark E. Gallegos
11929 Andasol Ave.
Granada Hills CA 91344-2233

APN: 2601-051-037
Laszlo Molnar
11937 Andasol Ave.
Granada Hills CA 91344-2233

APN: 2601-052-001
Daljit S. Sehmi
17427 Rainbow Ridge Cir
Granada Hills CA 91344-2240

APN: 2601-052-002
Y. B. Kim
17417 Rainbow Ridge Cir
Granada Hills CA 91344-2240

APN: 2601-052-003
Howard A. Russell
17407 Rainbow Ridge Cir
Granada Hills CA 91344-2240

APN: 2601-052-004
Edward G. Pollock
17401 Rainbow Ridge Cir
Granada Hills CA 91344-2240

APN: 2601-052-005
Alexander C. Georgiev
17389 Rainbow Ridge Cir
Granada Hills CA 91344-2207

APN: 2601-052-006
Iris Jacob
17381 Rainbow Ridge Cir
Granada Hills CA 91344-2207

APN: 2601-052-007
Gopal M. Lala
17373 Rainbow Ridge Cir
Granada Hills CA 91344-2207

APN: 2601-052-008
Joseph C. Phillips
17363 Rainbow Ridge Cir
Granada Hills CA 91344-2207

APN: 2601-053-001
Young H. Han
13000 Louise Ave.
Granada Hills CA 91344-1085

APN: 2601-053-002
Katherine W. Parker
13002 Louise Ave.
Granada Hills CA 91344-1085

APN: 2601-053-003
Vasken H. Saghbazarian
13014 Louise Ave.
Granada Hills CA 91344-1085

APN: 2601-053-004
Bill Shin
17915 Lone Oak Dr.
Granada Hills CA 91344-1081

APN: 2601-053-005
Edward J. Greene
17923 Lone Oak Dr.
Granada Hills CA 91344-1081

APN: 2601-053-006
Roscher Trust
416 Marguerita Ave.
Santa Monica CA 90402

APN: 2601-053-007
Arno & Adelheid Tr Roscher
17943 Lone Oak Dr.
Granada Hills CA 91344-1081

APN: 2601-053-008
Dinesh K. Lakhanpal
17901 Tuscan Ct.
Granada Hills CA 91344-1095

APN: 2601-053-009
Omar Q. Huda
17907 Tuscan Ct.
Granada Hills CA 91344-1095

APN: 2601-053-010
Debbie Kasha
17915 Tuscan Ct.
Granada Hills CA 91344-1095

APN: 2601-053-011
Phillip E. Stumbo
17900 Tuscan Ct.
Granada Hills CA 91344-1095

APN: 2601-053-012
Subash Khurana
17924 Tuscan Ct.
Granada Hills CA 91344-1095

APN: 2601-053-013
Crest Granada Hills Canyon
12810 Louise Ave.
Granada Hills CA 91344

APN: 2601-053-014
Boczanowski Development LTD
6335 Nancy Ridge Dr.
San Diego CA 92121

APN: 2601-054-002
Dening Cai
5567 Reseda Blvd. No. 110
Tarzana CA 91356

APN: 2601-054-003
PFAHLER Erik P
12806 Louise Ave.
Granada Hills CA 91344-1074

APN: 2601-054-005
James Wilson
12970 Louise Ave.
Granada Hills CA 91344-1077

APN: 2601-054-006
Crest Granada Hills Canyon
12810 Louise Ave.
Granada Hills CA 91344

APN: 2601-054-009
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17657 Tuscan Dr.
Granada Hills CA 91344-1060

APN: 2601-054-012
Crest Granada Hills Canyon
4041 MacArthur Blvd. Fl 4
Newport Beach CA 92660

APN: 2601-054-013
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12810 Louise Ave.
Granada Hills CA 91344-1074

APN: 2601-055-001
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12809 Louise Ave.
Granada Hills CA 91344-1075

APN: 2601-055-002
Ivan W. Prather
17709 Tuscan Dr.
Granada Hills CA 91344-1073

APN: 2601-055-003
Robert V. Poladian
17715 Tuscan Dr.
Granada Hills CA 91344-1073

APN: 2601-055-004
Son T. & Son P. Hoang
17727 Tuscan Dr.
Granada Hills CA 91344-1073

APN: 2601-055-005
Martin J. Prescott
17735 Tuscan Dr.
Granada Hills CA 91344-1073

APN: 2601-055-006
Purificacion Acorda
17739 Tuscan Dr.
Granada Hills CA 91344-1073

APN: 2601-055-007
Mark Pastorius
17743 Tuscan Dr.
Granada Hills CA 91344-1073

APN: 2601-055-008
Willard J. Gueringer
17807 Tuscan Dr.
Granada Hills CA 91344-1094

APN: 2601-055-009
Commonwealth Life Ins Co
197 E. Hamilton Ave. No. 101
Campbell CA 95008

APN: 2601-055-010
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APN: 2601-055-011
Joel M. Baril
17831 Tuscan Dr.
Granada Hills CA 91344-1094

APN: 2601-055-012
Stephen Ducatman
17839 Tuscan Dr.
Granada Hills CA 91344-1094

APN: 2601-055-013
Manzar S. Kuraishi
17845 Tuscan Dr.
Granada Hills CA 91344-1094

APN: 2601-055-014
Surinder Singh
17849 Tuscan Dr.
Granada Hills CA 91344-1094

APN: 2601-055-015
Vinesh R. Nathu
17855 Tuscan Dr.
Granada Hills CA 91344-1094

APN: 2601-055-016
Paul Grobert
17861 Tuscan Dr.
Granada Hills CA 91344-1094

APN: 2601-055-017
Dennis J. Feeney
17854 Oakrock Ct.
Granada Hills CA 91344-1082

APN: 2601-055-018
Ernest Williams
17846 Oakrock Ct.
Granada Hills CA 91344-1082

APN: 2601-055-019
Rudolfo A. Martin
17836 Oakrock Ct.
Granada Hills CA 91344-1082

APN: 2601-055-020
Richard M. Lundgren
17830 Oakrock Ct.
Granada Hills CA 91344-1082

APN: 2601-055-021
Robert W. Goldsmith
17822 Oakrock Ct.
Granada Hills CA 91344-1082

APN: 2601-055-022
Subhash C. Mantri
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Granada Hills CA 91394

APN: 2601-055-023
Harcharan S. Sidhu
17813 Oakrock Ct.
Granada Hills CA 91344-1082

APN: 2601-055-024
Lelah Jenkins
12819 Louise Ave.
Granada Hills CA 91344-1075

APN: 2601-055-025
Louis Porcaro
12831 Louise Ave.
Granada Hills CA 91344-1075

APN: 2601-055-026
Jang B. Sethi
12839 Louise Ave.
Granada Hills CA 91344-1075

APN: 2601-055-027
Bok Nam Park
12847 Louise Ave.
Granada Hills CA 91344-1075

APN: 2601-055-028
Timothy G. Hare
12901 Louise Ave.
Granada Hills CA 91344-1076

APN: 2601-055-029
Amy Forte
12909 Louise Ave.
Granada Hills CA 91344-1076

APN: 2601-055-030
Lawren W. Chapin
12917 Louise Ave.
Granada Hills CA 91344-1076

APN: 2601-055-031
Chandrakant D. Mahajan
12925 Louise Ave.
Granada Hills CA 91344-1076

APN: 2601-055-032
Robert Marsicano
12935 Louise Ave.
Granada Hills CA 91344-1076

APN: 2601-055-033
Audrey Snider
12943 Louise Ave.
Granada Hills CA 91344-1076

APN: 2601-055-034
Min Ja Nam
12955 Louise Ave.
Granada Hills CA 91344-1076

APN: 2601-055-035
Tony & Georgett Mushamel
12963 Louise Ave.
Granada Hills CA 91344-1076

APN: 2601-055-036
Timothy C. Harvey
12971 Louise Ave.
Granada Hills CA 91344-1076

APN: 2601-056-001
Sapio / Helgeson Trust
17864 Tuscan Dr.
Granada Hills CA 91344-1093

APN: 2601-056-002
John H. Reese
17854 Tuscan Dr.
Granada Hills CA 91344-1093

APN: 2601-056-003
Balbir Sahni
17848 Tuscan Dr.
Granada Hills CA 91344-1093

APN: 2601-056-004
James L. Racusin
17838 Tuscan Dr.
Granada Hills CA 91344-1093

APN: 2601-056-005
Hugo Halcovich
17830 Tuscan Dr.
Granada Hills CA 91344-1093

APN: 2601-056-006
Ronald S. Kassan
17816 Tuscan Dr.
Granada Hills CA 91344-1093

APN: 2601-056-007
Pramod G. Gan
17800 Tuscan Dr.
Granada Hills CA 91344-1093

APN: 2601-056-008
Don D. Lee
17740 Tuscan Dr.
Granada Hills CA 91344-1000

APN: 2601-056-009
Mark A. & Dana L. Elsbernd
17734 Tuscan Dr.
Granada Hills CA 91344-1000

APN: 2601-056-010
Daniel S. Alderman
17726 Tuscan Dr.
Granada Hills CA 91344-1000

APN: 2601-056-011
Attaollah Azamian
17716 Tuscan Dr.
Granada Hills CA 91344-1000

APN: 2601-056-012
Ahmad Mehrinfar
17710 Tuscan Dr.
Granada Hills CA 91344-1000

APN: 2601-056-013
HSIEH Teh Ming
17706 Tuscan Dr.
Granada Hills CA 91344-1000

APN: 2601-056-014
Bonnie J. Frost
17700 Tuscan Dr.
Granada Hills CA 91344-1000

APN: 2601-056-015
Gregory Drill
17670 Tuscan Dr.
Granada Hills CA 91344-1059

APN: 2601-056-016
Romualdo R. Tioleco
17658 Tuscan Dr.
Granada Hills CA 91344-1059

APN: 2601-057-001
Gary Etting
17606 Rushing Dr.
Granada Hills CA 91344-1936

APN: 2601-057-002
John G. Deenihan
17618 Rushing Dr.
Granada Hills CA 91344-1936

APN: 2601-057-003
Masis Ghevondian
17626 Rushing Dr.
Granada Hills CA 91344-1936

APN: 2601-057-005
Fred S. Morrow
17607 Mahoney Pl.
Granada Hills CA 91344-1939

APN: 2601-057-006
Carlos Sanchez
17601 Mahoney Pl.
Granada Hills CA 91344-1939

APN: 2601-057-007
Robert O. Flores
17681 Bryan Pl.
Granada Hills CA 91344-1941

APN: 2601-057-008
Jay D. Sherbon
17675 Bryan Pl.
Granada Hills CA 91344-1941

APN: 2601-057-009
Gholwan Mechammil
17671 Bryan Pl.
Granada Hills CA 91344-1941

APN: 2601-057-010
Mirpuri Trust # 1
325 E. Hillcrest Dr. No. 220
Thousand Oaks CA 91360

APN: 2601-057-011
Norman Bernstein
17657 Bryan Pl.
Granada Hills CA 91344-1941

APN: 2601-057-012
Anek Lokumkiattikul
17645 Bryan Pl.
Granada Hills CA 91344-1941

APN: 2601-057-013
Mike Recesso
17641 Bryan Pl.
Granada Hills CA 91344-1941

APN: 2601-057-014
Blanca E. Carrillo
11326 Dronfield Ave.
Pacoima CA 91331

APN: 2601-057-015
Allan N. Simon
17623 Bryan Pl.
Granada Hills CA 91344-1941

APN: 2601-057-016
Carl E. Scruton
17615 Bryan Pl.
Granada Hills CA 91344-1941

APN: 2601-057-017
Felton S. Walker
17605 Bryan Pl.
Granada Hills CA 91344-1941

APN: 2601-057-018
Shu K. Ho
17624 Mahoney Pl.
Granada Hills CA 91344-1938

APN: 2601-057-019
William F. Bender
17628 Mahoney Pl.
Granada Hills CA 91344-1938

APN: 2601-057-020
Layton R. Crouch
17652 Mahoney Pl.
Granada Hills CA 91344-1938

APN: 2601-057-021
Shahe Boyadjian
17662 Mahoney Pl.
Granada Hills CA 91344-1938

APN: 2601-057-022
Monroe P. Askins
17674 Mahoney Pl.
Granada Hills CA 91344-1938

APN: 2601-057-023
William H. Wimsatt
17671 Mahoney Pl.
Granada Hills CA 91344-1939

APN: 2601-057-024
Marlon R. Brooks
17665 Mahoney Pl.
Granada Hills CA 91344-1939

APN: 2601-057-025
Granada North Dev Co
1844 Hart No. F
Reseda CA 91335

APN: 2601-057-027
Stephen L. Hewitt
7616 Mahony Pl.
Granada Hills CA 91344

APN: 2601-058-001
James L. Trace
17558 Mahoney Pl.
Granada Hills CA 91344-1942

APN: 2601-058-002
Young B. Yang
17600 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-003
Sarkis S. Maronian
17606 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-004
Kambiz F. Biuki
17612 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-006
Joseph Braun
17622 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-007
Jaganath Naidu
17628 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-008
Brian A. Asalone
17632 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-010
Steven Phillips
17644 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-011
Jung W. Cha
17650 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-012
Victor Ceballos
17658 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-013
James R. Odin
17666 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-014
Young K. Min
17672 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-015
George E. Chang
17680 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-017
Vincent Ciccarelli
11700 Monte Leon Way
Northridge CA 91326

APN: 2601-058-018
Timothy Lukasiewicz
17616 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-058-020
Benjamin S. Pelter
17636 Bryan Pl.
Granada Hills CA 91344-1940

APN: 2601-059-001
Robert C. Pickelle
17875 Orna Dr.
Granada Hills CA 91344-1334

APN: 2601-059-002
Morris & Joanne Tru Minken
17867 Orna Dr.
Granada Hills CA 91344-1334

APN: 2601-059-003
Steven D. Silver
17859 Orna Dr.
Granada Hills CA 91344-1334

APN: 2601-059-004
Bong S. Kim
17851 Orna Dr.
Granada Hills CA 91344-1334

APN: 2601-059-005
Fang Dee Lin
17845 Orna Dr.
Granada Hills CA 91344-1334

APN: 2601-059-006
Jeffrey Rumburg
17837 Orna Dr.
Granada Hills CA 91344-1334

APN: 2601-059-007
Bradley J. Blahut
17829 Orna Dr.
Granada Hills CA 91344-1334

APN: 2601-059-008
Joseph Borrego
17870 Orna Dr.
Granada Hills CA 91344-1333

APN: 2601-059-009
John C. Pate
17864 Orna Dr.
Granada Hills CA 91344-1333

APN: 2601-059-010
Joannie Lin
17856 Orna Dr.
Granada Hills CA 91344-1333

APN: 2601-059-011
Diab Diab
17848 Orna Dr.
Granada Hills CA 91344-1333

APN: 2601-059-012
Glen E. Cline
17842 Orna Dr.
Granada Hills CA 91344-1333

APN: 2601-059-013
Daniel L. Bershin
17830 Orna Dr.
Granada Hills CA 91344-1333

APN: 2601-059-014
Vache Chakmakian
17820 Orna Dr.
Granada Hills CA 91344-1333

APN: 2601-059-015
Darshan K. Gaur
17843 Arvida Dr.
Granada Hills CA 91344-1358

APN: 2601-059-016
Jerry A. Subar
17837 Arvida Dr.
Granada Hills CA 91344-1358

APN: 2601-059-024
Yung P. & Tsao M. Yao
17831 Arvida Dr.
Granada Hills CA 91344-1358

APN: 2601-059-025
Casey K. Sarff
17823 Arvida Dr.
Granada Hills CA 91344-1358

APN: 2601-059-026
David S. Stairs
17815 Arvida Dr.
Granada Hills CA 91344-1358

APN: 2601-059-027
Jose A. Almodovar
17807 Arvida Dr.
Granada Hills CA 91344-1358

APN: 2601-059-028
Liching Chen
17801 Arvida Dr.
Granada Hills CA 91344-1358

APN: 2601-059-029
HWANG Yi Kung
17755 Arvida Dr.
Granada Hills CA 91344-1306

APN: 2601-059-030
Jae B. Song
17747 Arvida Dr.
Granada Hills CA 91344-1306

APN: 2601-060-001
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12481 Cascade Canyon Dr.
Granada Hills CA 91344-1554

APN: 2601-060-002
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12505 Cascade Canyon Dr.
Granada Hills CA 91344-1556

APN: 2601-060-003
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12517 Cascade Canyon Dr.
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APN: 2601-060-004
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12525 Cascade Canyon Dr.
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APN: 2601-060-005
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12533 Cascade Canyon Dr.
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12541 Bradford Pl.
Granada Hills CA 91344-1538

APN: 2601-061-002
Sharon Feldman
12551 Bradford Pl.
Granada Hills CA 91344-1538

APN: 2601-061-003
Bradford D. Byrnes
12557 Bradford Pl.
Granada Hills CA 91344-1538

APN: 2601-061-004
Allen M. & Yumi Shinbashi
12569 Bradford Pl.
Granada Hills CA 91344-1538

APN: 2601-061-005
Edmond T. Cho
12601 Bradford Pl.
Granada Hills CA 91344-1552

APN: 2601-061-006
Armando B. Talamantez
12607 Bradford Pl.
Granada Hills CA 91344-1552

APN: 2601-061-007
Gustavo J. Moreno
12615 Bradford Pl.
Granada Hills CA 91344-1552

APN: 2601-061-008
Dennis Fujii
12625 Bradford Pl.
Granada Hills CA 91344-1552

APN: 2601-061-009
Gregory Watkins
12633 Bradford Pl.
Granada Hills CA 91344-1552

APN: 2601-061-010
Sam Hariz
12641 Bradford Pl.
Granada Hills CA 91344-1552

APN: 2601-061-011
Kamel L. Kamel
12466 Cascade Canyon Dr.
Granada Hills CA 91344-1553

APN: 2601-061-012
Ronald S. Isacoff
12458 Cascade Canyon Dr.
Granada Hills CA 91344-1553

APN: 2601-061-013
Young S. Lee
12450 Cascade Canyon Dr.
Granada Hills CA 91344-1553

APN: 2601-061-014
Domenico Barbato
12442 Cascade Canyon Dr.
Granada Hills CA 91344-1553

APN: 2601-061-015
Gregory H. Kim
12436 Cascade Canyon Dr.
Granada Hills CA 91344-1553

APN: 2601-061-016
John Colwell
12428 Cascade Canyon Dr.
Granada Hills CA 91344-1553

APN: 2601-061-017
Robert S. Paris
12420 Cascade Canyon Dr.
Granada Hills CA 91344-1553

APN: 2601-061-018
Bruce A. Greenwood
12414 Cascade Canyon Dr.
Granada Hills CA 91344-1553

APN: 2601-061-019
Steven Lopez
12406 Cascade Canyon Dr.
Granada Hills CA 91344-1553

APN: 2601-061-020
Douglas S. Aberle
12400 Cascade Canyon Dr.
Granada Hills CA 91344-1553

APN: 2601-061-021
Ashok J. Patel
12350 Jeremy Pl.
Granada Hills CA 91344-1562

APN: 2601-061-022
Kevin J. McNaughton
12340 Jeremy Pl.
Granada Hills CA 91344-1562

APN: 2601-061-023
EZZATI Sohrab
12324 Jeremy Pl.
Granada Hills CA 91344-1562

APN: 2601-061-024
Max D. Curry
12320 Jeremy Pl.
Granada Hills CA 91344-1562

APN: 2601-061-026
Donald A. Kroll
12325 Jeremy Pl.
Granada Hills CA 91344-1562

APN: 2601-061-027
Gurjit Sethi
12341 Jeremy Pl.
Granada Hills CA 91344-1562

APN: 2601-061-028
Ghaleb H. Haddad
12351 Jeremy Pl.
Granada Hills CA 91344-1562

APN: 2601-061-029
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12455 Cascade Canyon Dr.
Granada Hills CA 91344-1554

APN: 2601-061-030
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12321 Jeremy Pl.
Granada Hills CA 91344-1562

APN: 2601-062-001
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11975 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-002
Ying S. Huang
11965 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-003
Harnek S. Thiara
11955 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-004
George R. Nadel
11945 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-005
Wilbur F. Clunen
11937 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-006
Steven M. Dunsmore
11929 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-007
Hermilito L. Villar
11925 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-008
Alfonso F. Gonzalez
11926 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-009
Manzar S. Kuraishi
11934 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-010
Maria L. Anson-Maya
11944 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-011
Joseph P. Wolk
11952 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-012
John P. Aversano
11960 Vara Pl.
Granada Hills CA 91344-2100

APN: 2601-062-013
Akram A. Almass
11974 Vara Pl.
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APN: 2601-062-014
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11985 Rexbon Rd.
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APN: 2601-062-015
Steven Maslow
11975 Rexbon Rd.
Granada Hills CA 91344-2130

APN: 2601-062-016
Rodolfo G. De Leon
11959 Rexbon Rd.
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APN: 2601-062-017
Lisa G. Euphrat
11953 Rexbon Rd.
Granada Hills CA 91344-2130

APN: 2601-062-018
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11945 Rexbon Rd.
Granada Hills CA 91344-2130

APN: 2601-062-019
Yosef Amzalag
11935 Rexbon Rd.
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APN: 2601-062-020
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12678 Classics Dr.
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APN: 2601-063-002
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12670 Classics Dr.
Granada Hills CA 91344-1948

APN: 2601-063-003
Marvin Needleman
12664 Classics Dr.
Granada Hills CA 91344-1948

APN: 2601-063-004
Kektor & Maracari Abakians
12658 Classics Dr.
Granada Hills CA 91344-1948

APN: 2601-063-005
Mohammad B. Ayati
12652 Classics Dr.
Granada Hills CA 91344-1948

APN: 2601-063-006
Udava Jagirdar
12640 Classics Dr.
Granada Hills CA 91344-1948

APN: 2601-063-007
Koang S. Pak
12630 Classics Dr.
Granada Hills CA 91344-1948

APN: 2601-063-008
Simon H. Meltzer
12620 Classics Dr.
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APN: 2601-063-009
Joseph A. McFadden
12610 Classics Dr.
Granada Hills CA 91344-1948

APN: 2601-063-010
Alfredo Lopez
17969 Montague Ct.
Granada Hills CA 91344-1945

APN: 2601-063-011
Jorge E. Pinos
17957 Montague Ct.
Granada Hills CA 91344-1945

APN: 2601-063-012
Philip I. Harber
17949 Montague Ct.
Granada Hills CA 91344

APN: 2601-063-013
Julius A. Alli
17911 Montague Ct.
Granada Hills CA 91344-1945

APN: 2601-063-014
Larry D. Falk
17905 Montague Ct.
Granada Hills CA 91344-1945

APN: 2601-063-015
Hanns M. Botz
17901 Montague Ct.
Granada Hills CA 91344-1945

APN: 2601-063-016
Hammond Trust
17904 Montague Ct.
Granada Hills CA 91344-1944

APN: 2601-063-017
Scott Runyon
17910 Montague Ct.
Granada Hills CA 91344-1944

APN: 2601-063-018
Robert D. Consolo
17918 Montague Ct.
Granada Hills CA 91344-1944

APN: 2601-063-019
Simon Mills
17926 Montague Ct.
Granada Hills CA 91344-1944

APN: 2601-063-020
Kuo Chun Ma
17936 Montague Ct.
Granada Hills CA 91344

APN: 2601-063-021
Kristina J. Frost
17938 Montague Ct.
Granada Hills CA 91344-1944

APN: 2601-063-022
Stuart Marcher
17942 Montague Ct.
Granada Hills CA 91344

APN: 2601-063-023
Rosanna G. Dy
17948 Montague Ct.
Granada Hills CA 91344-1944

APN: 2601-063-024
Charoon Eimukool
17956 Montague Ct.
Granada Hills CA 91344-1944

APN: 2601-063-025
Avio Piombetti
17964 Montague Ct.
Granada Hills CA 91344-1944

APN: 2601-063-026
Jeffrey Mannis
17972 Montague Ct.
Granada Hills CA 91344-1944

APN: 2601-063-027
Wael Dagher
17978 Montague Ct.
Granada Hills CA 91344-1944

APN: 2601-064-001
Hovsep Pilikian
12639 Classics Dr.
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APN: 2601-064-002
Do Y. Chun
12645 Classics Dr.
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APN: 2601-064-003
Marcus A. Petoyan
12651 Classics Dr.
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APN: 2601-064-004
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12657 Classics Dr.
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12669 Classics Dr.
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APN: 2601-064-007
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18002 Dali Dr.
Granada Hills CA 91344-1946

APN: 2601-064-008
Keun Y. Kim
18012 Dali Dr.
Granada Hills CA 91344-1946

APN: 2601-064-009
Lee V. Mason
18015 Dali Dr.
Granada Hills CA 91344-1946

APN: 2601-064-010
Robert L. Wiles
18005 Dali Dr.
Granada Hills CA 91344-1946

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APN: 2601-065-002
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Van Nuys CA 91406

APN: 2601-065-017
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17761 Mayerling St.
Granada Hills CA 91344-2122

APN: 2601-065-018
Harris Greenwald
17771 Mayerling St.
Granada Hills CA 91344-2122

APN: 2601-065-019
M. Gretchen Tr Anderson
19800 MacArthur Blvd. No. 800
Irvine CA 92715

APN: 2601-065-020
Zephyr II Inc
19800 MacArthur Blvd. No. 800
Irvine CA 92715

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Linda Wolfe
17823 Mayerling St.
Granada Hills CA 91344-2124

APN: 2601-065-023
William Wendorf
17849 Mayerling St.
Granada Hills CA 91344-2124

APN: 2601-065-024
Mark Tobin
17901 Mayerling St.
Granada Hills CA 91344-2126

APN: 2601-066-003
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17814 Greyhawk Pl.
Granada Hills CA 91344

APN: 2601-066-013
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11973 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-066-021
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17909 Mayerling St.
Granada Hills CA 91344-2126

APN: 2601-066-022
Harry Greanias
17917 Mayerling St.
Granada Hills CA 91344-2126

APN: 2601-066-023
James J. Atkinson
17925 Mayerling St.
Granada Hills CA 91344-2126

APN: 2601-066-024
Yansen Oei
17933 Mayerling St.
Granada Hills CA 91344-2126

APN: 2601-067-013
Wendy Carroll
11972 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-067-014
David J. Lionelli
11980 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-067-015
Steven H. Weinstein
11988 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-067-016
Victor H. Post
17918 Canyon Cove Pl.
Granada Hills CA 91344

APN: 2601-067-017
Bernard Heath
17917 Canyon Cove Pl.
Granada Hills CA 91344

APN: 2601-067-019
Laverne Kimball
12000 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-067-020
Howard D. Segal
12008 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-068-001
Greyhawk Ranch Homeowner S Assn
16461 Sherman Way No. 325
Van Nuys CA 91406

APN: 2601-068-002
Robert W. Goldsmith
12028 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-068-003
Robert A. Ruhl
12036 Wood Ranch Rd.
Granada Hills CA 91344-2154

APN: 2601-068-004
Kenneth J. Frier
12048 Wood Ranch Rd.
Granada Hills CA 91344-2154

APN: 2601-068-005
Andrew Hawthorne
12056 Wood Ranch Rd.
Granada Hills CA 91344-2154

APN: 2601-068-006
Joo H. Lee
12064 Wood Ranch Rd.
Granada Hills CA 91344-2154

APN: 2601-068-008
James H. Pulsipher
12072 Wood Ranch Rd.
Granada Hills CA 91344-2154

APN: 2601-068-009
Paul Merkle
18019 Mayerling St.
Granada Hills CA 91344-2128

APN: 2601-068-010
Bachar Molem
18011 Mayerling St.
Granada Hills CA 91344-2128

APN: 2601-068-011
Willaim G. Chialtas
18001 Mayerling St.
Granada Hills CA 91344-2128

APN: 2601-068-012
Ronald E. Kelly
17795 Mayerling St.
Granada Hills CA 91344

APN: 2601-068-013
John Kalayjian
17981 Mayerling St.
Granada Hills CA 91344

APN: 2601-068-014
Tim Quan
12049 Wood Ranch Rd.
Granada Hills CA 91344-2139

APN: 2601-068-015
John L. Ruffner
12041 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-068-016
Martin C. Coren
12033 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-068-017
Leonard Messinger
12025 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-068-018
Mark C. Kubin
12017 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-068-019
Paul Turley
12009 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-068-020
Dennis Goldman
12001 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-068-021
RWR Builders Inc
11991 Wood Ranch Rd.
Granada Hills CA 91344

APN: 2601-068-023
Steve Kitching
11979 Wood Ranch Rd.
Granada Hills CA 91344

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OWNERSHIP LIST

SUNSHINE CYN - #2602

APN: 2602-001-002
Paul T. Collins
13120 Constable Ave.
Granada Hills CA 91344-1105

APN: 2602-001-003
Donald W. Malinoff
13149 Ingres Ave.
Granada Hills CA 91344-1120

APN: 2602-001-004
William E. Florez
13157 Ingres Ave.
Granada Hills CA 91344-1120

APN: 2602-001-005
Richard H. Yoshida
13163 Ingres Ave.
Granada Hills CA 91344-1120

APN: 2602-001-007
Thomas Y. Fong
13177 Ingres Ave.
Granada Hills CA 91344-1120

APN: 2602-001-008
Aleksey Polonskiy
13183 Ingres Ave.
Granada Hills CA 91344-1120

APN: 2602-001-009
Arthur B. Chance
13207 Ingres Ave.
Granada Hills CA 91344-1122

APN: 2602-001-010
Eileen Posner
13215 Ingres Ave.
Granada Hills CA 91344-1122

APN: 2602-001-011
Alvin Moorehead
13221 Ingres Ave.
Granada Hills CA 91344-1122

APN: 2602-001-013
John L. Pahlow
13214 Ingres Ave.
Granada Hills CA 91344-1121

APN: 2602-001-014
William F. Stoehr
13200 Ingres Ave.
Granada Hills CA 91344-1121

APN: 2602-001-015
Anthony M. Garcia
13178 Ingres Ave.
Granada Hills CA 91344-1119

APN: 2602-001-016
Elwood M. Brown
13168 Ingres Ave.
Granada Hills CA 91344-1119

APN: 2602-001-017
Arnold K. Johnson
13160 Ingres Ave.
Granada Hills CA 91344-1119

APN: 2602-001-020
Don E. Deatrick
13220 Ingres Ave.
Granada Hills CA 91344-1121

APN: 2602-001-021
Alvin Moorehead
13221 Ingres Ave.
Granada Hills CA 91344

APN: 2602-001-022
Everett H. Lahmann
13161 Doss Ct.
Granada Hills CA 91344-1117

APN: 2602-001-023
Samuel J. Saso
13171 Doss Ct.
Granada Hills CA 91344-1117

APN: 2602-001-024
Linh C. T. Ho
13175 Doss Ct.
Granada Hills CA 91344-1117

APN: 2602-001-025
James M. George
13181 Doss Ct.
Granada Hills CA 91344-1117

APN: 2602-001-026
Ferenc Kovacs
13185 Doss Ct.
Granada Hills CA 91344-1117

APN: 2602-001-027
Dennis W. Quiles
13189 Doss Ct.
Granada Hills CA 91344-1117

APN: 2602-001-028
Balwinder S. Sukhija
13172 Doss Ct.
Granada Hills CA 91344-1117

APN: 2602-001-029
Arvindpal S. Nat
13162 Doss Ct.
Granada Hills CA 91344-1117

APN: 2602-001-030
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13150 Ingres Ave.
Granada Hills CA 91344-1119

APN: 2602-001-031
Fereidoon Simon
13130 Constable Ave.
Granada Hills CA 91344-1105

APN: 2602-001-032
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Granada Hills CA 91344-1107

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Granada Hills CA 91344-1102

APN: 2602-002-007
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13125 Balboa Blvd.
Granada Hills CA 91344-1102

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APN: 2602-002-011
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Granada Hills CA 91344-1139

APN: 2602-002-012
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Granada Hills CA 91344-1139

APN: 2602-002-013
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13142 Whistler Ave.
Granada Hills CA 91344-1139

APN: 2602-002-014
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13148 Whistler Ave.
Granada Hills CA 91344-1139

APN: 2602-002-015
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Granada Hills CA 91344-1139

APN: 2602-002-016
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13162 Whistler Ave.
Granada Hills CA 91344-1139

APN: 2602-002-017
Madhav D. Kale
13168 Whistler Ave.
Granada Hills CA 91344-1139

APN: 2602-002-018
Masato Takahashi
13174 Whistler Ave.
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APN: 2602-002-019
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13180 Whistler Ave.
Granada Hills CA 91344-1139

APN: 2602-002-020
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13188 Whistler Ave.
Granada Hills CA 91344-1139

APN: 2602-002-021
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13214 Whistler Lane
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APN: 2602-002-022
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13222 Whistler Lane
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APN: 2602-002-030
Won H. Lim
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13226 Whistler Ave.
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APN: 2602-003-008
Deanna J. Colton
13234 Whistler Ave.
Granada Hills CA 91344-1141

APN: 2602-003-009
Sam & Roslyn Weston
13242 Whistler Ave.
Granada Hills CA 91344-1141

APN: 2602-003-010
Gary Lachman
13246 Whistler Ave.
Granada Hills CA 91344-1141

APN: 2602-003-011
Jacques E. Stephen
13252 Whistler Ave.
Granada Hills CA 91344-1141

APN: 2602-003-012
Seyed A. Rooholamini
17243 Orozco St.
Granada Hills CA 91344-1149

APN: 2602-003-013
Edward Q. Bond
17247 Orozco St.
Granada Hills CA 91344-1149

APN: 2602-003-014
Jesus & Maria MacArio
17249 Orozco St.
Granada Hills CA 91344-1149

APN: 2602-003-015
Kenneth Lippert
17251 Orozco St.
Granada Hills CA 91344-1149

APN: 2602-003-016
David J. Kazdin
17253 Orozco St.
Granada Hills CA 91344-1149

APN: 2602-003-017
Jay R. Zarifian
17238 Sesnon Blvd.
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APN: 2602-003-018
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18634 Linnet St.
Tarzana CA 91356

APN: 2602-003-019
Edward E. You
17245 Orozco St.
Granada Hills CA 91344-1149

APN: 2602-003-020
Klaus Haase
17180 Sesnon Blvd.
Granada Hills CA 91344-1134

APN: 2602-003-021
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17172 Sesnon Blvd.
Granada Hills CA 91344-1134

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17156 Sesnon Blvd.
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APN: 2602-003-024
Stephanus Ong
17146 Sesnon Blvd.
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13172 Courbet Lane
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APN: 2602-004-002
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13180 Courbet Lane
Granada Hills CA 91344-1111

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APN: 2602-004-004
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13171 Courbet Lane
Granada Hills CA 91344-1111

APN: 2602-004-005
Frank B. Lee
13161 Courbet Lane
Granada Hills CA 91344-1111

APN: 2602-004-006
Alan R. Cueba
13151 Courbet Lane
Granada Hills CA 91344-1111

APN: 2602-004-007
Donald K. Hassig
13141 Courbet Lane
Granada Hills CA 91344-1111

APN: 2602-004-008
J. D. Langford
13133 Courbet Lane
Granada Hills CA 91344-1111

APN: 2602-004-009
John S. Maddox
13125 Courbet Lane
Granada Hills CA 91344-1111

APN: 2602-004-010
Gerhard R. Prost
13115 Courbet Lane
Granada Hills CA 91344-1111

APN: 2602-004-011
Luis A. Roman
13101 Courbet Lane
Granada Hills CA 91344-1111

APN: 2602-004-012
Richard D. Shald
17155 Courbet St.
Granada Hills CA 91344-1114

APN: 2602-004-013
Boris Polishchuk
17163 Courbet St.
Granada Hills CA 91344-1114

APN: 2602-004-014
Charles Snyder
17201 Courbet St.
Granada Hills CA 91344-1116

APN: 2602-004-015
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APN: 2602-004-016
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17219 Courbet St.
Granada Hills CA 91344-1116

APN: 2602-004-017
James P. Taylor
17225 Courbet St.
Granada Hills CA 91344-1116

APN: 2602-004-018
James E. Mims
17231 Orozco St.
Granada Hills CA 91344-1133

APN: 2602-004-019
Carole Morton
17233 Orozco St.
Granada Hills CA 91344-1133

APN: 2602-004-020
Richard C. Tresierras
17235 Orozco St.
Granada Hills CA 91344-1133

APN: 2602-004-021
Michael C. Cardon
17237 Orozco St.
Granada Hills CA 91344-1133

APN: 2602-004-022
Charles D. Alpern
17239 Orozco St.
Granada Hills CA 91344-1133

APN: 2602-004-023
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13261 Whistler Ave.
Granada Hills CA 91344-1142

APN: 2602-004-024
James A. Case
13249 Whistler Ave.
Granada Hills CA 91344-1142

APN: 2602-004-025
Joseph P. Sepikas
13241 Whistler Ave.
Granada Hills CA 91344-1142

APN: 2602-004-026
Edmond S. Sarkissian
13233 Whistler
Granada Hills CA 91344-1142

APN: 2602-005-001
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17041 Orozco St.
Granada Hills CA 91344-1130

APN: 2602-005-002
W. S. Curry
17035 Orozco St.
Granada Hills CA 91344-1130

APN: 2602-005-003
Fortino P. Espinoza
13115 Whistler Ave.
Granada Hills CA 91344-1140

APN: 2602-005-004
Richard Deburgh
17113 Courbet St.
Granada Hills CA 91344-1113

APN: 2602-005-005
A. S. Lieberthal
17121 Courbet St.
Granada Hills CA 91344-1113

APN: 2602-005-006
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17131 Courbet St.
Granada Hills CA 91344-1113

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13122 Courbet Lane
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APN: 2602-005-009
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13126 Courbet Lane
Granada Hills CA 91344-1111

APN: 2602-005-010
Thomas D. Thompson
13134 Courbet Lane
Granada Hills CA 91344-1111

APN: 2602-005-011
Phillip G. Burns
13140 Courbet Lane
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APN: 2602-005-012
Frank A. Estrada
13148 Courbet Lane
Granada Hills CA 91344-1111

APN: 2602-005-013
Francis R. McArthur
13154 Courbet Lane
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APN: 2602-005-014
Martin Moses
13160 Courbet Lane
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APN: 2602-005-015
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APN: 2602-005-016
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APN: 2602-005-017
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APN: 2602-005-018
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15207 Whistler Ave.
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APN: 2602-005-019
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13191 Whistler Ave.
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APN: 2602-005-020
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13185 Whistler Ave.
Granada Hills CA 91344-1140

APN: 2602-005-021
Ohannes Tatiossian
13177 Whistler Ave.
Granada Hills CA 91344-1140

APN: 2602-005-022
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13171 Whistler Ave.
Granada Hills CA 91344-1140

APN: 2602-005-023
Carlos O. Little
13165 Whistler Ave.
Granada Hills CA 91344-1140

APN: 2602-005-024
Boris Milman
13159 Whistler Ave.
Granada Hills CA 91344-1140

APN: 2602-005-025
William E. Norlund
13153 Whistler Ave.
Granada Hills CA 91344-1140

APN: 2602-005-026
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13145 Whistler Ave.
Granada Hills CA 91344-1140

APN: 2602-005-027
Eric A. Chase
13139 Whistler Ave.
Granada Hills CA 91344-1140

APN: 2602-005-028
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13131 Whistler Ave.
Granada Hills CA 91344-1140

APN: 2602-005-029
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13123 Whistler Ave.
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17116 Orozco St.
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APN: 2602-006-002
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Granada Hills CA 91344-1143

APN: 2602-006-003
Matias R. & Guicela Meza
17100 Orozco St.
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APN: 2602-006-004
Kenneth J. Lubas
17036 Orozco St.
Granada Hills CA 91344-1136

APN: 2602-006-005
Lawrence J. Rogge
17030 Orozco St.
Granada Hills CA 91344-1136

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17008 Orozco St.
Granada Hills CA 91344-1136

APN: 2602-006-009
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17000 Orozco St.
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APN: 2602-006-010
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17201 Orozco St.
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APN: 2602-006-011
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17171 Orozco St.
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APN: 2602-006-013
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17155 Orozco St.
Granada Hills CA 91344-1131

APN: 2602-006-014
Doug Stone
17147 Orozco St.
Granada Hills CA 91344-1131

APN: 2602-006-015
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17141 Orozco St.
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APN: 2602-006-016
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17133 Orozco St.
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APN: 2602-006-017
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17123 Orozco St.
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APN: 2602-006-018
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17204 Courbet St.
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APN: 2602-006-027
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17166 Courbet St.
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APN: 2602-006-028
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17158 Courbet St.
Granada Hills CA 91344-1112

APN: 2602-006-029
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17150 Courbet St.
Granada Hills CA 91344-1112

APN: 2602-006-030
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17144 Courbet St.
Granada Hills CA 91344-1112

APN: 2602-006-031
Fred J. Meyer
17138 Courbet St.
Granada Hills CA 91344-1112

APN: 2602-006-032
Iosif Shabsovich
17130 Courbet St.
Granada Hills CA 91344-1112

APN: 2602-006-033
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17122 Courbet St.
Granada Hills CA 91344-1112

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Granada Hills CA 91344-1224

APN: 2602-008-003
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Granada Hills CA 91344-1224

APN: 2602-008-004
Frank J. Sackley
12913 Winthrop Ave.
Granada Hills CA 91344-1224

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14189 Aztec St.
Sylmar CA 91342

APN: 2602-008-006
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12914 Barto Dr.
Granada Hills CA 91344-1201

APN: 2602-008-007
EZEKIEL Noel E
12926 Barto Dr.
San Fernando CA 91344-1201

APN: 2602-008-008
Lorraine Roark
12934 Barto Dr.
Granada Hills CA 91344-1201

APN: 2602-008-009
William S. Marrs
12942 Barto Dr.
Granada Hills CA 91344-1201

APN: 2602-008-010
Robert Werkmeister
12948 Barto Dr.
Granada Hills CA 91344-1201

APN: 2602-008-011
Brian Demellier
13000 Barto Dr.
Granada Hills CA 91344-1203

APN: 2602-008-012
Alan Budin
13010 Barto Dr.
Granada Hills CA 91344-1203

APN: 2602-008-013
Ary Shapiro
13016 Barto Dr.
Granada Hills CA 91344-1203

APN: 2602-008-014
Richard Seifried
13022 Barto Dr.
Granada Hills CA 91344-1203

APN: 2602-008-015
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13032 Barto Dr.
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APN: 2602-008-016
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13040 Barto Dr.
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APN: 2602-008-017
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17246 Van Gogh St.
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APN: 2602-008-018
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17244 Van Gogh St.
Granada Hills CA 91344-1219

APN: 2602-008-019
William J. Cotter
17242 Van Gogh St.
Granada Hills CA 91344-1219

APN: 2602-008-020
Paul Wolgast
17240 Van Gogh St.
Granada Hills CA 91344-1219

APN: 2602-008-021
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17238 Van Gogh St.
Granada Hills CA 91344-1219

APN: 2602-008-022
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17236 Van Gogh St.
Granada Hills CA 91344-1219

APN: 2602-008-023
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17234 Van Gogh St.
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APN: 2602-008-024
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12832 Meadowlark Ave.
Granada Hills CA 91344-1209

APN: 2602-009-007
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12838 Meadowlark Ave.
Granada Hills CA 91344-1209

APN: 2602-009-008
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12844 Meadowlark Ave.
Granada Hills CA 91344-1209

APN: 2602-009-009
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Granada Hills CA 91344-1209

APN: 2602-009-010
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APN: 2602-009-016
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13026 Meadowlark Ave.
Granada Hills CA 91344-1212

APN: 2602-009-017
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13032 Meadowlark Ave.
Granada Hills CA 91344-1212

APN: 2602-009-018
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APN: 2602-009-019
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APN: 2602-009-020
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13060 Meadowlark Ave.
Granada Hills CA 91344-1212

APN: 2602-009-021
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17252 Van Gogh St.
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17250 Van Gogh St.
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APN: 2602-009-024
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17248 Van Gogh St.
Granada Hills CA 91344-1220

APN: 2602-009-025
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13045 Barto Dr.
Granada Hills CA 91344-1204

APN: 2602-009-026
Henry Epstein
13039 Barto Dr.
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APN: 2602-009-027
Stanley F. Franklin
13031 Barto Dr.
Granada Hills CA 91344-1204

APN: 2602-009-028
Robert M. Suttle
13023 Barto Dr.
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APN: 2602-009-029
Edward H. Kossart
13017 Barto Dr.
Granada Hills CA 91344-1204

APN: 2602-009-030
Andrew R. Skarupa
13011 Barto Dr.
Granada Hills CA 91344-1204

APN: 2602-009-031
Cesar Garvida
13001 Barto Dr.
Granada Hills CA 91344-1204

APN: 2602-009-032
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12949 Barto Dr.
Granada Hills CA 91344-1202

APN: 2602-009-033
Lloyd D. Gold
12943 Barto Dr.
Granada Hills CA 91344-1202

APN: 2602-009-034
Earl Williman
12933 Barto Dr.
Granada Hills CA 91344-1202

APN: 2602-009-035
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12927 Barto Dr.
Granada Hills CA 91344-1202

APN: 2602-009-036
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12923 Barto Dr.
Granada Hills CA 91344-1202

APN: 2602-009-037
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12915 Barto Dr.
Granada Hills CA 91344-1202

APN: 2602-009-038
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12911 Barto Dr.
Granada Hills CA 91344-1202

APN: 2602-009-039
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APN: 2602-011-003
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17334 Bronte Pl.
Granada Hills CA 91344-1027

APN: 2602-011-004
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17330 Bronte Pl.
Granada Hills CA 91344-1027

APN: 2602-011-005
Tamer Diab
17322 Bronte Pl.
Granada Hills CA 91344-1027

APN: 2602-011-006
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17316 Bronte Pl.
Granada Hills CA 91344-1027

APN: 2602-011-007
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17310 Bronte Pl.
Granada Hills CA 91344-1027

APN: 2602-011-008
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17306 Bronte Pl.
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APN: 2602-011-009
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17268 Bronte Pl.
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APN: 2602-011-011
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17262 Bronte Pl.
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APN: 2602-011-012
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17256 Bronte Pl.
Granada Hills CA 91344-1025

APN: 2602-011-013
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17250 Bronte Pl.
Granada Hills CA 91344-1025

APN: 2602-011-014
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17242 Bronte Pl.
Granada Hills CA 91344-1025

APN: 2602-011-015
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APN: 2602-011-016
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APN: 2602-011-017
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APN: 2602-011-018
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APN: 2602-011-019
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17261 Boswell Pl.
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APN: 2602-011-025
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17340 Boswell Pl.
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APN: 2602-012-005
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17336 Boswell Pl.
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APN: 2602-012-006
Irwin G. Rosenberg
17330 Boswell Pl.
Granada Hills CA 91344-1024

APN: 2602-012-007
Beverly M. Marinkovich
17341 Tennyson Pl.
Granada Hills CA 91344-1009

APN: 2602-012-008
Charles & Kimberly Thompson
17345 Tennyson Pl.
Granada Hills CA 91344

APN: 2602-012-009
Donald J. Nickels
17351 Tennyson Pl.
Granada Hills CA 91344-1009

APN: 2602-012-010
W. G. Kucheravy
17357 Tennyson Pl.
Granada Hills CA 91344-1009

APN: 2602-012-011
Gerald Pilch
17363 Tennyson Pl.
Granada Hills CA 91344-1009

APN: 2602-012-012
John M. Zarcone
17367 Tennyson Pl.
Granada Hills CA 91344-1009

APN: 2602-012-013
Clark W. Grim
17366 Tennyson Pl.
Granada Hills CA 91344-1008

APN: 2602-012-014
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APN: 2602-012-015
David R. Cowan
17352 Tennyson Pl.
Granada Hills CA 91344-1008

APN: 2602-012-016
Hyon S. Yi
17346 Tennyson Pl.
Granada Hills CA 91344-1008

APN: 2602-012-017
Modesto Melena
17340 Tennyson Pl.
Granada Hills CA 91344-1008

APN: 2602-012-018
Mario B. Canepa
17321 Trosa St.
Granada Hills CA 91344-1011

APN: 2602-012-019
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12812 Jolette Ave.
Granada Hills CA 91344-1037

APN: 2602-012-020
Thomas K. Murphy
12820 Jolette Ave.
Granada Hills CA 91344-1037

APN: 2602-012-021
1996 Muller Trust
12828 Jolette Ave.
Granada Hills CA 91344-1037

APN: 2602-012-022
Preston S. Lane
12840 Jolette Ave.
Granada Hills CA 91344-1037

APN: 2602-013-001
Ilee Weatherspoon
17318 Boswell Pl.
Granada Hills CA 91344-1022

APN: 2602-013-002
David A. Brand
17312 Boswell Pl.
Granada Hills CA 91344-1022

APN: 2602-013-003
Michael L. Chesbro
17306 Boswell Pl.
Granada Hills CA 91344-1022

APN: 2602-013-004
Edward A. Brown
17300 Boswell Pl.
Granada Hills CA 91344-1022

APN: 2602-013-005
Atieh Movasaghi
17268 Boswell Pl.
Granada Hills CA 91344-1020

APN: 2602-013-006
Steve B. Seo
17264 Boswell Pl.
Granada Hills CA 91344-1020

APN: 2602-013-007
Fred M. Ishihara
17258 Boswell Pl.
Granada Hills CA 91344-1020

APN: 2602-013-008
Myong Y. Chon
17252 Boswell Pl.
Granada Hills CA 91344-1020

APN: 2602-013-009
Armando E. Tatis
17246 Boswell Pl.
Granada Hills CA 91344-1020

APN: 2602-013-010
Magdy E. Awad
17240 Boswell Pl.
Granada Hills CA 91344-1020

APN: 2602-013-011
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17234 Roswell Pl.
Granada Hills CA 91344-1020

APN: 2602-013-012
Maurice Greenberg
17225 Tennyson Pl.
Granada Hills CA 91344-1005

APN: 2602-013-013
Han Y. Kim
17229 Tennyson Pl.
Granada Hills CA 91344-1005

APN: 2602-013-014
Robert F. Devine
17235 Tennyson Pl.
Granada Hills CA 91344-1005

APN: 2602-013-015
Young S. Chu
17241 Tennyson Pl.
Granada Hills CA 91344-1005

APN: 2602-013-016
Win Kai Liu
17249 Tennyson Pl.
Granada Hills CA 91344-1005

APN: 2602-013-017
Spencer A. Carlsen
17255 Tennyson Pl.
Granada Hills CA 91344-1005

APN: 2602-013-018
William Cotsifas
17263 Tennyson Pl.
Granada Hills CA 91344-1005

APN: 2602-013-019
James A. Ramirez
17269 Tennyson Pl.
Granada Hills CA 91344-1005

APN: 2602-013-020
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17301 Tennyson Pl.
Granada Hills CA 91344-1007

APN: 2602-013-021
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17309 Tennyson Pl.
Granada Hills CA 91344-1007

APN: 2602-013-022
Hui L. Sun
17315 Tennyson Pl.
Granada Hills CA 91344-1007

APN: 2602-013-023
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17323 Tennyson Pl.
Granada Hills CA 91344-1007

APN: 2602-014-001
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17324 Tennyson Pl.
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APN: 2602-014-004
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17306 Tennyson Pl.
Granada Hills CA 91344-1006

APN: 2602-014-005
Christopher Torossian
17300 Tennyson Pl.
Granada Hills CA 91344-1006

APN: 2602-014-006
Janice M. Van Steen
17268 Tennyson Pl.
Granada Hills CA 91344-1004

APN: 2602-014-007
Alan R. Butts
17262 Tennyson Pl.
Granada Hills CA 91344-1004

APN: 2602-014-008
Salvatore Luongo
17256 Tennyson Pl.
Granada Hills CA 91344-1004

APN: 2602-014-009
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17250 Tennyson Pl.
Granada Hills CA 91344-1004

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17238 Tennyson Pl.
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APN: 2602-014-012
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17232 Tennyson Pl.
Granada Hills CA 91344-1004

APN: 2602-014-013
Jeff Cortina
17228 Tennyson Pl.
Granada Hills CA 91344-1004

APN: 2602-014-014
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17222 Tennyson Pl.
Granada Hills CA 91344-1004

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12759 Meadowlark Ave.
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APN: 2602-014-019
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12753 Meadowlark Ave.
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12768 Jolette Ave.
Granada Hills CA 91344-1431

APN: 2602-014-021
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12770 Jolette Ave.
Granada Hills CA 91344-1431

APN: 2602-014-022
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12772 Jolette Ave.
Granada Hills CA 91344-1431

APN: 2602-014-023
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12774 Jolette Ave.
Granada Hills CA 91344-1431

APN: 2602-014-024
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12754 Byron Ave.
Granada Hills CA 91344-1447

APN: 2602-014-025
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12756 Byron Ave.
Granada Hills CA 91344-1447

APN: 2602-014-026
Vincent G. Magorien
12760 Byron Ave.
Granada Hills CA 91344-1447

APN: 2602-014-027
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12762 Byron Ave.
Granada Hills CA 91344-1447

APN: 2602-014-028
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12761 Byron Ave.
Granada Hills CA 91344-1448

APN: 2602-014-029
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12759 Byron Ave.
Granada Hills CA 91344-1448

APN: 2602-014-030
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12755 Byron Ave.
Granada Hills CA 91344-1448

APN: 2602-014-031
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12776 Jolette Ave.
Granada Hills CA 91344-1447

APN: 2602-014-032
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12778 Jolette Ave.
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APN: 2602-014-036
Bliek Jacob Van Der
12752 Goethe Pl.
Granada Hills CA 91344-1423

APN: 2602-014-037
Lyle J. La Follette
12754 Goethe Pl.
Granada Hills CA 91344-1423

APN: 2602-014-038
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12753 Goethe Pl.
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APN: 2602-014-039
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12751 Goethe Pl.
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APN: 2602-014-043
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17137 Lisette St.
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APN: 2602-015-006
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17143 Lisette St.
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APN: 2602-015-007
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17149 Lisette St.
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Granada Hills CA 91344-1438

APN: 2602-015-009
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17161 Lisette St.
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APN: 2602-015-010
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17167 Lisette St.
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APN: 2602-015-011
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17173 Lisette St.
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APN: 2602-015-016
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12764 Meadowlark Ave.
Granada Hills CA 91344-1207

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17236 Goya St.
Granada Hills CA 91344-1206

APN: 2602-015-019
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17230 Goya St.
Granada Hills CA 91344-1206

APN: 2602-015-020
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17222 Goya St.
Granada Hills CA 91344-1206

APN: 2602-015-021
James Andreas
17216 Goya St.
Granada Hills CA 91344-1206

APN: 2602-015-022
Alexander V. Muller
17210 Goya St.
Granada Hills CA 91344-1206

APN: 2602-015-023
Bradford R. Runnerstrum
17200 Goya St.
Granada Hills CA 91344-1206

APN: 2602-015-024
Reuben M. Allen
17178 Goya St.
Granada Hills CA 91344-1205

APN: 2602-015-025
Lawrence W. Harmell
17172 Goya St.
Granada Hills CA 91344-1205

APN: 2602-015-026
Howell E. Walker
17166 Goya St.
Granada Hills CA 91344-1205

APN: 2602-015-027
Delmar W. Rasmussen
17158 Goya St.
Granada Hills CA 91344-1205

APN: 2602-015-028
Philip B. Morritt
17152 Goya St.
Granada Hills CA 91344-1205

APN: 2602-015-029
Julio Garcia
17146 Goya St.
Granada Hills CA 91344-1205

APN: 2602-015-030
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17138 Goya St.
Granada Hills CA 91344-1205

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Pacoima CA 91331

APN: 2602-016-003
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12923 Titian Ave.
Granada Hills CA 91344-1216

APN: 2602-016-004
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12915 Titian Ave.
Granada Hills CA 91344-1216

APN: 2602-016-005
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12909 Titian Ave.
Granada Hills CA 91344-1216

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APN: 2602-016-009
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12847 Titian Ave.
Granada Hills CA 91344-1215

APN: 2602-016-010
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12841 Titian Ave.
Granada Hills CA 91344-1215

APN: 2602-016-011
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12835 Titian Ave.
Granada Hills CA 91344-1215

APN: 2602-016-012
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12829 Titian Ave.
Granada Hills CA 91344-1215

APN: 2602-016-013
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12830 Winthrop Ave.
Granada Hills CA 91344-1221

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Granada Hills CA 91344-1221

APN: 2602-016-016
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12860 Winthrop Ave.
Granada Hills CA 91344-1221

APN: 2602-016-017
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12868 Winthrop Ave.
Granada Hills CA 91344-1221

APN: 2602-016-018
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12874 Winthrop Ave.
Granada Hills CA 91344-1221

APN: 2602-016-019
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12900 Winthrop Ave.
Granada Hills CA 91344-1223

APN: 2602-016-020
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12910 Winthrop Ave.
Granada Hills CA 91344-1223

APN: 2602-016-021
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12916 Winthrop Ave.
Granada Hills CA 91344-1223

APN: 2602-016-022
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12640 Bradford Pl.
Granada Hills CA 91344

APN: 2602-016-023
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12930 Winthrop Ave.
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APN: 2602-016-024
SRINIVASAN Mukund
12936 Winthrop Ave.
Granada Hills CA 91344-1223

APN: 2602-016-025
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12944 Winthrop Ave.
Granada Hills CA 91344-1223

APN: 2602-017-002
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17013 Lisette St.
San Fernando CA 91344-1435

APN: 2602-017-003
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17019 Lisette St.
Granada Hills CA 91344-1435

APN: 2602-017-004
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17025 Lisette St.
Granada Hills CA 91344-1435

APN: 2602-017-005
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17031 Lisette St.
Granada Hills CA 91344-1435

APN: 2602-017-006
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17037 Lisette St.
Granada Hills CA 91344-1435

APN: 2602-017-007
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17043 Lisette St.
Granada Hills CA 91344-1435

APN: 2602-017-008
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17049 Lisette St.
Granada Hills CA 91344-1435

APN: 2602-017-009
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17055 Lisette St.
Granada Hills CA 91344-1435

APN: 2602-017-010
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17061 Lisette St.
Granada Hills CA 91344-1435

APN: 2602-017-011
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17067 Lisette St.
Granada Hills CA 91344-1435

APN: 2602-017-012
Burakat Darghali
17073 Lisette St.
Granada Hills CA 91344-1435

APN: 2602-017-013
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17079 Lisette St.
Granada Hills CA 91344-1435

APN: 2602-017-014
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17101 Lisette St.
Granada Hills CA 91344-1438

APN: 2602-017-015
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17107 Lisette St.
Granada Hills CA 91344-1438

APN: 2602-017-016
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17130 Goya St.
Granada Hills CA 91344-1205

APN: 2602-017-017
SREDEN Barry
17124 Goya St.
Granada Hills CA 91344-1205

APN: 2602-017-018
Ofer Saly
17116 Goya St.
Granada Hills CA 91344-1205

APN: 2602-017-019
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17110 Goya St.
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APN: 2602-017-022
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17113 Van Gogh St.
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17121 Van Gogh St.
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17007 Lisette St.
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APN: 2602-018-002
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APN: 2602-018-004
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17136 Lisette St.
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APN: 2602-018-006
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17130 Lisette St.
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APN: 2602-018-007
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APN: 2602-018-012
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17078 Lisette St.
Granada Hills CA 91344-1436

APN: 2602-018-013
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17070 Lisette St.
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APN: 2602-018-014
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17062 Lisette St.
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APN: 2602-018-015
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17056 Lisette St.
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APN: 2602-018-016
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APN: 2602-018-017
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17042 Lisette St.
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APN: 2602-018-018
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APN: 2602-018-022
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12728 Jolette Ave.
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APN: 2602-018-023
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17157 Nanette St.
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17151 Nanette St.
Granada Hills CA 91344-1410

APN: 2602-018-025
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17145 Nanette St.
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APN: 2602-018-026
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17139 Nanette St.
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APN: 2602-018-027
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17133 Nanette St.
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APN: 2602-018-028
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APN: 2602-018-029
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17121 Nanette St.
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17109 Nanette St.
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Joseph Mikuljan
15905 Joseph Ct.
Sylmar CA 91342-1124

APN: 2603-011-061
Angel A. Garcia
15901 Joseph Ct.
Sylmar CA 91342-1124

APN: 2603-011-062
Sandy Lyon
15849 Joseph Ct.
Sylmar CA 91342-1121

APN: 2603-011-063
Ramona J. Whitson
15843 Joseph Ct.
Sylmar CA 91342-1121

APN: 2603-011-064
James J. Konat
15839 Joseph Ct.
Sylmar CA 91342-1121

APN: 2603-011-065
Henry F. Pardo
15835 Joseph Ct.
Sylmar CA 91342-1121

APN: 2603-011-066
Hazel N. Thomas
15827 Joseph Ct.
Sylmar CA 91342-1121

APN: 2603-011-067
Walter B. Jones
15936 Joseph Ct.
Sylmar CA 91342-1123

APN: 2603-011-068
Jose L. Villanueva
15932 Joseph Ct.
Sylmar CA 91342-1123

APN: 2603-011-069
Richard V. Regan
15926 Joseph Ct.
Sylmar CA 91342-1123

APN: 2603-011-070
Michael B. Senkiw
15922 Joseph Ct.
Sylmar CA 91342-1123

APN: 2603-011-071
Michael Slider
15918 Joseph Ct.
Sylmar CA 91342-1123

APN: 2603-011-072
Luis A. Tijerino
15914 Joseph Ct.
San Fernando CA 91342-1123

APN: 2603-011-073
Thomas J. Cizmar
15910 Joseph Ct.
Sylmar CA 91342-1123

APN: 2603-011-074
Elmer E. Schidt
15904 Joseph Ct.
Sylmar CA 91342-1123

APN: 2603-011-075
Jose T. Mareque
15900 Joseph Ct.
Sylmar CA 91342-1123

APN: 2603-011-076
Roy B. Crass
15850 Joseph Ct.
Sylmar CA 91342-1122

APN: 2603-011-077
Robert Points
15844 Joseph Ct.
Sylmar CA 91342-1122

APN: 2603-011-078
Anthony E. Muro
15840 Joseph Ct.
Sylmar CA 91342-1122

APN: 2603-011-079
Herbert A. Wilson
15836 Joseph Ct.
San Fernando CA 91342-1122

APN: 2603-011-080
Massimo Butera
15830 Joseph Ct.
Sylmar CA 91342-1122

APN: 2603-011-081
Rudy Gamboa
15822 Joseph Ct.
Sylmar CA 91342-1120

APN: 2603-011-082
Virginia Kalinowski
15815 Joseph Ct.
Sylmar CA 91342

APN: 2603-011-083
Timothy W. Scheid
15814 Joseph Ct.
Sylmar CA 91342-1120

APN: 2603-011-084
John A. Williams
15810 Joseph Ct.
Sylmar CA 91342-1120

APN: 2603-011-085
Bruce Boyd
15806 Joseph Ct.
Sylmar CA 91342-1120

APN: 2603-011-086
Gayl Butcher
15802 Joseph Ct.
Sylmar CA 91342-1120

APN: 2603-011-087
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15980 Yarnell St.
Sylmar CA 91342-1009

APN: 2603-011-088
Rodolfo Jaramillo
15976 Yarnell St.
San Fernando CA 91342-1009

APN: 2603-011-089
Danny Williams
15970 Yarnell St.
Sylmar CA 91342-1009

APN: 2603-011-090
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APN: 2603-011-093
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Sylmar CA 91342-1117

APN: 2603-012-006
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Sylmar CA 91342-1115

APN: 2603-012-011
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13671 Herrick Ave.
Sylmar CA 91342-1115

APN: 2603-012-012
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15601 Olden St.
Sylmar CA 91342-1244

APN: 2603-012-013
Robert Bild
15615 Olden St.
Sylmar CA 91342-1244

APN: 2603-012-014
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15625 Olden St.
Sylmar CA 91342-1244

APN: 2603-012-015
Roberto Rodriguez
15635 Olden St.
Sylmar CA 91342-1244

APN: 2603-012-016
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13650 Woodcock Ave.
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APN: 2603-012-017
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13660 Woodcock Ave.
Sylmar CA 91342-1135

APN: 2603-012-018
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13670 Woodcock Ave.
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APN: 2603-012-019
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13680 Woodcock Ave.
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APN: 2603-012-020
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13700 Woodcock Ave.
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APN: 2603-012-021
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13710 Woodcock Ave.
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APN: 2603-012-022
Lorenzo Chavez
13720 Woodcock Ave.
Sylmar CA 91342-1136

APN: 2603-012-023
Everett Lopez
13730 Woodcock Ave.
Sylmar CA 91342-1136

APN: 2603-012-024
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13740 Woodcock Ave.
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APN: 2603-012-025
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APN: 2603-015-044
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APN: 2603-015-045
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Sylmar CA 91342-1157

APN: 2603-015-050
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13470 Pala Ave.
Sylmar CA 91342-1157

APN: 2603-015-051
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13476 Pala Ave.
Sylmar CA 91342-1157

APN: 2603-015-052
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13500 Pala Ave.
Sylmar CA 91342-1159

APN: 2603-015-053
John G. Rossie
13506 Pala Ave.
Sylmar CA 91342-1159

APN: 2603-015-054
Philip Wagner
13514 Pala Ave.
Sylmar CA 91342-1159

APN: 2603-015-055
Phil J. Hays
13520 Pala Ave.
Sylmar CA 91342-1159

APN: 2603-015-056
Robert M. Richards
13528 Pala Ave.
Sylmar CA 91342-1159

APN: 2603-015-057
Philip E. Rosen
13536 Pala Ave.
Sylmar CA 91342-1159

APN: 2603-015-058
Robert M. Zamora
13540 Pala Ave.
Sylmar CA 91342-1159

APN: 2603-015-059
Jon A. Fields
13542 Pala Ave.
Sylmar CA 91342-1159

APN: 2603-015-060
Maurice J. Bunzey
13546 Pala Ave.
Sylmar CA 91342-1159

APN: 2603-015-061
George Prado
13547 Pala Ave.
Sylmar CA 91342-1160

APN: 2603-015-062
Patisera Latu
13543 Pala Ave.
Sylmar CA 91342-1160

APN: 2603-015-063
William Marano
13539 Pala Ave.
Sylmar CA 91342-1160

APN: 2603-015-064
Stephen J. Sheridan
13531 Pala Ave.
Sylmar CA 91342-1160

APN: 2603-015-065
Maryann Thomas
13525 Pala Ave.
Sylmar CA 91342-1160

APN: 2603-015-066
Kenneth D. Lewis
13517 Pala Ave.
San Fernando CA 91342-1160

APN: 2603-015-067
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13509 Pala Ave.
Sylmar CA 91342-1160

APN: 2603-015-068
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13501 Pala Ave.
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APN: 2603-015-069
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APN: 2603-015-070
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13477 Pala Ave.
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APN: 2603-015-071
Nathaniel A. Fortier
13471 Pala Ave.
Sylmar CA 91342-1158

APN: 2603-015-072
Trinidad F. Rivera
13463 Pala Ave.
Sylmar CA 91342-1158

APN: 2603-015-073
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13457 Pala Ave.
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APN: 2603-015-074
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APN: 2603-015-085
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Sylmar CA 91342-1157

APN: 2603-015-086
Matthew H. Kern
13418 Pala Ave.
Sylmar CA 91342-1157

APN: 2603-015-087
James R. & Bonnie M. Postle
13408 Pala Ave.
Sylmar CA 91342-1157

APN: 2603-015-088
Jeffrey F. McKenzie
13404 Pala Ave.
Sylmar CA 91342-1157

APN: 2603-015-089
Raul L. & Morneo Joa Moreno
13400 Pala Ave.
Sylmar CA 91342-1157

APN: 2603-015-090
Daniel P. Lopez
13401 Pala Ave.
Sylmar CA 91342-1158

APN: 2603-015-091
Arnold Capone
13403 Pala Ave.
Sylmar CA 91342-1158

APN: 2603-015-092
Sixto & Elvira Sumalbag
13409 Pala Ave.
Sylmar CA 91342-1158

APN: 2603-015-093
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13417 Pala Ave.
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APN: 2603-015-094
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APN: 2603-015-095
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APN: 2603-015-096
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APN: 2603-017-006
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Sylmar CA 91342-1104

APN: 2603-017-008
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APN: 2603-017-010
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Sylmar CA 91342-1130

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Sylmar CA 91342-1130

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Hulon F. Simpson
11705 Sheldon St.
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APN: 2603-019-013
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15740 Sorbonne St.
Sylmar CA 91342-1133

APN: 2603-019-014
Daniel Chamorro
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San Fernando CA 91342-1133

APN: 2603-019-016
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13660 Norris Ave.
Sylmar CA 91342-1140

APN: 2603-019-017
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APN: 2603-019-018
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13646 Norris Ave.
Sylmar CA 91342-1140

APN: 2603-019-019
Maria S. Ulloa
13640 Norris Ave.
Sylmar CA 91342-1140

APN: 2603-019-020
Sylvia Stelzner
13639 Norris Ave.
Sylmar CA 91342-1140

APN: 2603-019-021
Marvin B. Fishman
13645 Norris Ave.
Sylmar CA 91342-1140

APN: 2603-019-024
Gilbert Asidilla
15920 Excelsior St.
Sylmar CA 91342-1110

APN: 2603-019-025
William C. Felix
13655 Norris Ave.
Sylmar CA 91342-1140

APN: 2603-019-026
Maria E. Cardoza
13663 Norris Ave.
Sylmar CA 91342-1140

APN: 2603-020-001
Maxine N. Brown
15560 Excelsior St.
Sylmar CA 91342-1107

APN: 2603-020-002
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Sylmar CA 91342-1107

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15595 Sorbonne St.
Sylmar CA 91342-1132

APN: 2603-020-006
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15571 Sorbonne St.
Sylmar CA 91342-1132

APN: 2603-020-007
Daniel R. Kellstrom
15559 Sorbonne St.
Sylmar CA 91342-1132

APN: 2603-020-008
Ross Judd
15555 Sorbonne St.
Sylmar CA 91342-1132

APN: 2603-020-009
Valerie H. Preston
5553 Sorbonne St.
Sylmar CA 91342

APN: 2603-020-010
Ronald V. Wolfson
15551 Sorbonne St.
Sylmar CA 91342-1132

APN: 2603-020-011
Gregory L. Schmidt
15550 Sorbonne St.
Sylmar CA 91342-1131

APN: 2603-020-012
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15552 Sorbonne St.
Sylmar CA 91342-1131

APN: 2603-020-013
Francis E. McConnell
15556 Sorbonne St.
Sylmar CA 91342-1131

APN: 2603-020-014
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APN: 2603-020-015
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15574 Sorbonne St.
Sylmar CA 91342-1131

APN: 2603-020-016
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15582 Sorbonne St.
Sylmar CA 91342-1131

APN: 2603-020-017
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APN: 2603-020-018
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APN: 2603-020-019
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13716 Herrick Ave.
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APN: 2603-020-020
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13708 Herrick Ave.
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APN: 2603-020-021
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13700 Herrick Ave.
Sylmar CA 91342-1116

APN: 2603-020-022
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13682 Herrick Ave.
Sylmar CA 91342-1114

APN: 2603-020-023
William A. Byars
13672 Herrick Ave.
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APN: 2603-020-024
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APN: 2603-021-009
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APN: 2603-021-012
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APN: 2603-021-013
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APN: 2603-022-003
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16128 Filbert St.
Sylmar CA 91342-1044

APN: 2603-022-004
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16122 Filbert St.
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APN: 2603-022-005
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16114 Filbert St.
Sylmar CA 91342-1044

APN: 2603-022-006
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Sylmar CA 91342-1044

APN: 2603-022-007
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Sylmar CA 91342-1044

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APN: 2603-022-010
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14067 Bridle Ridge Rd.
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Sylmar CA 91342-1060

APN: 2603-022-012
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14059 Bridle Ridge Rd.
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APN: 2603-022-013
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APN: 2603-022-014
&. & Wang Yu
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Sylmar CA 91342-1060

APN: 2603-022-015
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14043 Bridle Ridge Rd.
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APN: 2603-022-016
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14037 Bridle Ridge Rd.
Sylmar CA 91342-1046

APN: 2603-022-017
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14031 Bridle Ridge Rd.
Sylmar CA 91342-1046

APN: 2603-022-018
Rosalina Leyva
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APN: 2603-022-019
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14010 Wagon Mound Rd.
Sylmar CA 91342-1066

APN: 2603-022-023
E. Faye Young
14014 Wagon Mound Rd.
Sylmar CA 91342-1068

APN: 2603-022-024
Jesus Castro
14018 Wagon Mound Rd.
Sylmar CA 91342-1068

APN: 2603-022-025
Calvin N. McGreggor
14022 Wagon Mound Rd.
Sylmar CA 91342-1068

APN: 2603-022-026
Michael Rotsten
14026 Wagon Mound Rd.
Sylmar CA 91342-1068

APN: 2603-022-027
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16001 Circle Diamond Rd.
Sylmar CA 91342

APN: 2603-023-001
Bernardino Aguilera
14009 Wagon Mound Rd.
Sylmar CA 91342-1047

APN: 2603-023-002
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14024 Bridle Ridge Rd.
Sylmar CA 91342-1056

APN: 2603-023-003
Sandra Flowers
14032 Bridle Ridge Rd.
Sylmar CA 91342-1056

APN: 2603-023-004
Vicente Barajas
14038 Bridle Ridge Rd.
Sylmar CA 91342

APN: 2603-023-005
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14044 Bridle Ridge Rd.
Sylmar CA 91342-1056

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APN: 2603-023-012
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APN: 2603-023-018
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14076 Bridle Ridge Rd.
Sylmar CA 91342-1071

APN: 2603-023-019
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16082 Filbert St.
Sylmar CA 91342-1042

APN: 2603-023-020
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16076 Filbert St.
Sylmar CA 91342-1042

APN: 2603-023-021
William A. Patterson
16070 Filbert St.
Sylmar CA 91342-1042

APN: 2603-023-022
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16064 Filbert St.
Sylmar CA 91342-1042

APN: 2603-023-023
Ronny D. Hackney
16060 Filbert St.
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APN: 2603-023-024
James Pushman
16052 Filbert St.
Sylmar CA 91342-1042

APN: 2603-023-025
Apostolos G. Livitsanos
16048 Filbert St.
Sylmar CA 91342-1042

APN: 2603-023-026
Aida Morrison
16042 Filbert St.
Sylmar CA 91342-1042

APN: 2603-023-027
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16036 Filbert St.
Sylmar CA 91342-1042

APN: 2603-023-028
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16028 Filbert St.
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APN: 2603-023-029
Ran Kim Jung
16024 Filbert St.
Sylmar CA 91342-1042

APN: 2603-023-030
Edgar Sarao
16018 Filbert St.
Sylmar CA 91342-1042

APN: 2603-023-032
Burchard N. Iler
14053 Wagon Mound Rd.
Sylmar CA 91342-1064

APN: 2603-023-033
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APN: 2603-023-034
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14041 Wagon Mound Rd.
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APN: 2603-023-035
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APN: 2603-023-036
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APN: 2603-023-037
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14023 Wagon Mound Rd.
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APN: 2603-023-039
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APN: 2603-023-040
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APN: 2603-023-041
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Sylmar CA 91342-1065

APN: 2603-023-042
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14058 Wagon Mound Rd.
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APN: 2603-023-043
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14062 Wagon Mound Rd.
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APN: 2603-023-044
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14066 Wagon Mound Rd.
Sylmar CA 91342-1065

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APN: 2603-023-046
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Sylmar CA 91342-1038

APN: 2603-023-047
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Sylmar CA 91342

APN: 2603-023-048
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Bendix Corp
15825 Roxford St.
Sylmar CA 91342-3537

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APN: 2604-002-039
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APN: 2604-002-040
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APN: 2606-006-027
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19026 Clymer St.
Northridge CA 91326

APN: 2606-006-028
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12243 Bradford Pl.
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APN: 2606-006-029
John C. Heinrich
17327 Firma Ct.
Granada Hills CA 91344-1902

APN: 2606-006-030
Simon Tima
17343 Firma Ct.
Granada Hills CA 91344-1902

APN: 2606-006-031
Edward B. Weissburd
17353 Firma Ct.
Granada Hills CA 91344-1902

APN: 2606-007-009
B. Chandler Shaw
17350 Firma Ct.
Granada Hills CA 91344

APN: 2606-007-010
B. Chandler Shaw
17350 Firma Ct.
Granada Hills CA 91344-1902

APN: 2606-007-011
Arnold J. Glassman
17340 Firma Ct.
Granada Hills CA 91344-1902

APN: 2606-007-012
Arnold L. Fertig
17330 Firma Ct.
Granada Hills CA 91344-1902

APN: 2606-007-013
Joseph J. Railla
17320 Firma Ct.
Granada Hills CA 91344-1902

APN: 2606-007-014
Ruben Piranian
17310 Firma Ct.
Granada Hills CA 91344-1902

APN: 2606-007-015
Salvador Arellano
17300 Firma Ct.
Granada Hills CA 91344-1902

APN: 2606-007-016
Naum Sigal
12227 Bradford Pl.
Granada Hills CA 91344-1916

APN: 2606-007-017
Edward N. Atamian
12221 Bradford Pl.
Granada Hills CA 91344-1916

APN: 2606-007-018
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17201 Warrington Dr.
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APN: 2606-007-019
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17219 Warrington Dr.
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APN: 2606-007-020
Keith Tuber
17227 Warrington Dr.
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APN: 2606-007-021
Kiana S. Bahadoran
17233 Warrington Dr.
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APN: 2606-007-022
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APN: 2606-007-023
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APN: 2606-007-024
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17253 Warrington Dr.
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APN: 2606-007-025
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APN: 2606-007-026
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17254 Warrington Dr.
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17251 Sunderland Dr.
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17224 Warrington Dr.
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17218 Warrington Dr.
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APN: 2606-008-027
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17212 Warrington Dr.
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17206 Warrington Dr.
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12207 Bradford Pl.
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12011 Jeanette Pl.
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APN: 2606-012-018
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12021 Jeanette Pl.
Granada Hills CA 91344-2334

APN: 2606-012-019
Raymond Trinidad
12031 Jeanette Pl.
Granada Hills CA 91344-2334

APN: 2606-012-020
Donna R. Schoeni
12041 Jeanette Pl.
Granada Hills CA 91344-2334

APN: 2606-012-021
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12049 Jeanette Pl.
Granada Hills CA 91344-2334

APN: 2606-012-022
Clifford A. Andersen
12101 Jeanette Pl.
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APN: 2606-012-023
Thomas V. Higgins
12111 Jeanette Pl.
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APN: 2606-012-024
Douglas C. Cole
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APN: 2606-012-033
Noel Takamatsu
12046 Bambi Pl.
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APN: 2606-012-034
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APN: 2606-012-039
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17406 Golden Cir
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APN: 2606-029-032
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APN: 2606-029-033
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APN: 2606-029-034
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APN: 2606-029-038
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APN: 2607-001-011
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APN: 2607-001-012
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APN: 2607-001-014
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17016 Midwood Dr.
Granada Hills CA 91344-2338

APN: 2607-001-015
Timothy Imre
17024 Midwood Dr.
Granada Hills CA 91344-2338

APN: 2607-001-016
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17034 Midwood Dr.
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APN: 2607-001-017
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APN: 2607-001-019
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APN: 2608-013-007
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APN: 2608-013-008
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12350 Bradford Pl.
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17350 Westbury Dr.
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APN: 2608-016-003
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17342 Westbury Dr.
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APN: 2608-016-004
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APN: 2608-016-007
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12414 Henzie Pl.
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APN: 2608-016-019
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12430 Henzie Pl.
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APN: 2608-016-020
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12434 Henzie Pl.
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APN: 2608-016-022
Sunil Varma
12442 Henzie Pl.
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APN: 2608-016-023
Doyle Shaw
12448 Henzie Pl.
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APN: 2608-016-024
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APN: 2608-016-025
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APN: 2608-032-003
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APN: 2608-032-004
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APN: 2608-032-005
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APN: 2608-032-006
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APN: 2608-032-007
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17462 Rushing Dr.
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APN: 2608-032-008
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17454 Rushing Dr.
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17448 Rushing Dr.
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APN: 2608-032-013
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17447 Golden Lane
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APN: 2608-032-023
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11957 Susan Dr.
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11924 Susan Dr.
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APN: 2609-006-010
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11943 Clonlee Ave.
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APN: 2609-013-005
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APN: 2609-013-006
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APN: 2609-013-007
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APN: 2609-014-027
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APN: 2609-015-024
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APN: 2609-015-025
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APN: 2609-019-024
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12624 Kenny Dr.
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APN: 2609-019-025
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12612 Kenny Dr.
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APN: 2609-019-026
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12600 Kenny Dr.
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APN: 2609-019-027
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APN: 2609-019-028
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APN: 2609-020-012
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12358 Kenny Dr.
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APN: 2609-020-016
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12346 Kenny Dr.
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APN: 2609-020-017
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12334 Kenny Dr.
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APN: 2609-025-036
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APN: 2609-025-038
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Newhall CA 91321-3748

APN: 2825-010-064
Ronald B. Cook
24610 Brittany Lane
Newhall CA 91321-3748

APN: 2825-010-065
Manuel A. De Leon
24606 Brittany Lane
Newhall CA 91321-3748

APN: 2825-010-066
Scott D. Willens
24604 Brittany Lane
Santa Clarita CA 91321-3748

APN: 2825-010-067
Peter J. Krug
24611 Brittany Lane
Santa Clarita CA 91321-3748

APN: 2825-010-068
John D. Hineman
24617 Brittany Lane
Santa Clarita CA 91321-3748

APN: 2825-010-069
Brittany Lane Homeowners Assn
24624 Brittany Lane
Santa Clarita CA 91321

APN: 2825-010-929
L A County Park
550 S. Vermont Ave.
Los Angeles CA 90020

APN: 2825-011-008
John Stead
24643 Fourl Rd.
Newhall CA 91321-3732

APN: 2825-011-009
Richard D. Wells
24637 Fourl Rd.
Newhall CA 91321-3732

APN: 2825-011-010
Ivan Briggs
24631 Fourl Rd.
Newhall CA 91321-3732

APN: 2825-011-011
Wayne W. Schubert
24625 Fourl Rd.
Newhall CA 91321-3732

APN: 2825-011-012
James S. Kinsfather
24619 Fourl Rd.
Newhall CA 91321-3732

APN: 2825-011-013
Sue M. Clarke
24613 Fourl Rd.
Newhall CA 91321-3732

APN: 2825-011-015
J
1155 E. Lancaster Rd.
Hayden Lake ID 83835

APN: 2825-011-017
Allen E. Hom
17221 Lido Lane
Huntington Bh CA 92647

APN: 2825-012-005
Charles P. Taylor
3500 E. Pacific Coast HWY
Corona Del Mar CA 92625

APN: 2825-012-007
Samuel L. Smiser
1312 Monterey Pl.
San Marino CA 91108

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OWNERSHIP LIST

SUNSHINE CYN - #2820

APN: 2820-002-001
Steven B. Gore
19021 Kilfinan St.
Northridge CA 91326-1021

APN: 2820-002-002
Victor Goethals
19011 Kilfinan St.
Northridge CA 91326-1021

APN: 2820-002-003
Pete Toubouras
19007 Kilfinan St.
Northridge CA 91326-1021

APN: 2820-002-004
Laurence Gordon
19001 Kilfinan St.
Northridge CA 91326-1021

APN: 2820-002-005
John P. Sterry
18947 Kilfinan St.
Northridge CA 91326-1019

APN: 2820-002-006
Klaus Wasko
18941 Kilfinan St.
Northridge CA 91326-1019

APN: 2820-002-007
Gordon W. Wolfe
18933 Kilfinan St.
Northridge CA 91326-1019

APN: 2820-002-008
Lan Chuen Wei
1244 Elkwood Dr.
Milpitas CA 95035

APN: 2820-002-009
Michael F. Merrick
18921 Kilfinan St.
Northridge CA 91326-1019

APN: 2820-002-010
Stuart M. Steinberg
18915 Kilfinan St.
Northridge CA 91326-1019

APN: 2820-002-011
Steven P. Rosenfield
18909 Kilfinan St.
Northridge CA 91326-1019

APN: 2820-002-012
Robert C. Forsyth
18901 Kilfinan St.
Northridge CA 91326-1019

APN: 2820-002-013
Myron E. Guss
18879 Kilfinan St.
Northridge CA 91326-1048

APN: 2820-002-014
Trey Heisler
18871 Kilfinan St.
Northridge CA 91326-1048

APN: 2820-002-015
Alfred H. Christensen
18865 Kilfinan St.
Northridge CA 91326-1048

APN: 2820-002-016
Bruce S. Jones
18857 Kilfinan St.
Northridge CA 91326-1048

APN: 2820-002-017
Marvin Gantsweg
13902 Fiji Way No. 119
Marina Dl Rey CA 90292

APN: 2820-002-018
Brent Chettle
18845 Kilfinan St.
Northridge CA 91326-1048

APN: 2820-002-019
Harold S. Vites
18841 Kilfinan St.
Northridge CA 91326-1048

APN: 2820-002-020
Mazyar Kangarloo
18831 Kilfinan St.
Northridge CA 91326-1048

APN: 2820-003-001
Philip W. Reichard
18830 Kilfinan St.
Northridge CA 91326-1049

APN: 2820-003-002
Danny E. Markoe
11845 Jellico Ave.
Granada Hills CA 91344

APN: 2820-003-003
Howard E. Hockenberry
18850 Kilfinan St.
Northridge CA 91326-1049

APN: 2820-003-004
Alvin D. Harris
18858 Kilfinan St.
Northridge CA 91326-1049

APN: 2820-003-005
Kevin R. Krzewinski
18864 Kilfinan St.
Northridge CA 91326-1049

APN: 2820-003-006
Alberta L. Fins
290 Fairway Lane
Ojai CA 93023

APN: 2820-003-007
David K. Allen
18878 Kilfinan St.
Northridge CA 91326-1049

APN: 2820-003-008
Edythe C. Fritch
P.O. Box 32562
Long Beach CA 90832

APN: 2820-003-009
Francis Weigand
18910 Kilfinan St.
Northridge CA 91326-1020

APN: 2820-003-010
Andrew Asuncion
18916 Kilfinan St.
Northridge CA 91326-1020

APN: 2820-003-011
Arthur L. Lopez
18922 Kilfinan St.
Northridge CA 91326-1020

APN: 2820-003-036
Paul G. Collins
18915 Kinbrace St.
Northridge CA 91326-1032

APN: 2820-003-037
Gary N. Yoshino
18909 Kinbrace St.
Northridge CA 91326-1032

APN: 2820-003-038
Timothy M. Beets
18901 Kinbrace St.
Northridge CA 91326-1032

APN: 2820-003-039
Reid A. Brekke
18867 Kinbrace St.
Northridge CA 91326-1030

APN: 2820-003-040
Keith Hershey
18861 Kinbrace St.
Northridge CA 91326-1030

APN: 2820-003-041
George D. Chermak
18855 Kinbrace St.
Northridge CA 91326-1030

APN: 2820-003-042
Tina C. Horn
18847 Kinbrace St.
Northridge CA 91326-1030

APN: 2820-003-043
William M. Ringness
18841 Kinbrace St.
Northridge CA 91326-1030

APN: 2820-003-044
Jerome M. Tiu
18831 Kinbrace St.
Northridge CA 91326-1030

APN: 2820-005-001
John G. Lewolt
18821 Kilfinan St.
Northridge CA 91326-1017

APN: 2820-005-002
William Yeung
12350 Ormskirk Ave.
Northridge CA 91326-1042

APN: 2820-005-003
Joginder Tr Shah
16133 Ventura Blvd. No. 1075
Encino CA 91436

APN: 2820-005-004
VROLYK John J
18817 Kilfinan St.
Northridge CA 91326-1017

APN: 2820-005-005
John B. Charnay
18813 Kilfinan St.
Northridge CA 91326-1017

APN: 2820-005-006
Rudolph D. Curiel
901 McKevett Rd.
Santa Paula CA 93060

APN: 2820-005-007
Edward H. Sieger
18816 Kilfinan St.
Northridge CA 91326-1018

APN: 2820-005-008
Jack D. Compton
18820 Kilfinan St.
Northridge CA 91326-1018

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OWNERSHIP LIST

SUNSHINE CYN - #2826

APN: 2826-017-041
Day Adventists Tr Seventh
10069 Avenue 400
Dinuba CA 93618

APN: 2826-017-045
Northern Trust of Californ
P.O. Box 92990
Chicago IL 60675

APN: 2826-017-049
Vignes J L Ranch Inc
P.O. Box 3382
Idyllwild CA 92549

APN: 2826-018-021
Darlene Tr Limbocker
20272 Colonial Cir
Huntington Bh CA 92646

APN: 2826-018-024
G. & D. Trs Debratash
5239 N. Commerce Ave. No. A
Moorpark CA 93021

APN: 2826-018-031
Pacific Coast Homes
P.O. Box 285
Houston TX 77001

APN: 2826-018-034
Crown Zellerbach Corp
P.O. Box 6099
Vancouver WA 98668

APN: 2826-018-066
Thane W. Wilson
25440 Via Gracioso
Valencia CA 91355

APN: 2826-018-067
David Coburn
6699 Alvarado Rd. No. 2308
San Diego CA 92120

APN: 2826-018-900
State of Calif Mountains Rec & Conse
3750 Solstice Canyon Rd.
Malibu CA 90265

APN: 2826-023-007
Charles P. Tr Taylor
3500 E. Coast HWY
Corona Dl Mar CA 92625

APN: 2826-023-008
Charles P. Tr Taylor
3500 E. Coast HWY No. 5
Corona Dl Mar CA 92625

APN: 2826-023-014
Time Warner Entertainment Co L P
4000 Warner Blvd. No. 112
Burbank CA 91522

APN: 2826-023-019
Cosimo P. Disesso
24233 The Old Rd.
Newhall CA 91321-3922

APN: 2826-023-021
George Tash
5777 Balcom Canyon Rd.
Somis CA 93066

APN: 2826-023-023
Michael Lovingood
24314 The Old Rd.
Newhall CA 91321-3921

APN: 2826-023-024
Gordon D. Carpenter
24136 The Old Rd.
Newhall CA 91321

APN: 2826-023-026
Carl R. Linderman
24000 The Old Rd.
Newhall CA 91321-3919

APN: 2826-023-030
City of Santa Clarita
23920 Valencia Blvd. No. 300
Valencia CA 91355

APN: 2826-023-900
U S Postal Service
850 Cherry Ave. No. 551
San Bruno CA 94099

APN: 2826-023-905
City of Santa Clarita
23920 Valencia Blvd. No. 120
Santa Clarita CA 91355

APN: 2826-025-002
Paul R. Holland
24529 Peachland Ave.
Newhall CA 91321

APN: 2826-025-005
Engineering Equity
19962 Roscoe Blvd. No. 35
Canoga Park CA 91306

APN: 2826-025-007
Sandra Baker
2354 Foster Ave.
Ventura CA 93001

APN: 2826-026-005
Trans Coast Financial Inc
8405 Pershing Dr. No. 301
Playa Del Rey CA 90293

APN: 2826-026-007
Louis Mattis
20101 Greenbriar Dr.
Tarzana CA 91356

APN: 2826-026-009
Charles Sezon
7732 Klump Ave.
Sun Valley CA 91352

APN: 2826-026-010
Obera Mercer
P.O. Box 221076
Newhall CA 91322

APN: 2826-026-011
Milton B. Goffman
18962 Harnett St.
Northridge CA 91326

APN: 2826-026-800
L A Cellular Telp Co SBE Par 1 Map 2
6045 E. Slauson
Commerce CA 90040

APN: 2826-026-901
Safe Harbor Investment Cor
8405 Pershing Dr. No. 300
Playa Del Rey CA 90293

APN: 2826-027-001
Browning Ferris Industries of Califo
P.O. Box 42165
Houston TX 77242

APN: 2826-028-005
Sunshine Canyon Inc
P.O. Box 42165
Houston TX 77242

APN: 2826-028-006
Barry B. Yamron
5454 Zelzah Ave. No. 211
Encino CA 91316

APN: 2826-028-009
Ferris Industries Browning
P.O. Box 42165
Houston TX 77242

APN: 2826-028-010
Industries Browning-Ferris
P.O. Box 42165
Houston TX 77242

APN: 2826-028-020
Northern Trust of Californ
P.O. Box 92990
Chicago IL 60675

APN: 2826-028-021
Mission Peak Co
9017 Reseda Blvd. No. 209
Northridge CA 91324

APN: 2826-029-002
Santa Fe Energy Co
1616 S. Voss Rd.
Houston TX 77057

APN: 2826-029-006
Vignes J L Ranch Inc
P.O. Box 3382
Idyllwild CA 92549

APN: 2826-029-007
Edward E. Beard
6541 Firebrand St.
Los Angeles CA 90045

APN: 2826-029-008
Union Oil Co of Calif
P.O. Box 7600
Los Angeles CA 90051

APN: 2826-029-012
Kenneth H. Tr Hunter
P.O. Box 5275
Santa Barbara CA 93150

APN: 2826-029-037
Russell F. Adm Johnson
P.O. Box 813
Santa Paula CA 93061

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OWNERSHIP LIST

SUNSHINE CYN - #2827

APN: 2827-004-007
Santa Clarita Valley Church of Chris
23519 San Fernando Rd.
Newhall CA 91321

APN: 2827-004-008
Santa Clarita Valley Church of Chris
23519 San Fernando Rd.
Newhall CA 91321

APN: 2827-004-009
Santa Clarita Valley Church of Chris
23519 San Fernando Rd.
Newhall CA 91321-3102

APN: 2827-004-010
D Agustini Sergio A
23647 San Fernando Rd.
Newhall CA 91321-3158

APN: 2827-004-012
Richard F. Gilman
23651 San Fernando Rd.
Newhall CA 91321-3158

APN: 2827-004-013
Manuel Santana
25208 Wheeler Rd.
Newhall CA 91321

APN: 2827-004-014
Jeannette McFarland
23645 San Fernando Rd.
Newhall CA 91321-3158

APN: 2827-004-016
Douglas G. Green
24149 Mentry Dr. No. D
Newhall CA 91321

APN: 2827-004-017
Theodore M. Leventhal
5425 Aldea Ave.
Encino CA 91316

APN: 2827-004-019
Harry H. Kinnen
23950 San Fernando Rd.
Newhall CA 91321

APN: 2827-004-020
Harry H. Kinnen
23950 San Fernando Rd.
Newhall CA 91321

APN: 2827-004-021
Harry H. Kinnen
23950 San Fernando Rd.
Newhall CA 91321

APN: 2827-004-022
Douglas E. Keever
23647 San Fernando Rd.
Newhall CA 91321-3158

APN: 2827-004-023
Faith Community Church
21704 Golden Triangle Rd. No.
Santa Clarita CA 91350

APN: 2827-004-025
Meadowridge Apartments Inc
Cna Plaza Nex
Chicago IL 60685

APN: 2827-004-026
Santa Clarita Valley Church of Chris
23519 San Fernando Rd.
Newhall CA 91321

APN: 2827-004-027
Douglas G. Green
24149 Mentry Dr.
Newhall CA 91321

APN: 2827-004-028
Chandler Investment Properties
610 N. Hollywood Way No. 301
Burbank CA 91505

APN: 2827-004-029
Chandler Investment Properties
610 N. Hollywood Way No. 301
Burbank CA 91505

APN: 2827-005-001
Andre E. Veluzat
23445 San Fernando Rd.
Newhall CA 91321-3118

APN: 2827-005-002
Paul T. Veluzat
P.O. Box 716
Newhall CA 91322

APN: 2827-005-004
Paul T. Veluzat
P.O. Box 716
Newhall CA 91322

APN: 2827-005-007
Raymond G. Neiditch
24325 San Fernando Rd. No. 205
Newhall CA 91321

APN: 2827-005-009
Raymond G. Neiditch
24325 San Fernando Rd. No. 205
Newhall CA 91321

APN: 2827-005-014
Sierra Point Partners
8820 Azul Cir No. 205
Canoga Park CA 91304

APN: 2827-005-015
Robert R. Rouse
1117 S. Robertson Blvd.
Los Angeles CA 90035

APN: 2827-005-016
Robert R. Rouse
1117 S. Robertson Blvd.
Los Angeles CA 90035

APN: 2827-005-017
William M. Rouse
1117 S. Robertson Blvd.
Los Angeles CA 90035

APN: 2827-005-018
Ghattas Hilu
16417 Knollwood Dr.
Granada Hills CA 91344

APN: 2827-005-019
Ghattas Hilu
16417 Knollwood Dr.
Granada Hills CA 91349-8671

APN: 2827-005-021
Patti S. Veluzat
P.O. Box 220219
Newhall CA 91322

APN: 2827-005-027
Sierra Point Partners
8820 Azul Cir
Canoga Park CA 91304

APN: 2827-005-028
Sierra Point Partners
8820 Azul Cir
Canoga Park CA 91304

APN: 2827-005-029
Robert R. Rouse
1117 S. Robertson Blvd.
Los Angeles CA 90035

APN: 2827-005-030
Norma L. Minna
14150 Enadia Way
Van Nuys CA 91405

APN: 2827-005-031
Whitney Canyon Ranch Associates Resi
2716 Ocean Park Blvd.
Santa Monica CA 90405

APN: 2827-005-032
Whitney Canyon Ranch Associates Resi
2716 Ocean Park Blvd.
Santa Monica CA 90405

APN: 2827-005-034
Jacob Albert
3537 Old Conejo Rd. No. 119
Newbury Park CA 91320

APN: 2827-005-035
Whitney Canyon Ranch Associates Resi
2716 Ocean Park Blvd.
Santa Monica CA 90405

APN: 2827-005-037
Paul T. Veluzat
P.O. Box 716
Newhall CA 91322

APN: 2827-005-039
Rene P. Veluzat
P.O. Box 219
Newhall CA 91322

APN: 2827-005-040
Gus Hilu
16417 Knollwood Dr.
Granada Hills CA 91344

APN: 2827-006-002
David J. Will
13226 Kismet Ave.
Sylmar CA 91342

APN: 2827-006-003
Michael Yurosek
23702 Pine St.
Newhall CA 91321-3109

APN: 2827-006-006
Chevron Usa Inc
P.O. Box 285
Houston TX 77001

APN: 2827-006-010
Henry Arklin
10550 Sepulveda Blvd. No. 206
Mission Hills CA 91345

APN: 2827-006-014
Henry Arklin
10550 Sepulveda Blvd. No. 206
Mission Hills CA 91345

APN: 2827-006-015
Henry Arklin
10550 Sepulveda Blvd. No. 206
Mission Hills CA 91345

APN: 2827-006-016
Chevron Usa Inc
P.O. Box 285
Houston TX 77001

APN: 2827-006-017
Chevron Usa Inc
P.O. Box 285
Houston TX 77001

APN: 2827-006-018
Chevron Usa Inc
P.O. Box 285
Houston TX 77001

APN: 2827-006-019
Chevron Usa Inc
P.O. Box 285
Houston TX 77001

APN: 2827-006-901
Newhall Co Water Dist
23780 Pine St.
Newhall CA 91321-3109

APN: 2827-007-001
Buford Randall
23654 Pine St. No. 6
Newhall CA 91321-3107

APN: 2827-007-005
Buford Randall
23654 Pine St.
Newhall CA 91321

APN: 2827-007-008
Renaud & Sue Veluzat
P.O. Box 597
Newhall CA 91322

APN: 2827-007-009
Renaud & Sue Veluzat
P.O. Box 597
Newhall CA 91322

APN: 2827-007-011
Glenn H. Randall
23552 Pine St.
Newhall CA 91321-3105

APN: 2827-007-012
Richard H. Sandnes
23508 Pine St.
Newhall CA 91321-3105

APN: 2827-007-013
Glenn Randall
23508 Pine St.
Newhall CA 91321

APN: 2827-007-014
Ann Randall
23508 Pine St.
Newhall CA 91321

APN: 2827-007-019
S & S Fence & Supply Co
P.O. Box 220027
Newhall CA 91322

APN: 2827-007-021
Bruce E. Palmer
25050 Hollyhock Ct.
Stevenson Rnh CA 91381

APN: 2827-007-023
S & S Fence & Supply Co
P.O. Box 220027
Newhall CA 91322

APN: 2827-007-026
Rodney J. Baron
23638 Pine St.
Newhall CA 91321-3107

APN: 2827-007-027
Gabriel G. Gordon
23634 Pine St.
Newhall CA 91321-3107

APN: 2827-007-028
James E. Bullock
1020 W. Main St.
Sac City IA 50583

APN: 2827-007-029
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-007-802
So Calif Edison Co SBE 148-19-525 A
23580 Pine St.
Newhall CA 91321-3105

APN: 2827-008-006
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-008-007
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-008-008
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-008-009
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-008-010
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-008-014
Service Corp International
P.O. Box 130548
Houston TX 77219

APN: 2827-008-015
Turner
P.O. Box 130548
Houston TX 77219

APN: 2827-008-034
Valley Memorial Park Eternal
P.O. Box 130548
Houston TX 77219

APN: 2827-008-920
Valley Memorial Park Eternal
23287 N. San Fernando Rd.
Newhall CA 91321

APN: 2827-009-008
Pauley Petroleum Inc
P.O. Box 2208
Roswell NM 88202

APN: 2827-009-010
Whitney Canyon Ranch Associates Resi
2716 Ocean Park Blvd.
Santa Monica CA 90405

APN: 2827-010-007
Newhall Refining Co Inc
P.O. Box 2208
Roswell NM 88202

APN: 2827-010-008
Newhall Refining Co Inc
P.O. Box 2208
Roswell NM 88202

APN: 2827-010-009
Newhall Refining Co Inc
P.O. Box 2208
Roswell NM 88202

APN: 2827-010-011
Pauley Petroleum Inc
P.O. Box 2208
Roswell NM 88202

APN: 2827-010-012
Pauley Petroleum Inc
P.O. Box 2208
Roswell NM 88202

APN: 2827-010-013
Newhall Refining Co Inc
P.O. Box 2208
Roswell NM 88202

APN: 2827-011-003
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-011-005
Turner
P.O. Box 130548
Houston TX 77219

APN: 2827-011-006
Turner
P.O. Box 130548
Houston TX 77219

APN: 2827-011-007
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-011-008
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-011-009
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-011-010
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-013-001
Jack Williams
16429 Sierra HWY
Canyon Cntry CA 91351

APN: 2827-013-003
Santana Manuel 1992 Trust
25208 Wheeler Rd.
Newhall CA 91321

APN: 2827-013-004
Gate King Partners
700 Emerson St.
Palo Alto CA 94301

APN: 2827-013-006
Galen K. Jones
23707 Wildwood Canyon Rd.
Santa Clarita CA 91321-3824

APN: 2827-013-007
John D. Hoskinson
24514 Thistle Ct.
Newhall CA 91321

APN: 2827-013-008
Richard D. Franklin
26635 Iron Canyon Rd.
Santa Clarita CA 91350

APN: 2827-013-009
Palm Springs Motors Inc Em
69200 E. Us Highway 111
Cathedral Cty CA 92234

APN: 2827-014-011
Kimberly A. Gibbs
23651 Pine St.
Newhall CA 91321-3106

APN: 2827-014-012
Kimberly A. Gibbs
23651 Pine St.
Newhall CA 91321

APN: 2827-014-013
Kimberly A. Gibbs
23651 Pine St.
Newhall CA 91321

APN: 2827-014-014
Gerald E. Gibbs
23651 Pine St.
Newhall CA 91321

APN: 2827-014-015
Gerald E. Gibbs
23651 Pine St.
Newhall CA 91321

APN: 2827-014-016
Gerald E. Gibbs
23651 Pine St.
Newhall CA 91321

APN: 2827-014-017
Jack C. Williams
16429 Sierra HWY
Canyon Cntry CA 91351

APN: 2827-014-018
Valentine J. Perkins
P.O. Box 221136
Newhall CA 91322

APN: 2827-014-019
Arthur B. Perkins
P.O. Box 579
Newhall CA 91322

APN: 2827-014-020
Richard C. Perkins
P.O. Box 221136
Newhall CA 91322

APN: 2827-014-022
Thomas L. Lee
23960 Wildwood Canyon Rd.
Newhall CA 91321-3816

APN: 2827-014-023
Thomas L. Lee
23960 Wildwood Canyon Rd.
Newhall CA 91321

APN: 2827-014-024
Jack C. Williams
16429 Sierra HWY
Canyon Cntry CA 91351

APN: 2827-014-025
Raymond L. Welch
23157 8th St.
Newhall CA 91321

APN: 2827-014-026
Dan F. Gerstenberger
P.O. Box 1418
Mammoth Lakes CA 93546

APN: 2827-014-027
Raymond L. Welch
23157 8th St.
Newhall CA 91321

APN: 2827-014-028
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23890 Wildwood Canton Rd
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APN: 2827-015-006
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23989 Wildwood Canyon Rd.
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APN: 2827-015-007
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23981 Wildwood Canyon Rd.
Newhall CA 91321-3815

APN: 2827-015-009
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23939 Wildwood Canyon Rd.
Newhall CA 91321-3815

APN: 2827-015-010
Ronald J. Pecel
23945 Wildwood Canyon Rd.
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APN: 2827-015-011
M. E. Gedgaudas
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Newhall CA 91321-3815

APN: 2827-015-013
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APN: 2827-015-014
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23975 Wildwood Canyon Rd.
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APN: 2827-015-015
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23173 Oakbridge Lane
Newhall CA 91321

APN: 2827-015-016
Robert Ormsby
23961 Wildwood Canyon Rd.
Newhall CA 91321-3815

APN: 2827-015-017
Margo F. Groger
23959 Wildwood Canyon Rd.
Newhall CA 91321-3815

APN: 2827-015-029
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23959 Arroyo Park Dr. No. 149
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APN: 2827-015-032
Richard M. Green
23131 Green Crest Dr.
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APN: 2827-015-033
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APN: 2827-015-034
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24149 Mentry Dr.
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APN: 2827-015-035
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24001 Wildwood Canyon Rd.
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APN: 2827-016-008
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24031 Wildwood Canyon Rd.
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APN: 2827-016-009
Wayne P. Oehler
24039 Wildwood Canyon Rd.
Newhall CA 91321-3817

APN: 2827-016-010
Mathilde M. Scott
23120 Wildwood Rd.
Newhall CA 91321-3812

APN: 2827-016-015
D. L. Larey
23121 Oakbridge Lane
Newhall CA 91321-3809

APN: 2827-016-016
George F. De Mott
23131 Oakbridge Lane
Newhall CA 91321-3809

APN: 2827-016-017
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22909 Market St.
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23149 Oakbridge Lane
Newhall CA 91321-3809

APN: 2827-016-019
Olga B. Reyes
23167 Oakbridge Lane
Newhall CA 91321-3809

APN: 2827-016-020
Andrew T. Curd
23173 Oakbridge Lane
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APN: 2827-016-022
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APN: 2827-016-023
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APN: 2827-016-024
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APN: 2827-016-027
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APN: 2827-017-008
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24058 Wildwood Canyon Rd.
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APN: 2827-017-009
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24046 Wildwood Canyon Rd.
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24022 Wildwood Canyon Rd.
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APN: 2827-017-014
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APN: 2827-017-015
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APN: 2827-017-016
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24004 Wildwood Canyon Rd.
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APN: 2827-017-024
Marjorie J. Hobert
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APN: 2827-017-025
Lee Rosier
23976 Wildwood Canyon Rd.
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APN: 2827-017-028
Manuel Santana
25208 Wheeler Rd.
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APN: 2827-017-029
Cloy E. Byerly
24030 Wildwood Canyon Rd.
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APN: 2827-017-030
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APN: 2827-017-032
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APN: 2827-018-009
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24111 Wildwood Canyon Rd.
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APN: 2827-018-010
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APN: 2827-018-012
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APN: 2827-018-013
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APN: 2827-018-014
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APN: 2827-018-016
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APN: 2827-018-018
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APN: 2827-019-007
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APN: 2827-019-008
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24114 Wildwood Canyon Rd.
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APN: 2827-019-010
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24082 Wildwood Canyon Rd.
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23352 Alamos Lane
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APN: 2827-023-053
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23306 Agramonte Dr.
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23316 Agramonte Dr.
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23211 Haskell Vista Lane
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APN: 2827-024-026
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23221 Haskell Vista Lane
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APN: 2827-024-027
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24143 Cross St.
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23220 Haskell Vista Lane
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APN: 2827-024-032
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23234 Haskell Vista Lane
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APN: 2827-024-033
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23210 Haskell Vista Lane
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23252 Haskell Vista Lane
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23310 Haskell Vista Lane
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23360 Haskell Vista Lane
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Newhall CA 91321-3925

APN: 2827-043-016
Dion Dosser
24232 Cary Ct.
Newhall CA 91321-3925

APN: 2827-043-017
Robert G. Allison
24228 Cary Ct.
Newhall CA 91321-3925

APN: 2827-043-018
Ruben Garcia
24222 Cary Ct.
Newhall CA 91321-3925

APN: 2827-043-019
Edward B. Fiock
24218 Cary Ct.
Newhall CA 91321-3925

APN: 2827-043-020
August Eltz
24212 Cary Ct.
Newhall CA 91321-3925

APN: 2827-043-021
Francine S. Gleckman
24208 Cary Ct.
Newhall CA 91321-3925

APN: 2827-043-022
Dennis G. Farnham
24202 Cary Ct.
Santa Clarita CA 91321-3925

APN: 2827-043-023
Newhall Hidden Valley Home
333 S. Hope St. Fl 38
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APN: 2827-044-001
James A. Dal Pozzo
24043 Briardale Way
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APN: 2827-044-002
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24037 Briardale Way
Santa Clarita CA 91321-3946

APN: 2827-044-003
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24029 Briardale Way
Newhall CA 91321-3946

APN: 2827-044-004
Susan G. Igdaloff
24019 Briardale Way
Newhall CA 91321-3946

APN: 2827-044-005
Billy J. McFarland
24013 Briardale Way
Newhall CA 91321-3946

APN: 2827-044-006
David F. Hastings
24009 Briardale Way
Newhall CA 91321-3946

APN: 2827-044-007
Paul A. Yochim
24005 Briardale Way
Santa Clarita CA 91321-3946

APN: 2827-044-008
Joseph M. Koch
24002 Briardale Way
Santa Clarita CA 91321-3946

APN: 2827-044-009
Kazuo Miyazaki
24006 Briardale Way
Newhall CA 91321-3946

APN: 2827-044-010
William Mossontte
24010 Briardale Way
Newhall CA 91321-3946

APN: 2827-044-011
Ronald B. Gray
24016 Briardale Way
Newhall CA 91321-3946

APN: 2827-044-012
Paul M. Bevilaqua
24024 Briardale Way
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APN: 2827-044-013
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APN: 2827-044-014
Michael R. Granen
24042 Briardale Way
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APN: 2827-044-022
Thomas R. Cahill
24135 Clearbank Lane
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APN: 2827-044-023
Martin L. Downen
24131 Clearbank Lane
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APN: 2827-044-024
Irwin Ginsburgh
24125 Clearbank Lane
Newhall CA 91321-3945

APN: 2827-044-025
Douglas F. Lewis
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24070 Briardale Way
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APN: 2827-044-037
Walter C. Breitinger
24066 Briardale Way
Newhall CA 91321-3946

APN: 2827-044-038
Robert J. Putynkowski
24113 Clearbank Lane
Newhall CA 91321-3945

APN: 2827-044-039
Douglas Aziz
24119 Clearbank Lane
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APN: 2827-044-040
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24118 Creekside Dr.
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24105 Clearbank Lane
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Dale Lookholder
24103 Clearbank Lane
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23410 Thornwood Dr.
Newhall CA 91321-3953

APN: 2827-045-003
Sang S. Cho
23414 Thornwood Dr.
Newhall CA 91321-3953

APN: 2827-045-004
John Reynertson
23420 Thornwood Dr.
Newhall CA 91321-3953

APN: 2827-045-005
Gary L. Nanson
23426 Thornwood Dr.
Newhall CA 91321-3953

APN: 2827-045-006
Robert J. Spierer
23432 Thornwood Dr.
Newhall CA 91321-3953

APN: 2827-045-007
Christopher J. & Ka Studden
23438 Thornwood Dr.
Newhall CA 91321-3953

APN: 2827-045-008
Steve G. Fredrickson
23444 Thornwood Dr.
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APN: 2827-045-009
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23450 Thornwood Dr.
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APN: 2827-045-010
Millie J. Huntley
23456 Thornwood Dr.
Newhall CA 91321-3953

APN: 2827-045-011
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23484 Thornwood Dr.
Newhall CA 91321-3953

APN: 2827-045-016
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23488 Thornwood Dr.
Newhall CA 91321-3953

APN: 2827-045-017
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23490 Thornwood Dr.
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APN: 2827-045-018
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23491 Thornwood Dr.
Newhall CA 91321-3954

APN: 2827-045-019
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Newhall CA 91321-3954

APN: 2827-045-020
Salvador B. Cancio
23483 Thornwood Dr.
Newhall CA 91321-3954

APN: 2827-045-021
Arthur J. Matter
23479 Thornwood Dr.
Newhall CA 91321-3954

APN: 2827-045-022
Darmon C. McGruder
23471 Thornwood Dr.
Newhall CA 91321-3954

APN: 2827-045-023
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23465 Thornwood Dr.
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APN: 2827-045-025
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23455 Thornwood Dr.
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APN: 2827-045-026
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Newhall CA 91321-3955

APN: 2827-045-063
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APN: 2827-046-005
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APN: 2827-046-006
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Newhall CA 91321-3747

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Newhall CA 91321-3747

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APN: 2827-046-016
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APN: 2827-046-017
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APN: 2827-046-018
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APN: 2827-046-019
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APN: 2827-046-022
James F. Gardunio
23832 Valley Oak Ct.
Newhall CA 91321-3746

APN: 2827-046-023
1992-3B Smart
23840 Valley Oak Ct.
Newhall CA 91321-3746

APN: 2827-047-001
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23605 White Oak Ct.
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APN: 2827-047-002
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23619 White Oak Ct.
Newhall CA 91321-3743

APN: 2827-047-003
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23643 White Oak Ct.
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23647 White Oak Ct.
Newhall CA 91321-3743

APN: 2827-047-008
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APN: 2827-047-009
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23671 White Oak Ct.
Santa Clarita CA 91321-3743

APN: 2827-047-012
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23675 White Oak Ct.
Newhall CA 91321-3743

APN: 2827-047-013
Deborah A. Pick
23679 White Oak Ct.
Newhall CA 91321-3743

APN: 2827-047-014
Paul Bona
23681 White Oak Ct.
Santa Clarita CA 91321-3743

APN: 2827-047-015
Rodger F. Gilbert
23683 White Oak Ct.
Newhall CA 91321-3743

APN: 2827-047-016
Mary J. Nardone
23682 White Oak Ct.
Santa Clarita CA 91321-3719

APN: 2827-047-017
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23680 White Oak Ct.
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APN: 2827-047-018
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23678 White Oak Ct.
Santa Clarita CA 91321-3719

APN: 2827-047-019
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23674 White Oak Ct.
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APN: 2827-047-020
At Newhall Homeowners Oaks
12233 W. Olympic Blvd.
Los Angeles CA 90064

APN: 2827-047-021
James C. Dunning
23656 White Oak Ct.
Santa Clarita CA 91321-3719

APN: 2827-047-022
Rafael P. Sustento
23652 White Oak Ct.
Santa Clarita CA 91321-3719

APN: 2827-047-023
Mark P. Gross
23648 White Oak Ct.
Santa Clarita CA 91321-3719

APN: 2827-047-024
Alan J. Shapiro
23644 White Oak Ct.
Santa Clarita CA 91321-3719

APN: 2827-047-025
William Friedman
23634 White Oak Ct.
Santa Clarita CA 91321-3719

APN: 2827-047-026
Robert B. Foltz
23622 White Oak Ct.
Santa Clarita CA 91321-3719

APN: 2827-047-027
Victor Sumian
23618 White Oak Ct.
Santa Clarita CA 91321-3719

APN: 2827-047-028
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23614 White Oak Ct.
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Elsmere Corp
2550 W. 237th St.
Torrance CA 90505

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Concha Martinez
12528 Nedra Dr.
Granada Hills CA 91344

APN: 2848-016-005
Jose R. De La Torre
9212 Mallison Ave.
South Gate CA 90280

APN: 2848-017-013
Whitney Canyon Ranch Associates Resi
2716 Ocean Park Blvd.
Santa Monica CA 90405

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Porter Ranch CA 91326-1115

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Virgil D. Hawks
18750 Lisburn Pl.
Northridge CA 91326-1121

APN: 2870-002-008
Kyung S. Shin
18740 Lisburn Pl.
Northridge CA 91326-1121

APN: 2870-002-009
Clark Swanson
18734 Lisburn Pl.
Northridge CA 91326-1121

APN: 2870-002-010
Jean S. Elkawass
18730 Lisburn Pl.
Northridge CA 91326-1121

APN: 2870-002-011
Avo Sarkisian
18731 Lisburn Pl.
Northridge CA 91326-1157

APN: 2870-002-012
Jeff E. & Ester Borenstein
18735 Lisburn Pl.
Northridge CA 91326-1157

APN: 2870-002-013
James B. Savitz
18741 Lisburn Pl.
Northridge CA 91326-1157

APN: 2870-002-014
Mel Mitchell
18751 Lisburn Pl.
Northridge CA 91326-1157

APN: 2870-002-015
Joseph K. Goldstein
12244 Darby Ave.
Northridge CA 91326-1116

APN: 2870-002-016
Orlando O. Cano
18756 Caithness St.
Northridge CA 91326-1106

APN: 2870-002-017
Rozik Aghdjanian
18748 Caithness St.
Northridge CA 91326-1106

APN: 2870-002-018
Duk Ryong Yun
18740 Caithness St.
Northridge CA 91326-1106

APN: 2870-002-019
Morris Dondick
18730 Caithness St.
Northridge CA 91326-1106

APN: 2870-002-020
John C. Impellizzeri
12255 Beaufait Ave.
Northridge CA 91326-1103

APN: 2870-002-021
Norma Bennett
12247 Beaufait Ave.
Northridge CA 91326-1103

APN: 2870-002-022
Marlene A. Guevara
12241 Beaufait Ave.
Northridge CA 91326-1103

APN: 2870-002-023
Stuart R. Markman
12233 Beaufait Ave.
Northridge CA 91326-1103

APN: 2870-002-024
Mansukh K. Shah
12225 Beaufait Ave.
Northridge CA 91326-1103

APN: 2870-002-025
Eui Y. Lee
12217 Beaufait Ave.
Northridge CA 91326-1103

APN: 2870-002-026
Terri Landstbom
12209 Beaufait Ave.
Northridge CA 91326-1103

APN: 2870-003-001
Behzad Partovi
18715 Kirkcolm Lane
Northridge CA 91326-1162

APN: 2870-003-002
Michael Miller
18707 Kirkcolm Lane
Northridge CA 91326-1162

APN: 2870-003-003
HWANG Kunsik
12114 Darby Ave.
Northridge CA 91326-1114

APN: 2870-003-004
Saul Rosenbaum
12122 Darby Ave.
Northridge CA 91326-1114

APN: 2870-003-005
Ronald V. Brown
12128 Darby Ave.
Northridge CA 91326-1114

APN: 2870-003-006
Sandra J. Masone
12136 Darby Ave.
Northridge CA 91326-1114

APN: 2870-003-007
Dennis J. Prevatt
18740 Roxburgh Pl.
Northridge CA 91326-1123

APN: 2870-003-008
Michael Orlov
18730 Roxburgh Pl.
Northridge CA 91326-1123

APN: 2870-003-009
Michael A. Herriott
18724 Roxburgh Pl.
Northridge CA 91326-1123

APN: 2870-003-010
Jeffrey R. Zebrack
18651 Cumnock Pl.
Northridge CA 91326-1107

APN: 2870-003-011
Merryll L. Meyers
18663 Cumnock Pl.
Northridge CA 91326-1107

APN: 2870-003-012
Daniel C. Morris
18675 Cumnock Pl.
Northridge CA 91326-1107

APN: 2870-003-013
William R. Gelpi
P.O. Box 901090
Palmdale CA 93590

APN: 2870-003-014
Bruce E. Adamson
18691 Cumnock Pl.
Northridge CA 91326-1107

APN: 2870-003-015
Pauline A. Gorman
18697 Cumnock Pl.
Northridge CA 91326-1107

APN: 2870-003-016
Gary R. Schultz
18701 Kirkcolm Lane
Northridge CA 91326-1162

APN: 2870-003-017
John C. Christian
18692 Cumnock Pl.
Northridge CA 91326-1108

APN: 2870-003-018
Frank J. Gagliano
18686 Cumnock Pl.
Northridge CA 91326-1108

APN: 2870-003-019
Prakash Chandran
1710 Santa Paula Pl.
Glendale CA 91208

APN: 2870-003-020
Raymond J. Hosek
18670 Cumnock Pl.
Northridge CA 91326-1108

APN: 2870-003-021
Fred A. Scavone
18662 Cumnock Pl.
Northridge CA 91326-1108

APN: 2870-003-022
Dongsoo Yim
12171 Beaufait Ave.
Northridge CA 91326-1149

APN: 2870-003-023
Sam Chitjian
12161 Beaufait Ave.
Northridge CA 91326-1149

APN: 2870-003-024
Wayne C. Smith
12151 Beaufait Ave.
Northridge CA 91326-1149

APN: 2870-003-025
Thomas B. Komer
12141 Beaufait Ave.
Northridge CA 91326-1149

APN: 2870-003-026
Judith A. Sturman
18643 Kirkcolm Lane
Northridge CA 91326-1160

APN: 2870-003-027
Ray D. Cziffer
18651 Kirkcolm Lane
Northridge CA 91326-1160

APN: 2870-003-028
Thomas A. Joldersma
18657 Kirkcolm Lane
Northridge CA 91326-1160

APN: 2870-003-029
Margaret M. Fitzgerald
18667 Kirkcolm Lane
Northridge CA 91326-1160

APN: 2870-003-030
Pedro C. Manalo
18675 Kirkcolm Lane
Northridge CA 91326-1160

APN: 2870-003-031
Robert G. Becker
18687 Kirkcolm Lane
Northridge CA 91326-1160

APN: 2870-004-001
Jeremiah A. Rowe
12282 Beaufait Ave.
Northridge CA 91326-1104

APN: 2870-004-002
Majid Ahmadian
12278 Beaufait Ave.
Northridge CA 91326-1104

APN: 2870-004-003
Jafar G. Moazzam
18251 Valley Vista Blvd.
Tarzana CA 91356

APN: 2870-004-004
Mark S. Freedman
12272 Beaufait Ave.
Northridge CA 91326-1104

APN: 2870-004-005
Morris Stembach
12264 Beaufait Ave.
Northridge CA 91326-1104

APN: 2870-004-006
Sharokh Nassiri
12256 Beaufait Ave.
Northridge CA 91326-1104

APN: 2870-004-007
Jesse S. Stancarone
12246 Beaufait Ave.
Northridge CA 91326-1104

APN: 2870-004-008
Norman H. Leventhal
12236 Beaufait Ave.
Northridge CA 91326-1104

APN: 2870-004-009
Charles J. Pankow
12228 Beaufait Ave.
Northridge CA 91326-1104

APN: 2870-004-010
David J. Long
12216 Beaufait Ave.
Northridge CA 91326-1104

APN: 2870-004-011
Ali A. A. Mahdavi
12200 Beaufait Ave.
Northridge CA 91326-1104

APN: 2870-004-012
Donald L. Prouty
12178 Beaufait Ave.
Northridge CA 91326-1102

APN: 2870-004-013
Allan H. Webber
12172 Beaufait Ave.
Northridge CA 91326-1102

APN: 2870-004-014
Joseph J. Porrazzo
12162 Beaufait Ave.
Northridge CA 91326-1102

APN: 2870-004-015
Robert J. Callender
12154 Beaufait Ave.
Northridge CA 91326-1102

APN: 2870-004-016
Pete T. Munoz
12146 Beaufait Ave.
Northridge CA 91326-1102

APN: 2870-004-017
John P. Chun
12138 Beaufait Ave.
Northridge CA 91326-1102

APN: 2870-004-018
Jerome Siegel
12130 Beaufait Ave.
Northridge CA 91326-1102

APN: 2870-004-019
Bryan J. Song
12120 Beaufait Ave.
Northridge CA 91326-1102

APN: 2870-004-020
David B. Supple
12112 Beaufait Ave.
Northridge CA 91326-1102

APN: 2870-004-021
Erich Struthoff
12100 Beaufait Ave.
Northridge CA 91326-1102

APN: 2870-004-022
Sindhu Sidharta
12084 Beaufait Ave.
Northridge CA 91326-1304

APN: 2870-004-023
Thomas M. Hillman
12076 Beaufait Ave.
Northridge CA 91326-1304

APN: 2870-004-024
Ricardo Lugo
12068 Beaufait Ave.
Porter Ranch CA 91326-1304

APN: 2870-004-025
David G. Schumacher
12060 Beaufait Ave.
Northridge CA 91326-1304

APN: 2870-004-026
Brian M. Oliver
12052 Beaufait Ave.
Northridge CA 91326-1304

APN: 2870-004-027
Allen Andersen
12046 Beaufait Ave.
Northridge CA 91326-1304

APN: 2870-004-028
Lee C. Spada
12038 Beaufait Ave.
Northridge CA 91326-1304

APN: 2870-004-029
Vartouhi Dorian
12030 Beaufait Ave.
Northridge CA 91326-1304

APN: 2870-004-030
Creighton R. Carver
12020 Beaufait Ave.
Northridge CA 91326-1304

APPENDIX B2

Homeowners Associations and Other Interested Parties

Homeowners Associations, Cities, and Other Interested Parties (Cont.)

Brentwood Homeowners Association
Robert N. Snader
11791 Chenault Street
Los Angeles, CA 90049

Brentwood Park Property Owners Association
Donald E. Cunningham
1414 South Grand Avenue
Los Angeles, CA 90015-3072

Burton Way Homeowners Association
Harold R. Hahn
479 South Sherbourne Drive
Los Angeles, CA 90048

California Country Club Homeowners Association
Val Cole
3246 Barbydell Drive
Los Angeles, CA 90064

Castellamare Homeowners Association
P.O. Box 104
Pacific Palisades, CA 90272

Cathay Circle Association
Louis F. Korn
6332 Warner Drive
Los Angeles, CA 90048

Central City East Association
Tracey L. Lovejoy
% CA Hampton Company
2523 Fourth Avenue
Los Angeles, CA 90018-1850

Central City West
1230 West Second Street
Los Angeles, CA 90026

Cheviot Hills
Leslie Raisbord
10241 Montemar Drive
Los Angeles, CA 90064

Citizens Committee to Save Elysian Park
Sallie Newbauer
1501 Carro Gordo Street
Los Angeles, CA 90026

City of Alhambra
Director of Planning
111 South First Street
Alhambra, CA 91801

City of Beverly Hills
Director of Planning
Planning Department
455 North Rexford Drive, Room G-40
Beverly Hills, CA 90210

City of Carson
Patrick Brown
Planning Department
701 East Carson
Carson, CA 90745

City of Commerce
Director of Planning
2535 Commerce Way
Commerce, CA 90040

City of Compton
Robert Gavin
Planning Department
205 South Willowbrook
Compton, CA 90220

City of Culver City
Carol DeLay
Planning Department
P. 0. Box 507
Culver City, CA 90232

City of El Segundo
Director of Planning
350 Main Street
El Segundo, CA 90245

City of Gardena
Roy Kato
Planning Department
1700 162nd Street
Gardena, CA 90247

City of Hawthorne
Director of Planning
4455 West 126th Street
Hawthorne, CA 90250

City of Huntington Park
Jack L. Wong
Planning Department
6330 Miles Avenue, Suite 145
Huntington Park, CA 90255

City of Inglewood
Tony De Bellis
Planning Department
One Manchester Boulevard
Inglewood, CA 90301

Homeowners Associations, Cities, and Other Interested Parties (Cont.)

City of Lomita
Director of Planning
P.O. Box 339
Lomita, CA 90717

City of Long Beach
Director of Planning
333 West Ocean Boulevard
Long Beach, CA 90602

City of Lynwood
Vicente Mas
Planning Department
11330 Bullis Road
Lynwood, CA 90262

City of Monterey Park
Director of Planning
320 West Newmark
Monterey Park, CA 90640

City of Pasadena
Director of Planning
100 West Garfield
Pasadena, CA 91109

City of Rancho Palos Verdes
Director of Planning
30940 Hawthorne Boulevard
Rancho Palos Verdes, CA 90274

City of Rolling Hills Estates
Director of Planning
4045 Palos Verdes Drive
Rolling Hills Estates, CA 90274

City of Santa Monica
Paul Barlant
Planning Department
1685 Main Street
Santa Monica, CA 90401

City of South Gate
Andrew Pasmant
Planning Department
8650 California Avenue
South Gate, CA 90280

City of South Pasadena
Director of Planning
1414 Mission Street
South Pasadena, CA 91030

City of Torrance
David Ferren
Planning Department
3031 Torrance Boulevard
Torrance, CA 90503

City of Vernon
Victor Vaits
Planning Department
4305 Santa Fe Avenue
Vernon, CA 90058

City of West Hollywood
Director of Planning
8611 Santa Monica Boulevard
West Hollywood, CA 90069

Committee for Community Concern
Margaret Reinhart
8026 Loyola Boulevard
Los Angeles, CA 90045

Concerned Citizens of South Central Los Angeles
P.O. Box 11337
Los Angeles, CA 90011

Crescent Avenue Homeowners Association
1717 Crescent Avenue
San Pedro, CA 90731

Crest Promontory Common Area Association
Fred Lartozian
12660 Promontory Road
Los Angeles, CA 90049

Downtown News Group
Marc Porter Zasada, Managing Editor
1264 West First Street
Los Angeles, CA 90026

Eagle Rock Association
Gale Cohen
5819 Lolete Avenue
Los Angeles, CA 90041

Echo Park Renters & Homeowners Association
Sandy Brighouse
2240 Lake Shore Avenue
Los Angeles, CA 90039

Elysian Valley Property Owners Association
Lillian Andrizzi, Vice President
2335 Gatewood Street
Los Angeles, CA 90031

Homeowners Associations, Cities, and Other Interested Parties (Cont.)

Esplanade Del Rey Homeowners Association
P.O. Box 5364
Playa Del Rey, CA 90296

Federation of Hillside and Canyon Association
Jerome Daniel
15530 Hamner Drive
Los Angeles, CA 90024

Federation of Hillside and Canyon Association
Carol Stevens
16611 Park Lane Circle
Los Angeles, CA 90049

Franklin-Hollywood
Boulevard West
7470 Franklin Avenue
Los Angeles, CA 90046

Fremont Place Association
Robert J. Page, President
74 Fremont Place
Los Angeles, CA 90005

Fremont Place Association
Steve Wilson, President
108 Fremont Place
Los Angeles, CA 90005

Fremont Place Association
Harry Wirtz, Manager
% Stagen Realty
250 North Canon Drive
Beverly Hills, CA 90201

Friends of Westwood
1015 Gayley Avenue, No. 1063
Los Angeles, CA 90024

Glassell Park Improvement Association
Mrs. Ruby De Vera, President
910 Alogro Place
Los Angeles, CA 90065

GMC Neighborhood Association
% Dick Higashi
16207 South Bonsalio
Harbor Gateway
Gardena, CA 90247

Hancock Park Neighborhood Association
Chickie Byre, President
% 157 North Lerchmont
Los Angeles, CA 90004

Harbor City Coordinating
23724 Kippen Street
Harbor City, CA 90710

Harbor City/Harbor
Gateway Chamber
P.O. Box 523
Harbor City, CA 90710

Harbor Gateway Torrance Community Association
20900 LaSalle Avenue
Torrance, CA 90501

Highland Park Coord.Council
Mr. & Mrs. L.B. Fisher
862 Elyria Drive
Los Angeles, CA 90065

Highland Park Heritage Trust
Bob Ebinger
369 North Avenue 53
Los Angeles, CA 90042

Highland Park Neighborhood Association
Henry Gonzales
2035 Colorado Boulevard
Los Angeles, CA 90041

Hillside Residents Association
Bill Shifferin
8448 Harold Way
Los Angeles, CA 90069

Hillside Village Property Owners Association
Ygnocio M. Alva, President
4523 Valley Boulevard
Los Angeles, CA 90032

Hobart Neighborhood Watch & Neighborhood Association
Tina Farash, President
528 West Hobart Boulevard, #1
Los Angeles, CA 90004

Hollywood Crescent Property Owners
Jim Bryant, President
Mrs. Irma Henderson
8215 Hillside Avenue
Los Angeles, CA 90069

Hollywood Knolls Community Club
3387 Barham Boulevard
P.O. Box 138
Los Angeles, CA 90068

Homeowners Associations, Cities, and Other Interested Parties (Cont.)

Hollywood Knolls Community Club
Jack Harlon
3417 La Sombra Drive
Los Angeles, CA 90068

Hollywood Land Improvement Association
J.E. Greenberg, President
3249 Ledgewood Drive
Los Angeles, CA 90068

Hollywood West Neighborhood Association
1730 North Vista Street
Los Angeles, CA 90046

Holmby Hills Property Owners Association
Robert S. Malouf, President
201 Barada Drive
Los Angeles, CA 90024

Holmby Westwood Property Owners Association
Sandy Brown
10778 Weyburn Avenue
Los Angeles, CA 90026

Homeowners Association of South Westwood
Joyce Foster
P.O. Box 241986
Village Station
Los Angeles, CA 90024

Howard Cohen
11171 Fairbanks Way
Culver City, CA 90230

John Welborne
220 South Irving Boulevard
Los Angeles, CA 90004

Karen and John Alston
917 South Windsor Boulevard
Los Angeles, CA 90019

Kentwood Home Guardians
8015 S. Sepulveda Boulevard
Westchester, CA 90045

Kentwood Homeowners Association
Mrs. E. Holm
7417 Henifer Avenue
Westchester, CA 90045

Kentwood Homeowners Association
Committee for Community Concern
8026 Loyola Boulevard
Los Angeles, CA 90045

L.A. Beautiful
404 South Bixel Street
Los Angeles, CA 90017

Legal Aid Foundation
1550 West 8th Street
Los Angeles, CA 90017

Lincoln Heights Preservation Society
2007 Daly Street
Los Angeles, CA 90031

Lincoln Heights Preservation Society
Jose Luis Sedano
588 East Avenue 28
Los Angeles, CA 90031

Lorraine Boulevard Association
Richard Workman, Chairman
678 South Lorraine
Los Angeles, CA 90005

Los Feliz Homeowners Association
1870 North Vermont Avenue, #541
Los Angeles, CA 90027

Los Feliz Improvement Association
Philip Homsey
4848 Bon View Avenue
Los Angeles, CA 90027

Los Feliz Improvement Association
William Roschen
Christi Van Cleve
5672 Tryon Road
Hollywood, CA 90068

Mandeville Canyon Association
Calvin M. Johnston, President
1641 Mandeville Canyon Road
Los Angeles, CA 90049

Mandeville Canyon Association
Ed Rosendon, President
2144 Banyan Drive
Los Angeles, CA 90049

Margaret Healy
2370 Midvale Avenue
Westwood, CA 90064

Marquez Knolls Neighborhood Association
P.O. Box 1307
Pacific Palisades, CA 90272

Homeowners Associations, Cities, and Other Interested Parties (Cont.)

Melrose Action Committee
721 North Kilkea Drive
Los Angeles, CA 90046

Melrose Neighborhood Association
P.O. Box 38364
Hollywood, CA 90038 .

Miracle Mile A.C.O.A.
Linda Scheid
734 South Dunsmuir Avenue
Los Angeles, CA 90036

Miracle Mile Residential Association
Lyn Cohen, President
1120 Ridgeley Drive
Los Angeles, CA 90019

Miracle Mile Residents Association
911 South Masselin Avenue
Los Angeles, CA 90004

Montecito Heights Improvement Association
Jay Birkowitz
1443 Montecito Drive
Los Angeles, CA 90031

Mt. Washington Association
Lucille Lemon
870 Elyria Drive
Los Angeles, CA 90065

Mt. Washington Association
Clare Marter-Kenyon
505 West Avenue 44
Los Angeles, CA 90065

Mt. Washington Association
Louise Padden
315 West Avenue 43
Los Angeles, CA 90065

North Beach Task Force
Moe Staunezar
824 Amoroso Place
Venice, CA 90291

North Westdale Homeowners Association
Melissa Ann Resnick
11436 Clarkson Road
Los Angeles, CA 90064

Oxford Square Association
Richard Goette and Alan Homberg, Co-Chairman
875 Victoria Avenue
Los Angeles, CA 90005

Pacific Palisades Historical Society
June Blum, President
P.O. Box 1299
Pacific Palisades, CA 90272

Pacific Palisades Residents Association
P.O. Box 617
Pacific Palisades, CA 90272

Palisades Association
Mrs. Sam Botwin
3603 South Leland Street
San Pedro, CA 90731

Palisades Residents Association of San Pedro
Karla Bittner, President
P.O. Box 5281
San Pedro, CA 90733

Pine Crest Neighborhood Association
William A. Freese
6847 Pine Crest Drive
Los Angeles, CA 90042

Planning & Zoning Commission
Evelyn Kieffer, Chairperson
9200 Sunset Boulevard
Los Angeles, CA 90009

Point Farmin Residents Association
P.O. Box 2602
Fort MacArthur Station
San Pedro, CA 90733

Ridgewood-Wilton Neighborhood Association
Rick Hauser, President
103 South Wilton Drive
Los Angeles, CA 90004

Ridgewood-Wilton Neighborhood Association
Virginia Kayor, President
221 South Wilton Drive
Los Angeles, CA 90004

Robert Sutro
130 South McCadden Place
Los Angeles, CA 90004

Roscomare Valley Association
2337 Roscomare Road #2-228
Los Angeles, CA 90077

Roscomere Valley Association
P.0. Box 67065
Los Angeles, CA 90065

Homeowners Associations, Cities, and Other Interested Parties (Cont.)

Rosecrans Neighborhood Association
738 West 149th Street
Harbor Gateway
Gardena, CA 90247

San Pedro Bay Historical Society
Flora T. Baker
P.O. Box 1106
San Pedro, CA 90733

San Pedro Peninsula Homeowners Coalition
P.O. Box 1658
San Pedro, CA 90733

San Pedro Peninsula Homeowners Association
1840 South Gaffey Street, No. 462
San Pedro, CA 90731

San Pedro Planning Alliance
P.O. Box 2606
Fort MacArthur Station
San Pedro, CA 90733

Sawtelle Community Association
2015 Sawtelle Boulevard
Los Angeles, CA 90025

Silverlake Residents Association
P.O. Box 587
Griffith Station
Los Angeles, CA 90039

South Brentwood Homeowners Association
Mary Lewis
974 Amherst Avenue
Los Angeles, CA 90049

South Brentwood Homeowners Association
Philip S. Schwartz
975 Amherst Avenue
Los Angeles, CA 90049

South Brookside Homeowners
Owen Smith
920 Longwood
Los Angeles, CA 90019

South Los Feliz Community Association
Donne Matson, Zoning
4418 Avocado Street
Los Angeles, CA 90027

South Shores Homeowners Association
P.O. Box 922
San Pedro, CA 90733

Southern California Gas Company
Dan Dockray
P.0. Box 3249/M.L. 25HO
Los Angeles, CA 90051

Steve M. Blanchard
P.O. Box 1109
Venice, CA 90294

Sunset Doheny Homes Association
P.O. Box 69702
Los Angeles, CA 90069

Sycamore Terrace Association
Gertrude Cares
4979 North Figueroa Street
Los Angeles, CA 90042

T.E.R.A.
Kathleen Aberman
1577 Hill Drive
Los Angeles, CA 90041

Temescal Canyon Association
P.O. Box 1101
Pacific Palisades, CA 90272

Terri Tippit
10967 Ayres
Los Angeles, CA 90064

Tract No. 7260 Association
B.L. Rogers, President
2030 Fox Hills Drive
Los Angeles, CA 90025

United Homeowners
P.O. Box 43338
Los Angeles, CA 90043

Upper Mandeville Canyon Association
P.O. Box 49845
Los Angeles, CA 90049

Upper Mandeville Canyon Property Owners Association
3744 Mandeville Canyon Road
Los Angeles, CA 90049

Upper S.M. Canyon Homeowners
P.O. Box 1746
Pacific Palisades, CA 90272

Venice Action Committee
723 Ocean Front Walk
Venice, CA 90291

Homeowners Associations, Cities, and Other Interested Parties (Cont.)

Vermont Knolls Community Club
1204 West 82nd Street
Los Angeles, CA 90024

Villa Velltetri Homeowners
Paul Doebler, Chairman
Community Affairs Committee
13336 Maxella Avenue, No. 5
Marina Del Rey, CA 90292

Vista Del Mar Neighbors
6508 Vista Del Mar
Playa Del Rey,CA 90293

Warfel & Condon
John Warfel
100 Wilshire Boulevard, #1760
Santa Monica, CA 90402

Wellington Square Improvement Association
Lena Brown, President
2009 Buckingham Road
Los Angeles, CA 90016

West Adams Heritage Association
4311 Victoria Park Drive
Los Angeles, CA 90019

West Residents Association
Martin Strudler
403 Westbourne Drive
West Hollywood, CA 90048

West Residents Association
Martin Strudlor
403 Westbourne Drive
West Hollywood, CA 90048

Westchester Vitalization Corporation
Jeanne Braunig
6320 West 84th Place
Westchester, CA 90045

Westpoint Height Homeowners Association
Mr. John Nash
6023 West 74th Street
Westchester, CA 90045

Westside Community Planning Council
Richard Agay
16661 Ventura Boulevard Penthouse
Encino, CA 91436-1914

Westside Village Civic Association
Maria Wallace, Vice President
3233 Shelby Avenue
Los Angeles, CA 90034

Westwood Civic Federation
Diane Plotkin
8443 West Fourth Street
Los Angeles, CA 90048

Westwood Gardens Civic Association
P.O. Box 64194
Los Angeles, CA 90064

Westwood Hills Property Owners
P.O. Box 24515
Los Angeles, CA 90024

Westwood Hills Property Owners Association
William T. Savage
11054 Cashiers Street
Los Angeles, CA 90049

Wilmington Homeowners Association
P.O. Box 1947
Wilmington, CA 90748

Wilmington Homeowners Association
Peter Mendoza, President
1013 Sanford Avenue
Wilmington, CA 90744

Wilmington North Neighborhood Association
Gertrude Schwab, President
317 West R Street
Wilmington, CA 90744

Wilmington Square Improvement Association
Lana Brown, President
2009 Buckingham Road
Los Angeles, CA 90016

Wilshire Homeowners Alliance
Tony Hays, Secretary
676 South Bronson
Los Angeles, CA 90005

Wilshire Homeowners Alliance
627 South Hudson Avenue
Los Angeles, CA 90005

Windsor Square Association
Marcus Crahon, Jr., President
% 157 North Larchmont
Los Angeles, CA 90004

Windsor Village Association
William O'Mara, President
839 South Lorraince Boulevard
Los Angeles, CA 90005

APPENDIX B3

Assemblymen and Other Government Officials/Interested Parties

Homeowners Associations, Cities, and Other Interested Parties Receiving Notice of Completion and Availability

135th Street Neighborhood Association
14153 Ainsworth Street
Harbor Gateway
Gardena, CA 90247

168th Street Commerce Association
1037 West 184th Street
Harbor Gateway Gardens, CA 90248

ALARM
Sabrina Schiller
225 Santa Monica Boulevard, Suite 1001
Santa Monica, CA 90401

Arlington Heights Area Committee, Improvement Club of L.A.
Mrs. Hallie Spikes
2419 Fourth Avenue
Los Angeles, CA 90018

Athens Heights Civic Protective Association
Dorothy F. Mourning
640 Locania Boulevard
Los Angeles, CA 90044

Atwater Community Association
3211 Garcia Street
Los Angeles, CA 90039

Banning Park Neighborhood Association
P.O. Box 2183
Wilmington, CA 90745

Barton Hill Neighborhood Organization
131 North Grand Avenue
San Pedro, CA 90731

Bel Air Association
Elaine R. Gerdau
100 Bel Air Road
Los Angeles, CA 90077

Bel Air Knolls Property Owners Association
Barbara Goldberg
16563 Park Lane Circle
Los Angeles, CA 90049

Benedict Canyon Association
Barbara Fine
1614 Benedict Canyon Drive
Beverley Hills, CA 90210

Benedict Canyon Association
Fred Hamer
2558 Benedict Canyon
Beverly Hills, CA 90210

Benedict Canyon Association
Andy Stern
1422 San Ysidro Drive
Beverley Hills, CA 90210

Beverly-Wilshire Homes Association
% Diana Plotkin, President
8443 West Fourth Street
Los Angeles, CA 90048

Beverlywood Homeowners Association
Joe Joyce
9374 Montemar Drive
Los Angeles, CA 90035

Boulevard Heights Homeowners
Tony Hays, President
726 South Bronson
Los Angeles, CA 90005

Brentwood Community Federation
P.O. Box 49779
Los Angeles, CA 90049

Brentwood Hills Association
Ms. Betsy Laties
1207 Tigertail Road
Los Angeles, CA 90049

Brentwood Hills Homeowners Association
Travis Miljan
P.O. Box 49495
Los Angeles, CA 90049

Brentwood Homeowners Association
M. Piatelli
133 West Layton Drive
Los Angeles, CA 90049

Brentwood Homeowners Association
Stanley Baer
152 North Canyon View Drive
Los Angeles, CA 90049

Brentwood Homeowners Association
Mary Jean Brady
P.O. Box 49427
Los Angeles, CA 90049-0427

Assemblymen, Senators, Board of Supervisors, and Other Agencies Receiving Notice of Completion and Notice of Availability

Assembly/Senator

Honorable Tom McClintock, Assemblyman
Thirty-Eighth Assembly District
10727 White Oak Avenue, Suite 124
Granada Hills, CA 91344

Honorable Tony Cardenas, Assemblyman
Thirty-Ninth Assembly District
9140 Van Nuys Boulevard, Suite 109
Panorama City, CA 91402

Honorable Cathie Wright, State Senator
Nineteenth Senatorial District
2345 Erringer Road, Suite 212
Simi Valley, CA 93065

County Board of Supervisors

Honorable Gloria Molina, Supervisor
County of Los Angeles
First Supervisorial District
869 Kenneth Hahn Hall of Administration
500 West Temple Street
Los Angeles, CA 90012

Honorable Yvonne Brathwaite Burke, Supervisor
County of Los Angeles
Second Supervisorial District
869 Kenneth Hahn Hall of Administration
500 West Temple Street
Los Angeles, CA 90012

Honorable Zev Yaroslavsky, Supervisor
County of Los Angeles
Third Supervisorial District
869 Kenneth Hahn Hall of Administration
500 West Temple Street
Los Angeles, CA 90012

Honorable Don Knabe, Supervisor
County of Los Angeles
Fourth Supervisorial District
869 Kenneth Hahn Hall of Administration
500 West Temple Street
Los Angeles, CA 90012

Honorable Michael Antonovich, Supervisor
County of Los Angeles
Fifth Supervisorial District
869 Kenneth Hahn Hall of Administration
500 West Temple Street
Los Angeles, CA 90012

Other Agencies

Rodney Nelson, Sr. Eng. Geologist
California Regional Water Quality Control Board
Los Angeles Region (4)
101 Centre Plaza Drive
Monterey Park, CA 91754-2156

Dr. Roberta L. Soltz, Mgr. Env. Affairs
Metropolitan Water District of Southern California
1111 Sunset Boulevard
Los Angeles, CA 90012

County of Riverside
Planning Department
4080 Lemon Street, 9th Floor
Riverside, Ca 92502-1409

Vicki Wilson, Director
County of Orange
Integrated Waste Management Department
320 North Flower Street, Suite 400
Santa Ana, CA 92703

Jeff Kolin
City of Santa Clarita
25663 West Avenue Stanford
Santa Clarita, CA 91365-1103

APPENDIX B4

Individuals Requesting Notification at Scoping Meeting

Individuals Requesting Notification at Scoping Meeting (April 29, 1992)

Ann M. Messina
13145 Whistler Avenue
Granada Hills, CA 91344

Diane Liberman
17327 Bronte Place
Granada Hills, CA 91344

Leo Ingalla
4590 Colorado Blvd.
Los Angeles, CA 90039

Gerald E. Walters
12521 Aristo Place
Granada Hills, CA 91344

Doug Martin
13066 Shenley Street
Sylmar, CA 91342

Frances Walters
12521 Aristo Place
Granada Hills, CA 91344

Tom & Maryanna Kienholz
13130 Whistler Avenue
Granada Hills, CA 91344

John Coker
12772 Jolette Avenue
Granada Hills, CA 91344

John Seckar
13031 Jolette Avenue
Granada Hills, CA 91344

Maria Holl
13344 Canyon Ridge Lane
Granada Hills, CA 91344

Salvatore & Jan Luongo
17256 Tennyson Place
Granada Hills, CA 91344

Janice Van Steen
17268 Tennyson Place
Granada Hills, CA 91344

Kenneth M. Wasserman
10 Universal City Plaza, Suite 2055
Universal City, CA 91608

Francis W. Navickas
13046 Jolette Avenue
Granada Hills, CA 91344

Nancy Burns
10450 E. Zelzah Avenue
Northridge, CA 91326

Mr. & Mrs. Albert Lax
12297 Woodley Avenue
Granada Hills, CA 91344

George Edwards
17219 Orozco Street
Granada Hills, CA 91344

Narayan Champawat
17149 Lisette Street
Granada Hills, CA 91344

Brenda Mosler
13172 Courbet Lane
Granada Hills, CA 91344

Ray Price
12936 Winthrop Avenue
Granada Hills, CA 91344

Roger F. Dames
12552 Neon Way
Granada Hills, CA 91344

John Manning
13129 Constable Avenue
Granada Hills, CA 91344

Irwin R. Dudow
12758 Deon Place
Granada Hills, CA 91344

Teresa Todd
13338 Canyon Ridge Lane
Granada Hills, CA 91344

Individuals Requesting Notification at Scoping Meeting (April 29, 1992) (Cont.)

Larry Rofe
17238 Van Gogh Street
Granada Hills, CA 91344

Sally Ehmke
17219 Courbet Street
Granada Hills, CA 91344

Andrea & Barry Mann
12838 Meadowlark Ave.
Granada Hills, CA 91344

Martha Bayer
17364 Angelaine Way
Granada Hills, CA 91344

Maria Sims Carpenter
10738 Gerald Avenue
Granada Hills, CA 91344

Jody Nuckolls
44169 Devol Street
Lancaster, CA 93535

Sharie Swallow-Buckey
3319 Falham Court
Palmdale, CA 93551

Jennie Juchien-niuj Wu
17723 Courdia Court
Granada Hills, CA 91344

Howard Wang
17423 Tuscan Drive
Granada Hills, CA 91344

Tao Wang
17423 Tuscan Drive
Granada Hills, CA 91344

Linda Smaldino
17711 Arvida Drive
Granada Hills, CA 91344

Stella E. Valdez
12874 Winthrop Ave.
Granada Hills, CA 91344

Cynthia S. Taylor
17405 Tuscan Drive
Granada Hills, CA 91344

Paul E. Sperrazza
17405 Tuscan Drive
Granada Hills, CA 91344

Jorge L. Juarez
13138 Constable Avenue
Granada Hills, CA 91344

Suzanne Takahashi
13138 Constable Avenue
Granada Hills, CA 91344

Willem J. Schram
12700 Darla Avenue
Granada Hills, CA 91344

Walter N. Prince
19025 Parthenia St. #200
Northridge, CA 91324

Ev Garfinkle
6073 Calvin Avenue
Tarzana, CA 91356

Norene M. Charnofsky
12636 Meadowlark Avenue
Granada Hills, CA 91344

Keith Larson
13640 Simshaw
Sylmar, CA 91342

Seyed A. Rooholamini
17243 Orozco Street
Granada Hills, CA 91344

APPENDIX B5

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City of Los Angeles Dept. of City Planning
Environmental Review Section
221 N. Figueroa Street, 15th Floor
Los Angeles, CA 90012-2601

Hadar Plafkin, City Planner
City of Los Angeles Dept. of City Planning
Environmental Review Section
221 N. Figueroa Street, 15th Floor
Los Angeles, CA 90012-2601

City of Los Angeles
City Clerk, Environmental Section
Room 395, City Hall
200 Spring Street
Los Angeles, CA 90012
Mail Stop 160

City of Los Angeles
Honorable Hal Bernson
12th District
Room 237, City Hall
200 Spring Street
Los Angeles, CA 90012
Mail Stop 220

City of Los Angeles
Building and Safety Department
Chief, Building Bureau Coordinating Division
Room 417, City Hall
200 Spring Street
Los Angeles, CA 90012
Mail Stop 115

City of Los Angeles
Frank Bonoff
Bureau of Engineering
Land Development/Map Division
634 South Spring Street, Suite 400
Los Angeles, CA 90014-3910
Mail Stop 901

City of Los Angeles
Consultant, Wastewater Program
Management Division
Bureau of Engineering
650 South Spring Street, Suite 1100
Los Angeles, CA 90014-3910
Mail Stop 549

City of Los Angeles
Fire Department - Hydrant Unit
Room 920, City Hall East
200 Spring Street
Los Angeles, CA 90012
Mail Stop 250

Crime Prevention Unit
Los Angeles Police Department
Parker Center
150 N. Los Angeles Street
Los Angeles, CA 90012
Mail Stop 400

City of Los Angeles
Al Carmichael, EIR Reviewer
Recreation and Parks Department
Room 1290, City Hall East
200 Spring Street
Los Angeles, CA 90012
Mail Stop 625-22

City of Los Angeles
Karin Smith
Environmental Affairs
221 North Figueroa Street, Room 200
Los Angeles, CA 90012-2639
Mail Stop 177

CITY OF LOS ANGELES
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Ara Kasparian
Bureau of Engineering
Environmental Management Section
650 South Spring Street, Suite 600
Los Angeles, CA 90014-1907
Mail Stop 939

City of Los Angeles
Drew Sones, Director
Department of Public Works
Bureau of Sanitation
433 Spring Street
Los Angeles, CA 90012
Mail Stop 520

City of Los Angeles
Board Members
Board of Public Works
200 North Spring Street, Room 353
Los Angeles, CA 90012

City of Los Angeles
Robert Takasaki, City Traffic Engineer
Department of Transportation
221 North Figueroa Street, Suite 600
Los Angeles, CA 90012-2639
Mail Stop 725

City of Los Angeles
Jodean M. Giese
Water and Power Department
Power Systems
111 North Hope Street, Room 1121
Los Angeles, CA 90012
Mail Stop 800

City of Los Angeles
R. Simms
Water and Power Department
Water Systems
111 North Hope Street, Room 1432
Los Angeles, CA 90012
Mail Stop 800

City of Los Angeles
Rowella H. Louie
Department of Cultural Affairs
433 South Spring Street, 10th Floor
Los Angeles, CA 90013-2048
Mail Stop 380

City of Los Angeles
Bob Rogers
South LA/Metro Planning Division
221 South Figueroa Street, 3rd Floor
Los Angeles, CA 90012-2639
Mail Stop 397C

City of Los Angeles
Jack Sedwick
Valley/West/Coastal Division
221 South Figueroa Street, 3rd Floor Los Angeles, CA 90012-2552
Mail Stop 397C

City Planning Commission
221 North Figueroa Street, 16th Floor
Los Angeles, CA 90012-2552
Mail Stop 395

Ventura County
Kim Hocking
Planning Department
800 South Victoria Avenue
Ventura, CA 93009

Los Angeles Unified School District
Environmental Review Unit
1449 South San Pedro
Los Angeles, CA 90015

South Coast Air Quality Management District
Cindy Greenwald
Local Government CEQA
21885 Copley Drive, 2nd Floor South
Diamond Bar, CA 91765

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County of Los Angeles
Department of Regional Planning
Impact Analysis Section
320 West Temple Street, Room 1354
Los Angeles, CA 90012-3208

Sanitation Districts of Los Angeles County
Stephen Maguin, Head
Solid Waste Management Department
P.O. Box 4998
1955 Workman Mill Road
Whittier, CA 90607

Los Angeles County
Department of Public Works
Mike Mohajer, Assistant Division Engineer
Environmental Programs Division
900 South Fremont Avenue, 11th Floor
Alhambra, CA 91803

County of Los Angeles
Brad McAllester, Director
Metropolitan Transportation Authority
Mobility and Air Quality Programs
One Gateway Center
Los Angeles, CA 90012

County of Los Angeles
Thomas Barnett
Department of Health Services
313 North Figueroa, Room 327-A
Los Angeles, CA 90012

County of Los Angeles
Department of Health Services
Richard Hanson, Director
Solid Waste Management Program
2525 Corporate Place, Room 150
Monterey Park, CA 91754

County of Los Angeles
Department of Health Services
Donald Stockenberg, Env. Health Specialist
79 Roycroft Avenue
Long Beach, CA 90803

County of Los Angeles
County Clerk
EIR Desk
12400 Imperial Highway
Norwalk, CA 90650

State Clearinghouse
Chris Belsky
Office of Planning and Research
1400 10th Street, Room 121
Sacramento, CA 95814

State of California
Department of Fish and Game
Local Coastal Planning
350 Golden Shore
Long Beach, CA 90802

Caltrans Panning - District 7
Stephen J. Buswell
IGR/CEQA Coordinator
Transportation Planning Office, 1-10C
120 South Spring Street
Los Angeles, CA 90012

California Regional Water Quality Control Board
Rodney Nelson
101 Centre Plaza Drive
Monterey Park, CA 91754

State of California
Santa Monica Mountains Conservancy
Rorie Skei, Program Manager
5750 Ramirez Canyon Road
Malibu, CA 90265

Southern California Association of Governmments
Inter-Governmental Review Section
818 West 7th Street, 12th Floor
Los Angeles, CA 90017

Environmental Protection Agency
David Tomsovic
Region 9
75 Hawthorne Street
San Francisco, CA 94105

National Park Service
Community Planner
Santa Monica Mountains Recreation Area
30401 West Agoura Road, Suite 100
Agoura Hills, CA 91301

U. S. Army Corps of Engineers
District Engineer, L.A. District
Flood Hazards Reports
911 Wilshire Boulevard
Los Angeles, CA 90017

U.S. Fish and Wildlife Service
Gail Kobetich
2730 Loker Avenue West
Carlsbad, CA 92008

U.S. Forest Service Resource
Bernice Bigelow
Planning Section
701 North Santa Anita Avenue
Arcadia, CA 91006

Sierra Club, Los Angeles Chapter
Urban Environment and Parks Committee
3345 Wilshire Boulevard, Suite 508
Los Angeles, CA 90010

Oak Tree Coalition
% Anson Burlingame
10058 Sunland Boulevard
Shadow Hills, CA 91040-1649

Michelle Eskue
Metropolitan Water District
Environmental Planning Department
350 South Grand Avenue
Los Angeles, CA 90071

Southern Pacific Lines
Environmental Attorney
One Market Plaza
San Francisco, CA 94105

Southern California Regional Rail Authority
Ron Mathieu, Manager Public Projects
700 South Flower Street, 26th Floor
Los Angeles, CA 90017-4606

LSA Consulting
Douglas F. Main
4675 MacArthur Court, Suite 625
Newport Beach, CA 92660

APPENDIX B6

Draft SEIR Distribution List
Browning-Ferris Industries

BFI DISTRIBUTION LIST

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Torrance, CA 90505

Ken Spiker
BKK Corporation
2550 237th Street
Torrance, CA 90505

Jim Aidukas
Browning-Ferris Industries, Inc.
14747 San Fernando Road
Sylmar, CA 91342

Arnie Berghoff
Browning-Ferris Industries, Inc.
444 South Flower Street, Suite 4180
Los Angeles, CA 90071

Dennis P. Fenton
Browning-Ferris Industries, Inc.
6601 Owens Drive, Suite 250
Pleasonton, CA 94588

Ed Medvic
Browning-Ferris Industries, Inc.
3326 Fitzgerald Road
Rancho Cordova, CA 95742

David Peters
Browning-Ferris Industries, Inc.
758 N. Eldridge
Houston, TX 77079

Ron Pfeifer
Browning-Ferris Industries, Inc.
9188 Glen Oaks Boulevard, 3rd Fl.
Sun Valley, CA 91352

Dan Tempelis
Browning-Ferris Industries, Inc.
14747 San Fernando Road
Sylmar, CA 91342

Mary Jane Valentine
Browning-Ferris Industries, Inc.
2157 Highway 151
Frankfort, KY 40601

Jeffrey G. Dobrowolski
GeoSyntec Consultants
Main Street, Suite 150
Huntington Beach, CA 150

Sharon Rubalcava
McClintock Weston
444 South Flower Street, 43rd Floor
Los Angeles, CA 90071

Steve Weston, Esq.
McClintock Weston
444 South Flower Street, 43rd Floor
Los Angeles, CA 90071

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Paul, Hastings, Janofsky & Walker
555 South Flower Street,
Los Angeles, CA 90071

Richard Gervais
Paul, Hastings, Janofsky & Walker
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Los Angeles, CA 90071

Ralph Osterling
Ralph Osterling Consultants
1650 Borel Place, Suite 204
San Mateo, CA 94402

Joan Flores
The Joan Milke Group
700 S. Flower Street, 11th Floor
Los Angeles, CA 90017

Robert H. Rice
The Kamber Group
500 South Grande Avenue, Suite 2050
Los Angeles, CA 90071-2606

Bruce Flushman, Esq.
Washburn, Briscoe & McCarthy
55 Francisco Street, Suite 600
San Francisco, CA 91433

Michael Zander
Zander Associates
150 Ford Way, Suite 101
Navato, CA 94945

APPENDIX B7

Draft SEIR Distribution List
San Fernando Valley

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Arcadia, CA 91006

Briar Cliff Improvement Association
Walter M. McIntyre
3142 Brookdale Road
Studio City, CA 91604

Briar Cliff Improvement Association
Dr. Mark Rubin
3156 Fryman Road
Studio City, CA 91604

Briar Cliff Improvement Association
Nancy Pohl
3141 Oakdell Lane
Studio City, CA 91604

Cahuenga Pass Property Owners Association
Deborah Grollman
7257 Pacific View Drive
Los Angeles, CA 90068

Cahunga Pass Property Owners Association
Krista Michaels
3335 Bennett Drive
Los Angeles, CA 90068

Citizens for K Districting
Ed Duvall
13443 Bradley Avenue
Sylmar, CA 91342

City of Burbank
Rick Pruetz, Planner
Planning Department
P.O. Box 6459
275 East Olive Avenue
Burbank, CA 91502

City of Glendale
Director of Planning
633 East Broadway, Room 103
Glendale, CA 91206-4386

City of Hidden Hills
Director of Planning
24549 Long Valley Road
Hidden Hills, CA 91302

City of San Fernando
Director of Planning
117 MacNeil
San Fernando, CA 91340

City of Simi Valley
Director of Planning
2929 Toro Canyon Road
Simi Valley, CA 93063

Community Redevelopment Agency
John Spoulding, Director of Planning
354 South Spring Street, Suite 800
Los Angeles, CA 90013

De Oro Homeowners Association
5170 Kelvin Avenue
Woodland Hills, CA 91364

East Valley Horse Owners Association
Phyllis Hines, Land Use Chair
11511 Orcas Avenue
Lake View Terrace, CA 91342

Encino Civic Association
Glen Bailey, President
5926 Hisperia Avenue
Encino, CA 91316-1014

Encino Property Owners
P.O. Box 17778
Encino, CA 91416-7778

Granada Hills Property Owners Association
Agnes Lewis
17943 Mayerling Street
Granada Hills, CA 91344

Granada Hills-Knollwood Property Owners
12301 Zelzah Avenue
Granada Hills, CA 91344

Hidden Hills Property Owners Association
24549 Long Valley Road
Hidden Hills, CA 91302

Hillside Homeowners Coalition
3675 Avendia del Sol
Studio City, CA 91604

Homeowners of Encino
Gerald Silver
P.O. Box 260205
Encino, CA 91426

JMB/Urban Development Company
John F. Matthews
2049 Century Park East, Suite 1950
Los Angeles, CA 90067

La Tuna Canyon Community Awareness Association
Mary Ann Geyer
10338 La Tuna Canyon Road
Sun Valley, CA 91352

Lakeview Terrace Home Owners Association
Land Use Chairman
P.O. Box 453
Sunland, CA 91040-0453

Lakeview Terrace Improvement Association
Phyllis Hines, President
11511 Orcas Avenue
Lake View Terrace, CA 91342

Lakeview Terrace Improvement Association
Land Use Chairman
% Lakeview Recreation Center
11075 Foothill Road
Lake View Terrace, CA 91342

Lyle A. & Lynette Burg Robe
11968 Lockridge Road
Studio City, CA 91604-4170

North East Valley Residents Association
% Dan Cox
11742 Stagg Street
North Hollywood, CA 91605

North East Valley Residents Association
7700 Laurel Canyon Boulevard
North Hollywood, CA 91605-2735

North Hollywood Homeowners Association
Susan Levy
P.O. Box 887
North Hollywood, CA 91603-0887

North Valley Homeowners Federation
P.O. Box 7717
Northridge, CA 91327

Northridge Urban Home Owners Association
Sharon Pierce
4311 Louise Avenue
Encino, CA 91316-3917

Pacoima Property Owners Association
P.O. Box 7431
Pacoima, CA 91331

Pacoima Property Owners Association
Fred Ford
11249 Borden Avenue
Pacomia, CA 91331

Reseda Community Association
P.O. Box 1431
Reseda, CA 91335

SAN FERNANDO VALLEY
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Reseda Homeowners Association
Rose Conley
18649 Calvert Street
Reseda, CA 91335

Rockpointe Homeowners Association
P.O. Box 3265
Chatsworth, CA 91313

Saddletree Ranch Homeowners Association
Richard L. Russell, Jr.
P.O. Box 7662
Mission Hills, CA 91346

San Fernando Coalition
Anson Burlingame
10058 Sunland Boulevard
Shadow Hills, CA 91040

Santa Susana Mountain Park Association
P.O. Box 4831
Chatsworth, CA 91313-4831

Save the Hills
Sandy Enfield, President
22385 Algunas Road
Woodland Hills, CA 91364

Shadow Hills Property Owners Association
Tina Eick
9647 Stonehurst Avenue
Sun Valley, CA 91352

Sherman Oaks Homeowners Association
Richard H. Close, President
14843 Jadestone Drive
Sherman Oaks, CA 91403

Sherman Village Homeowners
4871 Bluebell Avenue
Sherman Village, CA 91607

Sherwood Forest Homeowners
% Rocky Prockiw
17171 Greeham St
Northridge, CA 91325

Studio City Residents Association
P.O. Box 1374
Studio City, CA 91614

Sun Valley Homeowners Association
P.O. Box 1303
Sun Valley, CA 91352

Sunland Tujunga Association of Residents
Sylvia Gross
6269 Fern Canyon Trail
Tujunga, CA 91042

Sylmar Chamber of Commerce
13728-A Foothill Boulevard
Sylmar, CA 91342

Sylmar Residents Association
Charlene Lyell
14506 Bledsoe Avenue
Sylmar, CA 91342

Tarzana Property Owners Association
Louise F. Frankel
19501 Romita Street
Tarzana, CA 91356

Tarzana Property Owners Association
Irma Dobbyn
19601 Valdez Drive
Tarzana, CA 91356

Toluca Lake Homeowners Association
P.O. Box 2013
Toluca Lake Station
Toluca Lake, CA 91610

Tujunga Residents Association
Pat Koeler
10517 Haines Canyon Avenue
Tujunga, CA 91042

Valley Village Homeowners Association
P.O. Box 4916
Valley Village, CA 91617

Van Nuys Homeowners Association
% Alma Otto
14930 Leadwell Street
Van Nuys, CA 91405

Van Nuys Homeowners Association
P.O. Box 3528
Van Nuys, CA 91407

West Hills Property Homeowners
P.O. Box 4758
West Hills, CA 91308

Woodland Hills Homeowners Organization (WHHO)
P.O. Box 6368
Woodland Hills, CA 91365

Woodland Hills Property Owners Association
P. Kahn
23120 Mulholland Drive
Woodland Hills, CA 91364

Woodland Hills Residents Association
Dorothy Peisner, President
4330 Greer Road
Woodland Hills, CA 91364

APPENDIX B8

Draft SEIR Distribution List and Cover Letter for Libraries

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State Clearinghouse Number 92041053

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4975 Overland Avenue
Culver City, CA 90230

Los Angeles Public Library
Central Library
Science, Technology & Patents Department
630 West Fifth Street
Los Angeles, CA 90071

Los Angeles Public Library
Encino-Tarzana Branch
Diana Lisignoli-Cochran, Senior Librarian
18231 Ventura Boulevard
Tarzana, CA 91356-3630

Los Angeles Public Library
Mid-Valley Regional Branch & Bookmobile
Headquarters
Dan Dupill, Senior Librarian
16244 Nordhoff Street
North Hills, CA 91343-3806

Los Angeles Public Library
Platt Branch
Sherry Van Sickle, Librarian II
23600 Victory Boulevard
Woodland Hills, CA 91367

Los Angeles Public Library
Sylmar Branch
Kelly Burks, Acting Senior Librarian
13059 Glen Oaks Boulevard
Sylmar, CA 91342

San Fernando Library
Judith Babka, Library Manager
1050 Library Street
San Fernando, CA 91340

Los Angeles Public Library
Canoga Park Branch
Renee Ardon, Branch Librarian
7260 Owensmouth Avenue
Canoga Park, CA 91303-1529

Los Angeles Public Library
Chatsworth Branch
Leslie Chudnoff, Young Adult Librarian
21052 Devonshire Street
Chatsworth, CA 91311-2314

Los Angeles Public Library
Granada Hills Branch
Dara Eklund, Adult Librarian
10640 Petit Avenue
Granada Hills, CA 91344-6452

Los Angeles Public Library
Northridge Branch
Yvonne Wong, Adult Librarian
9051 Darby Avenue
Northridge, CA 91325-2743

Los Angeles Public Library
Porter Ranch Branch
Lina Daukas, Senior Librarian
11371 Tampa Avenue
Porter Ranch, CA 91326-1729

Los Angeles Public Library
Woodland Hills Branch
Michael Eisenberg, Branch Librarian
22200 Ventura Boulevard
Woodland Hills, CA 91364-1599

Valencia Library
Ms. J. Riaz, Manager
23743 West Valencia Boulevard
Valencia, CA 91355

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Central Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

In accordance with the City's Guidelines for implementation of the California Environmental Quality Act of 1970 adopted by the City Council and revised on January 27, 1981, the attached draft Environmental Impact Report is being placed with your branch for review by interested persons. Additional copies may be obtained by phoning the EIR Preparation Unit at (213)580-5547.

( ) This EIR may be discarded after _____

(X) This case is controversial and may be appealed. Before discarding, please check with this office.

Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Northridge Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

In accordance with the City's Guidelines for implementation of the California Environmental Quality Act of 1970 adopted by the City Council and revised on January 27, 1981, the attached draft Environmental Impact Report is being placed with your branch for review by interested persons. Additional copies may be obtained by phoning the EIR Preparation Unit at (213)580-5547.

( ) This EIR may be discarded after _____

(X) This case is controversial and may be appealed. Before discarding, please check with this office.

Drue Paul
Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Porter Ranch Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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Irene Paul
Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Sylmar Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Encino-Tarzana Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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Drew Paul
Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Valencia Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Woodland Hills Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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Steve Paul
Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Platt Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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Steve Paul
Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Culver City Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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Steve Paul
Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Canoga Park Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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Irene Paul
Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Chatsworth Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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Steve Paul
Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Granada Hills Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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( ) This EIR may be discarded after _____

(X) This case is controversial and may be appealed. Before discarding, please check with this office.

Steve Ford
Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: Mid-Valley Regional Branch & Bookmobile Headquarters

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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Drew Ford
Unit Head

CP-1292 (5/96)

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

TO: San Fernando Branch Library

FROM: Darryl L. Fisher
Environmental Preparation
Environmental Review Section

SUBJECT: EIR No.: 91-0377-ZC/GPA

State Clearinghouse No.: 92041053

Project Name: Sunshine Canyon Landfill

Location: 14747 San Fernando Road, Sylmar, CA 91342

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(X) This case is controversial and may be appealed. Before discarding, please check with this office.

Drew Pearl
Unit Head

CP-1292 (5/96)

ORIGINAL COMMENTS RECEIVED ON THE DRAFT SEIR

APPENDIX C1

State Agencies

Letter 3.3-1

State of California

California Environmental Protection Agency

MEMORANDUM

To: Chris Belsky
State Clearinghouse
1400 10th Street
Sacramento, CA 95814

Date: September 4, 1997

Hadar Plaflin
City of Los Angeles Planning Dept.
221 N. Figueroa Street, Ste.1500
Los Angeles, CA 90012

10/31/97 e

From: Jeannie H. Blakeslee
Permitting and Enforcement Division
CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD
8800 CAL CENTER DRIVE
SACRAMENTO, CA 95826

FILED SEP 4 1997 STATE CLEARINGHOUSE

Subject: SCH# 92041053 - DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT (DSEIR) FOR THE SUNSHINE CANYON LANDFILL, (SWIS# 19-AA-0853), LOS ANGELES COUNTY

California Integrated Waste Management Board (IWMB) staff have reviewed the DSEIR for the proposed expansion and operation of Sunshine Canyon Landfill. Staff's understanding of the proposed project follows:

The City of Los Angeles is designated as lead agency for the proposed project located within its jurisdiction. The County is a responsible agency for the proposed project. Upon certification of the final SEIR by the City, the County may use this document to form the environmental basis for subsequent discretionary actions.

The proposed project area is 1,102 acres; 494 acres in the City of Los Angeles, and 608 acres in the County of Los Angeles. The proposed City/County Landfill footprint in the City will occupy 194 acres within the City and then extend onto 42 acres within the County, and ultimately connect vertically and horizontally with the approved County landfill which consists of 215 acres.

Prior to or concurrent with the City/County Landfill Project approval by the City, both jurisdictions will execute an agreement that would exercise common power over the entire property (approximately 1,102 acres) and recognize existing discretionary approvals, contractual agreements or other arrangements.

Proposed uses on City acreage include the following:
1. Establishment of a green waste composting and wood waste recycling area (15 acres, 250 tons of material per day)
2. Construction of an access roadway
3. Construction of administrative offices, learning center and parking
4. Installation of a Plant Materials Center (nursery facility)
5. Installation of landfill gas flaring stations
6. Construction of leachate treatment/control systems/storage tank
7. Construction of sedimentation basins
8. Installation of a water storage tank

Proposed and existing uses on County property include the following:
1. Expansion of landfill footprint by 42 acres
2. Existing landfill footprint on 215 acres
3. Construction of an access roadway
4. Construction of administrative office and parking
5. Construction of scale house/maintenance yard
6. Installation of a water storage tank
7. Construction of leachate treatment/control systems/storage tank
8. Installation of landfill gas flaring stations
9. Removal of a sedimentation basin

Staff offer the following comments;

The Overview of the document indicates that an average of 11,000 tons per day (tpd) of waste is to be disposed at the facility. It also states that 11,000 tpd would be the maximum amount of waste accepted at the facility. The Project Description indicates an average of 11,000 tpd. Section 2.6.2 indicates that 12,100 tpd is the maximum anticipated quantity of waste deposited per operating day. What is the maximum anticipated quantity of waste to be disposed and materials to be processed at the facility? It would be helpful if a proposed maximum permitted daily tonnage instead of an average daily tonnage were consistently incorporated into the document. 1

The Project Description includes a discussion of SubTitle D requirements, and mentions the use of 30 ml high density polyethylene (HDPE) as part of the liner system. Figure 2.7-2 indicates that 60 ml HDPE would be used at this facility. In order to avoid confusion, it may be useful to state clearly which thickness of HDPE would be used as part of the liner system. 2

Section 4.1 Grading. Approximately 451 acres are to be graded, in three sequences. How much material is to be excavated? 3 Is blasting part of the excavation? If so, there may be substantial noise, air and dust impacts associated with the activity. 4 Where is the stockpiled material to be stored? 5

Grading is to take place in the expansion area, which has a potential for landslides. Construction activities would commence at the top of slide areas to retain slope stability. The landfill is in close proximity of the Santa Suzana and Northridge faults, and is in an area where liquefaction may pose a threat to landfill liner and leachate collection system integrity. 6

Although slope stability does not fall under IWMB's regulatory authority, we ask that actual design of the landfill reflect measures to minimize indirect impacts associated with potential problems with slope stability.

Thank you for the opportunity to review this document. Please contact me at (916) 255-4708 if you have any questions.

Cc: Joe Maturino, City of Los Angeles LEA
Connie Rocke, Los Angeles County LEA

STATE OF CALIFORNIA — PETE WILSON, Governor

Governor's Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814

October 31, 1997

HADAR PLAFKIN
CITY OF LOS ANGELES, DEPT. OF CITY PLANNING
221 N. FIGUEROA STREET, ROOM 1500
LOS ANGELES, CA 90012

Subject: SUNSHINE CANYON LANDFILL SCH #: 92041053

Dear HADAR PLAFKIN:

The State Clearinghouse has submitted the above named draft Environmental Impact Report (EIR) to selected state agencies for review. The review period is now closed and the comments from the responding agency (ies) is (are) enclosed.

These comments are forwarded for your use in preparing your final EIR. Should you need more information or clarification, we recommend that you contact the commenting agency (ies).

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact us at (916) 445-0613 if you have any questions regarding the environmental review process. Remember to refer to the project's eight-digit State Clearinghouse number so that we may respond promptly.

Sincerely,

Antero A. Rivasplata

ANTERO A. RIVASPLATA
Chief, State Clearinghouse

Enclosures
cc: Resources Agency

AUG-19-1997 09:25 FROM 916 323 3018 TO 917143678890 P.01

Notice of Completion

Appendix F

Mail to: State Clearinghouse, 1400 Tenth Street, Sacramento, CA 95814 916/445-0613

See NOTE below

SCH # 92041053

Project Title: Sunshine Canyon Landfill

Lead Agency: City of Los Angeles Planning Dept. Contact Person: Hadar Plafkin

Street Address: 221 N. Figueroa St., Room 1500 Phone: (213)580-5554

City: Los Angeles Zip: 90012 County: Los Angeles

Project Location

County: Los Angeles City/Nearest Community: Sylmar

Cross Streets: San Fernando Road and Balboa Boulevard Total Acres: 494

Assessor's Parcel No. Section: Twp. Range Base

Within 2 Miles: State Hwy #: 5 Waterways:

Airports: Railways: Schools:

Document Type

CEQA: ☐ NOP ☐ Early Cons ☐ Neg Dec ☐ Draft EIR ☒ Supplement/Subsequent EIR (Prior SCH No.) ☐ Other

NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI

Other: ☐ Joint Document ☐ Final Document ☐ Other

Local Action Type

☐ General Plan Update ☒ General Plan Amendment ☐ General Plan Element ☐ Community Plan ☐ Specific Plan ☐ Master Plan ☐ Planned Unit Development ☐ Site Plan ☒ Rezone ☐ Prezone ☐ Use Permit ☐ Land Division (Subdivision, Parcel Map, Tract Map, etc.) ☐ Annexation ☐ Redevelopment ☐ Coastal Permit ☐ Other

Development Type

☐ Residential: Units Acres
☐ Office: Sq.ft. Acres Employees
☐ Commercial: Sq.ft. Acres Employees
☐ Industrial: Sq.ft. Acres Employees
☐ Educational
☐ Recreational
☐ Water Facilities: Type MGD
☐ Transportation: Type
☐ Mining: Mineral
☐ Power: Type Watts
☐ Waste Treatment: Type
☐ Hazardous Waste: Type
☒ Other: Class 3 nonhazardous solid waste landfill

Project Issues Discussed in Document

☒ Aesthetic/Visual ☐ Agricultural Land ☒ Air Quality ☒ Archeological/Historical ☐ Coastal Zone ☒ Drainage/Absorption ☐ Economic/Jobs ☐ Fiscal ☒ Flood Plain/Flooding ☒ Forest Land/Fire Hazard ☒ Geologic/Seismic ☒ Minerals ☒ Noise ☐ Population/Housing Balance ☒ Public Services/Facilities ☒ Recreation/Parks ☒ Schools/Universities ☒ Septic Systems ☒ Sewer Capacity ☒ Soil Erosion/Compaction/Grading ☒ Solid Waste ☒ Toxic/Hazardous ☒ Traffic/Circulation ☒ Vegetation ☒ Water Quality ☒ Water Supply/Groundwater ☒ Wetland/Riparian ☒ Wildlife ☒ Growth Inducing ☒ Landuse ☒ Cumulative Effects ☐ Other

Present Land Use/Zoning/General Plan Use

A1-0-01 Open Space

Project Description

State Clearinghouse Contact: Mr. Chris Belsky (916) 445-0613

State Review Began: 7.24.97

Dept. Review to Agency 9.2

Agency Rev to SCH 9.5 10-29

* SCH COMPLIANCE 9.8 10-31

Please note SCH Number on all Comments

92041053

Please forward late comments directly to the Lead Agency

AQMD/APCD 33 (Resources: 7,26)

* Extended Review

Project Sent to the following State Agencies

X Resources
___ Boating
___ Coastal Comm
___ Coastal Cnsrv
___ Colorado Rvr Bd
___ Conservation
X Fish & Game # 5
___ Delta Protection
___ Forestry
___ Parks & Rec/OHP
___ Reclamation
___ SCDC
___ DWR
___ OES
___ Bus Transp Hous Aeronautics
X CHP
X Cultures # 7
X Trans Planning
___ Housing & Devel
___ Health & Welfare
___ Drinking H20
___ Medical Waste

___ State/Consumer Svcs
___ General Services
___ Cal/EPA
X ARB
X CA Waste Mgmt Bd
___ SWRCB: Grants
___ SWRCB: Delta
X SWRCB: Wtr Quality
___ SWRCB: Wtr Rights
X Reg. WQCB # 4
___ DISOCTC

___ Yth/Adlt Corrections
___ Corrections
___ Independent Comm
___ Energy Comsn
___ NAHC
___ PUC
___ Santa Mo Mtns
X State Lands Comm
___ Tahoe Rgl Plan
___ Other:

Letter 3.3-2

State of California

GOVERNOR'S OFFICE OF PLANNING AND RESEARCH

1400 TENTH STREET
SACRAMENTO 95814

PETE WILSON
GOVERNOR

PAUL F MINER
ACTING DIRECTOR

RECEIVED
CITY OF LOS ANGELES
NOV 1 8 1997
ENVIRONMENTAL UNIT

November 3, 1997

HADAR PLAFKIN
CITY OF LOS ANGELES, DEPARTMENT OF CITY PLANNING
221 N. FIGUEROA STREET
ROOM 1500
LOS ANGELES, CA 90012

Subject: SUNSHINE CANYON LANDFILL SEIR 91-0377 SCH #: 92041053

Dear HADAR PLAFKIN:

The State Clearinghouse has submitted the above named draft Environmental Impact Report (EIR) to selected state agencies for review. The review period is now closed and the comments from the responding agency(ies) is(are) enclosed. On the enclosed Notice of Completion form you will note that the Clearinghouse has checked the agencies that have commented. Please review the Notice of Completion to ensure that your comment package is complete. If the comment package is not in order, please notify the State Clearinghouse immediately. Remember to refer to the project's eight-digit State Clearinghouse number so that we may respond promptly. 7

Please note that Section 21104 of the California Public Resources Code required that:

> "a responsible agency or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency."

Commenting agencies are also required by this section to support their comments with specific documentation.

These comments are forwarded for your use in preparing your final EIR. Should you need more information or clarification, we recommend that you contact the commenting agency(ies).

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact at (916) 445-0613 if you have any questions regarding the environmental review process. 8

Sincerely,

Antero A. Rivasplata

ANTERO A. RIVASPLATA
Chief, State Clearinghouse

Enclosures
cc: Resources Agency

Notice of Completion

Appendix F

See NOTE below

SCH # 92041053

Mail to: State Clearinghouse, 1400 Tenth Street, Sacramento, CA 95814 916/445-0613

Project Title: Sunshine Canyon Landfill

Lead Agency: City of Los Angeles Planning Dept.

Contact Person: Hadar Plafkin

Street Address: 221 N. Figueroa St., Room 1500

Phone: (213)580-5554

City: Los Angeles **Zip:** 90012

County: Los Angeles

Project Location

County: Los Angeles **City/Nearest Community:** Sylmar

Cross Streets: San Fernando Road and Balboa Boulevard

Assessor's Parcel No. **Section:** **Twp.** **Range:** **Base:** **Total Acres:** 494

Within 2 Miles: State Hwy #: 5 **Waterways:**

Airports: **Railways:** **Schools:**

Document Type

CEQA: ☐ NOP ☐ Early Cons ☐ Neg Dec ☐ Draft EIR ☒ Supplement/Subsequent ☐ EIR (Prior SCH No.) ☐ Other

NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI

Other: ☐ Joint Document ☐ Final Document ☐ Other

Local Action Type

☐ General Plan Update ☒ General Plan Amendment ☐ General Plan Element ☐ Community Plan ☐ Specific Plan ☐ Master Plan ☐ Planned Unit Development ☐ Site Plan ☒ Rezone ☐ Prezone ☐ Use Permit ☐ Land Division (Subdivision, Parcel Map, Tract Map, etc.) ☐ Annexation ☐ Redevelopment ☐ Coastal Permit ☐ Other

Development Type

☐ Residential: Units Acres
☐ Office: Sq.ft. Acres Employees
☐ Commercial: Sq.ft. Acres Employees
☐ Industrial: Sq.ft. Acres Employees
☐ Educational
☐ Recreational

☐ Water Facilities: Type MGD
☐ Transportation: Type
☐ Mining: Mineral
☐ Power: Type Watts
☐ Waste Treatment: Type
☐ Hazardous Waste: Type
☒ Other: Class 3 nonhazardous solid waste landfill

Project Issues Discussed in Document

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Present Land Use/Zoning/General Plan Use

A1-0-0; Open Space

Project Description

State Clearinghouse Contact: Mr. Chris Belsky (916) 445-0613

State Review Began: 7.24.92

Dept. Review to Agency: 9.2

Agency Rev to SCH: ~~9.5~~ 10-29

* SCH COMPLIANCE: ~~9.8~~ 10-31

Please note SCH Number on all Comments

92041053

Please forward late comments directly to the Lead Agency

AQMD/APCD 33 (Resources: 7.26

* Extended Review

Project Sent to the following State Agencies

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- ___ Boating
- ___ Coastal Comm
- ___ Coastal Consv
- ___ Colorado Rvr Bd
- ___ Conservation
- X Fish & Game # 5
- ___ Delta Protection
- ___ Forestry
- ___ Parks & Rec/OHP
- ___ Reclamation
- ___ BCDC
- ___ DWR
- ___ OES
- ___ Bus Transp Hous
- ___ Aeronautics
- X CHP
- X Caltrans # 7
- X Trans Planning
- ___ Housing & Devel
- ___ Health & Welfare
- ___ Drinking H20
- ___ Medical Waste

State/Consumer Svcs
- ___ General Services
- ___ Cal/EPA
- X ARB
- X CA Waste Mgmt Bd
- ___ SWRCB: Grants
- ___ SWRCB: Delta
- X SWRCB: Wtr Quality
- ___ SWRCB: Wtr Rights
- X Reg. WQCB # 4
- ___ DTSC/CTC

Yth/Adlt Corrections
- ___ Corrections
- ___ Independent Comm
- ___ Energy Comm
- ___ NAHC
- ___ PUC
- ___ Santa Mn Mtns
- X State Lands Comm
- ___ Tahoe Rgl Plan
- ___ Other:

APPENDIX C2

Regional Agencies

SOUTHERN CALIFORNIA
ASSOCIATION of GOVERNMENTS

Main Office
818 West Seventh Street
12th Floor
Los Angeles, California
90017-3435

t (213) 236-1800
f (213) 236-1825

www.scag.ca.gov

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September 4, 1997

Mr. Hadar Plafkin, City Planner
City of Los Angeles
Department of City Planning
Environmental Review Section
221 North Figueroa Street
Los Angeles, CA 90012

RE: Comments on the Draft Subsequent Environmental Impact Report for the Sunshine Canyon Landfill Project - SCAG No. I 9700400

Dear Mr. Plafkin:

Thank you for submitting the **Draft Subsequent Environmental Impact Report for the Sunshine Canyon Landfill Project** to SCAG for review and comment. As areawide clearinghouse for regionally significant projects, SCAG assists cities, counties and other agencies in reviewing projects and plans for consistency with regional plans.

The attached detailed comments are meant as administrative comments to provide guidance for considering the proposed project within the context of our regional goals and policies. SCAG's policy level review will be initiated with the presentation of the proposed Sunshine Canyon Landfill Project to SCAG's Standing Committee on Implementation (SCI) on October 9, 1997 at 11:15 am at the SCAG office in Los Angeles. You are cordially invited to attend this meeting and answer any questions of the elected official members of the SCI. If you have any questions regarding the attached comments, please contact Bill Boyd at (213) 236-1960. He will be contacting you with further information concerning this SCI meeting.

Sincerely,

J. DAVID STEIN
Manager, Performance Assessment
and Implementation

JDS:lj

**COMMENTS ON THE CITY OF LOS ANGELES
SUNSHINE CANYON LANDFILL
DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT**

PROJECT DESCRIPTION

The proposed Project consists of the development , operation, maintenance, and monitoring of a Class III, nonhazardous solid waste landfill (City/County Landfill). The Project site is located in Sunshine Canyon, due south of the intersection of Interstate 5 and the State Route 14 junction. It is accessible off of San Fernando Road. A portion of the proposed City/County Landfill footprint is located on approximately 194 acres within the City of Los Angeles (City). In order to facilitate the design of the proposed project, an area of approximately 42 acres in the County of Los Angeles (County) would be developed. This acreage would be engineered to ultimately connect, both vertically and horizontally, to the proposed landfill in the City and the operational County Landfill (existing landfill footprint of approximately 215 acres).

Initially, these landfill areas would be operated separately and provide an average daily capacity of 5,000 tons per day (tpd) in the City and 6,000 tpd in the County. Within 18 to 24 months, following the commencement of landfilling operations in the City, landfilling operations would be combined into a single landfill operation and at one working face area. This would allow for an average waste intake rate of 11,000 tpd. This landfill footprint configuration would ultimately encompass approximately 451 acres and result in a net disposal capacity of 90 million tons. This footprint includes the operational County Landfill with an approved permitted capacity of 17 million tons.

The landfill would be operated 16 hours per day (i.e., 5:00 a.m. to 9:00 p.m., Monday through Saturday), 6 days per week, two shifts per day. At maximum operation, the landfill would employ 35 people, in addition to the 52 employees currently employed at the County Landfill.

The Project also consists of developing and operating numerous ancillary areas and facilities to support landfilling operations at the City/County Landfill. These would include: administrative offices, caretaker trailer, lunchroom/locker building, employee parking, environmental learning center, green waste/wood waste recycling area, plant materials center (or nursery) , scale house and check-in facility. The following environmental protection and control systems would be installed during the development of the City/County Landfill: subdrain system, foundation layer, liner system, leachate collection and removal system, surface water drainage controls, sedimentation basin, landfill gas collection and flaring system, and groundwater protection.

In order to eliminate potential environmental impacts, the proposed Project includes a number of

disposal site control measures or features, including: litter prevention and control, dust abatement, vector and bird control, noise control, odor control, fire control, hazardous waste exclusion and visual/landscaping buffer areas. In addition to these control measures or features, basic safety features would be provided, such as emergency shutoffs for all equipment, interlocking systems, for safe, coordinated startup and shutoff of connected equipment systems, protective covers for all exposed moving equipment, and adequate on-site safety features.

It is anticipated that a majority of the incoming wastes disposed of at the landfill would be generated in the City, surrounding communities proximate to the project site, and unincorporated areas in the County. It is also expected that refuse may be generated by other jurisdictions within the Los Angeles region. The primary form of refuse transport to the site would be transfer trucks from existing transfer stations/MRFs that are either owned, operated , or leased by the project proponent (Browning-Ferris Industries of California, Inc.). In addition to that traffic flow, wastes would be transported by municipal and private refuse-hauling vehicles collecting solid waste from various incorporated jurisdictions and unincorporated communities.

Alternatives to the proposed project include:

- No Project,
- Reduced Volume,
- Immediate Combined City/County Landfill Operations,
- Potential/Proposed Landfill Sites in Los Angeles County,
- Out-of- County Landfill Sites,
- Waste Management Technologies and Strategies,
- Remote Landfill Facilities In-State/Out-of-State

INTRODUCTION TO SCAG REVIEW PROCESS

The document that provides the primary reference for SCAG's project review activity is the Regional Comprehensive Plan and Guide (RCPG). The RCPG chapters fall into three categories: core, ancillary, and bridge. The Growth Management (adopted June 1994), Regional Mobility (adopted June 1994), Air Quality (adopted October 1995), Hazardous Waste Management (adopted November 1994), and Water Quality (adopted January 1995) chapters constitute the core chapters. These core chapters respond directly to federal and state planning requirements. The core chapters constitute the base on which local governments ensure consistency of their plans with applicable regional plans under CEQA. The Air Quality and Growth Management chapters contain both core and ancillary policies, which are differentiated in the comment portion of this letter. The Regional Mobility Element (RME) constitutes the region's Transportation Plan. The RME policies are incorporated into the RCPG.

Ancillary chapters are those on the Economy, Housing, Human Resources and Services, Finance, Open Space and Conservation, Water Resources, Energy, and Integrated Solid Waste Management. These chapters address important issues facing the region and may reflect other regional plans.

Ancillary chapters, however, do not contain actions or policies required of local government. Hence, they are entirely advisory and establish no new mandates or policies for the region.

Bridge chapters include the Strategy and Implementation chapters, functioning as links between the Core and Ancillary chapters of the RCPG.

Each of the applicable policies related to the proposed project are identified by number and reproduced below in italics followed by SCAG staff comments regarding the consistency of the project with those policies.

Consistency With Regional Comprehensive Plan and Guide Policies

1. The Growth Management Chapter (GMC) of the Regional Comprehensive Plan contains a number of policies that are particularly applicable to the Sunshine Canyon Landfill Project.

a. *Core Growth Management Policies*

3.01 The population, housing, and jobs forecasts, which are adopted by SCAG's Regional Council and that reflect local plans and policies, shall be used by SCAG in all phases of implementation and review.

SCAG staff comments. As SCAG has designated subregions, the City of Los Angeles part of the Project is situated in the City of Los Angeles subregion, whereas, the part of the project located in unincorporated Los Angeles County is situated in the North Los Angeles County subregion. Implementation of the project would result in the creation of approximately 35 new jobs. This would be a relatively insignificant amount of new jobs and would be within the projected growth for the area. The proposed project would help meet the need for facilities to handle existing and forecasted waste generated within the City of Los Angeles, and nearby cities and unincorporated areas in Los Angeles County. The proposed Los Angeles County Integrated Waste Management Plan and Siting Element, which includes facility needs that the Project is in part designed to meet, and is based on, adopted SCAG growth forecasts. The Draft SEIR contains a discussion of SCAG growth forecast consistency on pages 4-80 and 4-81. The Project is consistent with this core RCPG policy.

3.03 The timing, financing, and location of public facilities, utility systems, and transportation systems shall be used by SCAG to implement the region's growth policies.

SCAG staff comments: Recent studies of solid waste management issues in Southern California, including various City and County of Los Angeles studies referenced in the Draft SEIR, and the recently completed SCAG Solid Waste Task Force Report, have concluded that landfill capacity in the Southern California area has and continues to be a critical issue for local governments. Recycling efforts and the economic downturn during

the past five years have only extended the time to address increased landfill capacity or other waste management alternatives. Siting and expansion of landfills in the urban area has increasingly become more difficult, time consuming and costly. Consequently, the implementation of the proposed project could be considered as an action that would help cities and counties with their long term materials recovery and waste disposal options. This would be consistent with the objectives of the GMC to guide growth in the region and to mitigate its negative impacts. The Draft EIR contains information on phasing and timing, as stated in the above Project Description and on pages 2.-44 and 2.-45. The Project is consistent with this core RCPG policy.

b. *Ancillary Growth Management Policies*

3.05 *Encourage patterns of urban development and land use which reduce costs on infrastructure construction and make better use of existing facilities.*

SCAG staff comments. The Draft EIR, on page 4-80 and in other places throughout the document, acknowledges that Project site has available in-place infrastructure and ancillary facilities that can accommodate additional landfill development. These facilities are contained primarily in the existing active County Landfill site (entrance road, scales, administrative/training building, drainage, gas, waste treatment and water infrastructure) but also portions of the shut down City landfill site (entrance road, nursery, drainage, landfill gas and water infrastructure). Maximizing the use of these facilities helps to reduce the ultimate cost of waste management. The Project is supportive of this ancillary RCPG policy.

3.08 *Encourage subregions to define an economic strategy to maintain the economic vitality of the subregion, including the development and use of marketing programs, and other economic incentives, which support attainment of subregional goals and policies.*

SCAG staff comments. The Draft SEIR on page 4-259 acknowledges that the proposed Project is supportive of two economic development goals in the Los Angeles Citywide General Plan Framework Element (i.e., a physically balanced distribution of land uses that contributes toward and facilitates the City's long-term fiscal and economic viability, conserves natural resources, and provides adequate infrastructure and public resources; and, industrial growth that provides job opportunities for the City's residents and maintains the City's fiscal viability). It also notes that "project implementation would further minimize fuel consumption by developing a landfill in the City's jurisdiction close to wasteshed areas rather than transporting waste to other landfill locations located out-of-County: and, reduced transportation distance provides for lower tipping fees". The Project is supportive of this ancillary RCPG policy.

3.09 *Support local jurisdictions' efforts to minimize the cost of infrastructure and public service delivery, and efforts to seek new sources of funding for development and the provision of*

services.

SCAG staff comments. See SCAG staff comment on RCPG policy 3.05. The Project also includes facilities to handle green and wood waste, and integrates the resultant mulch material into the landfill daily cover program, thus saving costs and helping to keep tipping fees lower. The Project is supportive of this ancillary RCPG policy.

3.10 *Support local jurisdictions' actions to minimize red tape and expedite the permitting process to maintain economic vitality and competitiveness.*

SCAG staff comments. The Draft SEIR, in Section 2.0 (Project Description), acknowledges that the proposed Project builds upon an existing permitted County Landfill which has undergone extensive environmental review. The proposed City/County Landfill will benefit from this experience, and along with new and expanded environmental impact analysis, will help minimize red tape associated with the permitting of an expanded landfill. This in turn, will help to maintain the economic vitality and competitiveness of the combined City/County Landfill. The Project is supportive of this ancillary RCPG policy.

3.12 *Encourage existing or proposed local jurisdictions' programs aimed at designing land uses which encourage the use of transit and thus reduce the need for roadway expansion, reduce the number of auto trips and vehicle miles traveled, and create opportunities for residents to walk and bike.*

SCAG staff comments. The Draft SEIR acknowledges that the Project has a relatively insignificant number of employees and would not be subject to SCAQMD's Rule 2202. It also notes that the Project will result in 440 transfer truck trip ends daily (46% of refuse brought to site will be in transfer trucks) and 1,280 daily trip ends by curbside collection trucks. Mitigation measures are proposed to help encourage use of transfer trucks, direct truck traffic to non-peak hours and increase fees for trucks not carrying full loads. These actions will help reduce vehicle miles traveled by refuse vehicles. The Project is supportive of this ancillary RCPG policy.

3.18 *Encourage planned development in locations least likely to cause adverse environmental impact.*

SCAG staff comments. The Project is designed in a manner which will minimize adverse environmental impacts. The following objectives identified in the Draft SEIR are designed in a manner which will minimize adverse environmental impacts: ensure corporate commitment to meet environmental, health and safety goals, and exceed regulatory standards and requirements during landfilling construction, operation and closure; minimize impacts on air quality within the South Coast Air Basin by providing additional disposal capacity within the Los Angeles region, thereby reducing emissions from transporting

refuse longer distances; and, minimize significant impacts on environmental resources associated with the development of new landfill sites (i.e., proposed sites located within undisturbed canyon areas or remote desert locations) by using areas of the existing inactive landfill and other areas within Sunshine Canyon that are primarily disturbed and that have infrastructure in place to readily accommodate future development.

The mitigation measures included in the Draft EIR have been developed to address any identified adverse environmental impacts. The adequacy of project specific mitigation of impacts should be carefully considered by the City of Los Angeles and the County of Los Angeles. The Project is supportive of this ancillary RCPG policy, as it pertains to the above noted areas.

3.19 *Support policies and actions that preserve open space areas identified in local, state, and federal plans.*

SCAG staff comments. The Draft SEIR acknowledges in Section 4.14 (Public Services) that implementation of the proposed Project will result in the preservation of 987 of open space which will become part of the 8,000 acre Santa Clarita Woodlands State Park. This acreage includes 426 acres in the East Canyon dedication area for open space and recreational purposes, 81 acres dedicated for trail and road purposes, and over 480 acres of land located along the northerly and westerly boundaries of Upper Bee Canyon for wildlife preservation and recreational use. The Draft SEIR notes on page 2-85 that an existing 100 acre open space buffer area is located directly south of the inactive landfill. Within the buffer area, a voluntary tree planting program was initiated by the project proponent and over 11,000 trees have been planted, including over 1,300 coast live oak trees. The Draft SEIR also states on page 4-421 that the developer will fund one community service project within the City per year for 15 years, for such uses as construction of community swimming pools, community parks restoration or development, and community center rehabilitation or development. The Project is supportive of this ancillary RCPG policy.

3.20 *Support the protection of vital resources such as wetlands, groundwater recharge areas, woodlands, production lands, and land containing unique and endangered plants and animals.*

SCAG staff comments. The Draft EIR, in Section 4.4 (Biological Resources), acknowledges that the Project will have major impacts to biota, including: temporary and permanent impacts on biological resources (loss of over 80 acres of Venturan Coastal Sage Scrub, over 31 acres of Coast Live Oak Woodland, two populations of Slender Mariposa Lily and minimal amounts of other sensitive wildlife habitat (i.e., Southern Willow Scrub and Arroyo Willow Scrub). Development of the City/County Landfill will result in the removal of approximately 3 acres of jurisdictional waters, wetlands and riparian habitat. Impacts will also occur to the following sensitive animal species: San Diego Horned Lizard, California Gnatcatcher, Least Bell's Vireo and Western Burrowing Owl. The site does not

function as a wildlife corridor, because of previous landfill disturbance. Mitigation measures are proposed for wildlife habitat, wetlands and sensitive animal species. Additional procedures are proposed to protect migratory bird and raptor breeding sites (nests). Of special note, the existing County Landfill and shut-down City Landfill have maintained a plant materials center or nursery and revegetation program that is of major importance. The Draft SEIR notes that the existing nursery is recognized as one of the largest growers of coast live oak trees in the Southern California region and has initiated a program with Oregon State University and others to study advanced growing techniques for the coast live oaks and big-cone Douglas fir tree species. The adequacy of project specific mitigation of impacts should be carefully considered by the City of Los Angeles and the County of Los Angeles. Assuming the aforementioned mitigation actions are taken and prove effective, the Project would be supportive of this ancillary RCPG policy

3.21 *Encourage the implementation of measures aimed at the preservation and protection of recorded and unrecorded cultural resources and archaeological sites.*

SCAG staff comments. The Draft SEIR acknowledges that no sensitive cultural resources were found to be present on the surface of the site, and that only one non-significant known deposits of prehistoric or historic significance was identified during the records search. Based on this, the Draft SEIR concludes that the proposed Project will have no immediate or direct or indirect impact on cultural resources, and that if cultural resources are identified during the development process, additional studies will be undertaken and corrective actions taken. The project is supportive of this ancillary RCPG policy.

3.22 *Discourage development, or encourage the use of special design requirements, in areas with steep slopes, high fire, flood, and seismic hazards.*

SCAG staff comments. The Draft SEIR acknowledges that onsite grading activities associated with landfill cut-and-cover operations will directly impact development of approximately 451 acres and will result in the excavation of over 10 million cubic yards of material. Grading within the site would balance out over the life of the Project. Excavated soils would be used onsite as the liner foundation layer, liner operations layer, daily cover, intermediate cover, and for the vegetative or erosion control layer of the final cover. Extensive seismic investigation of the site is documented in the Draft SEIR and it states that the Northridge Earthquake produced no significant adverse impacts within the Project area. It concludes that no cumulative impacts for seismic exposure are anticipated. The Draft EIR states on page 4-40 that the landfill will be designed "to withstand the maximum probable earthquake without damage to the foundations or to the structures which control leachate, surface drainage, erosion or gas". It also notes some potential for liquefaction and slope stability (landslides) which can be easily mitigated. Mitigation measures are proposed for all adverse earth resource impacts.

The Draft SEIR documents extensive investigations of the potential risk of upset resulting

from disposal of hazardous materials, vectors, litter, employee safety and site security, human health explosion, airport safety (bird strikes) and electric and magnetic fields (two transmission lines traverse the site). Design features and mitigation measures are proposed to address any potential adverse impacts. The Draft SEIS also acknowledges some potential exists for "hot load" refuse fires, brush fires on-or off site, and subsurface refuse fire. Mitigation measures are proposed to address any adverse impacts.

The Draft SEIR states that a small portion of the project site (i.e., near the bottom of the canyon where the creek flows offsite) is designated within the 100 year floodplain. Sedimentation basins exist or are proposed to hold both predicted sediment load and provide storage capacity necessary to accommodate stormwater flow from the operational County landfill, the upper reaches of Sunshine Canyon and the proposed City/County Landfill.

The adequacy of project specific mitigation of impacts should be carefully considered by the City of Los Angeles and the County of Los Angeles. Assuming the aforementioned actions are taken and prove effective, the Project would be supportive of this ancillary RCPG policy.

3.23 *Encourage mitigation measures that reduce noise in certain locations, measures aimed at preservation of biological and ecological resources, measures that would reduce exposure to seismic hazards, minimize earthquake damage, and to develop emergency response and recovery plans.*

SCAG staff comments. Discussion of mitigation measures for most of these environmental factors is addressed under SCAG policies 3.20 and 3.22. Additionally mitigation measures are proposed to reduce noise below a level of significance. The Project is supportive of this ancillary RCPG policy.

2. The Regional Mobility Chapter (RMC) also has policies, all of which are core, that pertain to the proposed project. This chapter links the goal of sustaining mobility with the goals of fostering economic development, enhancing the environment, reducing energy consumption. promoting transportation-friendly development patterns, and encouraging fair and equitable access to residents affected by socio-economic, geographic and commercial limitations. Among the relevant policies in this chapter are the following:

Regional Streets and Highways Program Policies

4.10 *Potential down-stream congestion impacts from capacity enhancing projects will be studied.*

SCAG staff comments. The Draft SEIR in Chapter 4.13 (Transportation/Circulation) acknowledges on page 4-374 that the Project will add a maximum of 73 peak hour trips in either direction on Interstate 5. Although this volume of trips does not meet the significant impact criteria (150 or more peak hour trips) of the Los Angeles County Congestion

Management Program, the trips will add to a regionally significant AM and PM peak hour congestion problem on Interstate 5. The Draft SEIR on pages 4-346 and 347 notes that 220 transfer trucks and 640 curbside collection vehicles (daily/two-way) would use the facility. The transfer trucks are typically 60 feet long semis (23.5 ton capacity) and the curbside collection vehicles are typically 40 feet long (9 ton capacity). Project traffic distribution data on page 4-348 indicates that of the total 2,260 (daily/two-way) passenger car equivalent (PCE) trips, 10 percent (226 trips) are expected to be distributed north of the project site on I-5 and 45 percent (1,017 trips) are expected to be distributed east on I-5. The total of these I-5 trips (1,243 trips) adds to the continuing congestion problem on I-5. This is particularly significant, given the heavy-duty vehicle contribution that transfer trucks and curbside collection vehicles would add to the I-5 traffic. Although the proposed Project does not address the continuing increased congestion of I-5, it does however acknowledge responsibility to provide turn lane improvements at the I-5 /Rockford Street intersection.

SCAG's comments on the recently proposed Newhall Ranch project included the following: "*The Draft EIR indicates that capacity enhancements will be required on major highways (Interstate 5 and State Route 126), in part, to serve transportation demand generated from the Newhall Ranch Specific Plan. SCAG Regional Travel Forecast Model analysis and input on the regional transportation system from the County Transportation Commissions for the June 1997 SCAG Regional Transportation Plan indicate that for year 2020, most of Interstate 5 south of State Route 126 to State Route 14 is expected to experience delays as a percentage of travel time up to 50 to 70 percent of 1990 conditions. Furthermore, congested speeds on this segment of I-5 will be from 23 to 16 miles per hour in most areas. Greater delays and lower congested speeds south of the I-5/SR 14 intersection to I-405 are anticipated. No provisions for funding the additional improvements, including interchange enhancements, on I-5 have been identified. Funding of I-5 improvements needs to be addressed in the Final EIR, including the Newhall Ranch contribution, if any, to these improvements.* These comments are also applicable to the proposed Sunshine Canyon Landfill Project. Until the funding of congestion mitigation improvements to I-5 and impacted interchanges are resolved to the satisfaction of Caltrans, and LAMTA, the Project can not be found consistent with this core RCPG policy.

4.20 *Expanded transportation system management by local jurisdictions will be encouraged.*

4.23 *TSM activities throughout the region shall be coordinated among jurisdictions.*

SCAG staff comments. The Draft SEIR acknowledges in Section 4.13 (Transportation/Circulation) that the project design and congestion mitigation measures for arterials, impacted intersections and the access roadway into the Sunshine Canyon Landfill site reflect a sensitivity to TSM actions. The recommended automatic traffic surveillance and control (ATSC) signal improvements on San Fernando Road at the Project entrance driveway and at the intersection of San Fernando Road and Balboa Boulevard should be mitigation measures and the landfill developer should contribute their appropriate share to

these TSM improvements. The Project is conditionally consistent with these two core RCPG policies, assuming the aforementioned ATSC actions are taken.

Regional Non-Motorized Transportation Program Policies

4.25 The development of the regional transportation system should include a non-motorized transportation system that provides an effective alternative to auto travel for appropriate trips. The planning and development of transportation projects and systems should incorporate the following, as appropriate:

a " Provision of safe, convenient, and continuous bicycle and pedestrian infrastructure to and throughout areas with existing and potential demand such as activity areas, schools, recreational areas (including those areas served by trails), which will ultimately offer the same or better accessibility provided to the motorized vehicle.

b " Accessibility to and on transit (bus terminals, rail stations, Park-And-Ride lots), where there is demand and where transit boarding time will not be significantly delayed.

c " Maintenance of safe, convenient, and continuous non-motorized travel during and after the construction of transportation and general development projects. Existing bikeways and pedestrian walkways should not be removed without mitigation that is as effective as the original facility.

SCAG staff comments. Draft SEIR acknowledges on pages 4-385 through 387, that the City of Los Angeles proposes to develop a Class II bikeway along San Fernando Road and that this facility could conflict with truck access to the Project. Should this exist, a mitigation measure is proposed to address this conflict. The Draft SEIR acknowledges in Section 4.14 (Public Services) an extensive existing and proposed hiking and equestrian trail system in open space areas surrounding the Project. Consideration should be given in the long range future development of the site for open space purposes, to the inclusion of trail facilities to connect up with adjacent existing or proposed trails. The Project is consistent with this core RCPG policy.

3. The Air Quality Chapter (AQC) core actions that are generally applicable to the Sunshine Canyon Landfill Project are as follows:

5.11 Through the environmental document review process, ensure that plans at all levels of government (regional, air basin, county, subregional and local) consider air quality, land use, transportation and economic relationships to ensure consistency and minimize conflicts.

SCAG staff comments. The Draft SEIR does not acknowledge that the Project incorporates

most recently regional growth forecasts into the transportation and air quality modeling for the Project. We are unable to determine whether regional transportation/air quality impacts would be mitigated. Therefore, based on the information provided in the Draft SEIR, we are unable to find the Project consistent with this core RCPG policy.

4. The Water Quality Chapter (WQC) core recommendations and policy options relate to the two water quality goals:

- *To restore and maintain the chemical, physical and biological integrity of the nation's water (Federal Clean Water Act).*

  SCAG staff comments. The Draft SEIR appropriately acknowledges in Section 4.3 Surface and Groundwater), the manner in which the Project addresses this federal water quality goal.

- *To achieve and maintain water quality objectives that are necessary to protect all beneficial uses of all waters (State Porter-Cologne Water Quality Act).*

  SCAG staff comments. The Draft SEIR appropriately acknowledges in Section 4.3 (Surface and Groundwater) , the manner in which the Project addresses the achievement of State water quality goal.

The Water Quality Chapter's core recommendations and policy options that are particularly applicable to the Sunshine Canyon Landfill Project include the following:

11.02 Encourage "watershed management" programs and strategies, recognizing the primary role of local governments in such efforts.

SCAG staff comments. The Draft EIR references a number of "watershed management" strategies in Section 4.3 (Surface and Groundwater). The adequacy of project mitigation measures should be carefully considered by the City of Los Angeles, Los Angeles County Department of Public Works (Flood Control Division), Los Angeles Regional Water Quality Control Board and U.S. Army Corps of Engineers. The Project is consistent with this core RCPG policy.

11.05 Support regional efforts to identify and cooperatively plan for wetlands to facilitate both sustaining the amount and quality of wetlands in the region and expediting the process for obtaining wetlands permits.

SCAG staff comments. The Draft SEIR in Section 4.4 (Biological Resources) appropriately addresses the preservation and restoration of wetlands. See also previous SCAG staff comments relative to wetlands preservation and restoration under policies 3.18 and 3.20. A variety of project design features and mitigation measures are proposed relative to the

preservation and restoration of riparian ecosystem, including wetlands. The Army Corps of Engineers Section 404 permit, and ancillary wetlands restoration planning requirements will also govern the successful response to this policy. The adequacy of project mitigation measures should be carefully considered by the City of Los Angeles, Los Angeles County Department of Public Works (Flood Control Division), Los Angeles Regional Water Quality Control Board and U.S. Army Corps of Engineers. The Project is consistent with this core RCPG policy.

11.07 Encourage water reclamation throughout the region where it is cost-effective, feasible, and appropriate to reduce reliance on imported water and wastewater discharges. Current administrative impediments to increased use of wastewater should be addressed.

SCAG staff comments. The Draft EIR addresses the possible use of reclaimed groundwater and leachate, both of which are part of a comprehensive ground water management system. This water would be used onsite for landscape, irrigation, dust control, or other non-emergency need. The Project is consistent with this core RCPG policy.

5. The Integrated Solid Waste Management Chapter (ISWM) is non mandated; it is provided for information and advisory purposes. The recommendations in the chapter fulfill the chapter's objectives and do not create new legal mandates for local governments or other regional governmental organizations, like sanitation or waste management districts. The chapter includes the following appropriate policy recommendations:

14.1 Developing recycling industries and self sustaining markets for recycled materials.

SCAG staff comments. The Draft SEIR on page 2-3 acknowledges as a solid waste objective: recover, recycle, and/or reuse waste materials that would be otherwise disposed of at the City/County Landfill by providing public "drop-off", 'buyback". And greenwaste/wood waste recycling areas for local residents. The document also acknowledges on page 4-346 that at least 46 percent of the waste will be transported to the site from transfer stations or MRFs. No provision is referenced in the Draft SEIR which would support the development of recycling industries, except for green/wood waste recycling facilities, that would be developed on a 3 acre site within the Project. Consideration should be given to the development of other recycling industries at the landfill site, either as a part of the on-going landfilling activities or after the landfill is closed. The Project is supportive of this ancillary RCPC policy, as it relates to green/wood waste and the "drop-off" and "buyback" center.

14.3 Economic impacts of increased waste management costs.

SCAG staff comments. The Draft SEIR on page 2-3 acknowledges two key solid waste objectives that pertain this policy: 1) provide cost-effective disposal options for the City, County, and private haulers at a landfill facility located within the region to minimize

transportation costs; and 2) facilitate local and regional efforts directed toward attaining solid waste disposal capacity objectives for the City and County of Los Angeles contained in the California Integrated Waste Management Act of 1989 (AB 939) [and various listed City and County planning documents], and formally executed agreements between the County and the City that identify the need for maximum technically and environmentally feasible expansion of landfill sites. These objectives begin to address the critical issue of increased waste management costs. The Final SEIR should be updated to include policy reference to Chapter 14 (Integrated Solid Waste Management) of the Regional Comprehensive Plan and Guide and consideration of the various recommendations, especially those pertaining to landfills, in the April 1997, SCAG Solid Waste Task Force Report. The City/County Landfill should also consider the inclusion in the Final EIR of a mitigation measure that would include as an important goal to "accept waste only from jurisdictions in compliance with the waste diversion mandates of AB 939". The Project is supportive of this ancillary RCPG policy.

14.4 Promote new technologies.

SCAG staff comments. The Draft SEIR acknowledges that the Project will incorporate some new technology features in the design and operation of the City/County Landfill. These include the state-of-the-art Plant Materials Center, bottom composite and side-slope liner systems (including a more superior alternative side-slope liner) and an automatic tracking system to monitor and account for all incoming waste. In the evaluation of project alternatives, the Draft SEIR considered and rejected various waste management technologies and strategies, including: source reduction, recycling, composting, waste-to-energy, and the use of alternative daily cover materials. This analysis is included in Section 5.9 (Waste Management Technologies and Strategies). The Draft SEIR on page 1-14 concludes that "solid waste transformation technologies such as co-composting, pyrolysis, landfill mining, and high-volume shredding are considered speculative, and these technologies are not feasible alternatives to the proposed Project". Although the Draft SEIR acknowledges alternative waste management technologies, it does not address specific technologies in a comprehensive manner. The Project is partially supportive of this ancillary RCPG policy as it relates to the stated new technology project features, but not supportive of the policy as it relates to alternative waste management technologies.

14.5 Facilitating regional dialogue on intercounty waste disposal projects.

SCAG staff comments. The Draft SEIR presents a clear discussion of various alternative waste disposal facilities in Section 5.0 (Alternatives). The information presented is helpful in facilitating the regional dialogue on intercounty waste disposal projects. Furthermore, the Draft SEIR presents a case to support the selection of the proposed Project over the various alternatives noted in the Project Description. The Project is supportive of this ancillary RCPG policy.

Consistency with the 208 Plan for the South Coast Planning Area

Under Section 208 of the Clean Water Act, SCAG prepared the Areawide Waste Treatment Management Plan for the South Coast Planning Area in 1979 and made amendments to the plan in 1981. SCAG has been precluded from updating the plan due to lack of federal or state funds. The State Water Resource Control Board has not funded SCAG's updating of the 208 Plan for the South Coast Planning area. The growth forecasts on which the 208 plan was based and many of the plan's policies and actions are dated.

SCAG staff comments: As previously noted, the Project is consistent with SCAG's adopted population forecasts. These forecasts, however, have not been incorporated into the 208 Plan for the South Coast Planning Area. Furthermore, the various Residual Waste Management (especially Sanitary Landfill) policies and actions in the 208 Plan are dated SCAG is unable to make a finding that the Project is consistent with the 208 Plan for the South Coast Planning Area.

Conclusions and Recommendations:

(1) As noted in the staff comments, the proposed Draft Supplemental Environmental Impact Report for the Sunshine Canyon Landfill is consistent with or supports many of the core and ancillary policies in the Regional Comprehensive Plan and Guide Until the funding of congestion mitigation improvements to Interstate 5 and impacted interchanges are resolved to the satisfaction of Caltrans and LAMTA, the Project can not be found consistent with core policy 4.10. The Project is conditionally consistent with core policies 4.20 and 4.23. The Project is partially supportive of ancillary policy 14.4, but not supportive of the manner in which it addresses alternative waste management technologies. Furthermore, based on insufficient information in the Draft Supplemental Environmental Impact Report, we are unable to determine consistency with core policy 5.11.

(2) For the reasons stated herein, SCAG is unable to make a finding tht the Project is consistent with the 208 Plan for the South Coast Planning Area.

(3) All mitigation measures associated with the project should be monitored in accordance with AB 3180 requirements and reported to SCAG through the Annual Reasonable Further Progress Reports.

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

Roles and Authorities

THE SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS is a *Joint Powers Agency* established under California Government Code Section 6502 et seq. Under federal and state law, the Association is designated as a Council of Governments (COG), a Regional Transportation Planning Agency (RTPA), and a Metropolitan Planning Organization (MPO). Among its other mandated roles and responsibilities, the Association is:

! Designated by the federal government as the Region's *Metropolitan Planning Organization* and mandated to maintain a continuing, cooperative, and comprehensive transportation planning process resulting in a Regional Transportation Plan and a Regional Transportation Improvement Program pursuant to 23 U.S.C. '134(g)-(h), 49 U.S.C. '1607(f)-(g) et seq., 23 C.F.R. '450, and 49 C.F.R. '613. The Association is also the designated *Regional Transportation Planning Agency*, and as such is responsible for both preparation of the Regional Transportation Plan (RTP) and Regional Transportation Improvement Program (RTIP) under California Government Code Section 65080.

! Responsible for developing the demographic projections and the integrated land use, housing, employment, and transportation programs, measures, and strategies portions of the *South Coast Air Quality Management Plan*, pursuant to California Health and Safety Code Section 40460(b)-(c). The Association is also designated under 42 U.S.C. '7504(a) as a *Co-Lead Agency* for air quality planning for the Central Coast and Southeast Desert Air Basin District.

! Responsible under the Federal Clean Air Act for determining *Conformity* of Projects, Plans and Programs to the State Implementation Plan, pursuant to 42 U.S.C. '7506.

! Responsible, pursuant to California Government Code Section 65089.2, for *reviewing all Congestion Management Plans (CMPs) for consistency with regional transportation plans* required by Section 65080 of the Government Code. The Association must also evaluate the consistency and compatibility of such programs within the region.

! The authorized regional agency for *Inter-Governmental Review* of Programs proposed for federal financial assistance and direct development activities, pursuant to Presidential Executive Order 12,372 (replacing A-95 Review).

! Responsible for reviewing, pursuant to Sections 15125(b) and 15206 of the CEQA Guidelines, *Environmental Impact Reports* of projects of regional significance for consistency with regional plans.

! The authorized *Areawide Waste Treatment Management Planning Agency*, pursuant to 33 U.S.C. '1288(a)(2) (Section 208 of the Federal Water Pollution Control Act) .

! Responsible for preparation of the *Regional Housing Needs Assessment*, pursuant to California Government Code Section 65584(a).

! Responsible (along with the San Diego Association of Governments and the Santa Barbara County/Cities Area Planning Council) for preparing the *Southern California Hazardous Waste Management Plan* pursuant to California Health and Safety Code Section 25135.3.

SOUTHERN CALIFORNIA
ASSOCIATION of GOVERNMENTS

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September 30, 1997

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ENVIRONMENTAL
UNIT

Mr. Hadar Plafkin, City Planner
City of Los Angeles
Department of City Planning
Environmental Review Section
221 North Figueroa Street
Los Angeles, CA 90012

RE: Comments on the Draft Subsequent Environmental Impact Report for the Sunshine Canyon Landfill Project - SCAG No. I9700400

Dear Mr. Plafkin:

This is a follow-up letter to one dated September 4, 1997. At that time I invited you to attend our next meeting of the SCAG Standing Committee on Implementation (SCI), held October 9. Since then the SCAG Regional Council has called for a General Assembly to be held on October 9 instead of the regular committee meetings.

The item on the **Draft Subsequent Environmental Impact Report for the Sunshine Canyon Landfill Project** will be heard at the November 6, 1997 SCI meeting to be held at the SCAG office in Los Angeles, starting at 11:15 a.m. 9

SCAG staff comments to the SCI differ somewhat from those we originally sent you. They reflect a new agency position on projects impacted by recent 208 Plan consistency and conformity discussions with the State California Water Resources Control Board. A copy of these comments is enclosed.

If you have any questions please contact Bill Boyd at (213) 236-1960 for further information concerning this meeting which you are invited to attend.

Sincerely,

J. DAVID STEIN
Manager, Performance Assessment
and Implementation

JDS:lj

MEMORANDUM

TO: Standing Committee on Implementation

FROM: Bill Boyd, IGR Analyst, Telephone (213) 236-1960 -- boyd@scag.ca.gov

SUBJECT: Sunshine Canyon Landfill Draft Subsequent Environmental Impact Report

DATE: November 6, 1997

==========

Project Description

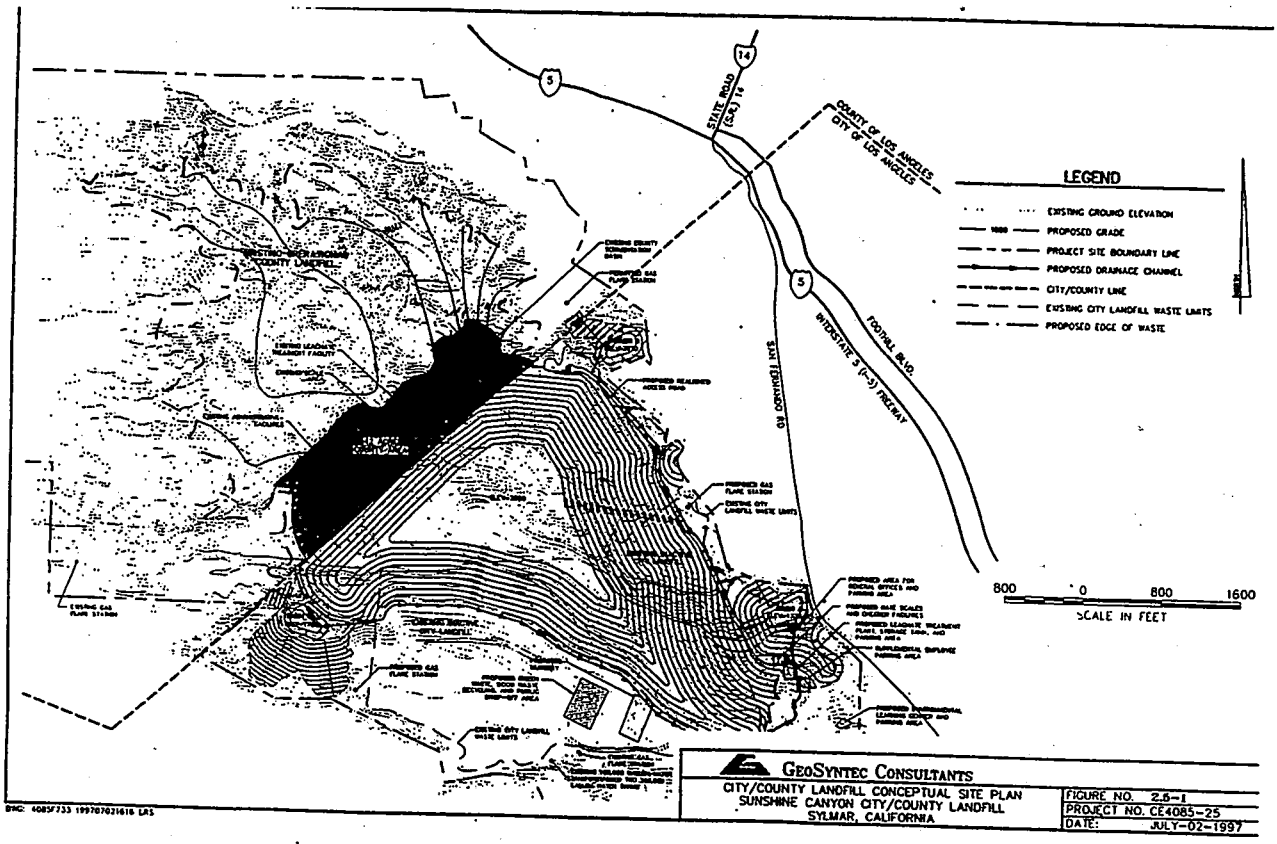
The proposed Project consists of the development , operation, maintenance, and monitoring of a Class III, nonhazardous solid waste landfill (City/County Landfill). The Project site is located in Sunshine Canyon, due south of the intersection of Interstate 5 and the State Route 14 junction. [See Figure 2.4-1] It is accessible off of San Fernando Road. A portion of the proposed City/County Landfill footprint is located on approximately 194 acres within the City of Los Angeles (City). In order to facilitate the design of the proposed project, an area of approximately 42 acres in the County of Los Angeles (County) would be developed. This acreage would be engineered to ultimately connect, both vertically and horizontally, to the proposed landfill in the City and the operational County Landfill (existing landfill footprint of approximately 215 acres). [See Figure 2.5-1]

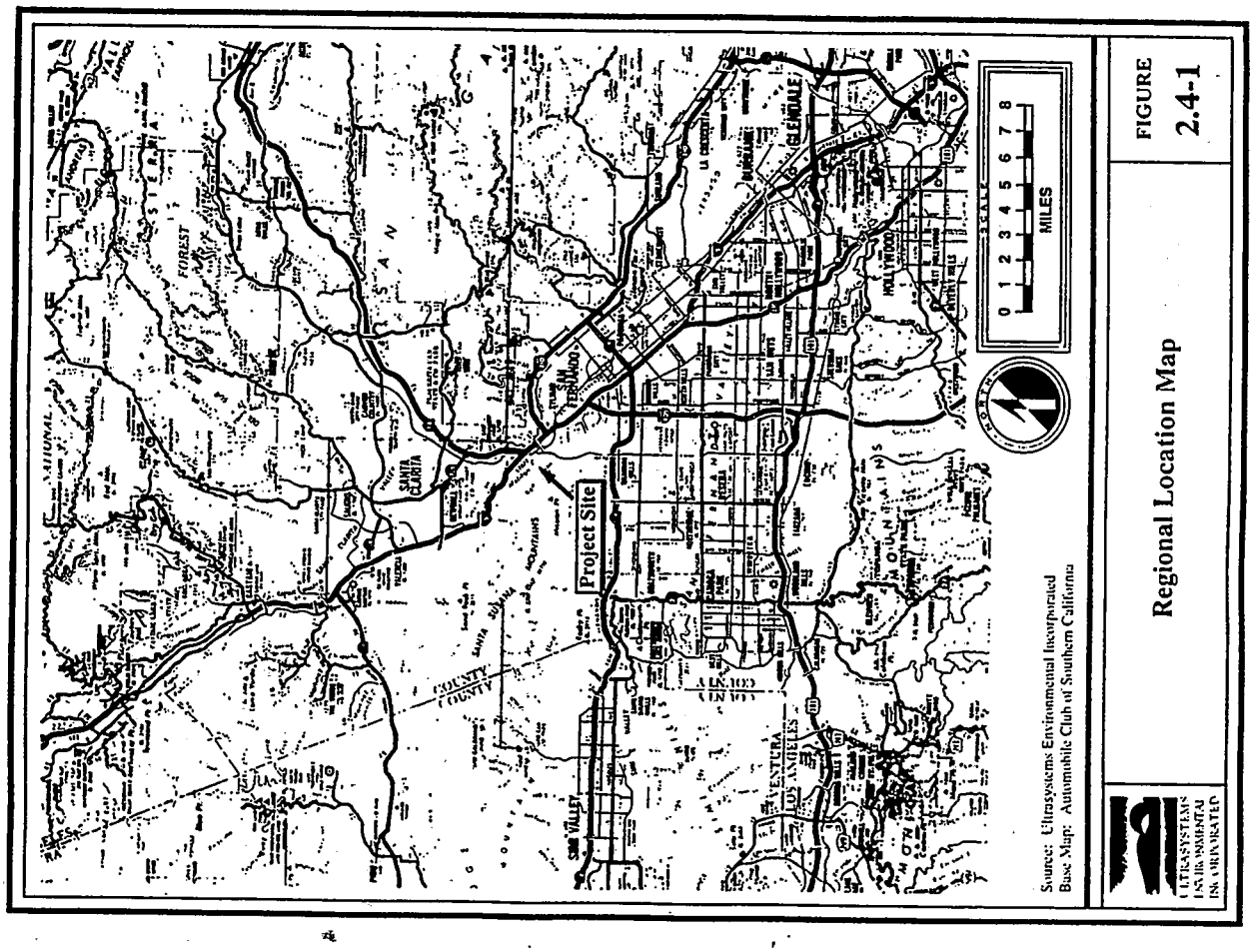
Initially, these landfill areas would be operated separately and provide an average daily capacity of 5,000 tons per day (tpd) in the City and 6,000 tpd in the County. Within 18 to 24 months, following the commencement of landfilling operations in the City, landfilling operations would be combined into a single landfill operation and at one working face area. This would allow for an average waste intake rate of 11,000 tpd. This landfill footprint configuration would ultimately encompass approximately 451 acres and result in a net disposal capacity of 90 million tons. This footprint includes the operational County Landfill with an approved permitted capacity of 17 million tons.

The landfill would be operated 16 hours per day (i.e., 5:00 a.m. to 9:00 p.m., Monday through Saturday), 6 days per week, two shifts per day. At maximum operation, the landfill would employ 35 people, in addition to the 52 employees currently employed at the County Landfill.

The Project also consists of developing and operating numerous ancillary areas and facilities to support landfilling operations at the City/County Landfill. These would include: administrative offices, caretaker trailer, lunchroom/locker building, employee parking, environmental learning center, green waste/wood waste recycling area, plant materials center (or nursery) , scale house and check-in facility. The following environmental protection and control systems would be installed during the development of the City/County Landfill: subdrain system, foundation layer, liner system, leachate collection and removal system, surface water drainage controls, sedimentation basin, landfill gas collection and flaring system, and groundwater protection.

In order to eliminate potential environmental impacts, the proposed Project includes a number of disposal site control measures or features, including: litter prevention and control, dust abatement , vector and bird control, noise control, odor control, fire control, hazardous waste exclusion and


LEGEND
EXISTING GROUND ELEVATION
PROPOSED GRADE
PROJECT SITE BOUNDARY LINE
PROPOSED DRAINAGE CHANNEL
CITY/COUNTY LINE
EXISTING CITY LANDFILL WASTE LIMITS
PROPOSED EDGE OF WASTE
NORTH
800 0 800 1600
SCALE IN FEET
STATE ROUTE (SR) 14
COUNTY OF LOS ANGELES
CITY OF LOS ANGELES
INTERSTATE 5 (I-5) FREEWAY
FOOTHILL BLVD.
SAN FERNANDO RD.
GEOSYNTEC CONSULTANTS
CITY/COUNTY LANDFILL CONCEPTUAL SITE PLAN
SUNSHINE CANYON CITY/COUNTY LANDFILL
SYLMAR, CALIFORNIA
FIGURE NO. 2.6-1
PROJECT NO. CE4085-25
DATE: JULY-02-1997


Project Site
SCALE
0 1 2 3 4 5 6 7 8
MILES
NORTH
Source: Ultrasystems Environmental Incorporated
Base Map: Automobile Club of Southern California
FIGURE
2.4-1
Regional Location Map
ULTRASYSTEMS ENVIRONMENTAL INCORPORATED

visual/landscaping buffer areas. In addition to these control measures or features, basic safety features would be provided, such as emergency shutoffs for all equipment, interlocking systems, for safe, coordinated startup and shutoff of connected equipment systems, protective covers for all exposed moving equipment, and adequate on-site safety features.

It is anticipated that a majority of the incoming wastes disposed of at the landfill would be generated in the City, surrounding communities proximate to the project site, and unincorporated areas in the County. It is also expected that refuse may be generated by other jurisdictions within the Los Angeles region. The primary form of refuse transport to the site would be transfer trucks from existing transfer stations/MRFs that are either owned, operated , or leased by the project proponent (Browning-Ferris Industries of California, Inc.). In addition to that traffic flow, wastes would be transported by municipal and private refuse-hauling vehicles collecting solid waste from various incorporated jurisdictions and unincorporated communities.

Alternatives to the proposed project include:

- No Project,
- Reduced Volume,
- Immediate Combined City/County Landfill Operations,
- Potential/Proposed Landfill Sites in Los Angeles County,
- Out-of- County Landfill Sites,
- Waste Management Technologies and Strategies,
- Remote Landfill Facilities In-State/Out-of-State

Key Issue

o Is the Project consistent with the Regional Comprehensive Plan and Guide?

Consistency With Regional Comprehensive Plan and Guide Policies

1. The Growth Management Chapter (GMC) of the Regional Comprehensive Plan contains a number of policies that are particularly applicable to this Project.

a. *Core Growth Management Policies*

3.01 The population, housing, and jobs forecasts, which are adopted by SCAG's Regional Council and that reflect local plans and policies, shall be used by SCAG in all phases of implementation and review.

SCAG staff comments. As SCAG has designated subregions, the City of Los Angeles part of the Project is situated in the City of Los Angeles subregion, whereas, the part of the project located in unincorporated Los Angeles County is situated in the North Los Angeles County subregion. Implementation of the project would result in the creation of approximately 35 new jobs. This would be a relatively insignificant amount of new jobs and would be within the projected growth for the area. The proposed project would help meet the need for facilities to handle existing and forecasted waste generated within the City of Los Angeles, and nearby cities and unincorporated areas in Los Angeles County The proposed Los Angeles County Integrated Waste Management Plan and Siting Element, which includes facility needs that the Project is in part designed to meet, and is based on, adopted SCAG growth forecasts. The Draft SEIR contains a discussion of SCAG growth forecast consistency on pages 4-80 and 4-81. The Project is consistent with this core RCPG policy. 10

3.03 The timing, financing, and location of public facilities, utility systems, and transportation systems shall be used by SCAG to implement the region's growth policies.

SCAG staff comments: Recent studies of solid waste management issues in Southern California, including various City and County of Los Angeles studies referenced in the Draft SEIR, and the recently completed SCAG Solid Waste Task Force Report, have concluded that landfill capacity in the Southern California area has and continues to be a critical issue for local governments. Recycling efforts and the economic downturn during the past five years have only extended the time to address increased landfill capacity or other waste management alternatives. Siting and expansion of landfills in the urban area has increasingly become more difficult, time consuming and costly. Consequently, the implementation of the proposed project could be considered as an action that would help cities and counties with their long term materials recovery and waste disposal options. This would be consistent with the objectives of the GMC to guide growth in the region and to mitigate its negative impacts. The Draft EIR contains information on phasing and timing, as stated in the above Project Description and on pages 2.-44 and 2.-45. The Project is consistent with this core RCPG policy. 11

b. *Ancillary Growth Management Policies*

3.05 Encourage patterns of urban development and land use which reduce costs on infrastructure construction and make better use of existing facilities.

SCAG staff comments. The Draft EIR, on page 4-80 and in other places throughout the document, acknowledges that Project site has available in-place infrastructure and ancillary facilities that can accommodate additional landfill development. These facilities are contained primarily in the existing active County Landfill site (entrance road, scales, administrative/training building, drainage, gas, waste treatment and water infrastructure) but also portions of the shut down City landfill site (entrance road, nursery, drainage, landfill gas and water infrastructure). Maximizing the use of these facilities helps to reduce the ultimate cost of waste management. The Project is supportive of this ancillary RCPG policy. 12

3.08 Encourage subregions to define an economic strategy to maintain the economic vitality of the subregion, including the development and use of marketing programs, and other economic incentives, which support attainment of subregional goals and policies.

SCAG staff comments. The Draft SEIR on page 4-259 acknowledges that the proposed Project is supportive of two economic development goals in the Los Angeles Citywide General Plan Framework Element (i.e., a physically balanced distribution of land uses that contributes toward and facilitates the City's long-term fiscal and economic viability, conserves natural resources, and provides adequate infrastructure and public resources; and, industrial growth that provides job opportunities for the City's residents and maintains the City's fiscal viability). It also notes that "project implementation would further minimize fuel consumption by developing a landfill in the City's jurisdiction close to wasteshed areas rather than transporting waste to other landfill locations located out-of-County: and, reduced transportation distance provides for lower tipping fees". The Project is supportive of this ancillary RCPG policy. 13

3.09 Support local jurisdictions' efforts to minimize the cost of infrastructure and public service delivery, and efforts to seek new sources of funding for development and the provision of 14

services.

SCAG staff comments. See SCAG staff comment on RCPG policy 3.05. The Project also includes facilities to handle green and wood waste, and integrates the resultant mulch material into the landfill daily cover program, thus saving costs and helping to keep tipping fees lower. The Project is supportive of this ancillary RCPG policy.

3.10 *Support local jurisdictions' actions to minimize red tape and expedite the permitting process to maintain economic vitality and competitiveness.*

SCAG staff comments. The Draft SEIR, in Section 2.0 (Project Description), acknowledges that the proposed Project builds upon an existing permitted County Landfill which has undergone extensive environmental review. The proposed City/County Landfill will benefit from this experience, and along with new and expanded environmental impact analysis, will help minimize red tape associated with the permitting of an expanded landfill. This in turn, will help to maintain the economic vitality and competitiveness of the combined City/County Landfill. The Project is supportive of this ancillary RCPG policy. 15

3.12 *Encourage existing or proposed local jurisdictions' programs aimed at designing land uses which encourage the use of transit and thus reduce the need for roadway expansion, reduce the number of auto trips and vehicle miles traveled, and create opportunities for residents to walk and bike.*

SCAG staff comments. The Draft SEIR acknowledges that the Project has a relatively insignificant number of employees and would not be subject to SCAQMD's Rule 2202. It also notes that the Project will result in 440 transfer truck trip ends daily (46% of refuse brought to site will be in transfer trucks) and 1,280 daily trip ends by curbside collection trucks. Mitigation measures are proposed to help encourage use of transfer trucks, direct truck traffic to non-peak hours and increase fees for trucks not carrying full loads. These actions will help reduce vehicle miles traveled by refuse vehicles. The Project is supportive of this ancillary RCPG policy. 16

3.18 *Encourage planned development in locations least likely to cause adverse environmental impact.*

SCAG staff comments. The Project is designed in a manner which will minimize adverse environmental impacts. The following objectives identified in the Draft SEIR are designed in a manner which will minimize adverse environmental impacts: ensure corporate commitment to meet environmental, health and safety goals, and exceed regulatory standards and requirements during landfilling construction, operation and closure; minimize impacts on air quality within the South Coast Air Basin by providing additional disposal capacity within the Los Angeles region, thereby reducing emissions from transporting refuse longer distances; and, minimize significant impacts on environmental resources associated with the development of new landfill sites (i.e., proposed sites located within undisturbed canyon areas or remote desert locations) by using areas of the existing inactive landfill and other areas within Sunshine Canyon that are primarily disturbed and that have infrastructure in place to readily accommodate future development. 17

The mitigation measures included in the Draft EIR have been developed to address any identified adverse environmental impacts. The adequacy of project specific mitigation of impacts should be carefully considered by the City of Los Angeles and the County of Los Angeles. The Project is supportive of this ancillary RCPG policy, as it pertains to the above noted areas.

3.19 *Support policies and actions that preserve open space areas identified in local, state, and federal plans.*

SCAG staff comments. The Draft SEIR acknowledges in Section 4.14 (Public Services) that implementation of the proposed Project will result in the preservation of 987 of open space which will become part of the 8,000 acre Santa Clarita Woodlands State Park. This acreage includes 426 acres in the East Canyon dedication area for open space and recreational purposes, 81 acres dedicated for trail and road purposes, and over 480 acres of land located along the northerly and westerly boundaries of Upper Bee Canyon for wildlife preservation and recreational use. The Draft SEIR notes on page 2-85 that an existing 100 acre open space buffer area is located directly south of the inactive landfill. Within the buffer area, a voluntary tree planting program was initiated by the project proponent and over 11,000 trees have been planted, including over 1,300 coast live oak trees. The Draft SEIR also states on page 4-421 that the developer will fund one community service project within the City per year for 15 years, for such uses as construction of community swimming pools, community parks restoration or development, and community center rehabilitation or development. The Project is supportive of this ancillary RCPG policy. 18

3.20 *Support the protection of vital resources such as wetlands, groundwater recharge areas, woodlands, production lands, and land containing unique and endangered plants and animals.*

SCAG staff comments. The Draft EIR, in Section 4.4 (Biological Resources), acknowledges that the Project will have major impacts to biota, including: temporary and permanent impacts on biological resources (loss of over 80 acres of Venturan Coastal Sage Scrub, over 31 acres of Coast Live Oak Woodland, two populations of Slender Mariposa Lily and minimal amounts of other sensitive wildlife habitat (i.e., Southern Willow Scrub and Arroyo Willow Scrub). Development of the City/County Landfill will result in the removal of approximately 3 acres of jurisdictional waters, wetlands and riparian habitat. Impacts will also occur to the following sensitive animal species: San Diego Horned Lizard, California Gnatcatcher, Least Bell's Vireo and Western Burrowing Owl. The site does not function as a wildlife corridor, because of previous landfill disturbance. Mitigation measures are proposed for wildlife habitat, wetlands and sensitive animal species. Additional procedures are proposed to protect migratory bird and raptor breeding sites (nests). Of special note, the existing County Landfill and shut-down City Landfill have maintained a plant materials center or nursery and revegetation program that is of major importance. The Draft SEIR notes that the existing nursery is recognized as one of the largest growers of coast live oak trees in the Southern California region and has initiated a program with Oregon State University and others to study advanced growing techniques for the coast live oaks and big-cone Douglas fir tree species. The adequacy of project specific mitigation of impacts should be carefully considered by the City of Los Angeles and the County of Los Angeles. Assuming the aforementioned mitigation actions are taken and prove effective, the Project would be supportive of this ancillary RCPG policy. 19

3.21 *Encourage the implementation of measures aimed at the preservation and protection of recorded and unrecorded cultural resources and archaeological sites.* 20

SCAG staff comments. The Draft SEIR acknowledges that no sensitive cultural resources were found to be present on the surface of the site, and that only one non-significant known deposits of prehistoric or historic significance was identified during the records search.

Based on this, the Draft SEIR concludes that the proposed Project will have no immediate or direct or indirect impact on cultural resources, and that if cultural resources are identified during the development process, additional studies will be undertaken and corrective actions taken. The project is supportive of this ancillary RCPG policy.

3.22 *Discourage development, or encourage the use of special design requirements, in areas with steep slopes, high fire, flood, and seismic hazards.*

SCAG staff comments. The Draft SEIR acknowledges that onsite grading activities associated with landfill cut-and-cover operations will directly impact development of approximately 451 acres and will result in the excavation of over 10 million cubic yards of material. Grading within the site would balance out over the life of the Project. Excavated soils would be used onsite as the liner foundation layer, liner operations layer, daily cover, intermediate cover, and for the vegetative or erosion control layer of the final cover. Extensive seismic investigation of the site is documented in the Draft SEIR and it states that the Northridge Earthquake produced no significant adverse impacts within the Project area. It concludes that no cumulative impacts for seismic exposure are anticipated. The Draft EIR states on page 4-40 that the landfill will be designed "to withstand the maximum probable earthquake without damage to the foundations or to the structures which control leachate, surface drainage, erosion or gas". It also notes some potential for liquefaction and slope stability (landslides) which can be easily mitigated. Mitigation measures are proposed for all adverse earth resource impacts. 21

The Draft SEIR documents extensive investigations of the potential risk of upset resulting from disposal of hazardous materials, vectors, litter, employee safety and site security, human health explosion, airport safety (bird strikes) and electric and magnetic fields (two transmission lines traverse the site). Design features and mitigation measures are proposed to address any potential adverse impacts. 22 The Draft SEIS also acknowledges some potential exists for "hot load" refuse fires, brush fires on-or off site, and subsurface refuse fire. Mitigation measures are proposed to address any adverse impacts. 23

The Draft SEIR states that a small portion of the project site (i.e., near the bottom of the canyon where the creek flows offsite) is designated within the 100 year floodplain. Sedimentation basins exist or are proposed to hold both predicted sediment load and provide storage capacity necessary to accommodate stormwater flow from the operational County landfill, the upper reaches of Sunshine Canyon and the proposed City/County Landfill. 24

The adequacy of project specific mitigation of impacts should be carefully considered by the City of Los Angeles and the County of Los Angeles. Assuming the aforementioned actions are taken and prove effective, the Project would be supportive of this ancillary RCPG policy.

3.23 *Encourage mitigation measures that reduce noise in certain locations, measures aimed at preservation of biological and ecological resources, measures that would reduce exposure to seismic hazards, minimize earthquake damage, and to develop emergency response and recovery plans.* 25

SCAG staff comments. Discussion of mitigation measures for most of these environmental factors is addressed under SCAG policies 3.20 and 3.22. Additionally mitigation measures are proposed to reduce noise below a level of significance. The Project is supportive of this ancillary RCPG policy.

2. The Regional Mobility Chapter (RMC) also has policies, all of which are core, that pertain to the proposed project. This chapter links the goal of sustaining mobility with the goals of fostering economic development, enhancing the environment, reducing energy consumption. promoting transportation-friendly development patterns, and encouraging fair and equitable access to residents affected by socio-economic, geographic and commercial limitations. Among the relevant policies in this chapter are the following:

Regional Streets and Highways Program Policies

4.10 *Potential down-stream congestion impacts from capacity enhancing projects will be studied.*

SCAG staff comments. The Draft SEIR in Chapter 4.13 (Transportation/Circulation) acknowledges on page 4-374 that the Project will add a maximum of 73 peak hour trips in either direction on Interstate 5. Although this volume of trips does not meet the significant impact criteria (150 or more peak hour trips) of the Los Angeles County Congestion Management Program, the trips will add to a regionally significant AM and PM peak hour congestion problem on Interstate 5. The Draft SEIR on pages 4-346 and 347 notes that 220 transfer trucks and 640 curbside collection vehicles (daily/two-way) would use the facility. The transfer trucks are typically 60 feet long semis (23.5 ton capacity) and the curbside collection vehicles are typically 40 feet long (9 ton capacity). Project traffic distribution data on page 4-348 indicates that of the total 2,260 (daily/two-way) passenger car equivalent (PCE) trips, 10 percent (226 trips) are expected to be distributed north of the project site on I-5 and 45 percent (1,017 trips) are expected to be distributed east on I-5. The total of these I-5 trips (1,243 trips) adds to the continuing congestion problem on I-5. This is particularly significant, given the heavy-duty vehicle contribution that transfer trucks and curbside collection vehicles would add to the I-5 traffic. Although the proposed Project does not address the continuing increased congestion of I-5, it does however acknowledge responsibility to provide turn lane improvements at the I-5 /Rockford Street intersection. 26

SCAG's comments on the recently proposed Newhall Ranch project included the following: *"The Draft EIR indicates that capacity enhancements will be required on major highways (Interstate 5 and State Route 126), in part, to serve transportation demand generated from the Newhall Ranch Specific Plan. SCAG Regional Travel Forecast Model analysis and input on the regional transportation system from the County Transportation Commissions for the June 1997 SCAG Regional Transportation Plan indicate that for year 2020, most of Interstate 5 south of State Route 126 to State Route 14 is expected to experience delays as a percentage of travel time up to 50 to 70 percent of 1990 conditions. Furthermore, congested speeds on this segment of I-5 will be from 23 to 16 miles per hour in most areas. Greater delays and lower congested speeds south of the I-5/SR 14 intersection to I-405 are anticipated. No provisions for funding the additional improvements, including interchange enhancements, on I-5 have been identified. Funding of I-5 improvements needs to be addressed in the Final EIR, including the Newhall Ranch contribution, if any, to these improvements.* These comments are also applicable to the proposed Sunshine Canyon Landfill Project. Until the funding of congestion mitigation improvements to I-5 and impacted interchanges are resolved to the satisfaction of Caltrans, and LAMTA, the Project can not be found consistent with this core RCPG policy. 27

4.20 *Expanded transportation system management by local jurisdictions will be encouraged.* 28

4.23 *TSM activities throughout the region shall be coordinated among jurisdictions.*

SCAG staff comments. The Draft SEIR acknowledges in Section 4.13

(Transportation/Circulation) that the project design and congestion mitigation measures for arterials, impacted intersections and the access roadway into the Sunshine Canyon Landfill site reflect a sensitivity to TSM actions. The recommended automatic traffic surveillance and control (ATSC) signal improvements on San Fernando Road at the Project entrance driveway and at the intersection of San Fernando Road and Balboa Boulevard should be mitigation measures and the landfill developer should contribute their appropriate share to these TSM improvements. The Project is conditionally consistent with these two core RCPG policies, assuming the aforementioned ATSC actions are taken.

Regional Non-Motorized Transportation Program Policies

4.25 The development of the regional transportation system should include a non-motorized transportation system that provides an effective alternative to auto travel for appropriate trips. The planning and development of transportation projects and systems should incorporate the following, as appropriate:

- *a o Provision of safe, convenient, and continuous bicycle and pedestrian infrastructure to and throughout areas with existing and potential demand such as activity areas, schools, recreational areas (including those areas served by trails), which will ultimately offer the same or better accessibility provided to the motorized vehicle.*
- *b o Accessibility to and on transit (bus terminals, rail stations, Park-And-Ride lots), where there is demand and where transit boarding time will not be significantly delayed.* 29
- *c o Maintenance of safe, convenient, and continuous non-motorized travel during and after the construction of transportation and general development projects. Existing bikeways and pedestrian walkways should not be removed without mitigation that is as effective as the original facility.*

SCAG staff comments. Draft SEIR acknowledges on pages 4-385 through 387, that the City of Los Angeles proposes to develop a Class II bikeway along San Fernando Road and that this facility could conflict with truck access to the Project. Should this exist, a mitigation measure is proposed to address this conflict. The Draft SEIR acknowledges in Section 4.14 (Public Services) an extensive existing and proposed hiking and equestrian trail system in open space areas surrounding the Project. Consideration should be given in the long range future development of the site for open space purposes, to the inclusion of trail facilities to connect up with adjacent existing or proposed trails. The Project is consistent with this core RCPG policy.

3. The Air Quality Chapter (AQC) core actions that are generally applicable to the Sunshine Canyon Landfill Project are as follows:

5.11 Through the environmental document review process, ensure that plans at all levels of government (regional, air basin, county, subregional and local) consider air quality, land use, transportation and economic relationships to ensure consistency and minimize conflicts. 30

SCAG staff comments. The Draft SEIR does not acknowledge that the Project incorporates most recently regional growth forecasts into the transportation and air quality modeling for the Project. We are unable to determine whether regional transportation/air quality impacts would be mitigated. Therefore, based on the information provided in the Draft SEIR, we are unable to find the Project consistent with this core RCPG policy.

4. The Water Quality Chapter (WQC) core recommendations and policy options relate to the two water quality goals:

- *To restore and maintain the chemical, physical and biological integrity of the nation's water (Federal Clean Water Act).* 31

SCAG staff comments. The Draft SEIR appropriately acknowledges in Section 4.3 Surface and Groundwater), the manner in which the Project addresses this federal water quality goal.

- *To achieve and maintain water quality objectives that are necessary to protect all beneficial uses of all waters (State Porter-Cologne Water Quality Act).* 32

SCAG staff comments. The Draft SEIR appropriately acknowledges in Section 4.3 (Surface and Groundwater) , the manner in which the Project addresses the achievement of State water quality goal.

The Water Quality Chapter's core recommendations and policy options that are particularly applicable to the Sunshine Canyon Landfill Project include the following:

11.02 Encourage "watershed management" programs and strategies, recognizing the primary role of local governments in such efforts. 33

SCAG staff comments. The Draft EIR references a number of "watershed management" strategies in Section 4.3 (Surface and Groundwater). The adequacy of project mitigation measures should be carefully considered by the City of Los Angeles, Los Angeles County Department of Public Works (Flood Control Division), Los Angeles Regional Water Quality Control Board and U.S. Army Corps of Engineers. The Project is consistent with this core RCPG policy.

11.05 Support regional efforts to identify and cooperatively plan for wetlands to facilitate both sustaining the amount and quality of wetlands in the region and expediting the process for obtaining wetlands permits.

SCAG staff comments. The Draft SEIR in Section 4.4 (Biological Resources) appropriately addresses the preservation and restoration of wetlands. See also previous SCAG staff comments relative to wetlands preservation and restoration under policies 3.18 and 3.20. A variety of project design features and mitigation measures are proposed relative to the preservation and restoration of riparian ecosystem, including wetlands. The Army Corps of Engineers Section 404 permit, and ancillary wetlands restoration planning requirements will also govern the successful response to this policy. The adequacy of project mitigation measures should be carefully considered by the City of Los Angeles, Los Angeles County Department of Public Works (Flood Control Division), Los Angeles Regional Water Quality Control Board and U.S. Army Corps of Engineers. The Project is consistent with this core RCPG policy. 34

11.07 Encourage water reclamation throughout the region where it is cost-effective, feasible, and appropriate to reduce reliance on imported water and wastewater discharges. Current administrative impediments to increased use of wastewater should be addressed. 35

SCAG staff comments. The Draft EIR addresses the possible use of reclaimed groundwater and leachate, both of which are part of a comprehensive ground water management system. This water would be used onsite for landscape, irrigation, dust control, or other non-emergency need. The Project is consistent with this core RCPG policy.

5. The Integrated Solid Waste Management Chapter (ISWM) is non mandated; it is provided for information and advisory purposes. The recommendations in the chapter fulfill the chapter's objectives and do not create new legal mandates for local governments or other regional governmental organizations, like sanitation or waste management districts. The chapter includes the following appropriate policy recommendations: 36

14.1 *Developing recycling industries and self sustaining markets for recycled materials.*

SCAG staff comments. The Draft SEIR on page 2-3 acknowledges as a solid waste objective: recover, recycle, and/or reuse waste materials that would be otherwise disposed of at the City/County Landfill by providing public "drop-off", 'buyback". And greenwaste/wood waste recycling areas for local residents. The document also acknowledges on page 4-346 that at least 46 percent of the waste will be transported to the site from transfer stations or MRFs. No provision is referenced in the Draft SEIR which would support the development of recycling industries, except for green/wood waste recycling facilities, that would be developed on a 3 acre site within the Project. Consideration should be given to the development of other recycling industries at the landfill site, either as a part of the on-going landfilling activities or after the landfill is closed. The Project is supportive of this ancillary RCPC policy, as it relates to green/wood waste and the "drop-off" and "buyback" center. 37

14.3 *Economic impacts of increased waste management costs.*

SCAG staff comments. The Draft SEIR on page 2-3 acknowledges two key solid waste objectives that pertain this policy: 1) provide cost-effective disposal options for the City, County, and private haulers at a landfill facility located within the region to minimize transportation costs; and 2) facilitate local and regional efforts directed toward attaining solid waste disposal capacity objectives for the City and County of Los Angeles contained in the California Integrated Waste Management Act of 1989 (AB 939) [and various listed City and County planning documents], and formally executed agreements between the County and the City that identify the need for maximum technically and environmentally feasible expansion of landfill sites. These objectives begin to address the critical issue of increased waste management costs. The Final SEIR should be updated to include policy reference to Chapter 14 (Integrated Solid Waste Management) of the Regional Comprehensive Plan and Guide and consideration of the various recommendations, especially those pertaining to landfills, in the April 1997, SCAG Solid Waste Task Force Report. The City/County Landfill should also consider the inclusion in the Final EIR of a mitigation measure that would include as an important goal to "accept waste only from jurisdictions in compliance with the waste diversion mandates of AB 939". The Project is supportive of this ancillary RCPG policy. 38

14.4 *Promote new technologies.*

SCAG staff comments. The Draft SEIR acknowledges that the Project will incorporate some new technology features in the design and operation of the City/County Landfill. These include the state-of-the-art Plant Materials Center, bottom composite and side-slope liner systems (including a more superior alternative side-slope liner) and an automatic tracking system to monitor and account for all incoming waste. In the evaluation of project alternatives, the Draft SEIR considered and rejected various waste management technologies and strategies, including: source reduction, recycling, composting, waste-to-energy, and the use of alternative daily cover materials. This analysis is included in Section 5.9 (Waste Management Technologies and Strategies). The Draft SEIR on page 1-14 concludes that "solid waste transformation technologies such as co-composting, pyrolysis, landfill mining, and high-volume shredding are considered speculative, and these technologies are not feasible alternatives to the proposed Project". Although the Draft SEIR acknowledges alternative waste management technologies, it does not address specific technologies in a comprehensive manner. The Project is partially supportive of this ancillary RCPG policy as it relates to the stated new technology project features, but not supportive of the policy as it relates to alternative waste management technologies. 39

14.5 *Facilitating regional dialogue on intercounty waste disposal projects.*

SCAG staff comments. The Draft SEIR presents a clear discussion of various alternative waste disposal facilities in Section 5.0 (Alternatives). The information presented is helpful in facilitating the regional dialogue on intercounty waste disposal projects. Furthermore, the Draft SEIR presents a case to support the selection of the proposed Project over the various alternatives noted in the Project Description. The Project is supportive of this ancillary RCPG policy. 40

Consistency with the 208 Plan for the South Coast Planning Area

As the designated Areawide Waste Treatment Management Agency for Southern California, SCAG is mandated under Section 208 of the Federal Clean Water Act [33 U.S.C. §1288] to engage in a comprehensive waste treatment planning process the primary product of which is the Areawide Waste Treatment Management Plan for the South Coast Planning Area (or "208 Plan"). Section 208(e) of the Clean Water Act provides that no NPDES permit may be issued for any point source which conflicts with the 208 Plan.

The current 208 Plan was prepared by SCAG in 1979. Due to a lack of federal or state funds, SCAG has been unable to update the Plan. Given the great demographic and environmental changes which have taken place in Southern California over the last two decades, the Regional Council has recognized that it is not feasible to determine whether a given project is consistent with the Plan. 41

While the statutes and regulations designate SCAG to make the conformity and consistency findings, the legal responsibility for these findings rest with the Regional and State Water Boards.

SCAG staff comments: As previously noted, the Project is consistent with SCAG's adopted population forecasts. These forecasts, however, have not been incorporated into the 208 Plan for the South Coast Planning Area. Furthermore, the various Residual Waste Management (especially Sanitary Landfill) policies and actions in the 208 Plan are dated SCAG is unable to make a finding that the Project is consistent with the 208 Plan for the South Coast Planning Area. SCAG and the State Water Resources Control Board are precluded from carrying out their mandated review responsibilities and the Project is currently inconsistent with the 208 Plan for the South Coast Planning Area and any NPDES permit issued for any point source associated with the Project would conflict with the 208 Plan.

Conclusions and Recommendations: 42

It is recommended that the Standing Committee on Implementation advise the City of Los Angeles that:

(1) As noted in the staff comments, the proposed Draft Supplemental Environmental Impact Report for the Sunshine Canyon Landfill is consistent with or supports many of the core and ancillary policies in the Regional Comprehensive Plan and Guide Until the funding of congestion mitigation improvements to Interstate 5 and impacted interchanges are resolved to the satisfaction of Caltrans and LAMTA, the Project can not be found consistent with core policy 4.10. The Project is conditionally consistent with core policies 4.20 and 4.23. The Project is partially supportive of ancillary policy 14.4, but not supportive of the manner in which it addresses alternative waste management technologies. Furthermore, based on insufficient information in the Draft Supplemental Environmental Impact Report, we are unable to determine consistency with core policy 5.11. 43

(2) For the reasons stated herein, SCAG is unable to make a finding that the Project is consistent with the 208 Plan for the South Coast Planning Area.

(3) All mitigation measures associated with the project should be monitored in accordance with AB 3180 requirements and reported to SCAG through the Annual Reasonable Further Progress Reports. 47

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November 11, 1997

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Mr. Hadar Plafkin, City Planner
City of Los Angeles
Department of City Planning
Environmental Review Section
221 North Figueroa Street
Los Angeles, CA 90012

RE: **Supplemental Comments on the Draft Subsequent Environmental Impact Report for the Sunshine Canyon Landfill Expansion Project - SCAG No. I 9700400**

Dear Mr. Plafkin:

SCAG's Standing Committee on Implementation on November 6,1997 approved staff comments included in the September 4, 1997 letter on the. **Draft Subsequent Environmental Impact Report for the Sunshine Canyon Landfill Expansion Project.** They also directed that we include the following supplemental comments on the above referenced project. 48

1. The Final EIR should address the manner in which the proposed project deals with the potential problems (litter, dirt , debris and odors) associated with high wind events in the Newhall Pass area. The Committee chair was especially concerned about this problem because of the close proximity of the landfill expansion over portions of the previous City of Los Angeles site to adjacent residential areas. 49

2. The Final EIR should address the manner in which the proposed project addresses the relationship of potential surface and groundwater related problems associated with the Van Orman Reservoir and the Metropolitan Water District water treatment facility. The Committee chair and other committee members expressed concern about the potential damage to the regions water supply that could result from surface or groundwater contamination. 50

3. The Final EIR should address the manner in which the design of the liner system for the proposed landfill expansion can accommodate seismic events of the magnitude of the Northridge. Earthquake. The Committee chair expressed concern that given the past experience of earthquakes (Sylmar and Northridge) in the vicinity of the Santa Susana Mountains, the design of the landfill liner system should be such that any rupture resulting from ground shaking activity can be detected rapidly and mitigated. 51

If you have any questions regarding the attached comments, please contact Bill Boyd at (213) 236-1960.

Sincerely,

J. DAVID STEIN
Manager, Performance Assessment and Implementation

Letter 3.4-3

CalEPA

Los Angeles Regional Water Quality Control Board

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Pete Wilson
Governor

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October 21, 1997

City of Los Angeles
Department of City Planning
Environmental Review Section
221 North Figueroa Street, 15th Floor
Los Angeles, CA 90012-2601
Attn: Hadar Plafkin, City Planner

SCH # 92041053 DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT-SUNSHINE CANYON LANDFILL SEIR 91-0377-ZC/GPA (FILE NO. 88-076)

We have reviewed the subject document and offer the following comments:

1. Regulations

Regulations for municipal solid waste landfills are no longer found in Chapter 15, Title 23, California Code of Regulations. They are now contained in Title 27 of the California Code of Regulations which became effective July 18, 1997. In the future please reference the appropriate sections of Title 27. 52

2. Section 5.2.2 Material Parameters for Static and Pseudo-Static Analyses

The material parameters utilized for the solid waste materials must be consistent with the parameters used for the Stage II development of the Sunshine Canyon County Landfill (presently unapproved by this Regional Board). 53

3. Surface Water

Alteration of a streambed requires the approval of a Corps of Engineers 404 permit and a Regional Water Quality Control Board 401 Certification permit. 54

If you have any questions, please call Don Peterson at (213)266-7578.

Rodney H. Nelson

RODNEY H. NELSON, Chief
Groundwater Regulatory Unit

cc: Elizabeth Haven, State Water Resources Control Board

Letter 3.4-4

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October 31, 1997

Mr. Hadar Plafkin
City Planner
221 N. Figueroa Street, 15th Floor
Los Angeles, CA 90012-2601

Re: Sunshine Canyon Landfill Draft Subsequent Environmental Impact Report (EIR)

Dear Mr. Plafkin:

The South Coast Air Quality Management District (SCAQMD) appreciates the opportunity to comment on the abovementioned project. The comments included herein are meant as guidance for the Lead Agency and should be incorporated into the Final SEIR wherever possible.

Pursuant to Public Resources Code Section 21092.5, please provide the SCAQMD with written responses to all comments contained herein prior to the certification of the document. The SCAQMD would be happy to work with the Lead Agency to address these issues and any other questions that may arise. Please call Ms. Tara Tisopulos, Air Quality Specialist - CEQA Section, at (909) 396-3102 if you have any questions regarding these comments.

Sincerely,

Henry Hogo

Henry Hogo
Planning Manager
Planning and Policy

SS:TT

Attachments

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Attachment 1

Comments on the Draft Subsequent EIR for the Sunshine Canyon Project

Section 1.7.1 - Unavoidable Significant Adverse Impacts

This section identifies significant adverse air quality impacts for various criteria pollutants [i.e., nitrogen oxides (NOx), reactive organic gases (ROG), and particulate matter (PM10)] due to project implementation. This section further states that "Regional emissions of all criteria pollutants [i.e., carbon monoxide, NOx, sulfur oxides (SOx) and PM10] will decrease by reduced mileage traveled within the South Coast Air Basin." The SCAQMD is unclear about why vehicle miles traveled (VMT) would be reduced, how they were derived, the specific amount of reductions being calculated, whether or not this reduction in VMT is included in the analysis of air quality impacts, etc. The SCAQMD does not see this information given in any greater detail in the Air Quality Impacts chapter. Therefore, please clarify these VMT reductions, in light of the additional trips being generated at this site, and provide all assumptions and calculations used. 55

Section 3.1.3 - Air Quality

Please note that the boundaries of the South Coast Air Basin do not include all of Los Angeles County, as of July 1, 1997, but rather, the non-desert portion of Los Angeles County. The SCAQMD's area of jurisdiction is different from the Basin and is as follows: the four-county South Coast Air Basin (Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino counties) and the Riverside County portions of the Salton Sea Air Basin (SSAB) (formerly part of the SEDAB). 56

This section states that the Basin is currently in nonattainment for lead. This statement is incorrect and should be corrected in the Final SEIR. 57

Sections 4.2.5 and 4.2.10

These sections refer to the 1994 Air Quality Management Plan (AQMP). Please note that the most currently adopted AQMP is the 1997 AQMP. The 1997 AQMP has also been approved by the California Air Resources Board and forwarded to U.S. EPA as part of the State Implementation Plan revision. However, U.S. EPA has not taken any approval action on the 1997 AQMP. This document should be referred to in the Final SEIR. Copies are available through the SCAQMD's Public Information Center at (909) 396-3600. 58

Section 4.2.7 - Site Preparation/Construction Sequencing

The Draft SEIR does not include an estimate of the anticipated duration of construction activities. In addition, it is unclear whether or not any operation activities will overlap any construction activities. Any overlap between construction and operational emissions should be 59

discussed and analyzed to determine overall site-specific impacts. If cell filling activities are occurring at the same time construction is occurring, the entire process should be treated as operational, analyzed together, and compared to the operational significance thresholds to determine project significance.

Table 4.2-5 contains construction emissions for initial site preparation. This table includes emissions of particulate matter (PM10) with an estimate of 60.8 pounds per day. Table 4.2-6 shows fugitive dust PM10 emissions from initial site preparation to be 399.8 pounds per day before mitigation. The SCAQMD recommends that unmitigated PM10 emissions from Table 4.2-6 be included in Table 4.2-5 for ease in identifying unmitigated project emissions. 60

Based upon the materials received regarding the proposed project, SCAQMD staff was unable to locate any calculations conducted that support the emissions estimates listed in Table 4.2-5. In attempting to verify the results in Table 4.2-5, SCAQMD staff re-calculated some of the emissions in Table 4.2-5 and found that some of the emission factors used in the Draft SEIR were based on an 8-hour day, 7-hour day, etc. Since it is stated in the Draft SEIR that the normal workday is 10 hours, the Lead Agency should adjust the calculations to reflect a 10-hour work day in the Final SEIR. Re-calculating emissions based on a 10-hour workday may show that the construction phase of the project creates significant emissions for pollutants other than NOx and PM10. 61

This section indicates that the Lead Agency used EMFAC-7EP to model mobile source emissions. Please note that the California Air Resources Board (ARB) has a more recently approved and updated version of these emission factors, EMFAC-7G. The SCAQMD recommends that the Lead Agency revise for the Final SEIR its mobile source emissions results using EMFAC-7G emission factors to reflect the most accurate data currently available. 62

Section 4.2.7 - Fugitive Dust

The SCAQMD's strongly recommends that air quality impacts be calculated using approved emission factors such as AP-42 which are more conservative. Other emissions factors should not be used unless documentation is provided supporting the use other emissions factors. In the case of using fugitive dust factors from the Transit Mixed Concrete (TMC) site, there is no supporting documentation justifying its use for the proposed landfill expansion project. Further, the TMC site is located approximately 10 miles away from the proposed expansion site and may have completely different soil characteristics. The SCAQMD therefore recommends using the more conservative AP-42 emission factors to ensure that the analysis captures the maximum potential adverse impact from this source. 63 64

Section 4.2.8 - Air Quality Operational Phase

As indicated in the comments for Section 4.2.7 above , equations supporting the results in Table 4.2-7 were not included in the materials received by the SCAQMD. Project specific calculations 65

should be provided (in an appendix, for example) to facilitate corroboration of the results by the public. Similarly, many of the results provided do not reflect a 10-hour work day. The SCAQMD recommends that the Lead Agency revise in the Final SEIR the applicable factors from the CEQA Handbook to reflect the 10-hour work day. If adjustments have not been made, Table 4.2-7 should be re-calculated.

Tables 4.2-14 and 4.2-15

These tables display emissions, control efficiencies and remaining emissions in an effort to quantify the effectiveness of applicable mitigation measures. By the way the table is set up, however, it is unclear which specific mitigation measures are associated with the control efficiencies listed. For example, the SCAQMD has no way of knowing what mitigation measure is being described under CO - Heavy Equipment Operation, and how a control efficiency of 40 percent was determined. The SCAQMD recommends that the Lead Agency revise these two tables to include the mitigation measures specified in the text and associate the appropriate control efficiency for that mitigation measures for each emissions source. 66

Truck Travel and Fugitive Dust Emissions

Please specify the length of paved roads and unpaved roads being referred to in Tables 4.2-15 and 4.2-16. As stated previously, there are no specific calculations provided to show how these emissions were calculated, therefore, it is difficult to assess the validity of the control efficiency. 67

The text does not clearly state which criteria pollutants exceed both construction and operational thresholds. SCAQMD is unclear about the overall findings of significance for air quality. The SCAQMD assumes, based on Table 4.2-15, that emissions will remain significant for CO, NOx, ROG, and PM10 on an operational basis. Construction emissions should also be re-assessed, noting that potential re-calculations may be in order. The SCAQMD recommends that the Lead Agency include a table or discussion that aggregates all unmitigated emissions (both construction and operation) for clarity. 68

Section 7.0 - Mitigation Reporting

The SCAQMD has evaluated the Mitigation Reporting and Monitoring Program, Section 7.0, and concluded that several mitigation measures have inappropriately been assigned to the SCAQMD to monitor. Please refer to Attachment 2 for a list of mitigation measures over which the SCAQMD has no jurisdictional or enforcement authority. 69

Health Risk Analysis Air Quality Modeling

According to the Draft SEIR, the Lead Agency used the SCREEN2 model to estimate the ground level concentration for zero plume rise, flat terrain, and hybrid configuration scenarios. The SCAQMD recommends that the Lead Agency utilize the ISCST3 model. If the Lead Agency continues to rely on the SCREEN2 model, however, a clarification of what assumptions were used, how data were derived, etc., needs to be included. 70 Currently, the SCAQMD is unable to 71

replicate the results contained in the Health Risk Analysis. The SCAQMD also noted discrepancies between emission rates for criteria pollutants (Table 6, Appendix B-6 and Table 4.2-8, Volume 1). 72

Section 4.2.13 - Odor Impacts

The odor discussion in the text (page 4-94, third full paragraph) implies that the SCAQMD has determined that the Sunshine Canyon Landfill is not a source of odors. Although it is true that in some instances odor complaints in the area have been traced to other sources or the sources could not be verified, the landfill has been cited a number of times for verified nuisance odor complaints by the SCAQMD, particularly when it was in full operation. This paragraph needs to be revised in the Final SEIR to more accurately reflect the past history of nuisance odor complaints. 73

In the next paragraph on the same page, the text implies that the SCAQMD has approved as adequate the existing odor control procedures. This information is not accurate. Although it may be true that the existing odor control procedures are effective under certain conditions, they may not necessarily be effective under all conditions. There are a number of parameters that could reduce the effectiveness of the odor control procedures including meteorology, maintaining the equipment in good condition, etc. Further, there is no evidence in the Draft SEIR that the existing odor control procedures will be effective once the landfill has expanded. The extent of the expansion could render as inadequate any odor control procedures similar to those currently in place. Therefore, the text needs to be modified to reflect the fact that the SCAQMD does not necessarily consider the existing odor control procedures are effective under all conditions. 74 75

Further, the Lead Agency should provide additional information to support the assertion that the proposed odor control procedures will be adequate for the expanded landfill. 76

Attachment 2

Mitigation Measures Not Under the Jurisdiction of the SCAQMD

Construction and Operation

- The project proponent will maintain equipment in tune per manufacturer's specifications.
- The project proponent will use catalytic converters on gasoline-powered equipment.
- The project proponent will retard diesel engine injection timing by 2 degrees.
- High-pressure fuel injectors will be installed.
- Heavy equipment will use reformulated, low-emission diesel fuel.
- The project proponent will substitute electric and gasoline-powered equipment for diesel-powered equipment where feasible.
- Where applicable, equipment will not be left idling for prolonged periods.
- Public streets shall be swept at the conclusion of construction work.
- Refuse truck shall be maintained in proper tune.
- High-pressure fuel injector nozzles shall be used, and diesel engine timing shall be retarded by 2 degrees.
- Using a progressive fee schedule, the project proponent shall encourage trucks to carry full loads.
- The project proponent shall encourage trucking to be performed during off-peak hours.
- When operating onsite, trucks shall not be left idling for periods in excess of 5 minutes.
- Private owner-operators shall be warned that, if their trucks emit excessive amounts of smoke as determined by scale house workers, they will not be allowed future access to the landfill facility.
- Filling in each active area shall be prolonged through the utilization of a 20-foot maximum cell height.
- Solid waste shall be compacted within 1 hour of its arrival at the working face.

MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Office of the General Manager

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NOV 03 1997
ENVIRONMENTAL
UNIT

October 31, 1997

Mr. Hadar Plafkin
Los Angeles City Planning Department
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, California 90012

Dear Mr. Plafkin:

Draft Subsequent Environmental Impact Report
No. 91-0377-ZC/GPA for the Sunshine Canyon Landfill ...

The Metropolitan Water District of Southern California (Metropolitan) has received the Draft Subsequent Environmental Impact Report (SEIR) for the Sunshine Canyon Landfill in Sylmar City, Los Angeles County. The proposed project consists of the development, operation, maintenance, and monitoring of a Class III, nonhazardous solid waste landfill. This letter contains our response as a potentially affected public agency.

Our review of the Draft SEIR indicates four main areas of concern: (1) existing Metropolitan facilities; (2) groundwater and water quality concerns to Metropolitan's existing Balboa Inlet Tunnel regarding proper leakage detection of leachate; (3) surface water runoff; and (4) pest control and management.

Existing Metropolitan Facilities

The proposed project may adversely affect both the Metropolitan's Balboa Inlet Tunnel and the Joseph Jensen Filtration Plant located approximately ½-mile southeast of the landfill entrance. This plant delivers up to 750 million gallons of water per day to portions of the San Fernando Valley, Ventura County, and west Los Angeles County areas. It will be necessary for the City of Los Angeles Planning Department to consider these facilities in its project planning. 77

In order to avoid potential conflicts with Metropolitan's facilities, we request that preliminary engineering design drawings or improvement plans for any activity in the area of Metropolitan's pipelines and rights-of-way be submitted for our review and written approval. 78

You may obtain detailed prints of drawings of Metropolitan's pipelines and rights-of-way by calling Metropolitan's Substructures Information Line at (213) 217-6564.

Groundwater and Water Quality Concerns

The potential leakage of leachate into the groundwater basin, as well as contamination of surface water, is a major concern for this region. Metropolitan is primarily concerned that the Balboa Inlet Tunnel and subsequent water supply could be at significant risk from the potential leakage of leachate. The Balboa Inlet is a concrete lined tunnel located immediately southeast of the proposed leachate treatment facility. The tunnel lining could be subject to decomposition and corrosion by leachate. Should leachate come in contact with the tunnel, water quality could be severely compromised. The Final SEIR should elaborate upon the proposed mitigation measures for groundwater quality impacts. The measures mentioned in the Draft SEIR include the recovery and treatment of leachate onsite and the sampling of the treated leachate on a regular basis to affirm suitability for reuse. It is Metropolitan's understanding that treatment of leachate-contaminated water is not possible through the normal water filtration process. Only a sewerage treatment plant would be able to treat such water, and then it would be unusable for public consumption. The loss of valuable water resources and subsequent treatment would be at great expense to the public. 79

In addition, the Draft SEIR discusses using treated leachate water for dust control onsite. Though such use of treated water may conserve other important water resources, the Final SEIR should distinguish the parameters that assure leachate is nonhazardous and discuss the tests that will be used to verify its safety. Metropolitan is concerned that leachate sprayed upon surface roads may contaminate both underground and surface water sources. In addition, such treated water will also come into contact with Metropolitan's Balboa Inlet Tunnel. The project as proposed would not comply with the State of California Water Resources Control Board Chapter 15 requirements to protect underground water quality for as long as the wastes represent a threat to groundwater resources. 80 81 82

Surface Water Runoff

The Draft SEIR discusses proposed modifications to the existing drainage patterns. These improvements consists of surface water drainage channels, interceptor ditches, and pipelines that would collect, direct and convey surface water runoff around the landfill site and route runoff into regulated sedimentation basins. The drainage pattern indicated in Figure 4.3-1 of the Draft SEIR appears to be directing the surface runoff into the same channel that flows by Metropolitan's Joseph Jensen Plant. Metropolitan is concerned about the possible impact on its facility and requests that the downstream surface water discharge facilities or stream beds be analyzed for potential redirected storm flow impacts. 83

Pest Control and Management

Various bird species, in addition to ravens, may be attracted to the landfill. The proposed landfill will provide a readily available food source for these pest species. Subsequent migration of birds to our Jensen Plant filtration basins and reservoirs would increase the potential for contamination of the water supply. The Final SEIR should detail the provisions for minimizing bird and pest contact with the proposed landfill, for example, the amount of hours allowed before refuse is covered with soil, the potential for having exposed refuse over night or weekends, etc. In addition, Metropolitan requests that the Final SEIR discusses the bird and pest control measures to be implemented in the green waste/wood waste, recycling and public drop off area. 84 85

We appreciate the opportunity to provide input to your planning process. If we can be of further assistance, please contact me at (213) 217-6242.

Very truly yours,

For Laura J. Simonek
Principal Environmental Specialist

DTF:hah

APPENDIX C3

County Agencies

Letter 3.5-1

COUNTY OF LOS ANGELES - DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL HEALTH
SOLID WASTE MANAGEMENT PROGRAM
2525 Corporate Place, Monterey Park, California 91754 (213) 881-4151

DHS

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CITY OF LOS ANGELES
OCT 31 1997
ENVIRONMENTAL
UNIT

October 29, 1997

Hadar Plafkin
Department of City Planning
Environmental Review Section
221 North Figueroa Street, Suite 1500
Los Angeles, CA 90012

SUBJECT: Sunshine Canyon Landfill, EIR Case No. 91-0377-ZC/GPA

The Los Angeles County Department of Health Services, Solid Waste Management Program (SWMP) has reviewed the SEIR for the Sunshine Canyon Landfill project. Our comments are as follows:

1. Section 2.0 - Project description.

Paragraph 2.5.7. Proposed Landfill Ancillary Facilities

This section states (page 2-42) that as a component of the "green waste/wood waste recycling area" a dropoff and buyback recycling center would be established for use by the local community. Figure 2.4-5 locates this area on the opposite side of the site from the entrance gate. Will this location require users to travel along the same roads used by heavy trucks and other equipment to get there? Possibly the dropoff center could be located nearer the entrance gate. 86

Paragraph 2.10.3. Unloading Waste Materials at the Landfill Working Face.

This section is vague regarding self-haul loads. 87

a. Are these the same as those described later on as "local delivery?"

b. Will all self-haul loads go to the green waste/wood waste drop-off area? If so, how will waste materials get from this area to the actual working face? 88

c. The separation of public self-haulers from commercial delivery trucks (collection and transfer trailers) is a fundamental part of landfill design, primarily due to safety issues. This should be discussed further. One feature that might be incorporated into the overall site design is a self-haul "transfer station" near the scale-house. In this regard, small loads would be dropped off near the scale house and from there transported to the working face in operator owned transfer trucks. This would altogether eliminate the necessity for public self-haulers to commingle with heavy trucks. 89

2. Section 4.2 - Air Quality

a. The document identifies three means of transporting waste to the site: Transfer trucks, curbside collection trucks, and local deliveries. The document makes the following assumptions:

Type of vehicle.	% of vehicular traffic	% of waste delivered
Transfer truck	20	46
Collection truck	58	52
Local delivery	22	2 *

90

* The sentence in the last paragraph on page 4-66 should be corrected to read "These vehicles would account for less than 2 percent of the total *amount of waste* that would be delivered to the site."

Whereas transfer trucks are predicted to account for only 20% of the vehicular traffic, they will deliver 46% of the waste. A practical mitigation measure would be to allow delivery to the site only in transfer trucks. This would potentially eliminate up to 400 vehicle trips per day. Curbside collection vehicles should be allowed to deliver waste to the site only if traveling less than ten miles from the point of collection. The SEIR (page 4-65) states that curbside collection trucks may travel to the site from jurisdictions as far away as Santa Monica, Culver City, Beverly Hills, and Inglewood. Each of these jurisdictions has a transfer station within its city limits, or there are transfer stations located nearby. This particular requirement is standard at many landfills throughout the state (for example, Orange County landfills, see EIR page 1-16, and the Keller Canyon Landfill in Contra Costa County.) 91

b. The proposed mitigation measures relating to delivery vehicles (page 4-87) are weak and will be ineffectual. These consist, in the first two instances of "encouraging" haulers to do something, i.e., to carry full loads, and to use the site during off-peak hours. On page 2-74 it is stated that the frequent hauling of partial loads would result in a surcharge notice being assessed. Why not encourage utilization of the site during off-peak hours through a lower tipping fee? 92

c. It would be helpful to have further information regarding the data presented in Table 4.2-7. Are these emissions based on the amount of pollutants emitted from equipment in good, fair, or poor operating condition? If these figures are for vehicles in good or very good condition, it should be explained how a 40% efficiency reduction can be obtained (Table 4.2-15) by retarding diesel engine injection timing 2 degrees, or installing high-pressure fuel injectors as stated on page 4-87. It is also hard to see why these are considered "mitigation measures" since a prudent operator would do these things as standard operating practices anyway. 93 94 95

Page 4-68. Combustion of Landfill Gas Emissions.

a. The document states that "while the FEIR Sunshine Canyon Landfill Extension proposed a total of eight flaring stations within Sunshine Canyon, revisions in LFG generation calculations as well as experience gained in the generation rates associated with the existing inactive landfill have shown that two additional flare stations will be required for the project." This will actually be a *reduction* in the number of flares from the previously proposed eight to five. The document states that LFG generation calculations form the basis for the determination that only five flares will (eventually) be required, but these calculations are not included in the SEIR. 96

b. It is difficult to decipher Table 4.2-9. This table is labeled "Permitted Daily Emissions From Flaring Activities." Do the figures portray actual emissions? What are "permitted" emissions? There are apparently two permitted flare stations in the county and an "existing" flare station within the city. Text associated with Table 4.2-9 states that for CEQA purposes, the volume of emissions associated with the 'permitted' activities has been doubled to include both existing emissions, and the proposed project at buildout. Table 4.2-9 should clearly show the total amount of emissions associated with a specific number of flares, i.e., two or five or eight, or however many will eventually be constructed. 97

Page 4-88. Fugitive Dust

Emissions of fugitive dust or particulate matter are created primarily at the working face of most landfills rather than by vehicular travel over hard-packed roads, yet the SEIR proposes mitigation measures devoted almost exclusively to road dust and ignores the working face. The majority of pm10 emissions are created when refuse is dumped at the working face. These emissions are, admittedly, the most difficult to control: Delivery trucks may contain highly dispersive material, some of which may be toxic or unhealthful. At the same time, until the material is actually dumped there is no way of knowing what will come out of the truck. The SEIR, however, does not address this at all. It is suggested that as a mitigation measure a water truck, capable of discharging a high pressure spray, be permanently stationed at the working face to knock down any load containing dust or particulates. 98

Page 4-47

a. The discussion of wind conditions focusses mainly on general conditions throughout the Los Angeles basin and provides little information regarding site specific conditions. 99

b. Figure 4.2-2 purports to be a windrose for the Sunshine Canyon Landfill, yet the related text (page 4-47) is set in the context of general conditions within the SCAB. 100

Page 4-92

The statement dismissing the significance of odor from refuse is unsubstantiated in the real world. The terrain of this site will provide a conduit to carry odors directly toward the residential community to the southeast at least 10% of the time as shown on Figure 4.2-2. 101

Page 4-94

The "mitigation measures" proposed to minimize odors from refuse are either already required by law (i. e., the use of daily cover), are vague ("operational techniques" shall be utilized to control odor sources at the landfill.), or will be ineffectual (solid waste shall be compacted within 1 hour or its arrival at the working face.) It is suggested that as mitigation measures the operators commit to covering highly odorous loads immediately, or maintain a source of odor suppressant chemicals on-hand for use when necessary. 102

Section 4.3 Surface and Groundwater

Page 4-103.

The document should explain the difference between an individual point source NPDES permit and the statewide general NPDES permit program viz-a-viz monitoring and reporting requirements, and why the statewide general program was selected. 103

Section 4.5 Noise

Paragraph 4.5.2. Operational Noise Impacts

a. This agency does not necessarily agree that just because " the noise emanating from the *existing, inactive* landfill ... is not audible to the residential developments located south of the project site ..." the conclusion can be drawn that sound from *proposed* landfilling operations would also be inaudible. It is stated in the SEIR that noise is audible if maintenance "equipment" is operating "near" the top deck area. The SEIR does not make it clear if this "equipment" would be consistent with the noise that could be expected from the type of equipment used in landfilling operations, nor does it make clear what is meant by "near" the top deck. 104

b. The SEIR does not address the noise that could be expected from the tub grinder which would be placed in the proposed green waste/wood waste processing area. This area is located at the closest point on the site to the residences to the south. 105

Page 4-219/4-220

It is stated in the SEIR that vehicles in excess of 6,000 pounds (gross) are prohibited from Balboa Boulevard. However, it cannot be concluded that "... landfill-bound truck traffic would not influence noise levels ... since these vehicles are prohibited from traveling along Balboa Boulevard." The SEIR estimates that up to 22 percent of the project related traffic may be due to local deliveries, i.e., vehicles less than 6,000 pounds. The proposed mitigation measures only address this issue by stating that "citizens, small commercial, and private users" shall be "encouraged" to use alternate routes. This may not be effective, however, in that Balboa Boulevard is the only practical route to the site from the communities of Granada Hills, Chatsworth, Canoga Park, and Reseda. 106

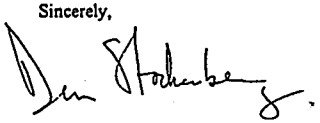
GENERAL

This SEIR (Table 3.2-1) defines the continuing operations of the county landfill as a 'related' project. In reality, the county and city portions of the site are each part of a single landfill. This document, therefore, describes only one half of the proposed landfill project - rarely are the cumulative impacts clearly addressed. In some respects this may be acceptable, e.g., the traffic analysis does factor traffic due to continuing operations into the background levels. In other cases, e.g., air impacts, it ignores the existing, and therefore cumulative, impacts from ongoing operations. 107

For example, the SEIR states that "Because the emissions associated with construction and operation of the cumulative projects cannot be determined without a full analysis of each project ... the cumulative analysis for the project's air quality must be generic by nature." This may be true in the case of some of the 33 projects identified as contributing to cumulative impacts, but it is not the case as far as the county landfill is concerned since that project was the subject of an in-depth study. The document is deficient in not providing at least some information in the cumulative impact section of each impact area. 108

Thank you for the opportunity to review and comment on this document. I can be reached at either (562) 438-6788 or (213) 881-4151 should you have any questions.

Sincerely,



Don Stockenberg, REHS

COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone: (626) 458-5100

HARRY W. STONE, Director

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

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December 4, 1997

IN REPLY PLEASE REFER TO FILE: P-2

Mr. Hadar Plafkin
City Planning
Los Angeles City Planning Department
Environmental Review Section
221 North Figueroa Street, Room 1500
Los Angeles, CA 90012

Dear Mr. Plafkin:

RESPONSE TO A SUBSEQUENT ENVIRONMENTAL IMPACT REPORT (SEIR) - SUNSHINE CANYON LANDFILL PROJECT

Thank you for the opportunity to provide comments on the SEIR for the proposed Sunshine Canyon Landfill Project. These comments supplement the comments provided by our Department in a letter dated December 4, 1997. We have reviewed the SEIR and offer the following comments:

Traffic and Lighting

The proposed project is estimated to generate approximately 2,260 passenger car equivalent (PCE) trips per day, 245 and 285 PCE trips during the a.m. and p.m. peak hours, respectively. **109**

We agree with the traffic study that the traffic generated by the project will not have any significant impact on County intersections or roadways.

Traffic volumes indicated in Figure 4.13-14 (1998 A.M. Peak-Hour Background Traffic Volumes) of the SEIR are identical to those in Figure 4.13-15 (1998 P.M. Peak-Hour Background Traffic Volumes). This discrepancy should be corrected. **110**

We recommend the State of California Department of Transportation also review this project for impacts/mitigations within its jurisdiction. **111**

If you have any questions, please contact Mr. Garland Seto of our Traffic and Lighting Division at (626) 458-5909.

If you have any questions regarding the environmental reviewing process of this Department, please contact Mr. Vik Bapna at the address on the first page or at (626) 458-4363.

Very truly yours,

HARRY W. STONE
Director of Public Works

Teri Grant for

DAVID YAMAHARA
Assistant Deputy Director
Planning Division

YC:km
54

Letter 3.5-3

COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone: (626) 458-5100

HARRY W. STONE, Director

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

December 4, 1997

IN REPLY PLEASE REFER TO FILE: EP-2

Mr. Hadar Plafkin, City Planner
Los Angeles City Planning Department
Environmental Review Section
221 North Figueroa Street, Room 1500
Los Angeles, CA 90012

Dear Mr. Plafkin:

SUBSEQUENT ENVIRONMENTAL IMPACT REPORT (SEIR)
SUNSHINE CANYON LANDFILL EXPANSION
CITY OF LOS ANGELES

Thank you for the opportunity to provide comments on the SEIR, dated July 1997 (State Clearinghouse Number 92041053), for the proposed Sunshine Canyon Landfill Expansion, City of Los Angeles. We have reviewed the subject SEIR in reference to areas of responsibility under the purview of the Environmental Programs Division of the Los Angeles County Department of Public Works (Department). The Department will be submitting additional comments under separate cover. The following is offered.

GENERAL COMMENTS

1. The California Integrated Waste Management Act of 1989 (AB 939), as amended, mandates the County to prepare a countywide siting element which must address the 15-year solid waste disposal capacity needs (1995-2010) of the unincorporated areas of the County, the City of Los Angeles, and other cities in Los Angeles County.

   The Department, under the auspices of the Los Angeles County Solid Waste Management Committee/Integrated Waste Management Task Force, prepared the Los Angeles County Countywide Siting Element dated June 1997 (June 1997 CSE). The June 1997 CSE was approved by a majority of the cities in Los Angeles County containing a majority of the cities' population in November 1997. The Sunshine Canyon Landfill Expansion, City of Los Angeles, has been identified in the June 1997 CSE. The proposed expansion will provide for a portion of the 15-year disposal capacity need identified in the June 1997 CSE. 112

2. Please revise all references to the "Los Angeles County Department of Public Works, Solid Waste Management Division" to read "Los Angeles County Department of Public Works, Environmental Programs Division" throughout the document. 113

SPECIFIC COMMENTS

1. Executive Summary, Section 2.2.1, Statistical Information in Connection with Solid Waste Generation and Permitted Capacity within the City of Los Angeles, page ES-11.

   As mandated by State law, the Department is responsible for collecting statistical data by jurisdiction of origin on the quantity of solid waste disposed at permitted solid waste disposal facilities in Los Angeles County. The Department is then required to consolidate this information and report the data to all appropriate cities and counties in the State of California. 114

   As discussed below and based on the data collected by the Department and reported to the City of Los Angeles and the California Integrated Waste Management Board, the information provided in Section 2.2.1 needs to be expanded/revised. The following identifies the quantities and distribution of that portion of the solid waste that was generated in the City of Los Angeles in 1995 and disposed of at permitted disposal facilities within and outside Los Angeles County:

   ♦ Permitted disposal facilities in Los Angeles County:

- Class III landfills	3,627,037 tons
- Unclassified landfills	145,239 tons
- Transformation facilities	56,525 tons

   ♦ Permitted disposal facilities outside Los Angeles County:

- Exports to Riverside County	4,623 tons
- Exports to Ventura County	8,630 tons
Total disposed	3,842,054 tons

   115

   Based on the 1995 estimated diversion rate of 40.6 percent listed in the above-mentioned Section and the above disposal quantities, the estimated solid waste generation rate for the City of Los Angeles in 1995 is 6,468,104 tons. Based on the estimated City population of 3,593,729, this translates into a per-capita waste generation rate of 1.80 tons of solid waste per person per year in the City of Los Angeles rather than 1.58 as listed in the document. 116

   All appropriate sections of the SEIR should be revised to reflect the above information.

2. Executive Summary, Table ES-1, page ES-13 (also shown on page 2-5 of Volume I).

Table ES-1 indicates that the information provided is based on the Preliminary Draft Los Angeles County Countywide Siting Element dated January 1996. However, the discussion fails to define the term "permitted disposal capacity." Please refer to Section 3.3.4 of the June 1997 CSE, page 3-4, and include the definition provided. The disposal quantities, remaining disposal capacity, and footnotes listed in Table ES-1 should be consistent with those provided in the June 1997 CSE. Additionally, footnote (d) of Table ES-1 should be revised to indicate that "The Chiquita Canyon Landfill has recently obtained a land use permit which provides for an anticipated disposal capacity of 23 million tons." 117 118 119

All appropriate Sections of the SEIR should be revised to conform with the comments listed above. 120

Additionally, it should be noted that the remaining combined permitted disposal capacity of all Class III landfills in Los Angeles County is estimated at approximately 86 million tons as of July 1, 1997. 121

3. Summary, Volume I, Section 1.9.1, Alternatives Not Evaluated, Mission/Rustic-Sullivan Landfill, page 1-12.

Revise this Section and other appropriate Sections of the SEIR to incorporate updated information on the status of the Mission/Rustic-Sullivan Canyons site, as identified in the June 1997 CSE. Specifically, the Mission/Rustic-Sullivan site is not identified as a possible landfill site in the June 1997 CSE. 122

4. Summary, Volume I, Section 1.9.1, Alternatives Not Evaluated, page 1-14, third bullet.

We agree that California's standards and requirements for the operation of disposal facilities are more stringent compared to other states. Additionally, disposal facilities located in Los Angeles County must operate under even more stringent conditions as mandated by local/regional agencies, as in the case of the Sunshine Canyon Landfill in the County unincorporated area. 123

5. Summary, Volume I, page 1-25, Status of Elsmere Solid Waste Management Facility, and Section 5.7.1, page 5-27.

Revise these Sections and all other appropriate Sections of the SEIR to incorporate updated information on the status of the Elsmere Solid Waste Management Facility, as identified in the June 1997 CSE. Specifically, they should reflect a proposed landfill capacity of 80 million tons exclusive of any Angeles National Forest lands. 124

6. Volume II, Appendices, page C13-2, Countywide Integrated Waste Management Plan.

Revise the definition of the Countywide Integrated Waste Management Plan to reflect the following:

- The Countywide Integrated Waste Management Plan also includes the Countywide Integrated Waste Management Summary Plan prepared by the County. 125

- The Countywide Integrated Waste Management Plan includes all Non-Disposal Facility Elements prepared for the County unincorporated area and each of the 88 cities located within Los Angeles County.

Subsequent detailed discussions of the various components of the Countywide Integrated Waste Management Plan should include a detailed description of the Countywide Integrated Waste Management Summary Plan, dated June 1997, which was prepared by the Department and approved by a majority of the cities in Los Angeles County containing a majority of the cities' population in November 1997. This document was prepared pursuant to the California Integrated Waste Management Act of 1989, as amended. 126

7. Volume II, Countywide Siting Element, page C13-3.

Revise the discussion to indicate that under current State law, the County of Los Angeles is mandated to prepare the Countywide Siting Element to specifically address the disposal capacity needs of the 88 cities in Los Angeles County and the County unincorporated communities for a 15-year planning period. 127

If you have any questions regarding the above comments, please contact the undersigned at (626) 458-3502, Monday through Thursday, 7:00 a.m. to 5:30 p.m.

Very truly yours,

HARRY W. STONE
Director of Public Works

M. MICHAEL MOHAJER
Assistant Division Engineer
Environmental Programs Division

JR:jr
P:\EPPUB\SECFINAL\ENGINEER\LETTERS\SUNSNEIR.DR3

APPENDIX C4

City Departments

Letter 3.6-1

FORM GEN. 160 (Rev. 6-80)

CITY OF LOS ANGELES

INTER-DEPARTMENTAL CORRESPONDENCE

RECEIVED
CITY OF LOS ANGELES
AUG 14 1997
ENVIRONMENTAL
UNIT

August 1, 1997

TO: Con Howe, Director
Department of City Planning

Attention: Hadar Plafkin

FROM: Fire Department

SUBJECT: COMMENTS OF DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT - SUNSHINE CANYON LANDFILL

All items of concern to this Department appear to have been addressed adequately at earlier levels of review. 128

WILLIAM R. BAMATTRE
Chief Engineer and General Manager

Richard E. Olsen

Richard E. Olsen, Assistant Fire Marshal
Bureau of Fire Prevention and Public Safety

REO:DHT:lq:a\sunshine.wp

FORM GEN. 160 (Rev. 6-80)

CITY OF LOS ANGELES

INTER-DEPARTMENTAL CORRESPONDENCE

Letter 3.6-2

Date: October 22, 1997

To: Mr. Con Howe, Director
Department of City Planning
Attention: Hadar Plafkin

From: Homer M. Morimoto, Division Engineer
Development Services Division
Bureau of Engineering

Subject: Draft Subsequent Environmental Impact Report (SEIR 91-0377-ZC/GPA) for the Sunshine Canyon Landfill at 14747 San Fernando Road

In response to your letter dated July 25, 1997, the Bureau of Engineering has the following comments in connection with the above-captioned document:

STREETS:

San Fernando Road north of the project driveway should be improved by constructing concrete curb, gutter, and a minimum 40-foot half roadway with appropriate transition near the northerly property line to join the freeway off-ramp improvements to the satisfaction of the City Engineer. San Fernando Road south of the driveway has been improved per Plan No. P-34901. Additional widening and/or dedication may be needed subject to the LADOT review of the traffic study. 129

HYDROLOGY:

Grading Plan should be submitted to the Valley Engineering office of the Bureau of Engineering, should the drainage construction become necessary. 130

GEOTECHNICAL REVIEW:

The report is generally geotechnically acceptable. However, Section 4.1 indicates that secondary displacement due to faulting could cause 8 inches of displacement beneath the landfill. The impact of this displacement on the proposed liner should be evaluated. 131

If you have any questions regarding this report, please contact Mr. Ray Saidi at (213) 485-3091.

HMM/GRS/gt
a:gtwp52

cc: Valley Engineering Office
Program Management Division
Geotechnical Review Section

Letter 3.6-3

Department of Water and Power the City of Los Angeles

RICHARD J. RIORDAN
Mayor

Commission
RICK J. CARUSO, *President*
MARCIA F. VOLPERT, *Vice President*
JOSÉ DE JESÚS LEGASPI
KENNETH T. LOMBARD
JUDY M. MILLER
IRENE N. KISHI, *Secretary*

S. DAVID FREEMAN, *General Manager*
HARRY M. SIZEMORE, *Chief Operating Officer*
ELDON A. COTTON, *Assistant General Manager – External Asset Management*
JAMES F. WICKSER, *Assistant General Manager – Water Services*
THOMAS M. McCLOSKEY, *Assistant General Manager – Marketing & Customer Service*
M. FAYE WASHINGTON, *Assistant General Manager/Chief Administrative Officer*
THOMAS C. HOKINSON, *Chief Assistant City Attorney for Water and Power*
PHYLLIS E. CURRIE, *Chief Financial Officer*

October 27, 1997

Mr. Hadar Plafkin, City Planner
City of Los Angeles
Department of City Planning
Environmental Review Section
221 North Figueroa Street, Suite 1500
Los Angeles, CA 90012-2601

Dear Mr. Plafkin:

Comments on the Subsequent Environmental Impact Report (SEIR)
Sunshine Canyon Landfill, EIR Case No. 91-0377-ZC/GPA

The Los Angeles Department of Water and Power (LADWP) welcomes the opportunity to comment on the Sunshine Canyon Landfill SEIR.

The LADWP's Water Services Organization provides the following discussion for your consideration:

- The area lies within the LADWP's 1805 Acreage Supply Charge (ASC) district and upon successful completion of the EIR process and the procurement of the necessary permits for the facility, the landfill project may be subject to the required ASC upon the owner's application for water service. **132**

- The subject area, consisting of approximately 194 acres within the City of Los Angeles, is to be utilized for landfill operations for the next 26 to 28 years. Upon closure of the landfill, this acreage could be extended to long-term nonuse. If ASC charges for this project are exempt because it is a City of Los Angeles facility, due consideration and review by the LADWP's Water Services Organization of the 1805 ASC rate may be required. **133**

- If there is any intended use of subsurface water (groundwater) or surface water (from precipitation or storm runoff) for irrigation or other consumptive use, approval must be obtained from the Upper Los Angeles River Area (ULARA) Watermaster. This landfill falls within the boundaries of the ULARA **134**

111 North Hope Street, Los Angeles, California *Mailing address:* Box 51111, Los Angeles 90051-0100
Telephone: (213) 367-4211 *Cable address:* DEWAPOLA *FAX:* (213) 367-3287

Recyclable and made from recycled waste.

watershed, and by adjudication all surface and subsurface water rights belong to the City of Los Angeles of which the Watermaster is the caretaker (enforcer) of those rights.

- Appropriate dust control measures must be provided. **135**

The LADWP's Energy Services Organization provides the following discussion for your consideration:

- Electrical service will be provided in accordance with the LADWP's rules and regulations. Electrical facility construction may cause limited temporary impact on the surrounding communities in the form of unavoidable noise, air pollution and traffic congestion during construction. **136**

If you require more information or have questions regarding the Water Services Organization's comments, please contact Mr. Douglas K. Sunshine at (213) 367-1162. If you require more information or have questions regarding the Energy Services Organization's comments, please contact Mr. Mark Williams at (213) 367-0270.

Sincerely,

Charles C. Holloway

CHARLES C. HOLLOWAY
Supervisor of
Environmental Assessment and EMF

c: Mr. Douglas K. Sunshine
Mr. Mark Williams

FORM GEN. 160A (Rev. 1/82)

CITY OF LOS ANGELES
INTER-DEPARTMENTAL CORRESPONDENCE

Letter 3.6-4

San Fernando Rd
& Sunshine Canyon
Landfill Access Rd

Date: November 25, 1997

To: Hadar Plafkin, City Planner
Department of City Planning

From: Robert T. Takasaki, Senior Transportation Engineer
Department of Transportation

Subject: **SUBSEQUENT ENVIRONMENTAL IMPACT REPORT FOR PROPOSED SUNSHINE CANYON CITY LANDFILL EXTENSION PROJECT (SEIR 97-0377-ZC/GPA)**

The Department of Transportation (DOT) has reviewed the July 1997 Subsequent Environmental Impact Report (SEIR) for the Sunshine Canyon City Landfill Extension Project. The proposed project consists of the development and operation of a Class III nonhazardous solid waste landfill facility and an on-site green waste/wood waste recycling area on a 205 acre site. The project is contiguous with the previously approved Sunshine Canyon County Landfill Extension project located in the unincorporated County area of Sunshine Canyon and utilizing a common access driveway on San Fernando Road south of the I-5 southbound off-ramp and south of Sierra Highway. The proposed City Landfill project would have an estimated net airspace volume of approximately 31 million tons and with an average solid waste disposal intake of approximately 5,000 tons per day. The maximum daily intake for the proposed City landfill is 5,500 tons per day. The City landfill operation will be open for refuse disposal from 6:00 AM to 6:00 PM, Monday through Saturday, excluding Sundays and holidays. Except as noted, the content of DOT's comments and recommendations to offset the traffic related impacts of the project on the surrounding streets and intersections as outlined in our letter of March 12, 1996 have been included in the July 1997 SEIR. 137

COMMENTS

The Conceptual Mitigation Plans contained in Appendix F for the intersection of San Fernando Road at the project driveway show three schemes in which two are Interim Improvement Plans and the third is an Ultimate Improvement Plan for that intersection. Only the Ultimate Improvement Plan was discussed with DOT in our prior review of the traffic study. DOT prefers the Ultimate Improvement Plan (dual northbound left turn lanes) to the Interim Improvement Plans (single northbound left turn lane). Therefore, DOT recommends that the Ultimate Improvement Plan be required as the mitigation measure for this location. 138

On Pages 1-76, 1-77 and 1-78, Table 1.10-1, Summary Matrix of Potential Environmental Impacts, Mitigation Measures, Net Unmitigated Adverse Impacts, Mitigation Compliance Responsibility and Monitoring Phasing and Enforcement Program, please make corrections as follows: 139

- On Page 1-76, under Section 4.13.1 Traffic and Mitigation Measures Column
  Roxford Street at the I-5 Freeway, (SB ramp)
  - Restripe **westbound** ~~southbound~~ approach on Roxford Street to provide dual left-turn lanes and one through lane.

  Roxford Street at the Encinitas/I-5 Freeway (NB ramp)
  - Restripe **northbound approach** ~~westbound through lane~~ on Encinitas Avenue to **provide left-turn lane, shared through/left-turn lane and shared through/right-turn lane** ~~left/through option lane.~~ 140

- On Page 1-77, under Section 4.13.1 Traffic and Mitigation Measures Column
  San Fernando Road at Balboa Boulevard
  - Replace second paragraph to state:
    Contribute to the design, construction and operation of the Northeast Valley Automated Traffic Surveillance and Control (ATSAC) system for this intersection. The current cost of ATSAC for the Northeast Valley System is $79,000 per intersection. The contribution to ATSAC should be made prior to the start of construction for this ATSAC System which is scheduled for the year 2003. 141

  San Fernando Road at Sierra Highway
  - Restripe **northbound approach** ~~through lane~~ on San Fernando Road to **provide a shared through/right-turn lane and exclusive right-turn lane** ~~through/right option lane~~ **and restripe the westbound approach of Sierra Highway for a 12-foot wide curb lane.** 142

  San Fernando Road at project driveway
  - Replace paragraph to state:
    Install a new traffic signal and widen and restripe the northbound approach of San Fernando Road to provide dual left-turn lanes and two through lanes. Also contribute to the design, construction and operation of the Northeast Valley ATSAC system for this intersection. The current cost of ATSAC for the Northeast Valley System is $79,000 per intersection. The contribution to ATSAC should be made prior to the start of construction for this ATSAC System which is scheduled for the year 2003. 143

- On Page 1-77, Table 1.10-1 immediately after the paragraph on San Fernando Road at project driveway
  - Please add the following paragraph:
    The required street improvements and signal modifications shall be guaranteed before the issuance of any building permit for this project through the B-Permit process of the Bureau of Engineering, Department of Public Works and the Encroachment Permit process of Caltrans (where applicable). Construction of the improvements to the satisfaction of DOT, the Bureau of Engineering and Caltrans (where applicable) must be completed before issuance of any certificate of occupancy. Prior to setting the bond amount the 144

Bureau of Engineering shall require that the developer's engineer or contractor contact DOT's B-Permit Coordinator, telephone (213) 580-5336, to arrange a pre-design meeting to finalize the proposed geometric and traffic signal designs needed for the project.

- On Page 1-78, under Section 4.13.4 Parking and Safety Concerns and Mitigation Measures Column
  Replace paragraph to state that a new traffic signal at the project landfill entrance should be installed immediately prior to issuance of any certificate of occupancy for the project. 145

On Page 4-372, Table 4.13-9, PROJECT-SPECIFIC MITIGATION MEASURES, should be revised to reflect the above comments described for Table 1.10-1. 146

On Page 4-379 under City Mitigation Measure, replace the first bullet to state:

Prior to issuance of any certificate of occupancy for the project, install a new traffic signal at the project landfill entrance and widen and restripe the northbound approach of San Fernando Road at the project driveway to provide dual left-turn lanes and two through lanes. Also contribute to the design, construction and operation of the Northeast Valley ATSAC system for this intersection. The current cost of ATSAC for the Northeast Valley System is $79,000 per intersection. The contribution to ATSAC should be made prior to the start of construction for this ATSAC System which is scheduled for the year 2003. 147

This memorandum does not constitute approval of the driveways and parking scheme for the project. Those require separate review and approval and should be coordinated with the Citywide Planning Coordination Section (Room 460, Counter "O") as soon as possible to avoid delays in the building permit approval process. 148

If any questions should arise, please contact John Sam of my staff at (213) 580-5206.

JSS6\wpwin\sunshine.wpd

c: Council District No. 12
West Valley District, DOT
Design Division, DOT
Citywide Planning Coordination Section, Counter "O", DOT
Valley District, Bureau of Engineering
Stephen Buswell, Caltrans
Betsy Lindsay, Utrasystems Environmental Incorporated
Linscott, Law & Greenspan, Engineers

Letter 3.6-5

HAL BERNSON
COUNCILMAN
TWELFTH DISTRICT

City Council
of the
City of Los Angeles
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RECEIVED
CITY OF LOS ANGELES
DEC 05 1997
ENVIRONMENTAL
UNIT

December 4, 1997

Mr. Hadar Plafkin, City Planner
City of Los Angeles
Department of City Planning
Environmental Review Section
221 North Figueroa Street, Suite 1500
Los Angeles, California 90012-2601

Re: Comments On Draft Subsequent Environmental Impact Report (Draft SEIR) for Sunshine Canyon Landfill Expansion Project. Case 91-0377-ZC/GPA, Reference # SCH 92041053.

Dear Mr. Plafkin;

I am pleased to have the opportunity to comment on the Draft Subsequent Environmental Impact Report (Draft SEIR) for the Sunshine Canyon Landfill Expansion Project. As the Chairman of the City Councils Planning and Land Use Management (PLUM) Committee, I see many projects that have significant impacts on the City of Los Angeles and various neighborhoods. Rarely, do I see a project of this magnitude and negative impact. 149

As the elected representative of the 12th Council District, I have the honor of speaking for the residents of Granada Hills who bear the impact of this project. We have reviewed the above referenced document and request consideration of the following comments: 150

TRAFFIC

Issue #1. A current and reliable traffic study is needed for the SEIR and should include the following from a worst case scenario viewpoint: 151

- Existing and future average daily traffic (ADT) volumes
- Traffic generation (including peak hour)
- Traffic distribution
- Analysis of peak hour demand and capacity using volume-to-capacity (V/C) and level of service (LOS) methodologies for intersections along with current and projected capacities of local roads, state highways, and freeways that might be impacted

Special attention needs to be given to the following intersections: 152

San Fernando Road at Project Driveway;
San Fernando Road at I-5 Freeway (southbound off ramp);
San Fernando Road at Sierra Highway;
San Fernando Road at Balboa Blvd.

Issue #2. This project will be "truck intensive". This study should address the current amount of truck traffic and other vehicular traffic, and the amount by which vehicular/truck traffic will increase both during construction, operation, and upon project completion. Data provided by the proponent is outdated and taken at times when the city side of the landfill was closed and is therefore inaccurate. A new study should include current data with truck types noted and actual truck routes. 153 154

Issue #3. The SEIR uses outdated and incorrect information with projections to the year 1998. Since that time period is only a month away, the entire traffic element must be redone with projections through the year 2003 or more. 155

Issue #4. The truck analysis is incremental and does not take into account the cumulative impacts of the County and City landfill operations open at the same time. The analysis also does not include the inert truck traffic. 156

AIR QUALITY

There are numerous issues of air quality that must be addressed and mitigated.

Issue #1. One of the problems which led to the Zone Revocation hearings of 1988 was that significant amounts of trash and dust which were blowing in the wind and landing in the neighborhoods homes below the landfill, and the City and Counties water supply. Pictures of large plumes of dirt and trash billowing upwards of 500 feet in the air were submitted to the ZA for proof. Additionally, credit records, doctors records and other sensitive material was retrieved by local residents from locations in Beverly Hills, Culver City and Santa Monica, all cities utilizing the landfill at the time. We were never able to quantify the amount of trash and possibly contaminated particulates that may have entered the water systems which supply 80% of the City and large areas of Los Angeles County. This evidence led ZA John Parker to conclude " **in the context of the strong winds which blow from the north, this landfill is probably in a POOR location**". (emphasis added) 157

The history of the area shows that this pass is in a very high wind tunnel. High pressure zones from the upper deserts are compressed in the venturi of the pass and create extremely strong winds from the north. In 1989, a major fire erupted on the landfill property. The Los Angeles City Fire Department estimated winds of in excess of 75 MPH which whipped the flames along the foothills and destroyed 18 homes in Porter Ranch. The AQMD regulations 158 159 160

prohibit dust and other air contaminants being blown into the air. Sunshine Canyon has been closed on a number of occasions for this reason. Amazingly the AQMD rule excludes wind in excess of 25 MPH as an act of nature. Since there are frequent high winds that blow in this area then dissipate on the valley floor, AQMD rules rarely apply. A wind circulation and frequency study must be done prior to any approvals.

Issue #2. The applicant admits to unavoidable significant adverse impacts to air quality relating to operational aspects of the project in its Draft SEIR. Air quality impacts are expected to remain above significant levels for criteria pollutants nitrogen oxides (NOx), reactive organic gases (ROG), and suspended particulate matter (PM10) due to project implementation. These impacts cannot be mitigated to levels below significance. 161

Issue #3. Odor impacts. There is no evidence in the Draft SEIR that the existing odor control procedures will be effective once the landfill has expanded. The extent of the expansion could render as inadequate any odor control procedures similar to those currently in place. 162

This landfill has been cited a number of times for verified nuisance odor complaints by the South Coast Air Quality Management District (AQMD). Perhaps the applicant should use a high percentage of dirt as cover, rather than ADC, to mitigate odor impacts of operations. 163

Issue #4. Traffic errors and the impact on air quality is greatly underestimated. Without corrected traffic impact studies and truck counts, the SEIR is naturally deficient in any evaluation of air impacts. The traffic projections produced by a new study will cause all air quality projections to be re-evaluated and calculated. 164

ALTERNATIVES

Issue #1. The No Project alternative is not really a no project alternative. BFI states clearly that if the No Project alternative is chosen, they will seek expansion in the County. The premise of the landfill is to "alleviate disposal capacity shortfalls in Los Angeles County". It must be pointed out that there are no current shortfalls, even though predicted for the year 1993, it never happened, and the surplus of landfill space today remains significant. Likewise, if the No Project alternative is chosen, then the county permit expansion of up to 70 million tons would adequately protect against any possible future landfill shortage. 165

Issue #2. The SEIR addresses operational and near operational out of county and state rail haul sites and states that they "would result in disturbances on desert environments, the need for secondary transfer stations facilities, and the use of waste-by-rail systems, which would result in greater environmental impacts". This concept is hard to understand in light of the impacts that BFI causes on human beings. In their view the impacts to a vacant mine or open desert is more important than the health of 15,000 citizens who will live in the debris "drop zone" caused by wind blown trash. Likewise the potentialof water contamination to the two major fresh water storage reservoirs for over 15,000,000 people in the greater Los Angeles/Ventura County areas. 166 167

A more serious effort must be shown toward consideration of alternative sites. 168

Issue #3. The SEIR does not address the fact that the City of Los Angeles currently has issued an RFP to look at new technologies or alternatives to land filling. The SEIR does not look at new technologies. The County currently operates the SERF project, and a private contractor operates another facility in Commerce-- both are waste-to-energy facilities. These facilities are similar to the ones used around the world, and in areas such as Japan, where they eliminate nearly 100% of all waste WITHOUT LANDFILLS. In Hemet, a new facility is being experimented with using polymer's to inject into sorted trash. The end product is a usable brick. No mention of any of these new technologies is found in the SEIR and they need to be explored; particularly, in light of the City of Los Angeles' RFP. 169

Issue # 4. The lack of serious consideration of the Orange County landfills who are willing to accept some LA County waste. This option is a good short term solution to any disruptions that "Could" happen until a full rail haul system, or new technology system could be built. Suggested consideration should be made of utilization of existing landfills in the following manner: 170

Until the year 2006:

A. Olinda and Olinda Alpha landfill, Orange County.
B. Bowerman Landfill, Orange County.
C. El Sobrante, Riverside County. 171

After the Year 2006:

A. Mesquite Regional Landfill, Imperial County.
B. Eagle Mountain Landfill, Riverside County.
C. Bolo Station Landfill, San Bernardino County.
D. New technology in basin.

REGIONAL DEVELOPMENT

Issue #1. Since there have been over 64,000 proposed and/or permitted housing units for the areas to the north which lie in the Chiquita Landfill area, this growth does not place any additional need for Sunshine Canyon since Chaquita is scheduled to take their trash. However, the traffic patterns that this growth will create along the I-14 and I-5 corridors, which run next to Sunshine Canyon, is enormous. These cumulative impacts are not included in this SEIR. The Southern California Association of Governments (SCAG) will take this issue up and the SEIR needs to properly analyze these impacts. 172 173

WATER QUALITY

Issue #1. The landfill lies within one mile upwind of the MWD Jensen Filtration Plant and the DWP Los Angeles Reservoir. These two facilities supply most of the water for Los Angeles City, County and parts of Ventura County. The City Zoning Administrator has documented that the landfill is in a bad location due to the frequent winds in the area. The possibility of wind blown contamination is of such great significance that extensive wind modeling must be done to guarantee that there is no wind blown contamination. 174

Issue #2. The Inlet Tunnel of the MWD Jensen Filtration Plant is within ½ mile of the landfill leachate collection system. The BFI system is a concrete system which is subject to breakage in severe earthquakes or erosion. A better system must be designed to protect the MWD Jensen Plant. 175

Issue #3. Surface runoff from the landfill will empty into a channel that flows directly in front of the MWD Jensen Filtration Plant. Any breakage or overflow of this channel could cause significant contamination. BFI needs to find a better run off control system. 176

Issue #4. BFI rests all of its protection from ground water contamination on the fact that the landfill is lined. However, the liner is merely 60 mil thick and will not withstand movements of over 12 inches. The 1994 Northridge earthquake moved the peak above the landfill 15-18 inches. The active earthquake faults in the area raise this issue to a level of significance and the EIR does not show how BFI can satisfy EPA standards for municipal landfills if the liner was to be damaged by another 1971 or 1994 size earthquake. 177

Issue #5. The liner warranty is valid for only 20 years. Degradation of the liner would continue each year making it less likely to withstand earth movements. This raises questions as to whether the liner, after 5 or 10 years could withstand even a modest earth movement. The EIR needs to show a scale of strength for each year of operation, and how BFI can guarantee the protection of the water table in later years, or after closure. 178

Issue #6. Bird contamination. During the previous operations of the City Sunshine Landfill, large flocks of birds would land in the open faces of the landfill then travel the 1 mile to the Jensen Filtration Plant and Los Angeles Reservoir. Analysis must be done to show the potential aerial contamination of water supplies from these birds-- both from carried mater and droppings. 179

MISCELLANEOUS

Issue #1. Property values. As the Councilman for the Granada Hills area I have had reports of home sales falling out of escrow due to the disclosure of the existence of a landfill near the home. I have also heard from many people that their property values have suffered. BFI must 180

guarantee the value of all future sales. A real estate analysis must be done to protect home owners from negative value impacts and BFI must be forced to underwrite any losses.

Issue #2. Buffer Zone. The SEIR does not address the fact that the proposed 100 +/-acre buffer zone has a number of active uses in it. A buffer zone must be free of any active uses which BFI has planned in their so called buffer zone. BFI must either eliminate proposed and current flare stations, sedimentation basins, oil wells, office uses, and other landfill activities, or extend the proposed buffer zone. 181

Issue #3. Previous history. The abuses of BFI are well known to the City of Los Angeles Planning Department, Board of Zoning Appeals and City Council. During the previous operation of the city side of Sunshine Canyon, prior to 1991, BFI was cited for many violations of Zoning codes and Building and Safety codes. Zoning Administrator John Parker ordered BFI to conduct a health survey in the area to determine health impacts of the dump, in 1988. BFI has never complied. BFI promised to conduct the survey, then used legal trickery to get out of it. A health survey, although somewhat outdated now, needs to still be conducted to determine any impacts or diminution of the quality of health in the area south of the landfill since its re-opening. 182 183 184

Thank you for your consideration.

Sincerely,



HAL BERNSON
Councilman, 12th District

HB:gs

Letter 3.6-6

ENVIRONMENTAL AFFAIRS DEPARTMENT
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December 5, 1997

Mr. Hadar Plafkin, City Planner
Department of City Planning
Environmental Review Section
221 N. Figueroa Street, Suite 1500
Los Angeles, CA 90012

Subject: Review of Sunshine Canyon Subsequent Environmental Impact Report (SEIR) 91-0377-ZC/GPA, Dated July 1997
State Clearinghouse Number (SCN) 92041053

Dear Mr. Plafkin:

This review of the draft of the Sunshine Canyon Landfill SEIR was conducted by the Environmental Affairs Department Local Enforcement Agency (LEA). The LEA, in partnership with other state and regional regulatory agencies, has the responsibility for ensuring the proper permitting, operation and closure of solid waste facilities within the City of Los Angeles. As a responsible agency under CEQA, our comments are focused on the environmental, technical and operational impacts related to the solid waste facility permit, which is required and issued by the LEA only after local land use entitlements are granted. 185

Section 1.0 Summary

Section 1.2 Overview

The term 'Average daily capacity" for the City portion is stated as 5,000 tons per day. The daily capacity should be listed as a maximum daily capacity and not an "average." In section 2.6.2 it states a maximum daily intake would be 5,500 tons per day which is in conflict with the earlier stated figure of 5,000 tons per day. This is repeated throughout the document and is inconsistent with future permitting that may occur. One maximum daily tonnage figure should be used, and it should not be an "average" but a maximum figure. 186

Section 2.0 Project Description

Figure 2.4.5 Aerial Map

Provide an aerial map indicating where the location of the reduced volume alternative would be located in relation to the other alternatives. 187

Section 2.5.4 Working Arrangement

Although the project proponent may wish to pursue an agreement between the City of Los Angeles and County of Los Angeles LEAs on enforcement at the site, the possibility has not been discussed. The likelihood of a joint enforcement agreement is uncertain and is not an accurate reflection of the project's operational future. The Project Description should accurately reflect anticipated conditions. 188

Section 2.5.6 General Design Features of the City/County Landfill Facility

Portions of California Code of Regulations Titles 14 and 23 have been merged into a new Title 27. Title 27 will apply to the majority of landfill activities. However, other proposed on-site operations may continue to be regulated by Title 14 or 23. Reference to all applicable CCR Titles should be included. 189

Section 2.5.7 Proposed Landfill Ancillary Facilities

Page 2-42 Green Waste/Wood Waste Recycling Area discusses placement of this activity near the existing inactive landfill. A drop-off and buyback recycling center for the local community is also described. In order to reduce safety hazards to the public, these unloading areas should be separate from the working face utilized by commercial vehicles. 190

Section 2.5.7 Scale House and Check-In Facility

Pages 2-39 and 2-43 discuss moving the scale house operations into the City of Los Angeles portion of the site, closer to the landfill entrance. Any impacts associated with a reduction in the on-site queue space for vehicles or other equipment should be evaluated. 191

Section 2.6.2 City/County Landfill Disposal Capacity and Operational Site Life

This section discusses average waste intake and weekly averages. The project proponent may have reached an agreement with the County that was incorporated into the County issued solid waste facility permit conditions to limit incoming tonnage on a weekly average. However, this is a condition with no precedent in City-issued solid waste facility permits. The Project Description should accurately reflect anticipated conditions. 192 If the project proponent wishes to seek a similar arrangement, this should be noted as speculative and would be an option to be considered beyond a daily tonnage limit. 193

Emergency Drainage Pipe

Update applicable drawings to show location of the proposed 500' section drainage pipe that the project proponent is planning to implement as an emergency drainage control measure. Also show the parts of the pipe which will be underground. Add a description of how this drainage pipe will be integrated into the drainage control system in the proposed expansion of the landfill into the City portion of the site. 194

Section 2.6.3 Waste Cell Development

This paragraph discusses the use of 9 inches of clean daily cover material. Page 2-42 of the SEIR also discussed the use of alternative daily covers such as green/wood waste alternative daily cover material. If alternative daily covers, other than clean soil are anticipated to be used, the associated impacts should also be evaluated in this document. 195

Section 2.7.7 Monitoring and Controlling Landfill Gas

The SEIR states that "One probe per 1,000 sq. ft. of landfill perimeter is proposed to be installed in locations of greatest concern." Be advised that the City of Los Angeles "Minimum Regulations for Sanitary Landfills in the City of Los Angeles" September 22, 1971, Amended December 7, 1973 III Dump (Operations and Maintenance) O.1. requires that gas probes be placed at 300-foot intervals. We have enclosed a copy for your information. The project description should be amended to incorporate the required City of Los Angeles probe spacing. 196

Section 2.8, Designated Local Enforcement Agency

The SEIR states that the City and County will enter an agreement where a joint authority will exercise common power over the entire project site. No discussions have taken place between the City of Los Angeles LEA, County of Los Angeles LEA or the project proponent on the development of such an agreement. The likelihood of such an agreement is speculative. The project description should discuss operation of the site with two separate LEAs. Any discussion of a joint enforcement should only be a secondary description. 197

Section 2.7.3, Waste-on-Waste Liner System and Figure 2.7-3

Page 2-57, The Figure 2.7-3 is inconsistent with the text. The text on page 2-57 states that the waste-on-waste liner is over engineered final cover on the side slopes of the inactive landfill. The drawing shows only a existing intermediate cover of two (2') feet under the waste-on-waste liner system. 198

The existing proposed closure design for the inactive City landfill portion has a six (6') foot monolithic final cover over waste. Revise the drawing to show that the waste-on-waste liner system is on the final cover and the thickness of the final cover is a minimum of six feet. 199

The Local Enforcement Agency considers the "low permeability soil liner" as part of the "liner system" and not part of the foundation layer. The text is unclear on whether or not the low-permeability soil liner is part of the "foundation layer." The text in Section 2.7.3 states that the waste-on-waste liner system has a compacted soil foundation layer (from the drawing, we assume it to be the buffer soil and subbase layers) next to the low-permeability soil liner layer of the waste-on-waste liner system. 200 201

Please clarify in the text that the subbase and buffer soil is the foundation layer that is referred to in the text and that the foundation layer sits on top of the final cover of the inactive City landfill. Add a label on the drawing showing what constitutes the "foundation layer."

Section 2.10.3 Unloading Waste Materials at the Landfill Working Face 202

Refer to comments on section 2.5.7 regarding unloading areas for green/wood waste materials.

The SEIR should clearly state that a load check program will be a requirement of the City of Los Angeles solid waste facility permit. Landfill personnel, not LEA inspectors, will be required to randomly select loads and inspect them for hazardous waste. The LEA will monitor implementation of this load check program by landfill personnel. 203

Section 2.13.1 Personnel Training

Facility personnel should also receive training in recognition of subsurface fires and procedures to respond to such an emergency. 204

Section 2.15.1 End Use of the Site

Insert a description of what happens with the proposed end use of the site under the existing closure plan. The following text summarizes the Local Enforcement Agency's position. The inactive city portion of the Sunshine Canyon Landfill is currently undergoing Final Closure Plan approval. Should the proposed landfill expansion project be approved, the proposed end use of the site and the closure conditions (under the existing closure plan for the inactive City portion which in affect at the time) will need to be revised and incorporated into the new closure plan which is to be submitted as part of the permit application to the Local Enforcement Agency. In any case, final cover will be installed on the currently inactive City portion landfill of the site. 205

Section 3.0 Environmental Setting

Section 3.1.7 Light, Local Setting

The description of existing light sources should also include a discussion of light sources used by the existing landfill to illuminate the various working face locations after dark. 206

Section 3.1.11 Transportation and Circulation, Local Setting

It is strongly suggested that an analysis be included in the SEIR on whether a traffic signal should or should not be installed on San Fernando Road at the entrance to the landfill due to the high volume of two-way traffic on San Fernando Road. 207

Section 4.0 Environmental Impact Analysis

Throughout the impact analysis section, mitigation measures include performing activities in accordance with various rules or regulations. These actions should not be considered as mitigation measures, but as operating minimums. Specifically, 208

designs, construction, and operations conducted in accordance with the California Code of Regulations Titles 14 and 27 are expected minimums. If these regulatory minimums are carried out consistently, impacts should be minimized. However, measures taken beyond these regulatory minimums would and should be considered as mitigation measures.

Figure 4.1-1 Existing and Anticipated Soils Stockpile Areas 209
This figure shows that soil will be stockpiled on the top deck of the existing inactive City landfill. Impacts resulting from stockpiling of soil in this area need to be evaluated. Areas covered by the soil stockpile will not be able to achieve permanent vegetative cover until the soil is removed. Settlement of the surface by the surcharge of a soil stockpile should also be evaluated along with any other potential impacts. 210

Section 4.1.4 Geologic Hazards –Seismicity
Page4-40 City Mitigation Measures. It is recommended that provisions be made for a back-up generator to supply power to the gas flare system in the event of any extended power outage. 211

Section 4.2.8 Air Quality Operational Phase (Long-Term)
Page 4-70 Active Working Face Area. The SEIR states that unloading of refuse would not create substantial quantities of dust emissions. Have there been any measurements of dust generation during refuse unloading? Depending on the method, manual vs. automated, and the type of wastes, demolition inert vs. food waste, varying amounts of dust could be generated. Include a discussion on how the determination of insignificance was reached. 212

Combustion of Landfill Gas Emissions
What is the basis for doubling the current emissions limit under the existing SCAQMD permit (3 stations) for flaring LFG to account for both existing (1 station) and future buildout (5 stations) conditions? 213

Section 4.2.13 Odor Impacts
Potential odors associated with the storage and processing of green/wood waste materials could result in negative impacts. These impacts should be evaluated along with possible mitigation measures. 214

Refer to comment on section 2.7.7 Monitoring and Controlling Landfill Gas for sample probe installation. 215

Installment of an odor neutralizing or deodorant misting system should be considered as a mitigation measure in areas of potential odor sources. 216

The SEIR indicates LFG may be used to produce electricity (Pages 4-83 and 4-95). What are the environmental impacts associated with this activity? In what environmental document are these impacts evaluated? If there has not been an 217

analysis, there should be an explanation that when project information is known, there would be a separate environmental review

Section 4.5, City Noise Standards
Page 4-205, Paragraph 4, Plans, and Policies. The section states that "...continue to regulate construction or excavation noise between the hours of 9:00 p.m. and 7:00 a.m. of the following day..." This statement conflicts with the second bullet item "Construction Noise" on the same page. This bullet item states that the limits are between 7:00 A.M. and 6:00 P.M. Verify the correct limiting hours of the City noise ordinance. 218

Sections 4.6 Light and Glare
The environmental impact discussion states that the landfill would be operational during the hours of 5:00 AM to 6:00 PM. While this may be the hours that waste is accepted, the project description states that operational activities such as maintenance would be conducted until 9:00 PM. The potential for light and glare impacts and other environmental impacts from maintenance operations should also be evaluated. 219

Section 4.9.1 Hazardous Materials
Page 4-293, Paragraph 2. If during a load check, or during regular operations hazardous materials are found, the supervisor must contact, in addition to Cal-EPA and DTSC, the Los Angeles County Fire Department Health Hazardous Materials unit. 220

Section 4.9.1 Cumulative Impact
Page 4-296, Paragraph 3. The section states "Buildout of residential projects would increase the amount of HWW inadvertently disposed of in the solid waste stream." Note; Buildout of residential projects will not increase amount of HHW (not HWW), what may increase the amount would be an increase in permitted tonnage which in turn would result in a cumulative increase in HHW. 221

Section 4.9.1 City Mitigation Measures
Page 4-297, Bullet 5. We recommend the mitigation measure for load checks be increased from 1 in 1,000 tons, to 1.5 in 1,000 tons to be more protective. 222

Page 4-297, Bullet 6. DTSC will not provide a hazardous waste identification, that would be provided by the operator or Los Angeles County Health Hazardous Materials unit. 223

Page 4-297, Section 4.9.1. Bullet 9. The City will not "deem an inspector to be qualified through training and experience..." The inspector referred to must be identified clearly. If the inspector is an employee of BFI who will conduct hazardous waste load checks, then it is BFI's responsibility to deem the inspector qualified. The City currently assures that all LEA inspectors are qualified. 224

Section 4.9.2 - Vectors

Environmental Impact (paragraph 1, page 4-300). Oversized tires are often used at landfill sites for road demarcation and securing tarps, etc. Standing water tends to accumulate in these tires, especially after heavy rainfall. This document should include control measures outlining how the operator intends to prevent tires from attracting and propagating vectors on site (especially mosquitoes). If the operator is not going to use tires on site, then inclusion of these control measures is not necessary. 225

Section 4.9.3 - Litter

City Mitigation Measures (paragraph 2, page 4-305). Clarification is needed regarding the phrase, *"...periodic application of cover material during the day and at the end of the working day..."*

Is the operator going to apply cover material periodically throughout the day at the working face? Is this in addition to applying a full daily cover at the end of each operational day? If so, then these two different activities must be distinguished and clarified. 226

Section 4.13.5 Access Roadway in Sunshine Canyon

Realignment of the haul road and relocation of the scale house has the potential to effect the number of vehicles that are able to queue on-site. Approximately how many vehicles will be able to queue on-site after relocation of the scale house? 227

Section 4.14.1 Fire an Emergency Medical Services

The storage of green and wood waste should be discussed as a source of potential combustion. Measures to control any such fires should be explored. 228

Section 7.0 Mitigation Reporting

Table 7.4-1 - Mitigation Reporting and Monitoring Program (MRMP)

4.2.12 – Operations: Construction Equipment (page 7-10). Remove City LEA as an Enforcement Agency. 229

Page 7-26. The following mitigation measure requires further explanation: "Full-time inspectors shall be employed onsite for inspection of waste materials. Full-time inspectors shall be deemed by the City to be qualified through training and experience to perform assigned duties." 230

State who would employ these inspectors. (City of Los Angeles, BFI, or another party? 231 If full-time inspectors are deemed necessary, which City department is responsible for ensuring inspector qualification and training? 232 If the City LEA is responsible then it should be so stated.

Section 7.7 Public Access to Records

State where a public records file will be maintained, such as at a local library. Indicate if regulatory agencies inspection reports will also be included in this file. 233

Section 7.4 Designated LEA

The City of Los Angeles LEA is the designated LEA for the City. BFI cannot designate another LEA. This needs to be made clear in the document. 234

In the Summary Matrix of the environmental impacts under the category Operations 4.2.12, Refuse Trucks page 12, the LEA should be deleted as the monitoring agency for truck operations activity such as truck idling, truck arrival times, and truck loads as these are not LEA requirements. 235

If you have any questions, please call Josephine Gonzalez, LEA Program Environmental Supervisor at (213) 580-1073 or me at (213) 580-1068.

Sincerely,

Wayne Tsuda, Director
Materials and Waste Resources Division

Attachments
WT:JG

MINIMUM REGULATIONS FOR SANITARY LANDFILLS IN THE CITY OF LOS ANGELES

Landfills

(Combustible, Non-Combustible Materials)

September 22, 1971
As Amended December 7, 1973

In accordance with Section 66.15 of the Los Angeles Municipal Code, the Board of Public works may issue revocable permits for the operation of "Fill and Cover" dumps, if in the Boards discretion such dumps are in the public interest. Permits for such dumps will be issued only to the operators.

The following rules and regulations have been established by the Board of Public Works under authority granted in the Los Angeles Municipal code. However, each permit for a dump is issued only after investigation by the Board and the other agencies concerned, of the particular site under consideration.

Specific regulations are set up in each separate permit. These may be more restrictive than the rules and regulator's set forth herein. Deviations may also be granted in accordance with Section VII herein.

I. APPLICATION - REPORT AND PLAN

A. Applications shall be filled with a report that includes the following:

1. Applications for a permit shall be sworn to and include the name, address and telephone number of the proposed operators legal description of the site; name and address or the owner of the site copy of lease or other documents under which the proposed operator is authorized to use the land if he is not the owner.

2. Applications for renewals shall be submitted in writing accompanied by the required bond and a sworn statement as to whether there has been any change in the information submitted with the original application.

3. The name, address, and telephone number of the manager or foreman.

4. Any fictitious name proposed to be used.

5. The proposed method of operation, including the location and depth of cuts, type and availability of equipment to be used, source and quantity of all cover material, water supply, and sewage disposal.

6. Any request for deviations from the rules and regulations together with the reasons therefor, made in accordance with Section VIII.

I. APPLICATION - REPORT AND PLAN (CONT'D)

B. Permits will be issued only to operators.

C. All applications for dump permits shall include a map and plan giving pertinent information relative to the following:

1. The site in its entirety.
2. The current ground water level and maximum high water level of record.
3. Any water ways or channels adjacent to or likely to affect the site.
4. Location of and pertinent information relative to water wells, active or inactive, and springs.
5. The contours of the dump site before and after filling.
6. Type of underlying soil.
7. Existing building locations and proposed building locations.
8. Intended points of ingress and egress, including roads and ramps and including existing or proposed paving or means of controlling dust in streets to be used for ingress and egree which are adjacent to developed areas.
9. Location and type of fence.

10. The operator shall file a report on how much of the filling has been completed and estimated time for completion of the dump, also hours and days of operation, and prices for accepting materials. This shall be due at the time of renewal of a permit or filing of an original application.

D. 1. Seven sets of plans and reports shall be submitted to the Department of Public Works. These are to be checked and approved by all departments or agencies involved before a permit is issued.

2. Permit will be granted only if roads to and from the site which are adjacent to developed areas are paved or a satisfactory method of dust control is installed and maintained.

II. INSPECTIONS

The Board of Public Works of the City of Los Angeles, the Los Angeles County Health Department, the Los Angeles Department of Water and Power, the Los Angeles Fire Department and the State Regional Water Pollution Control Board may make inspections, of the premises involved, the materials accepted for dumping on said premises, and the methods employed in cutting, dumping and filing operations.

III. DUMP (OPERATIONS AND MAINTENANCE (Combustible Dumps)

A. All waste materials placed in the dumps shall be spread, repeatedly run over with a bulldozer and otherwise effectively compacted in successive layers of not to exceed 3 feet compacted depth, except for solid, non-combustible material which is larger than 3 feet in its least dimension. Compaction of all waste material shall be done so as to adequately reduce voids and level the surface to properly support the earth, sand or other approved covering material.

B. Watering may be done to aid compaction providing the quantity and quality of water applied and the method or location of application does not result in ponding to the extent as may cause leaching or otherwise result in leaching from the disposed rubbish or other waste material into, or contamination or pollution of underground water formations. Such watering shall not soak substantial masses of manure and similar materials to such and extent as would be likely to produce spontaneous combustion. Wetting shall be discontinued or sufficiently reduced when the authorized enforcement agency determines such wetting is or may contributing to or producing a neighborhood odor nuisance.

C. Whenever the depth of compacted waste material reaches a maximum of 9 feet the surface shall be suitable leveled, compacted and then covered with earth, sand or equivalent approved materials to provide a depth of such cover of at least 9 inches. Suitable stakes, markers or other approved means shall be provided and maintained when necessary to aid the operator in keeping within this requirement or to aid inspectors in checking compliance.

D. All deposited waste materials shall be covered as required in "C" with the close of each working day, all rubbish not permanently placed and compacted as specified above shall be covered with sufficient earth, sand, gravel, decomposed granite, or other approved material so that no rubbish or refuse is visible on the site. (Section D adopted December 7, 1973).

E. The top surface and all side slopes of all completed lifts shall be maintained so that no rubbish or refuse shall be visible through the cover material and so maintained as to prevent fire and visible discharge of vapor or smoke. Regarding or recovering shall be done as necessary.

F. When the dump is filled to finished grade a final seal of at least 3 feet or well compacted, approved materials shall be applied to the top and all side surfaces, including the completed working face. After any portion of the dump has been filled to finish grade, the final 3-foot seal shall be placed on all such filled area within 60 days. The slope of any finished surface shall not exceed 30 degrees from the horizontal. All finished slopes shall be protected in an approved manner from erosion or similar effects by planting, provision of drainage structures or other methods of equal effectiveness. (Section F Amended December 7, 1973)

G. Dumping operations shall be limited to a working face of not over 150 linear feet in length for each bulldozer. Each bulldozer required herein shall be kept ready and available for leveling and compacting on the dump site at all times when dumping is permitted and shall be operated as much as necessary to meet all requirements hereof.

H. Manure and quantities or masses of organic food wastes, grass cuttings and similar materials shall be spread to a depth of not to exceed 2 feet and, insofar as practical, shall be mixed with other refuse. Such manure and similar materials shall be promptly and thoroughly covered with rubbish and other waste or with approved cover material. The equivalent of only one 2-foot layer of manure or similar organic waste material will be permitted for each 9-foot lift.

I. Waste containing magnesium, oils, paints, varnishes, drugs, medicines, chemicals, phenols, or creosote compounds, acids, brines, caustics, organic industrial waste, dead animals or fowls, garbage, waste from privies or chemical toilets, oil well brines, contaminated and/or oil well drilling muds, oil dehydration tank wastes, tank bottoms, acids sludges, and other liquids, solids, substances or other materials which may deleteriously affect a water supply shall not be accepted for disposal at the sump unless specifically permitted and approved as a deviation under Section VIII hereof.

J. No open fires or burning of any type shall be permitted on the site. Any and all comfort heating devices maintained on the premises shall be approved by the Fire Department.

K. A representative of the dump operator shall be present during dumping operations to control and supervise the activities.

L. The permittee shall remove daily all rubbish that has been dumped within any portion of a public street abuting the disposal site.

M. If found by the Board to be in the public interest, the permit may include the requirement for posting prices and hours when the dump is to be open to the public, and the requirement that the permittee accept rubbish from any person paying the posted fees during those hours. Such signs shall include the name and telephone number of the operator of the dump and a telephone number that one may call during non-operating hours. The information shown on the signs shall not be changed prior to filling with the Board any such change.

N. Dirt may be excavated to elevations established by the permittee and stockpiled on the premises, but shall not be removed or hauled from the dump site without the written permission of the Board of Public Works. (Section N adopted June 2, 1967).

O. Permittee shall be required to confine, to the area covered by permit, gases that originated from the deposit of combustible materials that my be explosive and/or potentially harmful in nature.

1. Permittee shall furnish monthly a report signed by a responsible testing company of readings at each of the test holes placed at 300-foot intervals around perimeter of site indicating the amounts of gas or gases present. Said test holes shall be made accessible to authorized representatives of the Board of Public Works for any tests considered necessary and the expense thereof shall be borne by the Permittee.

2. Any system installed and maintained to prevent migration and eliminate gases shall be subject to approval by the Board of Public Works and other appropriate Agencies.

IV. NON-COMBUSTIBLE DUMPS

Dumps used exclusively for waste material classified as inert or non-combustible material shall be maintained and operated as to avoid creating a dust nuisance. All material shall be placed, leveled or maintained so as to avoid creating rodent harborages.

V. TOILETS

Toilet facilities shall be provided and properly maintained on all dump sites and within 300 feet or the dumping operation. An approved portable chemical toilet, either on wheels or skids, may be used in lieu of a water flushing type toilet.

VI. FENCING - RODENTS AND NUISANCES

A. The property shall be provided with an approved and suitable type of fence or barrier to prevent unregulated or unauthorized entry or dumping. Gates shall be kept closed and locked during hours when the dump is not open for business. Where the operating area is adjacent to or clearly visible from developed property or a street designated as an important traffic artery, it shall be screened by solid fencing or planting of an approved type to a height of 6 feet. Said fence or planting shall be properly maintained at all times.

Suitable fencing shall be maintained where necessary to prevent a neighborhood nuisance caused by windblown paper and debris.
All wooden fences upon any portion of the property covered by the permit shall be neatly painted or stained, and maintained in good repair so as to present a reasonably attractive appearance.
A 6-foot solid fence of approved material shall be maintained along the entire length of the south property line of the dump sites (Wilmington District) or, in lieu thereof, shrubbery may be planted and properly maintained at all times to form a solid 6-foot hedge, provided a 6-foot chain link or suitable wire fence is maintained in connection therewith.
In lieu of the above requirements of this section, the Board may require the permittee, after determining that it is in the public interests, to install and maintain one or a combination of the following methods of landscaping and fencing around any portion or all the disposal site:

1. An 8-foot solid wall, or an 8-foot solid fence, provided with shrubs, plants, or hedges, having a height of at least 3 feet at the time of planting, which will, upon maturity, screen at least 25 per cent of the length of the fence; or

2. An 8-foot chain link fence <u>and</u> earth berm with a height of at least 6 feet, covered with acceptable plants or shrubs, with the berm being on the inside of and immediately adjacent to such fence; or

3. A 6-foot chain link fence topped with 3 strands of barbed wire for a total height of approximately 8 feet with a dense planting screen consisting of evergreen trees and suitable shrubs having a minimum height of 6 feet at the time of planting, adjacent to the interior of the said fence. Subsection 1, 2 & 3 Adopted: August 29,1969

B. No salvage operations will be permitted unless specifically authorized by the permit. Where salvage operations are permitted the salvaged material shall be removed from the premises daily or stored in a closed building of an approved type or within a vehicle as defined in the Vehicle Code, State of California. The residue from salvage operations shall be placed in the current dumping area and covered with earth before midnight daily.

C. Approved methods shall be used to minimize dust in the operations of the dump.

D. Install and maintain in good condition a 20-foot paved roadway within the disposal site from the adjoining public thoroughfare for a minimum distance of 300 feet beyond the entrance and exit gates.

E. Sheds and other building shall be constructed in such a manner as to prevent rodent harborage, be neatly painted or stained and maintained in good repair so as to present a reasonably attractive appearance.

F. Inspection of the premises shall be made by the permittee or his responsible representative at least once each operating day for rodents, insects, vermin and for burrows, droppings, larva or other evidence of vectors. Any infestation shall be immediately controlled by the proper use of poisons, or other suitable remedy, and the area involved shall be subsequently covered the same day with at least one foot of earth, sand, or other approved material.

G. a report shall be filed with the Board, signed by a responsible pest control company, at least once a month showing that the premises have been checked for rodents, the results of such inspection and what measures were taken with respect thereto.

VII. WATER SUPPLY AND DRAINAGE CONTROL

A. An approved water supply for firefighting purposes shall be provided on the premises.

1. Said supply shall be sufficient to supply at least two 1 1/2-inch hose lines each equipped with 1/2-inch nozzle tips in such a manner that they discharge a workable stream for a minimum distance of 20 feet when operating simultaneously. All hose and nozzle tips shall be kept in good condition and ready for instant use.

2. Each hose line shall be limited to 100 feet in length.

3. The hose shall be located so as to cover all portions of the working face of the dump which it is to serve.

4. In the event that the salvage operations are located so that the hoselines will not suffice, then additional fire protection will be required.

5. Water lines supplying the fire hose need not be buried.

6. Additional pipe shall be installed as the working face of the fill progresses, such pipe to be of adequate size and installed in such a manner as to allow for friction loss as the distance to the sump face increase, in order that sufficient volume and pressure may be had at the nozzles at all times.

B. An approved sanitary drinking supply shall be provided on the site.

C. All surface waters shall be diverted from the site so as to prevent percolation through any of the dumped material or erosion of the cut sections of the dump. This diversion may be accomplished by placing an impervious dike around the dump area, taking all precautions necessary to assure that any waters diverted by said dike shall be guided to proper storm drain facilities, or as so ordered.

D. Dumping operations shall be kept a distance of at least 50 feet from the official right-of-way of any watercourse or proposed drainage channel unless a lesser distance is specifically permitted and approved as a deviation under Section VIII.

E. No excavation shall be made to a depth greater than 10 feet above the maximum recorded ground water table. Any existing areas which are below this depth shall be filled with clean earth or sand and well compacted. Where ground water elevation records indicate that it is safe to do so, a variance from the 10-foot distance stated above may be granted as a deviation under Section VIII.

F. Sufficient permanent bench marks 4"x4" wood posts or 2" metal posts or similar markers shall be installed and maintained indicating elevations, as specified in the permit.

VII. DEVIATION FROM REGULATIONS

Permission to deviate from certain requirements as noted herein, will be considered upon written application to the Board of Public Works and may be granted by said Board only after concurrence and written approval is obtained from each of the other departments concerned.

IX. SURVEY BOND

A. That a bond from an approved survey company in the sum of at least $10,000 approved as to form by the City Attorney and payable to the City of Los Angeles shall be filed with the City of Los Angeles, indemnifying the said City against any liability for damages or expense in the event of damage to City-owned or other public facilities or rights by any operation conducted pursuant to the permit, or to defrey expenses or damages in the event that said City or its agencies find it necessary to undertake corrective measures as a result of dumping-operations to protect the public health, safety, and welfare. Further, that such bond shall be continued in full force and effect for a period extending from the effective date of the permit to a date two years subsequent to the termination of the authority granted therein, or for a period of two years subsequent to the date that said operations are wholly and completely abated including the placing of the 3 feet of final cover as required in Section III "F" of these regulations.

B. In the case of applications or renewals where a bond has been deposited as a prerecuisite of zoning variance, a copy of the bond shall be submitted with the application.

X. ENFORCEMENT

The enforcement of the provision or conditions of this permit shall be the responsibility of the Department of Public Works.

Permits may be suspended or revoked by the Board of Public Works because of violation of the provisions of these regulations or other applicable provisions of the Los Angeles Municipal Code or State laws or regulations. Nothing in these regulations shall preclude enforcement of applicable provisions of the Municipal Code or State Law by the duly responsible agencies.

PC402/PMW/adm

APPENDIX C5

Local Agencies

Letter 3.7-1

CITY OF Glendale CALIFORNIA

633 E. Broadway, Room 103, Glendale, CA 91206-4386 • (818) 548-2140 (818) 548-2144
(818) 548-2115 FAX (818) 240-0392

Planning Division

RECEIVED
CITY OF LOS ANGELES
AUG - 5 1997
ENVIRONMENTAL
UNIT

July 31, 1997

Hadar Plafkin
City Planner
City of Los Angeles
Dept. of City Planning
Environmental Review Section
221 N. Figueroa St., Ste. 1500
Los Angeles, CA 90012

RE: EIR Case No. 91-0377-ZC/GPA
Sunshine Canyon Landfill
Ref. No. SCH No. 92041053
14747 San Fernando Rd., Sylmar

Dear Mr. Plafkin:

Thank you for the opportunity to respond to the draft EIR for the Sunshine Canyon Landfill.

After review of the document it has been found that the project will have no impact on the City of Glendale or its operation. 236

Sincerely,

John W. McKenna
Director of Planning

David A. Bobardt
Planner

DAB:pv

PRINTED ON RECYCLED PAPER

Letter 3.7-2

Public Works
25663 W. Ave. Stanford
Santa Clarita
California 91355-1103

Phone
(805) 294-2500
Fax
(805) 294-2517

City of
Santa Clarita

December 5, 1997

Ms. Irene Paul, Associate Planner
Environmental Impact Report Coordinator
City of Los Angeles
Department of City Planning
221 North Figueroa Street, 15th Floor
Los Angeles, CA 90012-2601

SUBJECT: Comments on the Sunshine Canyon Landfill Subsequent Environmental Impact Report (SEIR, SCH No. 92041053)

Dear Ms. Paul:

Thank you for allowing us the opportunity to review and comment on the above-referenced SEIR for the proposed expansion of the Sunshine Canyon.

Over the past eight years the City of Santa Clarita has stayed actively involved in the regional solid waste planning process. Initially, our focus was primarily that of opposition to the placement of new landfills at multiple locations adjacent to the City limits. For the past several years, however, a considerable effort has been made to focus on the broader issues of solid waste management. The GBB Report, the UCLA Policy Summit, and other current efforts to focus the concerns of the cities throughout the County have all been undertaken with the goal of providing constructive input into the planning process. We have undertaken our comments on the SEIR document with this, as well as the CEQA Guidelines, in mind. 237

Based on our review and understanding of the Draft SEIR prepared for the Sunshine Canyon Landfill expansion project, we offer the following comments and observations for your consideration in the Final SEIR. 238

1) The SEIR contains numerous references to the proposed Elsmere Canyon Landfill as a 190-million ton facility, located in the Angeles National Forest, having a footprint of 700+ acres and an operational life of from 50 to 100 years. As you may be aware, this iteration of the proposed Elsmere Canyon landfill has been dropped from consideration by the United States Forest Service (USFS), and the County of Los Angeles Regional Planning Department, the regulatory agencies involved in processing the request. 239

PRINTED ON RECYCLED PAPER

Specifically, the Omnibus Parks and Public Lands Management Act of 1996 prohibits the use or trade of land within the Angeles National Forest for use as a landfill facility. The Act was signed into law by President Clinton on November 12, 1997, effectively ending consideration of the 190-million ton proposal by the USFS. The USFS subsequently requested of the property owner, Browning Ferris Industries (BFI), that the case be withdrawn and BFI has complied. County Regional Planning has also requested in writing that the project be withdrawn from consideration, and though BFI has not complied with this request, County Regional Planning staff is no longer actively processing the proposal. Additionally, County senior management staff have publicly stated that Elsmere Canyon will not be developed as a landfill. 240

In light of the above, we would recommend that all references to the development of Elsmere Canyon as a landfill be deleted from the SEIR. 241
Failing that, we request that language be added to the SEIR that the Elsmere Canyon landfill proposal identified in therein is no longer actively under consideration, nor is it at this time a viable or legal landfill development option. 242

2) The proposed expansion project does not include the development of an associated on-site Materials Recovery Facility (MRF) to complement existing recycling and composting activities at the landfill site. Reconsideration should be given to the provision of a MRF at this location insofar as it would assist the City of Los Angeles, and the region, to meet AB 939's mandated diversion goal of 50%, and the City's own adopted goal of 70% diversion. To not implement a MRF at this location appears to be a sorely missed opportunity for both the public and the applicant. 243

3) Our review of the air quality section indicates that the section is difficult to read and is unclear. Impacts are addressed in a number of different ways, rely on studies done at different times and under varying conditions, and generally do not clearly convey information to the lay reader. 244 The air quality impacts of this project exceed components of both state and federal statutes, and this should be clearly stated. 245 Ultimately, the air quality impacts of this project are adverse and unavoidable even after mitigation measures are applied. 246
Additionally, the Health Risk Analysis (Section 4.2.9) set forth on page 4-64 discusses SCAQMD guidelines. Care should be taken to identify whether the Health Risk Analysis undertaken pursuant to SCAQMD standards will also meet those required under the federal Clean Air Act; it is our understanding that the requirements vary between the acceptable levels, parts per million, 247

between the state and federal, with the federal being the less permissive of the two.

This concludes our comments on the Draft SEIR at this time. If you have any questions or concerns, please call me at (805) 294-2522.

Sincerely,

Donald M. Williams
Senior Planner

DMW:js

SADMIN\LANDFILL\SNSTINEIR.LTR

APPENDIX C6

Other Interested Parties/Organizations

Los Angeles Unified School District

Letter 3.8-1

Facilities Services Division

Ruben Zacarias
Superintendent of Schools

Beth Louargand
General Manager

Bob Niccum
Director of Real Estate and Asset Management

Environmental Review File
Sunshine Canyon Landfill

RECEIVED
CITY OF LOS ANGELES
DEC 10 1997
ENVIRONMENTAL
UNIT

December 3, 1997

Los Angeles City Planning Department
Environmental Review Section
221 North Figueroa Street, Room 1500
Los Angeles, CA 90012
Attention: Hadar Plafkin, City Planner

Dear Mr. Plafkin:

Re: SUNSHINE CANYON LANDFILL SUBSEQUENT ENVIRONMENTAL IMPACT REPORT (SEIR) NO. 91-0377-ZC/GPA

Thank you for giving the Los Angeles Unified School District the opportunity to comment on the SEIR for the Sunshine Canyon Landfill project.

The air quality at three local schools – Van Gogh Street and El Oro Way Elementary Schools, and Robert Frost Middle School – could be affected by the project. Therefore, adequate and feasible mitigation measures must be incorporated into this project to address potential impacts on these schools and reduce those impacts to a level of insignificance. 248

The attached comments from the District's Environmental Health and Safety Branch discuss the air quality impacts and propose mitigation measures to address such impacts. 249

If you need additional information, please call me at (213) 633-8985.

Very truly yours,

Patricia Dean
Environmental Review Unit

Attachment
c: Ms. Korenstein
Ms. Louargand
Mr. Koch
Mr. Arabzadeh
Mr. McCallum
Ms. Diekmann
Mr. Frydman
Ms. Manning
Mr. Monares

REAL ESTATE AND ASSET MANAGEMENT BRANCH: 355 South Grand Avenue, Suite 500, Los Angeles, CA 90071
Telephone (213) 633-7581 • Fax (213) 633-7546 • e-mail: realestate@lausd.k12.ca.us

INTER-OFFICE CORRESPONDENCE
Los Angeles Unified School District

TO: Joan Friedman, Environmental Planning Associate
Real Estate and Asset Management Branch

Date
December 1, 1997

FROM: Bill Piazza
Environmental Health and Safety Branch

SUBJECT: Sunshine Canyon Landfill: SEIR

In response to your request to provide comments on the air quality element for above referenced project, the following is provided.

Upon review of the available documentation presented in the Subsequent Environmental Impact Report (SEIR) staff notes that the applicant readily proclaims particulate (PM_{10}) and nitrogen oxide (NO_x) emissions associated with construction of the proposed project would produce "adverse" and "significant" air quality impacts. Operational impacts were also reported to be "adverse" for PM_{10}, NO_x and carbon monoxide (CO). However, staff believes that even with the applicant's admission of the project's significant impacts, their analysis is erroneous in its approach to quantify contaminant values with the use of outdated predictive emission equations and assumptions that favor under prediction. 250

For example, the applicant utilizes soil testing data collected from a site located approximately 10 miles from the proposed project to develop a fractional profile of total suspended particulates (TSP) to particulates ≤ 10 microns (PM_{10}). As such, the value utilized by the applicant was 28.6 percent. Based on this value, a daily PM_{10} generation rate, assuming a water spray application to suppress dust, was estimated to be 158 pounds per day. Nevertheless, the California Air Resources Board (CARB) and South Coast Air Quality Management District (SCAQMD) recommend higher fractional values of 55 and 50 percent, respectively. In addition, the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards (OAQPS) "strongly recommends" that "site-specific data" be utilized when generating emission estimates with approved predictive emission equations. In the absence of such data, a standard or recognized default value must be used. Therefore, to exemplify the applicant's attempt to under predict particulate generation, use of the 50 percent fractional value will yield a daily emission rate of 303 pounds. As such, the applicant underestimates the daily emission rate by 145 pounds. 251

In addition, the applicant predicts particulate emissions associated with vehicular travel on paved surfaces within the boundary of the landfill will emit approximately 3,333 pounds per day. Assuming a control efficiency of 95 percent for a twice daily water application, the daily generation rate is approximately 167 pounds. Notwithstanding the applicant's approach to quantify particulate generation, they base this estimate on a predictive emission equation that is no longer valid. If one utilizes the current OAQPS emission factor equation and applies the applicant's control efficiency of 95 percent, the 252

emissions generated from truck travel on paved roads within the landfill are predicted to be 275 pounds per day. As a result, the applicant underestimates the daily PM_{10} generation rate by 108 pounds.

However, even with the significant discrepancy in particulate source strength noted above and their admission of the project's adverse affect on local air quality, implementation of proposed mitigation measures will not limit the degradation of air quality and project related impacts remain significant and unavoidable. 253

As result of the project's potential to degrade local air quality, staff is concerned for the health of the students and staff attending schools in proximity of the proposed landfill. To underscore our concern, the South Coast Air Quality Management District reports "Inhalation of particulates may cause coughing, wheezing, and physical discomfort in breathing, and may alter the immune system. Elevation in the level of ambient particulates has been linked to increased mortality, respiratory infections, asthma attacks, and aggravation of pre-existing respiratory and cardiovascular diseases. The results of these conditions include increased hospitalizations, and school and work absences (SCAQMD 1997)." 254

NO_x refers to a mixture of nitric oxide (NO) and nitrogen dioxide (NO2) compounds. However, it is reported that NO reacts rapidly to form NO_2 in and around areas with high NO_x generation rates. Exposure to NO_2 will elicit or alter sensory responses. Impaired pulmonary function, increased incidence of acute respiratory disease and difficulty in breathing for individuals afflicted with bronchitis especially young children have also been documented (SCAQMD 1994). 255

Adverse health effects associated with CO exposure result primarily from its ability to displace oxygen and bind with the hemoglobin in the blood, reducing the capacity of the blood to carry oxygen. Exposure to CO may elicit mild headaches and breathlessness with moderate exercise. Continued exposure may lead to severe headaches, irritability, impaired judgment and memory, and rapid onset of fatigue (Cal/EPA, 1995). 256

As a result, contaminant emissions generated from construction and operational activities, as presented in the SEIR, are considered unacceptable and necessitate appropriate mitigation for students and staff who work and/or attend class at the neighboring Van Gogh Street, El Oro Way and Robert Frost Middle school sites. 257

Unless the applicant can quantify through the application of revised emission estimates and associated dispersion modeling that project related emissions will not contribute to an existing air quality violation or expose sensitive individuals to substantial pollutant concentrations, the applicant must provide effective offsite controls to minimize contaminant infiltration within occupied building structures. 258

Offsite controls shall mean the installation of local air purification systems which exhibit a control efficiency of not less than 95 percent for particulates (≤ 10 microns) 259

gases and vapors. Additionally, outdoor ancillary structures used by students and staff during lunch and recess (i.e., tables and benches) shall receive periodic cleaning to minimize particulate deposition and subsequent reentrainment. 260

Please advise as to the disposition of this memorandum and subsequent response by the applicant. I can be reached at (213) 743-5086 should you have any questions or need additional information. 261

:bp

Approved: Dianne Doi, Deputy Branch Director

Letter 3.8-2

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
Environmental Review Section

Date: July 25, 1997

TO: Owners of Property and Occupants Within a 2-mile radius

NOTICE OF COMPLETION AND AVAILABILITY OF
DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT NO. 91-0377-ZC/GPA

SITE LOCATION: 14747 San Fernando Road, Sylmar, CA 91342

A development project has been proposed for this site, for which the captioned draft subsequent environmental impact report has been prepared. The project is described as: Consisting of the development, operation, maintenance, and monitoring of a Class III, nonhazardous solid waste landfill (herein, City/Country Landfill on proposed project). A portion of the proposed City/County Landfill footprint is located on ±194 acres within the City portion of Sunshine Canyon and provides an estimated net airspace disposal capacity of 55 million tons within the City.

Initially, the City and County landfill areas would be operated separately and provide an average daily capacity of 5,000 tons per day (tpd) in the City and 6,000 tpd in the County. However, within 18 to 24 months following the commencement of landfilling operations in the City, the City and County landfilling operations would be subsequently combined into a single landfill operation and at one working face area. This would allow for an average waste intake rate of 11,000 tpd. The combined development of land within both jurisdictions would result in one landfill footprint being constructed in Sunshine Canyon. The landfill footprint configuration would ultimately encompass ±451 acres.

Anticipated significant effects on the environment are: Earth Resources, Air Quality, Surface and Groundwater, Biological Resources, Noise, Light and Glare, Land Use, Natural Resources, Risk of Upset, Population, Housing, Right-of-Way and Access, Transportation and Circulation, Public Services, Energy Conservation, Utilities, Safety, Aesthetics/View and Cultural Resources

If you wish to review a copy of the draft subsequent environmental impact report (EIR) or the documents referenced in the DEIR, you may do so at 221 N. Figueroa Street, Room 1500, Los Angeles. Copies of the DEIR are also at the following locations:

Planning Department Branch Office:
Valley, 6255 Van Nuys Blvd., Van Nuys, CA 91401

Library Branches:
Canoga Park Branch, 7260 Owensmouth Ave., Canoga Park, CA 91303-1529
Chatsworth Branch, 21052 Devonshire St., Chatsworth, CA 91311-2314
Granada Hills Branch, 10640 Petit Ave., Granada Hills, CA 91344-6452
Central Library, 630 W. Fifth St., Los Angeles, CA 90071

(CONTINUED ON PAGE 2)

Mid-Valley Regional Branch & Bookmobile Headquarters, 16244 Nordhoff St., North Hills, CA 91343-3806
Northridge Branch, 9051 Darby Ave., Northridge, CA 91325-2743
Porter Ranch Branch, 11371 Tampa Ave., Porter Ranch, CA 91326-1729
Sylmar Branch, 13059 Glen Oaks Blvd., Sylmar, CA 91342
Encino-Tarzana Branch, 18231 Ventura Blvd., Tarzana, CA 91356-3630
Valencia Branch, 23743 W. Valencia Blvd., Valencia, CA 91355
Woodland Hills Branch, 22200 Ventura Blvd., Woodland Hills, CA 91364-1599
Platt Branch, 23600 Victory Blvd., Woodland Hills, CA 91343
Culver City Library, 4975 Overland Ave., Culver City, CA 90230
San Fernando Library, 1050 Library St., San Fernando, CA 91340

If you wish to submit comments following review of the Draft EIR, please reference the file number on first page, and submit them in writing by October 31, 1997

Send Comments to: Los Angeles City Planning Department
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

Contact Person: Hadar Plafkin, (213)580-5554

If a public hearing is required for the approval action on the underlying project (i.e. subdivision, zone change, conditional use, variance etc.) a separate hearing notice will be mailed to you at a later date for such purpose.

CON HOWE
Director of Planning

for Hadar Plafkin
City Planner

CP-6808 (4/96)

Do not work the Sunshine Cyn Dump the Board is seeing them!!! Take more location! Make them use the time they have as they are supposed to!

262

[illegible]
[illegible]
[illegible]

Letter 3.8-3

RECEIVED
CITY OF LOS ANGELES
JUL 2 9 1997
ENVIRONMENTAL
UNIT

re: Report No. 91-0377-ZC/GPA

Hadar Plafkin
City Planner

We have been residents at our present location for nearly 30 years. Throughout this period, we and our neighbors have been in a nearly constant struggle with government officials and landfill proponents to control and or desist unsavory operations in Sunshine Canyon.

When the Santa Ana winds occur, we have been inundated with debris and leavings blown from the dump. The most disastrous event was a firestorm in this area, which occurred a few years ago. Although blame was never publicly placed, the fire started from the area of the dump. 263

Therefore, in the most rigorous way, we vehemently oppose this proposed landfill project. 264

Which beckons a much broader issue: Why is it that citizens,such as ourselves, and not appointed and elected officials bear the brunt of defense against such unsafe environmental proposals?

Sincerely

Joycelyn Turner

Joycelyn Turner

Davidson Turner

Davidson Turner
17512 Tuscan Drive
Granada Hills, Calif. 91344

Letter 3.8-4

ANHEUSER-BUSCH COMPANIES

July 29, 1997

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AUG - 5 1997
ENVIRONMENTAL
UNIT

Mr. Hadar Plafkin
Los Angeles City Planning Department
221 N. Figueroa Street, Room 1500
Los Angeles, California 90012

Re: Proposed Sunshine Canyon Landfill Site

Dear Mr. Plafkin,

Anheuser-Busch Sales and Services of Sylmar recently received a letter from your office notifying us of a proposed landfill site within two miles of our facility. The letter further indicated that a copy of the Environmental Impact Report (EIR) would be available for review at a variety of public library locations in the Los Angeles area. In a telephone conversation with you today you indicated that the EIR contains multiple volumes but that a summary document of this EIR may become available. I would like to request a copy of this summary document should it become available. You may mail the summary document to the following address: 265

Anheuser-Busch Companies, Inc.
One Busch Place (202-4)
St. Louis, MO 63118-1852

Attn. Blair Norris - Environmental Affairs Department

Please notify me if there is a charge for this document. If you have any questions regarding this request please contact me at (314) 577-4365.

Sincerely,

Blair Norris

Blair Norris
Environmental Engineer
Corporate Environmental Affairs

Anheuser-Busch Companies Inc.
Executive Offices
One Busch Place
St. Louis MO U.S.A. 63118-1852
Telex 44-2340 ANHEUSCH UT

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July 30, 1997

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
ENVIRONMENTAL REVIEW SECTION
221 NO. FIGUEROA STREET, ROOM 1500
LOS ANGELES, CALIFORNIA 90012

CONTACT PERSON: HADAR PLAFKIN

I have received a letter dated July 25, 1997 entitled, "Notice of Completion and Availability of Draft Subsequent Environmental Impact Report No 91-0377-ZC/GPA.

I am an owner of property within the 2-mile radius of the Site Location: 14747 San Fernando Road, Sylmar, CA 91342

These are my comments.

I have lived on Daryl Avenue, Granada Hills, CA for 29 years.

There is not enough space or energy to express my feelings regarding this project which has been a source of great concern for those of us who live here. This project would not be remotely considered as a landfill if the powers that be would honestly come out and look at the facts and research the environmental impacts such a mega-dump will have on so many people for such a long, long period of time as well as quite possibly contaminate the water supply of the City of Los Angeles. 266

I hope this situation is give the most grave consideration as it is truly over-whelming -- the consequences. 267

Now, we in Granada Hills have been able to re-construct our homes and business' after the earthquate three + years ago, we were able to cope with the recession of the past few years, the fires which have plauged us here in the hills in the past, but this mega-dump is something over which we have no control -- such a project is ad infinitum. 268 The destruction of the mountains to create it -- can't reconstruct a mountain, 269 can't control waste liquification below the ground from the garbage and filth, 270 can't control the stench as the trash is deposited into a beautiful neighborhood which has long been established here. 271

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AUG - 7 1997
ENVIRONMENTAL UNIT

When President Clinton gave his inaugural address, and I am quoting him, he said at one point in his speech, "Our children should not have to play at the edge of garbage dumps in our cities but in parks. It is my desire to accomplish this for our American children during my administration."

This Sunshine Canyon Dump is "0" feet from O'Melveney Park, the largest park in Los Angeles, second only to Griffith Park. It is also adjacent to Bee Canyon Park where only recently playground equipment has been installed for pre-school children. We have zero grafetti up here, almost never hear a police siren, have pride of ownership and take care of our neighborhoods and each other. 272

The Van Gogh Elementary School, which was totally demolished in the earthquake has just been rebuilt and will open for the Fall session the cost of which is unknown to me. It is approximately 8 to 10 blocks from the edge of the landfill property. 273

A footnote:

August 1, 1997

Tonight on the 5:00 p.m. Channel 4 news with Paul Moyer, it was reported a geological survey has determined that Granada Hills, Santa Clarita, and other Northern areas of the San Fernando Valley are prone to eqrthquakes previously not considered because of a condition known as liquification of the soil. Hal Fischman on Channel 5 at 10:25 gave a similar report, however more extensive and maps were shown on the TV which I am sure are available to the City of Los Angeles Environmental people. We also know that waste and garbage is prone to liquification after a period of time after it is under ground. 274

We all know our lives, as they are controlled by this imminent project, are held in the hands of a few men - the County Board of Supervisors and the Los Angeles City Council. It is time again for us here in this lovely area (this 2-mile radius of the Sunshine Canyon Landfill) to stand up and be counted. 275

Write to your City Council, The Board of Supervisors and to this Department of City Planning.

Respectfully.

Letter 3.8-6

RICHMONT
Investment Property Services, Inc.

July 31, 1997

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AUG 01 1997
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UNIT

Mr. Hadar Plafkin
City Planner
City of Los Angeles
Department of City Planning
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

Re: **14747 San Fernando Road**
Sylmar, CA 91342

Dear Mr. Plafkin:

We would appreciate receiving from you as soon as possible a copy of your executive summary or summary report of the draft subsequent environmental impact report (EIR) No. 91-0377-2C/GPA pertaining to the above referenced property. **276**

Please forward this information to us as soon as it may be available from your office. If possible, two copies would be greatly appreciated. If there is a charge for this information please contact us as soon as possible so payment may be arranged.

Thank you for your assistance in this matter.

Sincerely,

George R. Monte
Principal

cc: Beverly Foster
Standard Real Estate Investors

107 West Lemon Avenue • Monrovia, California 91016
(818) 836-1000 • FAX (818) 836-1008

Letter 3.8-7

12715 Goethe Place
Granada Hills, CA 91344
August 4, 1997

Los Angeles City Planning Dept.
Environmental Review Section
221 N. Figueroa St., Rm. 1500
Los Angeles, CA 90012

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Re: 91-0377-ZC/GPA

Dear City Planner:

Please, please do no allow the site at 14747 San Fernando Road, Sylmar, CA 91342 to be used as a landfill. The Sunshine Canyon landfill is already polluting our community and we need less, not more, dumping of debris, etc. in our community. **277**

My husband and I moved out here with our children about 20 years ago. Prior to moving here none of us had any allergies. After a year, we were all getting allergies. At first we did not know why, but speculated it was the Sunshine dump. Now we are positive it was caused by the dump because after it closed, our allergies seemed to clear-up. (Not right away, but a year or two later.) **278**

Also, there is a continuous amount of debris and dust in the air. Again, when the dump was in operation, the inside of our home, our garage, and even our cars were always dusty, even shortly after cleaning. When the dump closed, there was a very noticeable difference. The inside of our home did not get as dusty and the cars stayed cleaner longer. Likewise when the dump went back into operation, everything got dusty again. **279**

Of course there are other environmental factors of concern to us. There is always the problem of leakage and contamination of the soil and underground water, which can cause chronic diseases if undetected. It sometimes takes years before one of these diseases develop, and then it is too late. **280** Of course, there's the known pollution from dump trunks coming into the dump area, too. **281**

Finally, it is just not fair that the "Valley" (*Our location in the valley has been singled out to receive trash for a period of time way in excess of that initially agreed to when dumping first began*) has to be the receptacle for all of Los Angeles' trash. Los Angeles is a large county and there are other areas which should be used for dumping. In fact, each supervisial district should be responsible for its own trash. **282**

Therefore, I respectfully ask that you deny the project as described on your notice 91-0377-ZC/GPA.

Respectfully Submitted,,

Sharon E. Yackey
Taxpayer and Responsible Citizen

Cd: Hal Bernson
City Councilman

Letter 3.8-8

CARNEVALE & LOHR, INC.
MARBLE AND GRANITE
6521 Clara Street Bell Gardens, California 90201
(562) 927-8311 Fax (562) 806-2797

August 7, 1997

Los Angeles City Planning Department
Environmental Review Section
221 N. Figueroa St., Room 1500
Los Angeles, CA 90012

Attention: Hadar Plafkin
Re: 91-0377-ZC/GPA
Site Location: 14747 San Fernando Rd
Sylmar, CA 91342

Dear Hadar,

In reference to the development project that has been proposed to be situated within the City portion of Sunshine Canyon. I am vehemently opposed to the idea of developing, operating and maintaining, and monitoring a Class III, nonhazardous solid waste landfill within or near the confines of populated domains. The anticipated effects on the environment are not in my personal best interest, my family's or my neighbors'. The negative effects are far more numerous than the positive impact that it could have for public use. I would suggest that a project with such anticipated effects on the environment and society be relocated to an area far removed from any areas where people will be residing; even if relocation means increased fees to transport the nonhazardous solid waste. 283

Regards,

Louie Carnevale
LC/lh
development project
landfill sylmar
8-7-97

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AUG 1 2 1997
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UNIT

Letter 3.8-9

LASER
Landfill Alternatives Save Environmental Resources

Participating Organizations:
- Citizens Against the Chiquita Canyon Landfill Expansion
- Coalition of West Covina Homeowners Associations
- Communities United for Safe Trash Management
- Foundation for the Preservation of the Santa Susana Mountains
- Friends of Caballero Canyon
- Friends of Pico Canyon
- Friends of Towsley Canyon
- Hacienda Heights Improvement Association
- Kagel Canyon Civic Association
- Mothers and Others Against the Dump
- North Valley Coalition
- Ridge Trail Park Trust
- Santa Clarita Citizens' Transportation Association
- Santa Clarita Civic Association
- Santa Clarita Oak Conservancy
- Santa Clarita Organization for Planning the Environment
- Santa Clarita Valley Canyons Preservation Committee
- Santa Susana Mountain Park Association
- Save Our Sylmar
- Save the Angeles Foundation
- Val Verde Civic Association

Founding Members:
Ed Ayres
Glenn Bailey
Rona Berger
Allan Cameron
Frank Cox
Mary Edwards
Jan Hinkston
Ann Irvine
Vera Johnson
Jill Klajic
Marsha McLean
Arlene Mead
Chip Meyer
Mike Ormsby
Karen Pearson
Lynne Plambeck
Sue Vila
Rob Zapple
Anne Zihak

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8-8-97

Mr. Hadar Plafkin
Los Angeles City Planning Dept.
Environmental Review Section
221 N. Figueroa St.
Los Angeles, Ca. 90012

Re: Sunshine Landfill Expansion Draft Subsequent Environmental Impact Report #91-0377-ZC/GPA

Dear Mr. Plafkin:

We are a California non-profit organization made up of civic groups homeowners associations and environmental organizations throughout Los Angeles County. We have been active participants in solid waste issues in Los Angeles County since 1990.

Our organization commented extensively on the Sunshine Landfill Expansion during the County process. We were therefore surprised not to receive a copy of the DEIR for the City expansion. We have several members who are interested in different aspects of the project and therefore request a copy of the DEIR so that we may photocopy and divide it between our members. 284

We hope you will send us this document at the as soon as possible. Thank-you in advance for your help.

Sincerely,

Lynne A. Plambeck
Chairperson

23942 Lyons Avenue, Suite 103-353 • Newhall, CA 91321-2423 • (818) 845-7652

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SEP 24 1997
ENVIRONMENTAL
UNIT

17 August 1997

Donald T. Kasper
12356 Jolette Ave.
Granada Hills, CA 91344

Los Angeles City Planning Dept.
Hadar Plafkin
Environmental Review Section
221 N. Figueroa St, Room 1500
Los Angeles, CA 90012

Re: Comments on EIR No. 91-0377-ZC/GPA, A Class III Landfill in Sunshine Canyon

Dear Mr. Plafkin,

I am writing in response to section 4.2 (Air Quality) which describes the weather patterns and predicted airborne contaminant dispersion as a result of the landfill operation in Sunshine Canyon.

The EIR describing the windflow patterns is pathetically poor science. Its tries to state that mild winds from the South occur year-round, blowing any possible air contamination into the Northern canyons and away from the Los Angeles basin. This is patently untrue. **285**

I have attached an article I published in the Journal of Applied Meteorology which describes Winter wind conditions in the San Fernando Valley (SFV) as those winds blow through the Newhall Pass (and over Sunshine Canyon). This report, like all the others describing winds in the SFV, were not mentioned in the EIR. **286**

The basis of my complaint is the following:
The Santa Ana winds flow through three mountain passes from the High Desert into the Los Angeles Basin. They are the: Newhall Pass, Santa Ana Canyon, and Cajon Pass. The duration and extent of these winds is so great within the Newhall Pass, I conducted a tree study sponsored by California State University, Northridge showing the amount of tree deformation due to the winds, and correlated that with spot windvane anemometer observations throughout the pass and the mountains on either side of the pass. A reprint of that article is enclosed. **287**

Winds on the West side of the pass are much stronger that the East side. I have clocked winds to 65 mph with sustained winds of 40 mph on the East face of Oat Mountain (just West of the dump) on many occasions. The winds occur prevalently from October through May. Taking the 6 event number quoted in the EIR and multiplying by 10 for a total of 60 events per year is the most probable number reflecting what actually occurs there.

The wind blows from NW to NE. Strong Santa Ana events dominate from the NE covering the Central and Western SFV. Some of that wind blows down the canyons of Oat Mountain. Most of these canyons are oriented along a NW-SE axis, blowing a large component of winds from the NW and down the foothills of Oat Mountain in the Central SFV. Unfortunately for Sunshine Canyon whose top dumping zone will be at 2100 feet, this wind sheer occur along the canyons of Oat Mountain at an elevation of 1500 feet. **288**

What occurs during the Winter half of the year is a fan dispersion of enormous force that focuses at the Northern apex of the SFV, and disperses into the entire valley. **289**

↓

Unless of course, the winds are mild, and there is a strong inversion. In that case, the winds skip over the inversion much like tossing a pebble onto a lake, where the winds extend as far as Catalina, kicking up large ocean swells there.

One of the largest canyons in the Oat Mountain area is Bee Canyon. This canyon diverts a significant component of the Santa Ana's, and funnels them into Granada Hills and the Van Norman Lakes. These lakes provide a significant part of the water for Los Angeles, and have the unique distinction of being post-processing reservoirs. That is, the water from the California Aqueduct is treated then poured into the lakes. From there is goes directly into the drinking water supply. **290**

These observations occurred over a decade before the Sunshine EIR. It is attached for your edification. The wind rose presented in figure 4.2-2 should either be labeled "Summer Wind rose for the SFV", or be thrown out altogether as a complete misrepresentation of the annual winds of the SFV. **291**

One interesting item was not mentioned in the EIR. The Santa Clarita area, including the Newhall Pass has a large accumulation of oil wells and oil processing facilities. Many sites have gas flaring towers to burn off the natural gas collected with the oil pumping. It is surprising that the EIR never considered what will happen in Santa Ana events when Northerly breezes from these fields and their NOx and SOx contaminants mix with dump gases. **292**

In my review of the literature, there was an interesting report about SFV sea breezes. Your report shows only breezes coming up from Burbank which occur during Catalina eddy conditions. But what about other times? One of the most common sea breezes in the SFV is a Westerly breeze that originates in the Oxnard plain, blowing West over the Simi Hills, and into the SFV. This creates a sea breeze front with mixing and strong vertical currents in its path. The vertical rise is large enough that a line of clouds oriented North to South periodically demarcates the front. The sea breeze moves East, stagnating against the San Gabriel mountains of the Eastern SFV. **293**

This produces a stagnation effect that serves to trap pollution in the SFV. Unlike the "it will dump out of the valley at Burbank and go away" conclusion of the EIR, repeated strong onshore flows in Summer will serve to accumulate pollution in the Central and Eastern SFV. Combined the Summer diurnal land breeze ejecting dump gases down the Canyons of Oat Mountain and the Newhall Pass, there is much less circulation and cleansing of SFV air than the report would indicate.

Mitigation:
The Santa Ana winds are prevalent and strong in the Western Newhall Pass during Winter. The only mitigation feasible (short of closing the dump) is to monitor the winds along the ridge defining the Western part of the dump. When winds exceed some threshold (say, sustained for some interval over 25 mph), dumping should occur for the next 24 hours at lower elevations. **294**

Regards,

Donald Kasper
Ph: (562) 593-9153
Email: kasper@lainet.com

enclosures

Reprinted from JOURNAL OF APPLIED METEOROLOGY, Vol. 20, No. 11, November 1981
American Meteorological Society
Printed in U. S. A.

Santa Ana Windflow in the Newhall Pass as Determined by an Analysis of Tree Deformation

DONALD T. KASPER[1]

Department of Geography, California State University, Northridge 91324

(Manuscript received 6 March 1980, in final form 2 July 1981)

ABSTRACT

A tree deformation study was conducted in a suburban area of the Newhall Pass (located to the north of Los Angeles, California) to determine the direction and intensity of the Santa Ana windflow. Trees were used to provide the large data base necessary to study the windflow in rugged terrain in an area that is very vulnerable to the fire hazard presented by these winds.

To obtain a large data base, the study involved the use of several tree species. Comparison of the wind-direction data obtained from the trees correlates very closely with windvane data obtained in the study area. In measuring the intensity of the winds, a statistical deformation index was devised that is not affected by differing species response to the wind. This index is based upon the total number of trees per unit area that are deformed. It transforms the study of wind intensity—as reflected by the trees—from a largely qualitative judgement of the degree of tree deformation to a quantitative statistic.

With a careful consideration of non-wind effects which can deform the trees, studies of this type are very inexpensive and easy to conduct, providing an accurate climatological wind record as an adjunct to long-term meteorological data, especially in data-sparse regions.

1. Introduction

The Newhall Pass is one of the few passes in the Transverse Mountain range system that allows the flow of the Santa Ana winds to continue from the high desert into the Los Angeles basin. Unlike the other passes (Cajon, San Gorgonio and Santa Ana), the Newhall pass has not yet been studied in detail.

A 30 km^2 area on the south side of the pass was chosen as the study area. Three major canyons incise the relatively rugged terrrain—Limekiln, Aliso and Bee canyons. To establish a network of wind stations in this terrain would be both difficult and costly to provide the density of wind stations required to ascertain the microtopographical wind characteristics. Trees, on the other hand, can provide a very dense data base from which the details of windflow in the area can be determined. A total of 465 trees were studied to provide a detailed reconstruction of the windflow.

The city of Los Angeles abuts against the hills in the study area. This suburban perimeter is the most sensitive to the Santa Anas that blow through the pass; the fire hazard associated with the Santa Anas is well known (Sommers, 1978; Fosberg *et al.*, 1966; Edinger *et al.*, 1964). Since fires have burned on several occasions to the edge of the suburban homes in this study area, detailed documentation of the Santa Ana intensity and direction is certainly worthwhile.

2. Determining the wind type affecting the trees

In the study of tree deformation, past studies have followed a consistent sequence of steps. The principal step is to determine what wind is deforming the trees. Only the most detrimental winds—those that have damaged the trees to an observable extent—can be measured. It is most often not the mean annual wind. Along the coast, the trees will be deformed by salt-laden winds blowing off the ocean (Davies, 1810; Edwards and Claxton, 1964; Kayane, 1969; Thomas, 1973). In regimes with winter snows, the trees will be affected by winds that blow the snow and glaze droplets (Lawrence, 1939; Yoshino, 1964, 1975) or the trees may be affected by summertime winds that damage new growth (Putnam, 1948). Yoshino (1975) emphasized these types of tree response in the following classification scheme:

I: Branches are bent drastically to the leeward of the tree by the prevailing winds during their growing period. This type consists of conifers and poplars.

II: Branches on the windward side of the tree are severed by the effects of winter winds carrying snow or frozen rain. This type consists only of conifers as far as is known.

III: Trunks and branches both deformed drastically by the prevailing wind during their growing

[1] Current affiliation: Union Oil Company, International Geophysical Division, Los Angeles, CA 90017.

0021-8952/81/111267-10$06.50
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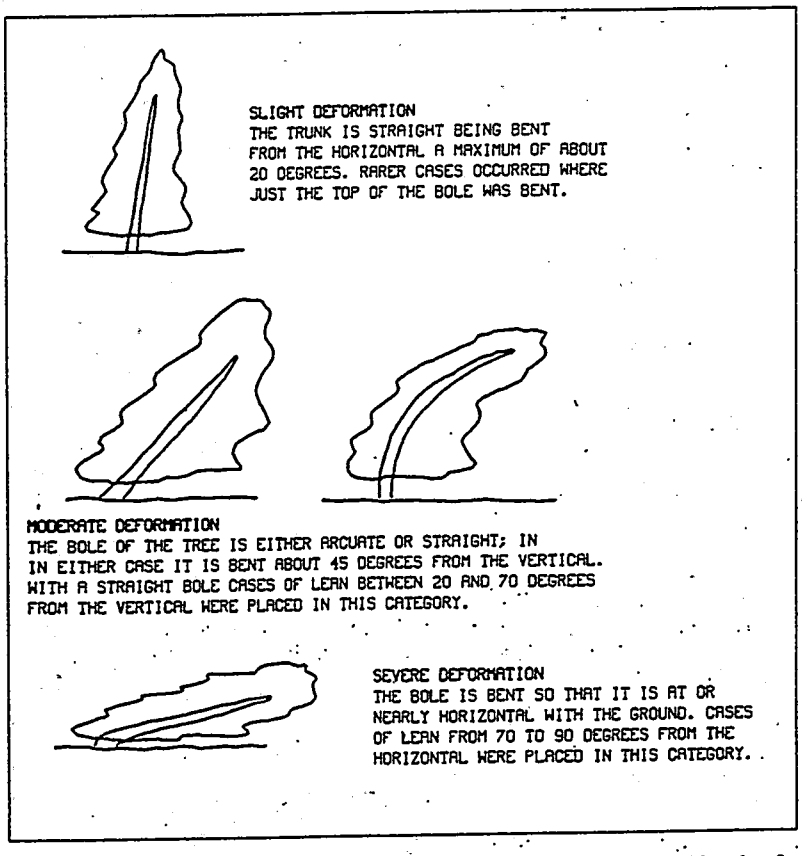


FIG. 1. Pictoral sketches and the accompanying definitions for the three levels of deformed trees comprising the deformation-intensity scale.

season. This type consists of deciduous and evergreen broadleaf trees. They are often found in coastal areas.

IV: Trunks are deformed due to occasional strong winds. The shape of the canopy is symmetrical.

This study consists of the only deformation type (according to Yoshino) that has yet to be studied—deformation type IV. The only intense winds that occur in the area are the Santa Ana winds. The Santa Anas blow almost exclusively from September to June of each year (with peak intensities in fall and spring). They exert a strong and dessicating force on the trees. During the subsequent growing season new growth sprouts unimpeded. The result is a deformed tree bole with a symmetrical and largely unaffected canopy.

There are two aspects of the winds that can be obtained from the deformed trees. The direction the tree is leaning indicates the direction the wind blew from in deforming it. Direction of lean was measured with a Lensatic compass to the nearest 5° interval. An indication of wind intensity can be gauged by establishing a scale of deformation. Fig. 1 depicts the scale devised for this study. Fig. 2 shows more complex variations of the scale which occur in the field. Photos 1–4 show actual field examples.

3. Comparisons with meteorological data

Tree data are often coupled with some meteorological data from weather stations in the study area. Such data serve as a secondary verification of the tree results. A number of locales were selected in the study area where spot windvane data were recorded during the winter of 1976–77. The idea was to have a large number of sample sites throughout the study area so that a representative wind sample would be derived. The distribution of windflow for the entire area was determined with the results compared to the distribution indicated by the trees. This provides good evidence as to whether the trees reflect the main Santa Ana flow.

Fig. 3 exhibits a number of points that have been discussed so far. The figure shows the distribution of each level of deformation and the windvane results in a cumulative graph. The following conclusions can be made from the graph:

• The graph is a normal distribution. To emphasize this, the data have been plotted on probability paper (it has the characteristic that a normal distribution will plot as a straight line). The mean direction of Santa Anas is 360° with 80% of all winds in the area blowing from between NW and NE.

• The different levels of deformation correspond very closely indicating that each is a response to the same windflow.

• The windvane and tree deformation results are almost identical; the trees are accurately reflecting the regional windflow.

• The windvane data represent a graphing of only Santa Ana winds. The close correlation of the windvane curve and the tree deformation curves shows that the trees studied are only deformed by Santa winds.

4. Non-wind effects acting on the trees

The primary source of error in a tree deformation study are non-wind effects that induce deformation of the trees. It is the most important aspect of any tree deformation study, but has received little attention in the literature. Since this is a suburban study, errors due to man-made and natural non-wind effects must be considered.

The climate is quite mild in that trees in the study area are not affected by ice, snow or glaze droplets (it never snows in the area), or salt spray (the study area is 30 km from the ocean). Nor were the rarer effects of flood, avalanche, hail, cold, lightning or fire observed. Drought is not a problem for these trees grew on homeowners' property with all trees appearing adequately watered.

Trees exhibiting any of the following characteristics were excluded from use in this study:

• Newly planted trees, that is, those with trunks that are less than 3 inches in diameter. The trunks are often tall and unable to support the canopy causing them to lean over.

• Guy-wired or staked trees (especially newly planted trees). They do not show the accurate degree of deformation of the correct azimuth of lean. Acceptable are large trees with tiny stakes that are not tied to the trees, being old remnants.

• Any tree near other trees that have since been cut down that could have influenced the growth of the tree in question. This is evidenced by the old stumps that are often not removed.

• Scars on the trunk, especially on the side opposite the direction of tree lean, indicating that the tree is leaning due to being hit by an auto or otherwise damaged.

• Wilting of a tree due to lack of water. The needles and leaves are characteristically wilted.

• Subsidence of the soil near sprinkler system pipes inducing tree lean. This is often associated with a depression of the soil adjacent to the pipe, with the tree leaning into the depression.

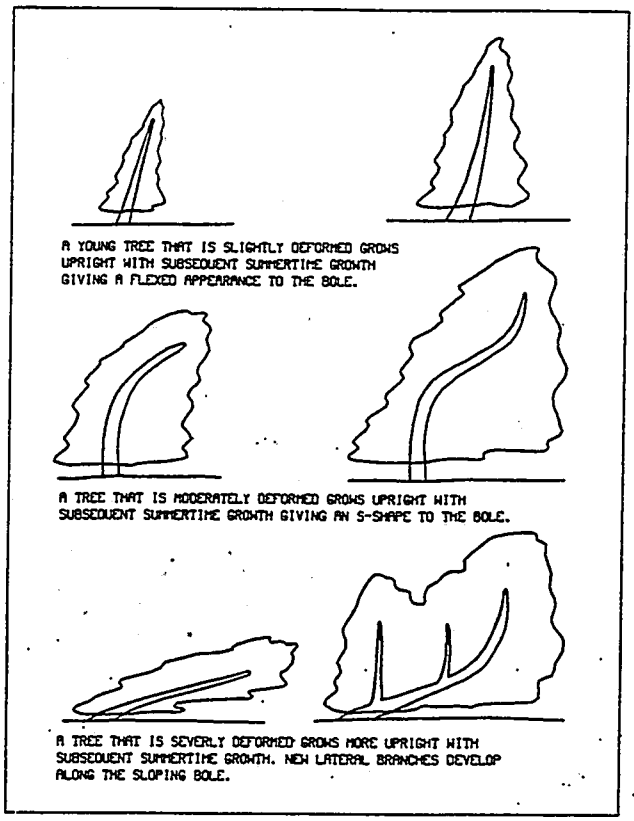


FIG. 2. Examples of more complex variations of the deformation–intensity scale that occur in the field are depicted.

• Trees with undermined or exposed roots. The roots are exposed due to erosion or windthrow (trees uprooted partially and leaning due to a single, intense windstorm).

• Trees planted in non-compacted earth fill, especially trees planted in soil filled behind brick embankments.

• Soil creep and landsliding. These trees are on noticeable slopes with the trees leaning downhill.

• Groves of trees, since they could be deformed by winds altered by the grove itself.

• Trees sheltered from winds blowing from any direction. This includes sheltering by other trees and by the local terrain. Sheltering by houses is by far the most common—probably why far less trees exhibit deformation in the area than would be expected in a natural forest setting.

• Pruning, inducing irregular trunk growth and artificial bole curvature. Trees arching over with evidence of old branch or prior tree shoot stubs at the point of curvature.

• Reaching for sunlight by growing out from houses or other trees.

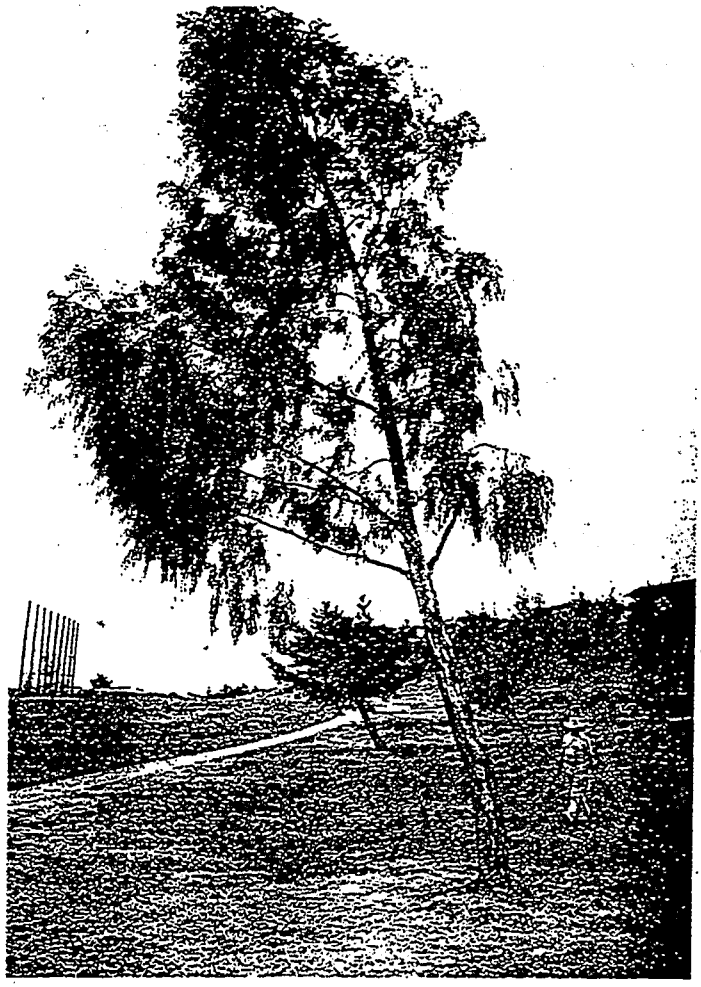


PHOTO 1. A eucalyptus tree exhibiting slight deformation. Though this tree shows a tendency for more foliage to occur to the lee, this is not found with the three trees in the immediate background. Foliage assymetry is not as consistent a characteristic of tree deformation intensity (for this area) as is the curvature of the tree bole.

• Trenches, streetwork or other digging that could have damaged the roots or softened the soil so that the tree collapsed into the area of soft soil.

• Trees that bend along the bole length in more than one direction. This is often a result of several prior times of tree guy-wiring and/or pruning.

• This study selected for trees with straight boles for at least one foot from ground-level then leaning over. This minimizes the possibility of recording one-time windthrow events rather than long-term wind deformation effects. Trees with straight boles from the ground up were scrutinized for evidence of windthrow. The dislodging of the roots produces a mounding of the soil upwind with the near-surface roots becoming exposed in subsequent years.

Fig. 4 shows a frequently observed pattern of man-induced deformation. Several effects on the trees that are difficult or impossible to determine are changes in soil fertility, differences in soil type, retarded root growth, disease or insect pests, effects of tree age, summertime heat stress, air pollution and injurious chemicals.

One final error source needs to be considered. Most studies have used only one species of tree to use as a wind indicator. The logic involves the concept of a "species effect". The concept is that since different species have different degrees of resistance to the wind, the use of a scale of tree deformation must be a unispecies study. This recently was re-emphasized by Wade and Hewson (1979).

This study is a multispecies study. About 51% of the trees studied were pines, 23% were eucalyptus and 12% evergreen pear (*Pyrus kawakami*). The remainder consists of lesser percentages of other tree types. In a suburban setting the tree type will not be homogenous. To have a large data base a multispecies study is necessary. The primary ques-



PHOTO 2. Two large eucalyptus trees exhibiting moderate deformation. Note the arcuate bole of the tree on the right. The tree on the left has the same arcuate trunk, but this is partially obscured by more recent growth directed more upright.



PHOTO 3. A pine with a straight trunk classified as moderate deformation.



PHOTO 4. A pine exhibiting severe deformation. The bole extends straight up for about 1 ft, then bends at an angle of 80° from the vertical. This emphasizes the violent nature and power of the worst Santa Ana windstorms.

tion considered here is the following: Are the other errors so great that the species effect need even be considered? Is the species effect a minor error?

With regards to the direction of tree lean, a species effect is not evidenced. Fig. 5 is a cumulative graph of two groups and one species of tree: pines, euca-

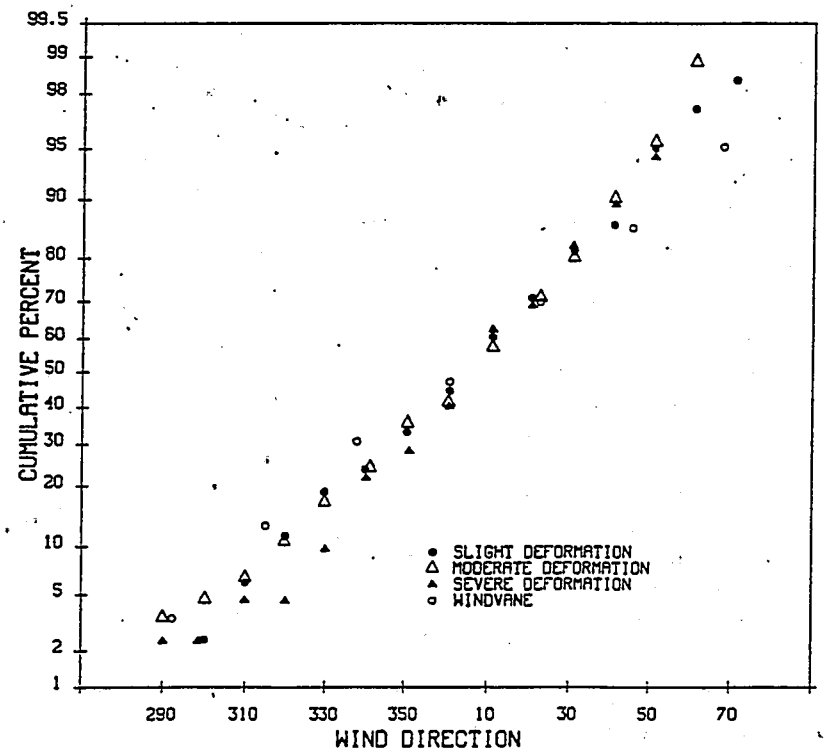


FIG. 3. A comparison of the levels of slight, moderate and severe deformation as compared to the windvane results. The close relationship between the tree and windvane results is emphasized by plotting the data on probability paper (which has the effect that a normal distribution plots as a straight line).

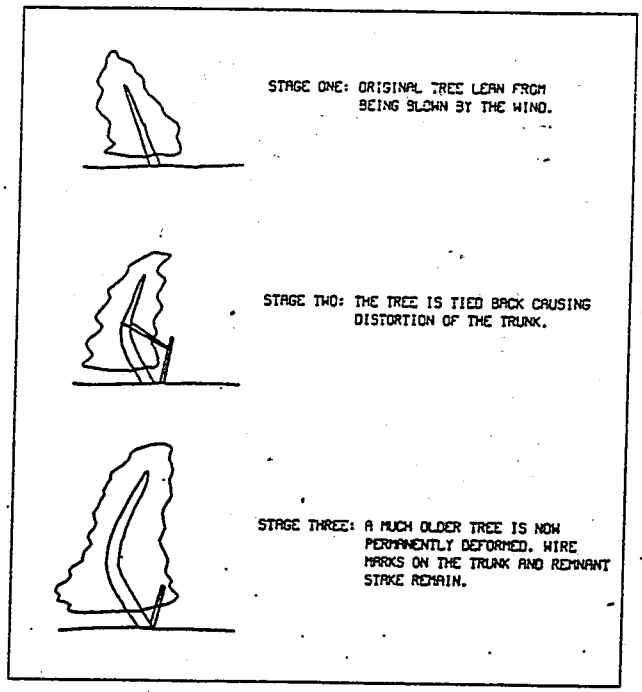


FIG. 4. Man-induced effects considerably alter the appearance of the trees. Shown here is a common sequence of events that produces an unnatural curvature of the tree. As these suburban trees become more deformed by the wind they are concurrently more apt to be altered by man in some way.

lyptus and the tree *Pyrus kawakami*. The distribution of each is graphed along with the windvane results. These groups compare closely to each other and the windvane distribution. The distributions are identical to those of Fig. 3 (where all types of trees were included together). This shows quite clearly that more than one species of tree can be used in studying wind direction.

5. Pattern of windflow in the study area

Testing the magnitude of tree deformation for evidence of a species effect is much harder though two lines of evidence cast doubt on any strong species effect in the study area. If a species effect was pronounced, it would be expected that when mapped, the boundaries separating the magnitudes of deformation would correspond to different tree types. Regions of severe deformation would exist only where pines are found, for example. The occurrence of pine and eucalyptus trees are distributed throughout the study area with no evidence of such an effect observed.

In Fig. 6 the distribution of the direction and intensity of tree deformation in the study area has been mapped. The pattern corresponds not to one of species differences, but rather, strictly topographical effects are noted. In the west and central parts of the study area the pattern is the simplest. The area of Horse ravine, in the direct lee of the Santa Susana mountains which rise to 3000 ft to the immediate north is an area of slight deformation except for the western portion which is affected by winds coming down Limekiln Canyon. The area titled Porter Ranch golf course is affected almost solely by NNE winds with Limekiln Canyon winds having a minimal effect.

The boundary of moderate deformation (called the moderate deformation line) follows the 1100 ft contour up to the southern edge of Bull Canyon. This is the elevation at which the canyons and rugged terrain give way to the flatlands of the San Fernando Valley. The trees indicate a merging of the canyon winds with the NNE winds—the NNE winds dominating. Since these canyon winds do not extend into the flatlands where the NNE winds dominate, the canyon winds are not regarded as being as strong. It would be hard for Aliso and Limekiln canyons to direct much of the Santa Ana winds considering that their origins are downslope and to the lee of the Santa Susana mountain ridge so are laregly sheltered from the main Santa Ana flow. The moderate deformation line is believed to be a result of more intense winds occurring in the hills of the western and northern part of the study area. Note the dominance of the NNE winds with little canyon flow discernible there.

North and South Knollwood ravines contain the Knollwood golf course, being the sites of severe deformation in the eastern part of the study area. On the western edges of these two ravines, low north–south oriented ridges occur that block the

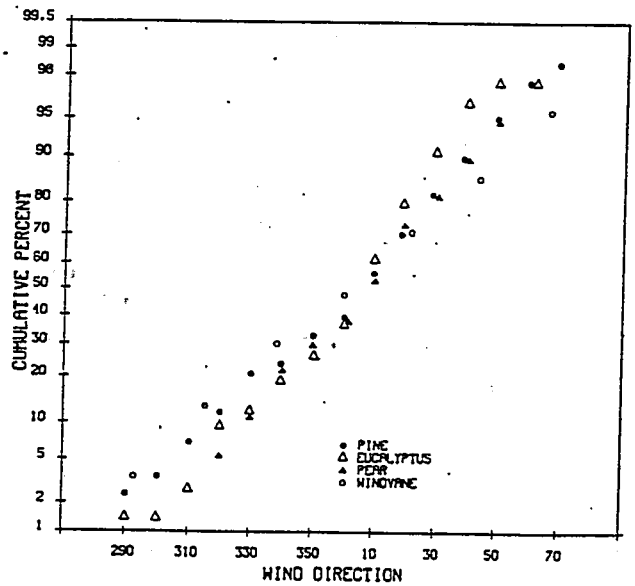


FIG. 5. A comparison of three tree types and the windvane results. The close relationship between the tree types and the windvane results is emphasized by plotting the data on probability paper (which has the effect that a normal distribution plots as a straight line).

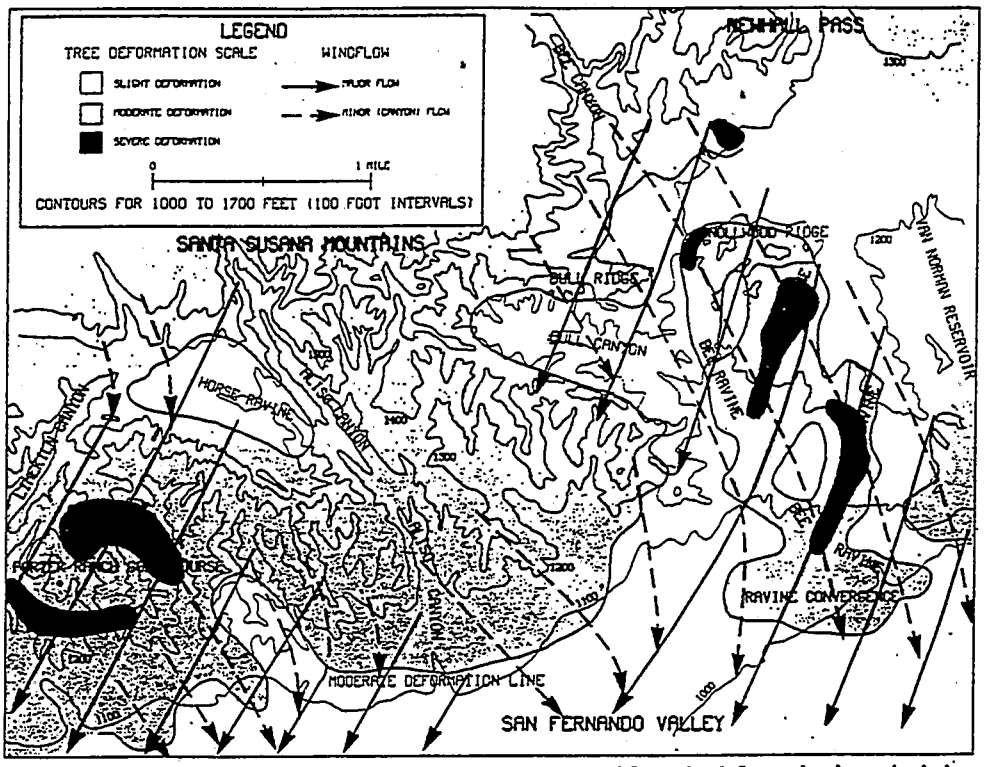


FIG. 6. Relative wind intensity and direction of windflow derived from the deformation intensity index and the direction of tree lean. This map is based on the interpretation of 465 trees for this area.

NNE flow. As a result, areas of slight deformation occur in their lee.

Bee Canyon is different than Aliso and Limekiln canyons. Bee Canyon is situated in the western part of the Newhall Pass (in the northeastern part of the study area). It is the most prominent canyon in the pass. As expected, a strong flow coming down the canyon (and its southern extension called Bee Ravine) is indicated by both the pattern of tree deformation and the direction of tree lean. This flow

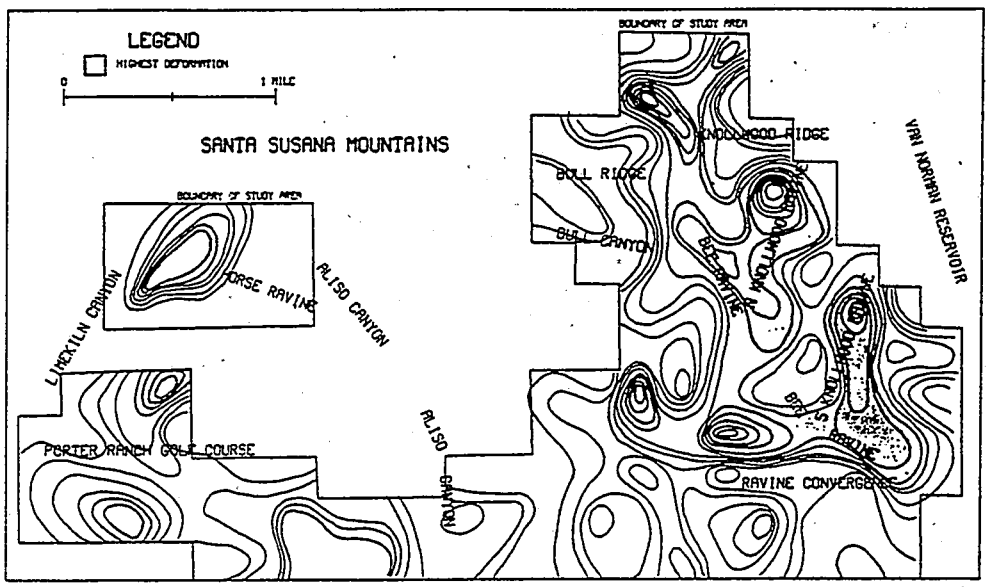


FIG. 7. Contour map of relative wind intensity derived from the statistical deformation index. Though its basis is different than the deformation–intensity index, the results are quite similar (see Fig. 6).

hits Bull and Knollwood ridges causing greater deformation there than adjacent areas. Little wind occurs in the lee of Bull Ridge or the ravine to the south and east of the mouth of Bee Canyon. This NW (canyon) flow extends no further than the ravine convergence area where the main Santa Ana flow dominates.

6. An alternate deformation intensity index

It could logically be expected that areas of higher wind speeds would exhibit not only trees of greater deformation intensity but also that more trees per unit area would be affected. No previous study has used this index primarily because of the small number of trees that have generally been sampled. This type of statistical deformation index has several advantages over the use of a deformation-intensity type of index especially with regards to suburban studies:

- Half of all the trees studied occurred in parking strips and yet virtually none of the severely deformed trees were found there. While the size distribution of slight and moderately deformed trees are quite similar with 59% of slight and 51% of moderately deformed trees being 3–10 inches in diameter, only 24% of severely deformed trees are in this size range. Apparently, small and severely deformed trees are greatly pruned or removed. This induces a bias toward areas where the trees are less likely to be removed such as parks, golf courses and the front yards of homes. The statistical deformation index, including all levels of deformation, will eliminate this effect since trees of slight and moderate deformation are frequently found in parking strips.
- A deformation scale does not have to be devised. A major component of deformation-intensity type indices is the climatic effects acting upon the trees. Since each study area has different climatic effects dominating, previously devised deformation scales cannot be applied to new study areas without careful research and consideration. The statistical deformation index does not greatly depend upon the interpretation of single trees (reflecting climatic effects). A minimization of climatic influence should make tree deformation results between different study areas more readily comparable.
- The index minimizes the influence from any species effect. Any tree deformed above a low threshold (reflected as slight deformation) will be included in the index. This also provides portability of the index to other areas with different tree types.
- In allowing more than one species to be studied, a much larger data base is available to study the windflow.
- Problems of where to draw the boundaries of the various levels of deformation do not arise. The researcher does not have to rely on his judgement as where to exactly draw boundaries in areas with little data.
- It takes the study of tree deformation from a largely qualitative deformation scale to a quantitative statistic. A contour map can be drawn from the statistical deformation index results.
- Finer resolution of deformation intensity is available. Far more contour levels are available compared to the three grades of deformation.
- The new index minimizes the influence of single trees, especially in areas with few trees. This will concurrently minimize the influence of erroneously identified trees.

A map of the study area was marked off into grid cells with the total number of deformed trees being counted for each. From this, the contours were drawn. Fig. 7 shows deformation in the study area using this index. Despite the different nature of this index from the deformation-intensity index, the patterns of deformation are quite similar. Note especially the lack of any indication of strong canyon flow out of Aliso Canyon. Also, the ravine convergence area is more clearly delineated by the index. As a result of the similarity of these two indices, it appears that the species effect is not a significant source of error operating here.

7. Conclusions

A total of 465 trees were studied in a 30 km² area of the south side of the Newhall Pass to study the direction and intensity of the Santa Ana windflow as it leaves the brushland to the north and abuts against the suburban area of the city of Los Angeles. This large sampling was taken to see if the trees could provide a detailed reconstruction of these winds as they blow down the ravines and over the ridges in rugged terrain.

Rather than duplicate the methodology of past studies which have generally compared single station wind data to a surrounding region (often with mixed results) it was decided to use a portable windvane to sample the winds at a number of locales in the study area. Comparison of the windvane data to the wind direction indicated by lean of the trees showed a very close correlation—the trees accurately indicate the direction of the Santa Ana windflow in the area.

To study wind intensity in the study area, two indices were devised. First, a deformation scale was established similar to previous studies which have been conducted. Additionally, a new deformation-intensity index was developed based on the total number of trees per unit area that were deformed. This new index is superior to that it does not rely upon a qualitative judgement of the extent of deformation for a tree.

The study placed considerable emphasis on discerning wind from non-wind effects. An analysis of non-wind effects is one of the most important aspects of any tree study. As a suburban study, both natural and man-made effects were considered.

For small-scale studies involving Santa Ana winds, trees can provide a large data base at very low cost. They are climatological indicators of very long-term wind effects. Tree deformation data act as a useful adjunct to standard meteorological data in providing a more detailed analysis of the winds being studied.

Acknowledgments. I wish to thank Dr. Arnold Court, professor of Climatology at the Geography department of California State University at Northridge for his help with the methodologies and instrumentation used in the windvane portion of the study. Special thanks to Mr. Donald L. Kasper for his help in studying the trees and helpful comments on the phenomena observed and to Paul Kinmond of Union Oil Company for his help in generating the figures for this article using the corporate computer graphics system.

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16934 Knollwood Dr.
Granada Hills, CA-91344
September 22, 1997

Los Angeles City Planning Dept.
Environmental Review Section
221 N. Figueroa Street, Room 1500
Los Angeles, CA 90012

RECEIVED
CITY OF LOS ANGELES
SEP 2 2 1997
ENVIRONMENTAL
UNIT

Attn: Mr. Kedar Playskin

RE: File # 91-0377-2C/GPA (Letter Copy Enclosed)

I have been to a library branch to view the available documents on the Sunshine Canyon Landfill. I counted 39 volumes. The last two seemed to be in regard to the current review - each of those approximately 3"-4" in depth. Very "daunting" - to Mr. G. Q. Public! However, this letter is very "simple" - in its views and requests. 295

We are very much opposed to any expansion of the Sunshine Canyon Landfill. Our main concern has been, and continues to be, the close proximity to the water source at the Jensen Filtration plant (as well as area ground water). That is 296 297

not to say other concerns, such as odor, dust, debris, traffic and roadways, noise, ecology, and environmental/health related problems - are not also significantly troublesome. 298 301

Our feeling is that this is "on out of the ordinary/unique" situation - in respect to the "extremely close proximity to the water plant." As mentioned in the information letter, the Sunshine Landfill is a designated non-hazardous landfill. Certainly - that would be the ideal premise. However, it would surely be a certainty that hazardous waste would find its way into the landfill. Also, it's a certainty that the area is earthquake prone. It is our understanding that B.F.I. - the landfill operator, has been cited for numerous contamination violations, at other landfill operations. 302 303 304 305

Who is going to really listen to what "the people" have to say? Who is going to stand up for "the people"? Who is going to say "money doesn't talk"? We certainly hope we don't live 306

3/

So long as to see a situation of citywide water contamination. Given the other associated problems we probably won't! Please, please, please - someone - truly stand for the environment.

Sincerely,
Nancy & Phil Bogna

Albert Knight, Vice-President
SANTA SUSANA MOUNTAINS PARK ASSOCIATION
P. O. Box 4831
Chatsworth CA 91313-4831

10 October 1997

RECEIVED
CITY OF LOS ANGELES
OCT 2 2 1997
ENVIRONMENTAL
UNIT

attn:
Hadar Plafkin, City Planner
Department of City Planning
Enviromental Review Section
221 North Figueroa Street, Suite 1500
Los Angeles, California 90012

Gentlemen:

As Vice-President of the Santa Susana Mountains Park Association, I have been given the SAD task of replying to the Draft Subsequent EIR for the Sunshine Canyon Landfill (EIR Case # 91-0377-ZC/GPA). I use the word SAD quite intentionally. Despite the various mitigation measures associated with this project, the fact remains that a non-replaceable Oak Woodland enviroment will be almost completely destroyed by the Sunshine Canyon Landfil project. 307

When I first decided to comment on the pertinent EIR, my intention was to comment only on the Cultural Resources portion of the EIR. This because I was a crew member during one of the archaeological surveys of the canyon. Because of this survey participation, I had an opportunity to see the entire canyon for myself. I would like to say that the archaeological portions of the EIR is reasonably adequate....although I would have liked to have seen additional sub-soil testing of at least some of the areas where archaeological materials were located. However, I have decided to not comment at length on this aspect of the EIR..... 308

I do wish to say that, had the Sunshine Canyon area been personally examined by a large number of members of the local community, the project would have never been allowed to proceed. If a large number of members of the local community been allowed to see the area for themselves, I have no doubt that a considerable number of people would have tried to block the entrance to the canyon, to prevent work from proceeding. 309

In my opinion, and in the opinion(s) of the membership of the SSMPA, the destruction of the Sunshine Canyon ecosystem is a crime against our regional enviroment. 310 The destruction of 1000s of mature Oak trees in the beautiful canyon bottom, 311 and the displacement (and death) of countless animals IS NOT and CAN NOT be mitigated, even by the protection of the adjacent canyon, and by the creation of a phony replacement forest, on the slopes above the canyon bottom. 312

The membership of the SSMPA, including myself, are deeply saddened by the negative effects that this project is having and will have in the future. We all want your office to know that we will NEVER permit another land fill of this type to be established in the Santa Susana Mountains, either in Los Angeles or in Ventura County. 313

Please do not give us cause to turn our sadness into anger- by proposing or by planning another massive land fill of this type. Please do not continue to see our wonderful regional natural heritage as expendable.... 314

The destruction of the Sunshine Canyon ecosystem is an outrage....please do not repeat the process elsewhere. 315

Sincerely,

Albert Knight

Albert Knight,
Vice-President, Santa Susana Mountains Park Association

Letter 3.8-13

RECEIVED
CITY OF LOS ANGELES
OCT 27 1997
ENVIRONMENTAL UNIT

Ed You
9714 Sepulveda, #216
North Hills, Ca. 91343
October 22, 1997

Dear Hader Plafkin + L.A.C.P.D

I just heard about the Sunshine Canyon Landfill. There are many aspects of this landfill that disturb me:

1.) the health risks from such a huge dump being so close to a residential area (particulates, cancer, asthma, childhood illnesses, assorted infectious diseases); 316

2.) the history of Browning Ferris Industries in other parts of the nation concerning racketeering; 317

3.) the history of BFI in regards to uncorrected violations from the old city portion of the dump; 318

4.) the increased air pollution in the valley from the dump, especially because of its location in the wind tunnel of the Santa Suzanna Pass; 319

5.) the inevitable contamination of the water reservoir downwind and downhill from the dump site; 320

6.) the site not being earthquake unstable, and the resultant "liner" damage and leakage into the water table. 321

7.) the harmful gases that are generated from the decomposition. 322

8.) the county and city reneging on keeping the old site closed, and converted into a recreational center according to the original agreement from the 60's. 323

9.) the city's and county's rationale being driven purely by money, and the "politics" of it all, verses, what is right and protective of human beings. 324

10.) How we'll be able to explain, or not explain, all this devastation to our children and grandchildren. 325

... and perhaps you know more controversial issues. 326

Please oppose this landfill expansion. Please.

Sincerely,

Ed You

Letter 3.8-14

10-28-97

RECEIVED
CITY OF LOS ANGELES
NOV 4 - 1997
ENVIRONMENTAL UNIT

L.A. City Planning Dept.
Environmental Review Section
221 N. Figueroa St., Suite 1500
Los Angeles, CA 90012-2601

Attn.: Hadar Plafkin, City Planner

Ref. Case No. 97-0377-ZC/GPA, Sunshine Canyon Landfill

I have many concerns and questions regarding the proposed opening of the Sunshine Canyon Landfill. I understand that disposal of trash in a city the size of Los Angeles is a serious problem; however, quality of life for the citizens of Los Angeles is also of concern. 327

It seems the city/county is willing to sacrifice a neighborhood and perhaps the quality of the water supply of Los Angeles in the interest of trash disposal. Some concerns and questions follow. 328

1. The dump is located upwind of water treatment facilities for the City of Los Angeles and surrounding counties. The issues of blowing dust and ground water contamination exist. 329 The potential for earthquake damage to the dump liner and damage to the Balboa inlet tunnel with subsequent groundwater contamination is a concern. 330

2. This area experiences heavy winds. In addition to the drinking water reservoir, there are many homes in the area downwind from the dump. It was a problem in the early years of the dump. What will be done so it will not be a problem again with more dumping and higher volume dumping? Will the dump shut down on extremely windy days in an effort to protect the community? 331

3. What about the impact on the community and traffic on Balboa Blvd. with the addition of trucks hauling a potential of 14,000 tons of trash a day on an already busy street. 332 333 Will it become the dump for the entire region? 334 Has the contamination of the air due to diesel exhaust been addressed or will the trucks be running on clean fuel?

4. Will there be an independent health inspection process? 335

One basic question remains. What is being done to ensure that the dump is not a terrible mistake? And if it is a mistake, as many people believe, what can be done to close it down? 336

Joanne Collins

Joanne Collins
17731 Candia Court
Granada Hills, CA 91344

Letter 3.8-15

LAW OFFICE OF JEFFREY H. HILL
23929 WEST VALENCIA BLVD., SUITE 101
VALENCIA, CA 91355-2109
TEL: (805) 259-6357
FAX: (805) 254-4844

October 30, 1997

RECEIVED
CITY OF LOS ANGELES
NOV 03 1997
ENVIRONMENTAL UNIT

Attn: Hadar Plafkin
Los Angeles City Planning Dept.
Environmental Review Section
221 N. Figueroa St., Room 1500
Los Angeles, Ca 90012

Re: Draft EIR File No. 91-0377-ZC/GPA
Site Location 14747 San Fernando Rd., Sylmar, Ca 91342

Dear Mr. Plafkin:

I represent the Newhall Hidden Valley Homeowners Association.

After review and consideration of the above referenced draft subsequent environment impact report the Board of Directors of the Newhall Hidden Valley Homeowners Association has resolved to oppose the development. 337

Specifically, increased traffic of heavy vehicles on already crowded roadways and proximity of the development to residential areas constitute a threat to the air quality, safety, and quality of life of the residents of Hidden Valley. 338

If you have any questions, please do not hesitate to contact me. Thank you.

Very truly yours,

JEFFREY H. HILL

JHH:sf

Letter 3.8-16

North Valley Coalition

RECEIVED
CITY OF LOS ANGELES
NOV 05 1997
ENVIRONMENTAL UNIT

Hadar Plafkin, City Planner
Dept of Regional Planning
Environmental Review Section

Nov.3, 1997

Dear Hadar Plafkin,

We are writing in advance of submitting our comments on the draft EIR for Sunshine Canyon to seek a clarification. The letter that accompanied the EIR states that BFI is seeking a permit to receive 11,000 tpd at the Sunshine Canyon Landfill site. BFI already has permission to import 9,000 tpd in their Solid Waste Facilities Permit (i.e. 6,000-6,600 tpd of buried waste, plus the remainder up to 9000 tpd consisting of waste that the County calls "exempt.") This "exempt waste," of course, arrives by truck creating the same impacts associated with traffic and air quality as the buried waste. Few of these items will leave the site. 339

Is BFI then seeking approval to import an additional 2,000 tpd to reach 11,000 tpd, as your letter suggests or 5000-5,500 tpd making the inflow requested 14,000-14,500? 340

This is a very significant difference and we cannot evaluate the potential impacts of this project without it. Knowing the time constraints placed upon submitting our response, please clarify as soon as possible. 341

Thank You,

Mary Edwards
North Valley Coalition
17219 Orozco Street
Granada Hills, 91344
(818) 360-7635
FAX (818) 360-0457

North Valley Coalition
Response to
SEIR 91-0377-/ZC/GPA
November, 1997

RECEIVED
CITY OF LOS ANGELES
Wayde Hunter
DEC 05 1997
ENVIRONMENTAL
UNIT

4.1 EARTH RESOURCES

FEIR Documentation, Page 4-3
According to the proponent: "The following list of references specific volumes, sections, and page numbers of the certified FIER and its incorporated technical documentation that provide background information and technical analyses relevant to the topic of earth resources. Development of the proposed project, including the additional +/-42 acres located in County jurisdiction, has been previously addressed within the context of this certified FEIR. Any new potential earth resources impacts associated with the proposed project and the relocation of ancillary facilities and environmental protection and control systems onto City lands will be addressed in the Draft SEIR." It goes on to cite numerous volumes, Sections, Appendixes, Topical Responses, and goes on to give a summary in Appendix C1. Why wasn't this material included? This material should have been include as a part of the SEIR since it is impossible for the public to determine the difference between old and "new potential impacts". Have the reviewing agencies been provided this documentation, if not have they reviewed the referenced material in order to determine whether or not there are any new potential impacts between County FIER and City SEIR? The public must be given more time to review this document. The proponent has maliciously denied the local homeowners/organizations copies of this SEIR, choosing instead to deliver them to such places a Westwood. It is also stated that several geologic assessments of the entire Sunshine Canyon area (owned by the project proponent) have been conducted including Robert Bean 1978; Geolabs 1981; The Earth Technology Corporation 1988; PRA Group 1982, 1989, 1991, and 1994. Why were these studies not included and where are they located? The review of the referenced data alone would occupy the entire time allotted to review the entire SEIR. How can the working public be expected to review this document and the referenced documents in the time allowed? Additionally, the referenced EIR does not reflect the actual proposals/mitigations implemented in the County to-date. There are changes in which BFI has sought County approval for modification due to cost, an inability to meet the goals as stated, new regulations, and new technology application. Why have these changes not been identified, the reasons, the approving agency and included? Many of the sections referenced did not address the public's requests for answers during the EIR process. Repeated attempts to have the proponent address the questions asked were ignored and lumped under a topical response that did not address the questions asked. Further , the proponent frequently sidestepped impacts to the residents by saying that they were only reviewing the County side and that impacts to the City would be addressed later. The entire portions of the documents referenced must be included in order for the public and the City agencies to properly assess the information provided.

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ENVIRONMENTAL IMPACT, Page 4-4
In paragraph 3, it states that: "Excess material from grading activities would be stockpiled and stored within areas of the City/County Landfill footprint, as shown in Figure 4.1-1, throughout project development, and in paragraph 4 it states that: "It is anticipated that stockpiling would initially occur in the County portion of Sunshine Canyon, within the northern canyon area. This area is normally being used as a stockpile area for County Landfill operations." Given the anticipated closure of County operations in favor of the City expansion in 2 -3 years, and given the contours drawn over the northern canyon area, it appears that this canyon must be filled prior to the need for the stockpiled dirt in the City? If this is so where will this and the already stockpiled County dirt be moved to? Has this potential moving of stockpiled dirt for a second or third occasion been addressed in the impacts to air quality? The area shown on the City side and marked as "Anticipated Stock Pile Area" is on the western end of the berm in an area that is most exposed to the wind and in the closest proximity to the residents to the south. Given the fact that BFI has been unable to control dust in this area before (please refer to prior Zoning actions for testimony and pictures) and given the fact that they are unable to mitigate the air quality impacts they

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should not be permitted to utilize this area for any dump related activities. It should also be noted that the existing landfill is closed and that final cover is required for this area.

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Lithologic Description, Page 4-12
Figure 4.1-3 is said to represent the locations of monitoring wells and exploratory borings. Based on this map there are no monitoring wells located near the entrance of the landfill. Why not? Figure 4.1-4 is reported to depict the geologic formations. Apparently, this figure was intended to be viewed in color as the following items under the legend are indistinguishable from each other. Contact, Mappable Bed within mappable unit, and Fault. Please provide a color map and/or one with legend items sufficiently different to discern the various geologic features.

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Soils, Page 4-19
The proponent states that: "Surficial soils are important for varying reasons. Soil characteristics have an impact of nearly all aspects of design and construction of the proposed project, ancillary facilities, and areas, in addition to the development of an erosion control and revegetation plan.." Why doesn't the proponent note that this can also have an effect on air quality? Given the depth of soils indicated in paragraph 2, how can the proponent compare and justify the use of TSP from Transit Mixed Concrete's proposed site in Soledad Canyon Road located 10 miles from Sunshine?

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Onsite Landslides, Page 4-20
It states that landslides are identified on Figure 4.1-4. It goes to state that in paragraph 3 that: "Another landslide is located southeast of the existing inactive landfill, south of the landfill entrance and adjacent to San Fernando Road." The section mentioned is not discernible on the figure. Why? The proponent states that this landslide is not expected to impact proposed landfill development due to its distance from the footprint of the waste fill and drainage systems. Does this landslide pose any danger to any ancillary facilities? Could it possibly affect the County drainage system?

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ENVIRONMENTAL IMPACT, Page 4-22
In paragraphs 3, 4, and 5 the proponent dismisses potential landslides either seismically or as a result of future operations. The proponent is not being candid. Why is it not discussed that the largest landslide during the 1971 San Fernando earthquake was on the northern edge of Caltrans land adjacent to the existing closed City landfill in the area that will undergo extensive grading? What about the collapsed ridge just south of the City/County line? What about the collapsed southeastern end of the berm during the 1994 Northridge earthquake? What about the extensive mud slides at the entrance that washed over San Fernando Road during extremely wet period in circa 1996? Why is there no discussion of the problems with sliding when a watertank and the City incinerator were being constructed on the southwestern end of the berm area? Why aren't these things documented and placed on a map? Given that at various Zoning hearings the proponent has always claimed that land movement problems were unanticipated and that varied and sometimes extensive earthmoving activities were required to correct. If this is true how can the proponent just summarily dismiss landslides?

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Figure 4.1-5, Page 4-26
In describing the Santa Susana Fault on page 4-31 the proponent states that the shortest distance between the ground surface at the project site and the fault itself is 3.1 miles. How is this possible since the entrance to the landfill and the I-5 where the fault crosses (Balboa Boulevarrd) is less than 1.0 mile?

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CUMULATIVE IMPACTS, Page 4-23
Again the proponent does not even attempt to address the problems. As stated above the proponent is not candid and seeks only to promote the project.

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ENVIRONMENTAL IMPACT, Page 4-32

Regulatory Background

A number of paragraphs discuss State and Federal regulations that address seismic design criteria. Appendix C-15 contains a Static and Seismic Stability Assessment, Proposed Phase II Construction, Sunshine Canyon Landfill Extension, dated November 1996. Exhibit (WH-6), letter from Leslie F. Harder, Jr., Chief, Division of Engineering, Department of Water Resources dated July 21, 1997 to Mr. Rodney Nelson, Chief of Landfills Unit, California Regional Water Quality Control Board should be included as it points out deficiencies in this report. Why hasn't the proponent included this material? 372

CUMULATIVE IMPACT, Page 4-44

Again the proponent does not even attempt to address the problems. As stated above the proponent is not candid and seeks only to promote the project. See response to Enrivonmental Impact, 4-22. 373

General Comments and Observations, 4.1 Earth Resouces, Pages 4-3 thru 4-44

Given sections 4.1.3, Geologic Hazards - Subsidence and 4.1.4, Geologic Hazards - Seismicity, the following Exhibit (WH-8), U.S.Geological Survey Open-File Report 96-517 should also be included. Why wasn't this kind of information included? Does the subsidence and/or elevation as described in this report affect the landfill and the area immediately surrounding it? Is there a possibility groundwater could be altered, drainage problems develop or leachate collection be affected in any way? 374 375 376

Wayde Hunter

North Valley Coalition
Response to
SIER 91-0377-ZC/GPA
November, 1997

4.2 Air Quality

FEIR Documentation, Page 4-45

According to the proponent: "The following list references specific volumes, sections, and page numbers of the certified FEIR and its incorporated technical documentation that provide background information and technical analyses relevant to the topical issue of air quality. Development of the proposed project, including the additional +/-42 acres located in County jurisdiction, has been previously addressed within the context of this certified FEIR. Any new potential air quality impacts associated with the proposed project and the relocation of ancillary facilities and environmental protection and control systems onto City lands will be addressed in the Draft SEIR." 377

It goes on to cite numerous volumes, Sections, Appendixes, Topical Responses, and goes on to give a summary in Appendix C1. Why was this material not included? This material should have been included as a part of the SEIR since it is impossible for the public to determine the difference between old and "new potential impacts". Have the reviewing agencies been provided this documentation, if not have they reviewed the referenced material in order to determine whether or not there are any new potential impacts between County FEIR and City SIER? The public must be given more time to review this document. The proponent has maliciously denied the local homeowners organizations/associations copies of this SEIR, choosing instead to deliver them to such places as Westwood. Additionally, there other related documents incorporated by reference that are supposedly available for review:- Report of Waste Discharge Proposed Sunshine Canyon Extension Site, Report of Disposal Site Information Volumes I, II, and Addendum 1, Final Closure Plan for Sunshine Canyon, Addendum to the Final Closure and Post Closure Maintenance Plans for Sunshine Canyon City Landfill in such diverse sites as Monterey Park and Los Angeles. How can the working public be expected to research the documents referenced which are only located in libraries or remote sites over 25 miles away? Saturday is the only real chance for the working public to review but how are so many people suppose to share the single copy of the FIER located at each library given the time frame allotted? Are the Department of Health Services or the Planning Department for the City of Los Angeles even open on a Saturday? The review of this referenced data alone would occupy the entire time allotted to review the entire SEIR. Additionally, the referenced EIR does not reflect the actual proposals/mitigations implemented in the County to-date. There are changes in which BFI has sought County approval for modification due to cost, an inability to meet the goals as stated, new regulations, and new technology application. Why have these changes not been identified, the reasons, and the approving agency and included? Many of the sections referenced did not address the public's request for answers during the EIR process. Repeated attempts to have the proponent address residents concerns were ignored and lumped under a topical response that did not address the questions asked. Further, the proponent frequently sidestepped impacts to the residents by saying that the they were only reviewing the County side and that impacts to the City would be addressed later. The entire portions of the documents referenced must be included in order for the public and the City agencies to properly assess the information provided.

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Environmental Setting, Page 4-45

4.2.1 Existing Conditions & 4.2.2 California's SCAB Regional Climatic Characteristics

Under the Existing Conditions section the reader is lead to believe that site-specific information is about to follow, however, the information presented is only a broad description of the South Coast Air Basin. The next section 4.2.2, California's SCAB Regional Climatic Characteristics under the headings of Climate, Precipitation, and Humidity – the reader is again given only generalities, not site-specific information. Under the heading Temperature, on page 4-46, the reader is informed that a SCAQMD monitoring station located at 24875 San Fernando Road in Newhall may generally be consider to be representative of the project area. What other monitoring stations were considered and why were they considered not representative? When the topic of Wind on page 4-47 is discussed, site-specific information is now included in the form of figure 4.4.2, Windrose for the Sunshine Canyon Landfill. The proponent again returns to SCAB generalities under the headings of Cloudiness, and Inversions. What are the site-specific characteristics of this project under the headings presented? What are the impacts of these weather conditions to the proposed project and to the public health?

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While the topic of Wind on page 4-47 deals in generalities it discusses wind on-site measurements as having an overall averaged wind speed of 9.9 mph with a maximum 1-hour measurement of 45 mph. It goes on to state that it does not preclude the presence of very high wind speeds. Why has this database of readings been included at this point? What high wind speeds have been recorded at the landfill both City and County? The Windrose and anemometer readings included in Appendix B8 are for Site 1. There are at least two other sites. Where is Site 1 located? Why has the wind speed data that has already been gathered on-site during the operation of the old City landfill and the currently operating County landfill not been provided? During past operations on the City side of the landfill, the South Coast Air Quality Management District inspectors observed the anemometer located there to be holding steady at 100 mph with gusts estimated at 125 mph. As recently as 10/13/97 the Daily Activity Log Sheet for the County landfill and signed by Ken Murray, County Inspector, records winds of 50 – 60 miles per hour. Santa Ana conditions are said to average 5 –10 occurrences per year. What parameters establish them as Santa Ana's? What speeds and durations were recorded at both city/county landfills?

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4.2.3 Criteria Air Pollutants, Page 4-51

The definitions of Carbon Monoxide, Reactive Organic Gases, et cetera are taken from what source?

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4.2.4 Ambient Air Quality Standards and Annual Statistics, Page 4-53

The proponent merely seeks to advance his own project and does not attempt to provide information for the public or the agencies to evaluated the impacts. When information is presented which does not advance or support the proponents position explanations are included which minimize the impacts, for example:

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Under the heading Existing Air Quality, on page 4-53 after referencing the SCAQMD monitoring station located at 24875 San Fernando Road in Newhall and Table 4.4-2 the proponent explains in the last sentence that the larger particles are filtered out by the respiratory system and pose more of a nuisance than a health threat. What studies is this assumption based on? The proponent goes on talk about (PM_{10}) but other than explaining possible sources does not address the health impacts as they did for the larger particles. Why? On page 4-55 the proponent in the last sentence before 4.2.5 states that the data in Table 4.2-2 suggests that the air quality problems in the study area are mainly due to the transport of pollutants into the area from upwind sources. What was this determination based on and who made it? Does the SCAQMD agree with this assessment? If the project area is "(v)ery sensitive to additional O_3 precursor and particulate

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pollutant. . ." as the proponent suggests and given the fact that landfills are the largest stationary source of pollutants, what impact will this project have on the Santa Clarita Valley since winds blow both directions? Does the SCAQMD have to consider those impacts and if not why? What are the impacts to residents of the San Fernando Valley in the area immediately surrounding the landfill given that the Federal standards have been revised and that additional studies such as those exhibits attached are now available? The attached Consumer Report excerpt page 36, 37, & 38 and dated August 1997 (Exhibit WH-1) states that: "Scientists have detected a sizable and reliable connection between dirty air and health problems in dozens of communities large and small, old and new, in every type of climate, throughout North America." It further goes on to state that : "So consistent is the association that epidemiologists can even estimate the annual U.S. toll from air pollution-about 50,000 deaths from heart disease, asthma, stroke, bronchitis, and the like."

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On page 37, column 1 of the article, it states that: "Two significant contributors to these effects are ozone and particulate matter (emphasis added). Under ozone it states that many studies have found harmful consequences. "Children at a Connecticut asthma camp were 40 percent more likely to have an acute asthma attack on high ozone summer days than on average days." "The first results of an ongoing 10-year study of southern California schoolchildren has found a direct correlation between school absences and lifetime exposure to ozone." "Studies in major U.S. cities show that daily mortality rates increase along with ozone, even if the ozone is below current legal limits".

Under Particulates in column 2 the article says that: "A few weeks ago, researchers reported that infant mortality in the most polluted communities is 25 percent higher than in the cleanest ones. "A study of 13,000 children in 24 North American communities found that youngsters in the community with the worst fine-particle pollution had 65 percent more bronchitis than those in the cleanest community." "The most striking evidenced comes for the so-called Six City study, in which researchers from Harvard and Brigham Young universities followed more than 8000 adults for an average of 15 years, comparing their health to local fine-particle counts." The results revealed that the city with the most small-article pollution, had 25 percent higher mortality rate (emphasis added). than residents of the cleanest city. The study was repeated using 500,000 adults in 151 communities and similar results were obtained.

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Another article that bolsters this information is a story in the Daily News, dated Thursday, November 20, 1997 in which a study paid for by the AQMD tied daily air pollution measurements to patient admissions at Kaiser Permanente hospitals including Woodland Hills and Panorama City (Exhibit WH-2). "This is the first study of its kind conducted in the (Los Angeles) Basin and shows that the region's air pollution continues to be a leading public health concern," said Shankar Prasad, health effects officer for the South Coast Air Quality Management District. The Kaiser study matched ozone levels and particulate emissions throughout 1995 with Kaiser records covering 1.6 million patients. For every 10-microgram increase in the concentration of particulates, hospital admissions rose an average of 7 percent for chronic respiratory illnesses, 3 percent for cardiovascular disease and 3.5 percent for acute respiratory illnesses. Ozone had a similarly hazardous effect. During the study, when ozone concentrations in the air rose by 10 parts per billion, an average of 2.7 percent more people with chronic respiratory problems, 5.7 percent more cardiovascular disease suffers and 1.5 percent more people with acute respiratory disease check themselves into the hospital. Additional excerpts of articles dealing with the harmful effects of emissions and PM_{10} are also included (Los Angeles Times, Sunday, November 23, 1997 – Exhibit WH-3), Coalition for Clean Air, Spring 1997 – Exhibit WH-4), The Amicus Journal, Summer 1997 – Exhibit WH-5).

Residents have called on numerous occasions in the past for health studies to be performed. It has been stated by residents at past Zoning hearings and in response to the EIR that cancer clusters exist in the Granada Hills neighborhood nearest the landfill. An informal health survey was provided that showed that residents in this area suffered twice the national average of upper

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respiratory distress. BFI denied the voracity of this information and later failed to provide the health study as ordered by the Zoning Board and Board of Zoning Appeals. BFI has refused to comply with this and other conditions imposed on them by claiming that the City did not have the right to make them do anything since the Variance had expired. See Exhibit (WH-7), Second Draft, Hearings and Conditions, September 1991. How can a proponent with these past failures to comply with City Zoning be trusted or granted another approval when the health and welfare of residents are at risk? How can the City even consider this project without adequate health studies?

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Fugitive Dust Emissions, Page 4-62

In the second sentence of this section it is states that AP-42, Compilation of Air Pollutant Emission Factors (USEPA, 1985) is used to derive a factor of 110 pounds of total suspended particulate matter (TSP) per day, per acre graded. It goes on to state that this value is based on a medium level of activity, silt content of about 30 percent, and a semiarid climate. The following statement is not understood. "Test data used to derive the specified value are not sufficient to derive the specific dependence of dust emissions on correction parameters and for the purposes of this analysis, none have been applied". Is the proponent saying that the proposed expansion site does not meet these criteria? Please explain? What test data is being referred to and why was it not included? In the third sentence it refers to tests conducted by Transit Mixed Concrete at their proposed site in Soledad Canyon Road located 10 miles away producing a TSP of only 28.6 percent as opposed to the 45 percent in AP-42. In sentence four, the proponent switches to a new calculation for PM_{10} based on this information. Why wasn't documentation included to support why this data more accurately reflects conditions at the landfill site? Does the SCAMD agree with this assessment? How does the overall makeup of the soil and geology compare to each other? Based on this misapplication of data, Table 4.2-6 on page 4-63 is understated by at least 17 percent. The preparer states that "Construction work at the proposed landfill footprint would disturb a relatively small area (estimated not to exceed 40 acres at any given time). In accordance with information provided by the project proponent, actual excavation operations would be further restricted to an even smaller area not expected to exceed about 10 acres per day of the 40 acre footprint." Forty acres or even 10 acres is not a "relatively small area" when located in the wind tunnel that is the Newhall-Saugus Pass. Given the terrain and the existing weather conditions it is not possible to mitigate the dust. Past zoning actions and the EIR for the County expansion contain documentation and pictures of dust produced in the City landfill (now closed) of dust being visible for 10.4 miles away, of dust blowing from berms and hillsides, of water from watering trucks being blown into the air without ever touching the ground. What guarantees are in place to insure that all surfaces once disturbed during construction and to the completion of construction are properly sealed and/or watered given the steep nature of the terrain and the ferocious winds? Please explain how the proponent can mitigate dust when they have been unable to revegetate the closed City landfill or even the cut slopes on the County landfill? Please explain how water trucks will gain access to cut slopes? In the last sentence on this page the preparer accepts that the USEPA, AP-42 estimates that regular watering may (emphasis added) reduce fugitive dust emissions by as much as 50 percent. Here it suits their purposes to accept a rate that as stated before will exceed their ability to attain. What permits the preparer to accept or reject parts of such documents as the AP-42 at will to minimize or promote this project? Do the reviewing agencies concur with this approach? The PM_{10} emissions given on page 4-63, Table 4.2-6 is totally understated based on BFI's selection/manipulation of data parameters.

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Table 4.2-5, Construction Emissions for Initial Site Preparation is not correct. The proponent fails to state the cumulative impacts because the landfill will continue to take trash even while the City side is being constructed. Trash will also be accepted on the City side once the most basic City infrastructure/construction has been attained. How will construction proceed and how long will construction last? Why hasn't the proponent taken into account the cumulative impacts?

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4.2.8 Air Quality Operational Phase (Long-Term), Page 4-64

This section states that: "At full operation, the proposed project (combined landfill within both jurisdictions) will receive an anticipated average solid waste intake of approximately 11,000 tons per day (tpd)". On Tuesday, November 18, 1997 at a Proposed General Plan Amendment/Zone Change Meeting held in Granada Hills, the proponents when asked if the 11,000 tpd was correct indicated that it was not and that the tonnage would be much higher than the 11,000 stated in the SEIR. The SIER does not take into account that the County has a permitted inflow rate and that it will continue to operate as the new City/County landfill is constructed: Further, the green waste from both sides has been excluded. Given that the tonnage will be much higher, all subsequent Tables 4.2-7 Heavy Equipment Emissions for Site Operations, Table 4.2-8 Operation Gaseous Emissions, Table 4.2-9 Permitted Daily Emissions from Flaring Activities, 4.2-10 Estimated Emissions for Truck Travel over Unpaved Surfaces, Table 4.2-11 Estimated Fugitive Dust PM_{10} Emissions for Site Operations, et cetera do not accurately reflect the air impacts.

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Combustion of Landfill Gas Emissions, Page 4-68

The proponent presents a confusing discussion of the status of flaring stations in the City and County and then goes on the state that the permitted emissions for combustion are presented in Table 4.2-9. It is unclear what this table really represents. Is it two flares (one existing City flare and the one County flare that has been built) or is it three flares (one existing City flare and the two permitted County flares)? The note section under the table on 4-69 makes things no clearer and no calculations are included to show how the proponent arrives at the final lb./day. As stated before this table cannot be correct. On Tuesday, November 18, 1997 at a Proposed General Plan Amendment/Zone Change Meeting held in Granada Hills, the proponents when asked if the 11,000 tpd was correct indicated that it was not and that the tonnage would be much higher than the 11,000 stated in the SEIR.

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Fugitive Dust, Page 4-70

Under the title Active Working Face Area, Page 4-70. Where is the value of 31.5 pounds of PM10 per acre per day derived from and what is the basis for reducing it to approximately 19 pounds during daily cover and compaction operations?

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Under the title Landfill Area Excavation, Page 4-70. Where is the value of 31.5 pounds of PM10 per acre per day derived from and what is the basis for reducing it to approximately 38 pounds during landfill excavation?

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Under the title Stockpile Erosion, Page 4-71. It is stated "By adjusting this value to reflect the reduced onsite PM_{10} content, approximately 35 pounds of PM_{10} emissions would be released daily". What was this value? What data supports this reduction? Does the SCAMD agree with this reduction?

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Under the title Vehicular Travel on Paved Surfaces, Page4-71. The emissions are based on 1110 trucks. The emissions cannot be correct. As stated before On Tuesday, November 18, 1997 at a Proposed General Plan Amendment/Zone Change Meeting held in Granada Hills, the proponents when asked if the 11,000 tpd was correct indicated that it was not and that the tonnage would be much higher than the 11,000 stated in the SEIR.

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Under the title Truck Travel on Unpaved Surfaces, Page 4-71. The emissions cannot be correct. On Tuesday, November 18, 1997 at a Proposed General Plan Amendment/Zone Change Meeting held in Granada Hills, the proponents when asked if the 11,000 tpd was correct indicated that it was not and that the tonnage would be much higher than the 11,000 stated in the SEIR.

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4.2-9 Health Risk Analysis, Page 4-74

On page it states that the USEPA SCREEN2 dispersion model was utilized to determine the maximum pollutant concentration at downwind receptors locations. On page 4-76 it also states that "It should be noted that the SCREEN2 model is not designed for a complex terrain such as Sunshine Canyon". This is followed by a statement that the model will over predict rather than under predict the health risks. We believe that this is not the case. The assumption that the terrain were flat and that zero plume rising doesn't take into account that there are severe downdrafts, vortexes, and eddies which may cause a plume to be depressed below its exit point. Are there no other models more appropriate? Is this the model recommended by the SCAQMD?

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The risk analysis modeling is based on in-flare exhaust concentrations derived from the existing landfill flare station and augmented to a combustion rate of 4,400 cubic feet per minute. Why doesn't the modeling include the cumulative rates from both the City and the County both existing (2 flares) and future (5 flares)? Why aren't the cumulative impacts of all the landfilling, construction and combined with the ambient air also considered? Does this model, and the Table 4.2-13 on page 4-76 in any way represent the cumulative toxics and the cumulative cancer risks that the public will be exposed to by all landfilling activities or just LFG flaring? If not, how does the proponent or the AQMD justify presenting it as a true Health Risk Assessment?

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Air Quality Management Plan, Page 4-77

The determination of consistency with the AQMP given on page 4-78 represents a gross misrepresentation of the facts by the proponent. To begin with, the proponent makes the statement that: "In accordance with that document, a project conforms with the AQMP if the following consistency requirements are met". The reader expects to see a list of the requirements. The proponent now mixes requirements with self-serving explanations in 3 out of 4 bullets. It is apparent that the proponent does not meet the established guidelines.

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The first bullet in part states that: "(t)he County portion of the project site is located within a job-poor region and will positively contribute to job opportunities available within this region". Since the County portion of landfill is only 40 acres and will be the first section to close, and since workers will be hired regardless of where they may live, this statement is plainly not supported by fact.

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In the second bullet the proponent would have you believe that the level of service on traffic routes will not be degraded below acceptable levels. The proponent has understated the total tonnage to be received (City & County in operation at same time plus excluded recycling) and therefore the vehicle trips. The proponent has also not provided current traffic data, has made erroneous assumptions as to the traffic composition, and has not forecast impacts beyond 1998.

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In the third bullet the proponent reverts to a statement of requirements as addressed in SCAG's Guideline for Implementation of 1989 AQMP Conformity Procedures but does not make any claims that this has been satisfied.

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In the fourth bullet after acknowledging that the impact analysis demonstrates that significant levels of air pollutants will be generated, launches into the most egregious, self-serving, totally asinine justification for imperiling the health and welfare for the residents in the area surrounding the landfill by claiming that "(t)he exhaust and particulate emissions associated with project implementation would be associated with another landfill project".

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Page 4-79 further illustrates our point about the confusing mix of fact, data, and the proponent's attempts to minimize any negative information. The continuation of the previous subject addresses the 1997 Draft AQMP but does so with bullets that merely highlight information and do not contain any intrusive and self-serving comments.

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Growth Management Chapter, Page 4-79

On page 4-81 it states that "the project site (within the County) is within the Santa Clarita subarea which has a jobs/housing ratio of 1.18 for the year 2010 making this region jobs poor." It goes on to state that : "Therefore implementation of the project would therefore serve to improve the jobs/housing balance in this subarea and subregion by providing additional job opportunities". This statement is plainly not true for a number of reasons. Workers will be hired regardless of where they may live. Additionally, this project involves only 35 jobs and only a fraction of them would be employed on the County portion of landfill (42 acres) and likely the first section to close. 458 459

When speaking of the general plan amendment required for the project the proponent noted that: "residential use onsite would not be a feasible option at this location". While this is true it should be noted that SCAG encourages existing or proposed local jurisdictions programs which create opportunities for residents to walk and bike and that the closed City landfill and its environs were to be offered to the Department of Parks & Recreation, City of Los Angeles upon closure. 460

The proponent goes on to state that: "The development of a landfill within this project site would significantly reduce infrastructure cost...". If relevant policies of SCAG are used which encourage patterns of land use which reduce costs in infrastructure construction and make better use of facilities, why isn't it noted that this is conflict with SCAGs policy to encourage existing or proposed local jurisdictions programs which create opportunities for residents to walk and bike. To what advantage is this to the general public and why would this be a reason to approve the project? 461

The proponent also says that "If project development does not occur, transportation or hauling costs to other landfill facilities located either in-County or out-of-County would increase due to greater travel distances". What data or assumptions is this information based on? 462 463

Does the SCAQMD agree with this assessment? The proponent also states that: the development of the proposed project would minimize many significant environmental impacts such as biological resources, development of new infrastructure, and air quality emission impacts associated with new site development, or the exportation of wastes to other landfills. Where is the data that supports these contentions? 464

Does the proponent consider that there may be offsetting factors given that other landfills may in fact reduce travel due to their proximity to the anticipate wastestream or that they may be less environmentally harmful than the project proposed? 465

City of Los Angeles Air Quality Element, Page 4-82

In Goal 1 the proponent states that the project supports consistency with the AQMP and sustenance of Citywide economic growth to obtain good air quality. How can this be when the landfill which is the largest stationary source of emissions is being expanded in an area with already poor quality air? 466 467

As requested before, where is the data that supports these contentions? Does the proponent consider that there may be offsetting factors given that other landfills may in fact reduce travel due to their proximity to the anticipate wastestream or that they may be less environmentally harmful than the project proposed? 468

In Goal 2 how does the proponent justify the statement "and thereby ensure attainment of this goal when fact, a). rideshare programs are not mandatory, b). that the AQMD is permitting monies to be paid rather than enforcing/encouraging ridesharing, and c). that given only 87 employees that they live in close enough proximity to each other to form even one carpool, let alone enough to have any impact on air quality? 469 470 471

In Goal 3 it is stated that transfer trucks that haul partial loads will be penalized, thereby encouraging full loads and reduced truck movement. What data supports this contention? Has BFI in the past enforced penalties and if so were partial loads reduced, what monies were collected and who was the beneficiary? 472 473

In Goal 4 it states that the project should minimize the impacts of land use development on air quality. A CEQA analysis and stand-alone health risk assessment is offered up. As stated by this respondent and others, these studies and others do not accurately reflect the impacts due to the 474



way in which parameters were manipulated, the understated inflow, the exclusion of green waste and wood waste recycling, and due to the fact that the studies do not represent cumulative impacts.

In Goal 5 it states that the project would include development of a green waste and wood waste recycling and public drop-off area to support recycling efforts in order to improve energy efficiency primarily at City facilities. How many tons per day are involved? Precisely how does this equate to energy efficiency primarily at City facilities? 475 476

Cumulative Impact, Page 4-83

In paragraph two of this section table 4.2.8 Air Quality Operational Phase (Long-Term), Page 4-64 is referenced. As stated before, on Tuesday, November 18, 1997 at a Proposed General Plan Amendment/Zone Change Meeting held in Granada Hills, the proponents when asked if the 11,000 tpd was correct indicated that it was not and that the tonnage would be much higher than the 11,000 stated in the SEIR. The SEIR does not take into account that the County has a permitted inflow rate and that it will continue to operate as the new City/County landfill is constructed. Further, the green waste from both sides has been excluded. Given that the tonnage will be much higher, all subsequent Tables 4.2-7 Heavy Equipment Emissions for Site Operations, Table 4.2-8 Operation Gaseous Emissions, Table 4.2-9 Permitted Daily Emissions from Flaring Activities, 4.2-10 Estimated Emissions for Truck Travel over Unpaved Surfaces, Table 4.2-11 Estimated Fugitive Dust PM_{10} Emissions for Site Operations, et cetera do not accurately reflect the air impacts. 477 478 479 480

City Mitigation Measures, Page 4-84

Under the title Exhaust Emission the proponent lists a series of bullets claiming that they will variously tune equipment, use catalytic converters, retard diesel engine injection, use high-pressure fuel injectors, use low-emission fuel, not leave equipment idling for long periods, and will curtail construction during smog alerts. As previously asked who will monitor these mitigations to ensure that they are implemented? Have these same mitigations not already been implemented for all on-site equipment because they would have been required mitigations in the County? 481 482

Table 4.2.14, Construction Emissions, Control Measure Reduction Efficiency, and Residual Emissions on page 4-85 is not correct. As stated before, on Tuesday, November 18, 1997 at a Proposed General Plan Amendment/Zone Change Meeting held in Granada Hills, the proponents when asked if the 11,000 tpd was correct indicated that it was not and that the tonnage would be much higher than the 11,000 stated in the SEIR. The SEIR does not take into account that the County has a permitted inflow rate and that it will continue to operate as the new City/County landfill is constructed. Further, the green waste from both sides has been excluded. Also see our response to Fugitive Dust Emissions, Page 4-62 section. 483 484 485

CITY MITIGATION MEASURES

4.2.11 Construction, Page 4-84

Under the title Exhaust Emissions the proponent states in a series of bullets that if these items are implemented it will reduce the emissions to the maximum extent possible. It is not clear whether or not this equipment will come from onsite or will be brought in especially for the construction. 486

What agency will check to insure that these mitigations are implemented? Given that the County expansion was already materially detrimental to the residents and that it was approved under overriding considerations shouldn't these pieces of equipment already be operated in such a manner? If not why? 487 488

Fugitive Dust, Page 4-86

The statement "Dust from construction activities, including physical site disturbance, material deliveries, employee commuting, and potential wind erosion during high wind episodes, may create a visual and soiling nuisance beyond the property line" should be revised to "will create". 489

It goes on to state that "because dust impacts are expected to be significant during the construction phase, standard mitigation measures (by project design) will be implemented... as required by SCAMD Rules 402 (Nuisance) and 403 (Fugitive Dust). What are rules 402 and 403 and why were they not included? 490

Are the mitigations that follow this statement "standard" or are they by "project design"? 491

Rule 403 used to preclude any enforcement if the winds were over 25 mph and the operator was making a reasonable attempt to control. Even if 403 has been revised how will this mitigate dust? 492

Under the mitigations measures that follow, the daily watering and soil stabilization, the graded areas shall be watered, the disturbed areas shall be revegetated with an interim groundcover as proposed is not attainable as previously outlined in our response to Fugitive Dust Emissions, Page 4-62 in which the preparer states that "Construction work at the proposed landfill footprint would disturb a relatively small area (estimated not to exceed 40 acres at any given time). In accordance with information provided by the project proponent, actual excavation operations would be further restricted to an even smaller area not expected to exceed about 10 acres per day of the 40 acre footprint." Forty acres or even 10 acres is not a "relatively small area" when located in the wind tunnel that is the Newhall-Saugus Pass. Given the terrain and the existing weather conditions it is not possible to mitigate the dust. 493

Past zoning actions and the EIR for the County expansion contain documentation and pictures of dust produced in the City landfill (now closed) of dust being visible for 10.4 miles away, of dust blowing from berms and hillsides, of water from watering trucks being blown into the air without ever touching the ground. What guarantees are in place to insure that all surfaces once disturbed during construction and to the completion of construction are properly sealed and/or watered given the steep nature of the terrain and the ferocious winds? 494

Please explain how the proponent can mitigate dust when they have been unable to revegetate the closed City landfill or even the cut slopes on the County landfill? 495

Please explain how water trucks will gain access to cut slopes? 496

In the next mitigation it states that the wind speed shall be continually monitored using onsite anemometers and excavation shall be halted when the 15-minute average wind speed exceeds 15 mph or when instantaneous wind speed exceeds 25 mph. The proponent fails to provide any details. 497

Since there are 3 anemometers onsite will the data be taken from all three sites and averaged? 498

If not from all three sites, which site will have precedence? 499

How will all workers be notified to cease operations and how long will this take? 500

Given the fact that winds spring up very quickly how does the proponent prevent dust from going offsite as the exposed areas can go up to 5 days without sealant, steep terrain will have no water, interim revegetation will not have had a chance to grow, therefore how can the dust be abated in a reasonable short period?

Fugitive Dust, Page 4-88

The applicant admits that: "past operations have shown that the higher-elevation upper plateau an southern berm areas of the existing inactive landfill have experienced greater wind-generated fugitive dust occurrences than the lower elevations within the canyon", and "the lack of revegetation on the active face of the landfill surface has exacerbated difficulties inadequately controlling fugitive dust emissions during periods of high wind conditions". The proponent claims success in other portions of the site. Specifically, precisely what areas are considered to be successful? 501

Do the responsible agencies agree with this assessment? 502

Has final cover been applied and has the required revegetation been accomplished? If not why? 503

The proponent's project will occupy precisely the same geographic location, will experience the same winds, and has admitted difficulties in controlling dust emissions. Nothing in the mitigations proffered in this SEIR can prevent dust from blowing off-site. 504

Table 4.2-15, Operational Emissions, Control Measure Reduction Efficiency, and Residual Emissions on page 4-89 is not correct. As stated before, on Tuesday, November 18, 1997 at a Proposed General Plan Amendment/Zone Change Meeting held in Granada Hills, the proponents when asked if the 11,000 tpd was correct indicated that it was not and that the tonnage would be much higher than the 11,000 stated in the SEIR. 505

The SEIR does not take into account that the County has a permitted inflow rate and that it will continue to operate as the new City/County landfill is constructed. Further, the green waste from both sides has been excluded. Also see our response to Fugitive Dust Emissions, Page 4-62 section. 506

Table 4.2-16, Operational Fugitive Dust PM10 Emissions, Control Measure Reduction Efficiency, and Residual Emissions on page 4-90 is not correct. As stated before, on Tuesday, November 18, 1997 at a Proposed General Plan Amendment/Zone Change Meeting held in Granada Hills, the proponents when asked if the 11,000 tpd was correct indicated that it was not and that the tonnage would be much higher than the 11,000 stated in the SEIR. 507

The SEIR does not take into account that the County has a permitted inflow rate and that it will continue to operate as the new City/County landfill is constructed. Further, the green waste from both sides has been excluded. Also see our response to Fugitive Dust Emissions, Page 4-62 section. 508

General Observations and Comments

The SEIR as presented represents nothing more than a self-serving document perpetuated by the proponent in an effort to gain approval for an environmentally unsafe project. The document is a contorted mix of referenced data, which is not included, and of tables based on assumptions without supporting data and which fail to present the cumulative impacts of the project and as such is a violation of California Environmental Quality Act (CEQA). 509

The SEIR represents an incremental approval of entire original project as proposed (215 million ton City/County Landfill) and as such is a violation of the California Environmental Quality Act (CEQA). 510

This document is replete with mitigations that are suggested "as possible" but in fact may not ever be done. Only mitigations that are to be implemented should be permitted to remain. 511

Recycling will be located on the southern berm in the area that is the nearest to the residents. 512
There is no discussion of the emissions, noise, and odors from this type of operation. 513
No discussion of truck trips generated. Also there is no discussion of viewsheds to the residential area to the south of the landfill. 514

The landfills past violations and actions relating to City agencies must be taken into account when reviewing this SEIR. BFI, the proponent has refused to comply with their original Variance and the additional Conditions that were applied by various Zoning Administrators, Boards of Zoning Appeals, the Planned Land Use Committee, and the City Council. 515

Changes to the conditions of final approval at the current County expansion must be taken into account. The proponent makes many proposals for compliance or mitigation in the EIR in order to gain approval but then has subsequently sought changes. These changes were not identified in the SEIR. 516

There is no discussion on the effects on the property values of residents. 517

There is no discussion on the quality of life. 518

A one day traffic study was conducted with the aid of Councilman Bernson's office in late November 1997. The results do not support or validate the proponents outdated studies. 519

The composition of the landfill both City and County would not be the same if the use of tarps and alternate cover continues. The lack of dirt can result in an entirely different structure which will possibly negate the seismic loading data, leachate production, stability, et cetera. 520

The drainage from the County landfill and the upper reaches of Sunshine Canyon are shown to be dependent on concrete culverts located on top of the already closed City landfill both southern and northern portions. The raising of a hill of trash which effectively blocks the drainage of the upper canyon and then routes it over existing trash is a recipe for disaster. Blockages or breaks may occur may occur during flood events and/or in conjunction with seismic activity which may cause the water to overflow or undercut the channels. These kind of scenarios will result in trash being washed out and that can either contaminate the waters flowing from the mouth of the canyon and/or undermine the integrity of the landfill. 521

North Valley Coalition
Response to
SEIR 91-0377-/ZC/GPA
November, 1997

Excerpt Consumer Reports
Clearing the Air
August 1997
Exhibit (WH-1)

AIR QUALITY • SPECIAL REPORT

Clearing the air



Is our air clean enough?

It was what scientists call a "natural experiment," a serendipitous way to study, in this case, whether people would be healthier if the air were cleaner. An environmental economist at Brigham Young University spotted the research opportunity: A labor dispute had shut down the steel mill near Provo, Utah, for 13 months, removing the major source of air pollution (aside from cars) in the isolated mountain valley. The method he applied couldn't have been simpler. From the valley's three hospitals he collected counts of admissions for respiratory illness—before, during, and after the plant shutdown.

And the results could not have been more striking. When the mill was running, hospital admissions were 40 percent higher for bronchitis and 17 percent higher for pneumonia. Especially startling was the effect on preschool children: twice as many admissions for bronchitis and asthma.

IN SHORT

Air pollution, especially tiny particles, kills about 50,000 people in the U.S. each year.

Asthma is aggravated by pollution, but it can be kept under control if you get the right medications and keep your home clear of allergens.

Ratings of high-filtration vacuum cleaners, page 40.

Yet Provo's atmosphere didn't seem particularly bad. Even when the mill was in full operation, the valley's air was only slightly dirtier than national air-pollution regulations allow.

That 1989 study is one of many dozens in the past decade that point to a worrisome new conclusion: Outdoor air—even air that meets present pollution standards—still can be hazardous to your health.

Scientists have detected a sizable and reliable connection between dirty air and health problems in dozens of communities large and small, old and new, in every type of climate, throughout North America.

So consistent is the association that epidemiologists can even estimate the annual U.S. toll from air pollution—about 50,000 deaths from heart disease, asthma, stroke, bronchitis, and the like. That's more people than die in auto accidents. Thousands of these deaths occur in places where air meets current national standards.

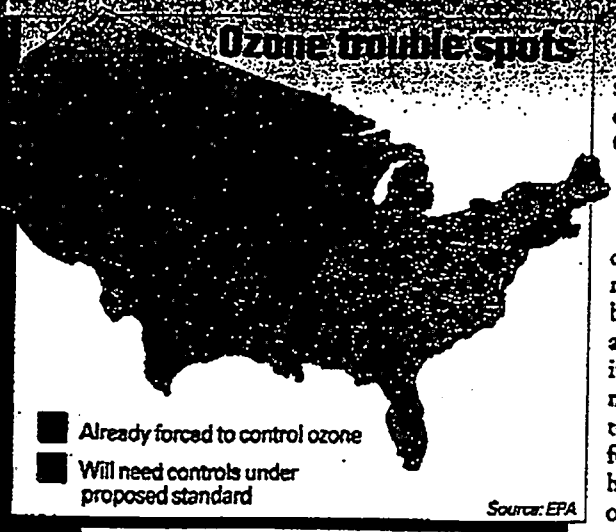
"I know of no other environmental risk factor where the exposure is so ubiquitous and the effects are so large," says C. Arden Pope, author of the Provo study.

After considering the evidence of previously unrecognized hazards, the U.S. Environmental Protection Agency (EPA) proposed strengthening air-pollution standards for the first time since 1990. The new regulations, which President Clinton endorsed in June, were expected to be published in July.

The proposal has elicited strenuous protest from industries that contribute most heavily to air pollution: oil, autos, utilities, and heavy manufacturing. Resurrecting arguments shaped during previous clean-air debates, these industries predict that compliance would threaten thousands of jobs and intrude on Americans' lives. They have sent dozens of lobbyists to churn up Congressional opposition.

And employing a tactic increasingly common in health and environmental controversies, industries have launched a direct attack on the science itself. Typical is a Mobil Corp. newspaper advertisement asserting that the link between air pollution and illness is "based on shaky science" that is "unraveling" and "incomplete."

However, a close look at this "shaky" evidence shows that it is anything but. The real debate, in our opinion,



Deceptive Scenic Casco Bay, Me., is downwind of so many ozone sources that—as monitors in the shed in the background reveal—its air violates current standards.

Photo by Joseph Devenney; illustration by Dave Morril

should be over how much air pollution we should tolerate.

Bad air, bad health

Proving a link between environmental pollution and disease is normally a daunting task. But in the case of air pollution and health, scientists have obtained remarkably consistent, significant results no matter where they've looked.

Many of the studies have used a similar technique: They've compared deaths and hospital admissions with air-pollution measurements made by pollution-control agencies.

"All this data is publicly available," notes Joel Schwartz, associate professor of environmental epidemiology at the Harvard School of Public Health and author of many of the studies. "You find people dying from chronic lung disease, pneumonia, and sudden heart attacks. These aren't people [already] lying in the hospital with tubes stuck in them. The biggest increase we find on high air-pollution days is in people dead on arrival at the hospital."

Two significant contributors to these effects are ozone and particulate matter.

Ozone. This is an unstable gas formed in the air by sunlight-induced reactions between two types of emissions, nitrogen oxides from combustion and vapors from sources such as gasoline and solvents. Ozone pollution gets worse when the weather heats up.

Ozone is beneficial in the upper atmosphere, but toxic below. It readily reacts with whatever it touches, which makes it irritating to living tissue. A few seconds in a high concentration of ozone is like opening your eyes in an overchlorinated swimming pool.

Many studies have found harmful consequences:

- Children at a Connecticut asthma camp were 40 percent more likely to have an acute asthma attack on high-ozone summer days than on average days. (Laboratory studies of asthmatic and normal volunteers suggest that ozone magnifies the effect of the allergens and irritants that set off attacks.)
- The first results of an ongoing 10-year study of southern California schoolchildren has found a direct correlation between school absences and lifetime exposure to ozone.
- When healthy volunteers exercise in ozone concentrations like those routinely found outdoors in urban areas, their lung function deteriorates, they develop an irritable cough, and their airways become inflamed.
- Studies in nine major U.S. cities show that daily mortality rates increase along with ozone, even if the ozone is below current legal limits.

Particulates. These are what they sound like: tiny particles. Much tinier than ordinary dust, they can be inhaled into the deepest recesses of the lung and lodge there for a long time. The most damaging particles, the very smallest ones, usually are by-products of combustion.

Their effects on people have been measured in many cities in the U.S. and in other countries: more respiratory illnesses and more deaths.

- A few weeks ago, researchers reported that infant mortality in the most polluted communities is 25 percent higher than in the cleanest ones.
- A study of 15,000 children in 24 North American communities found that youngsters in the community with the worst fine-particle pollution had 65 percent more bronchitis than those in the cleanest community.
- The most striking evidence comes from the so-called Six City study, in which researchers from Harvard and Brigham Young universities followed more than 8000 adults for an average of 15 years, comparing their health status to local fine-particle counts.

The results: Residents of Steubenville, Ohio, the city with the most small-particle pollution, had a 25 percent higher mortality rate than residents of the cleanest city, Portage, Wisc. The excess deaths were almost entirely from lung cancer and cardiopulmonary disease.

The researchers were so amazed by their findings that they repeated the study using an even larger number of people—500,000 adults in 151 communities. They got similar results.

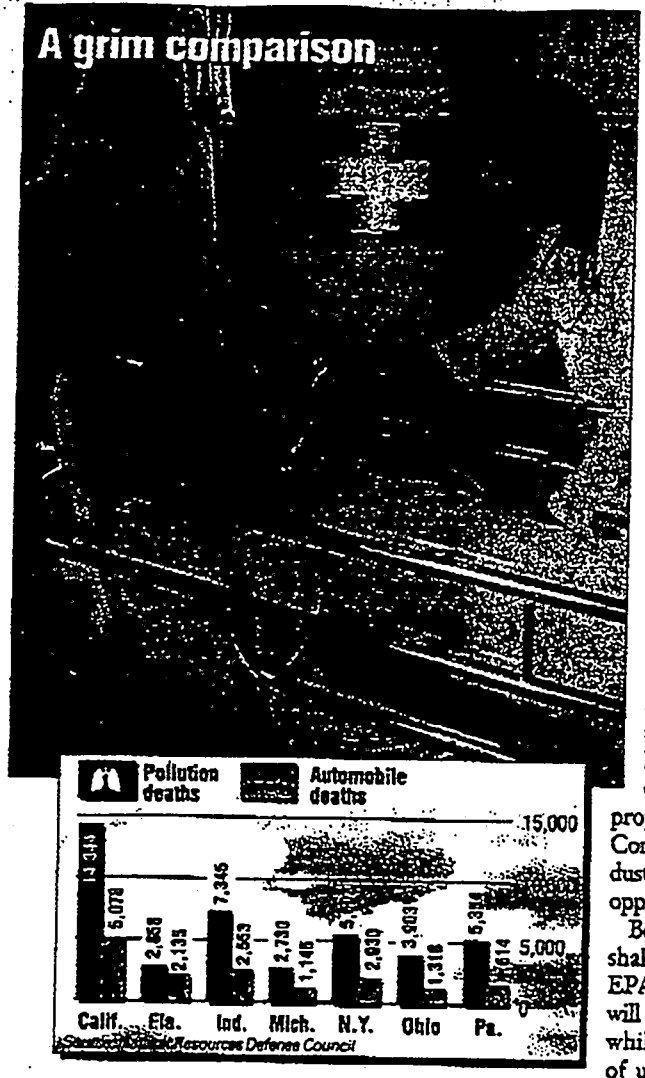
Laboratory evidence is accumulating as well, says Schwartz, the Harvard epidemiologist. "Three different research groups have now independently reported that these particles produce the kinds of cardiovascular changes suspected in causing sudden death from heart attack."

Tightening the rules

The U.S. passed its most comprehensive air-pollution law, the Clean Air Act Amendments, in 1970. Since then, the air has gotten a lot cleaner in some respects. Still, 121 million Americans—nearly half the population—live in areas where air does not meet existing health-based standards. Nevertheless, the new health studies prompted the EPA to propose even stricter standards for ozone and particulates:

Improved in the past decade, ozone concentrations have declined 6 percent, and particulates are down 22 percent. But air in many areas still violates the standards.

Ozone. The standard, now the equivalent of 0.09 parts per million averaged over an eight-hour period, would be tightened to 0.08 parts per million. (Environmental and respiratory-health groups, such as the American Lung Association, prefer an even lower level—0.07 parts per million.) The expected effect: millions fewer people losing lung capacity and 140,000 fewer cases of acute respiratory symptoms each year.



Roll up the windows. *Study after study shows more deaths and hospitalizations when the air is bad. That leads to such calculations as this one: the number of deaths attributed to particulate air pollution in one year in several states' metropolitan areas, compared with the number of automobile deaths.*

This change would mainly affect heavily populated regions that just barely meet current standards, such as the upper Ohio River Valley and the Carolinas. These areas would likely have to do what regions with even more ozone pollution have already done: Crack down on polluting cars, require gasoline and solvents with less vapor, and—above all—make industries and power plants clean up more of their emissions.

Particulates. The current standard treats all small particles—those measuring less than 10 microns—as one group. It turns out that industries can meet this standard by controlling the largest of the group, such as soot and dust, while doing nothing about the very fine particles—less than 2.5 microns—that scientists now realize do the most damage.

The EPA's proposal would add a specific limit for the very fine particles—an annual average of 15 micrograms per cubic meter, with an allowable 24-hour "peak average" of no more than 65 micrograms per cubic meter. The change would save about 15,000 lives a year and avoid 8000 hospitalizations, the EPA estimates.

This change would have its biggest impact on the coal- and oil-burning industries and utilities and on diesel vehicles, which have largely escaped strict regulation under present rules.

The current debate

Not surprisingly, those very same industries are leading—and bankrolling—a vigorous lobbying and public-relations campaign against the EPA's proposal. Many members of Congress—especially from the industrial Midwest—have taken up opposition to the EPA's proposal.

Besides dismissing the science as shaky, the opponents scoff at the EPA's claim that the new rules will cost less than $9-billion a year while returning health benefits of up to $120-billion. Industry puts the cost at closer to $60-billion—and says the EPA has overstated the value of the lives saved.

"A lot of people argue it needs more study," says Joe Lastelic, spokesman for the American Petroleum Institute. "You shouldn't be spending all that money if you're going to get minimal benefits."

In fact, it is difficult for anyone to predict the cost. Those industries have made the same threats repeatedly over the years, but when regulations have changed anyway, the predicted economic disasters haven't materialized. For example:

- In 1990, industry warned that Federal rules requiring better sulfur-dioxide pollution controls on large power plants (to control acid rain) would cost as much as $1500 per ton of pollution removed, while the EPA predicted $500. Actual cost: $70 to $100 per ton.
- In the 1980s, oil companies resisted changing to a lower-vapor gasoline. "They complained that the cost of gasoline would shoot up 3 to 5 cents a gallon and that there would be long lines at gas stations," recalls Bill Becker, director of the Association of State and Territorial Air Pollution Program Administrators. "Nothing of the sort happened. The cost increase was a fraction of a cent."

Policy analysts say this happens because, when given no choice, companies come up with new technological solutions. In fact, a study commissioned by the American Iron and Steel Institute found that steel mills in the upper Ohio River Valley could comply with the EPA particulate proposal at "minimal cost."

It's also very difficult to put a price tag on the health benefits. There are many different ways of calculating the cost to society of death and illness.

Recommendations

Even if industries' cost of cleaning up exceeds people's cost of breathing dirty air, that's no excuse to do nothing about it.

"Pollution is hideously expensive already," says George Thurston of the New York University School of Medicine's Institute of Environmental Medicine, the author of many air-pollution and health studies. "People are going to the hospital, they're taking medicines, they're taking sick days. What we are really talking about here is transferring the costs from the general public to the polluter."

Unpersuasive. One of the silliest arguments against tighter air standards: We need urban ozone to help shield us from sunlight-induced skin cancer. In fact, the protection is negligible compared to the respiratory damage.

As we said in our report, "Facing Our Fears" (December 1996), the debate on such questions needs to be shaped by public values, supported as much as possible by hard information.

We endorse strengthening the nation's air-pollution standards. The science suggests that the health benefits would be great, history suggests that industry's costs will be less than advertised, and the public has consistently shown that it wants the Government to make sure the air is cleaner.

Photo courtesy of The Stock Market

Pollution linked to hospital stays

Close connection of smog, illness alarms activists

By David R. Baker
Daily News Staff Writer

As smog and soot levels rise in the Los Angeles air, so do hospital admissions for asthma, pneumonia and other respiratory problems, a new study found.

The study, to be released today at an air-quality symposium, tied daily air pollution measurements to patient admissions during 1995 at Kaiser Permanente hospitals, including those in Woodland Hills and Panorama City.

Researchers found that the number of admissions rose in lock step with increases in either ozone levels or the amount of particulates — airborne pollutants far smaller than the diameter of a human hair.

"This is the first study of its kind conducted in the (Los Angeles) Basin and shows that the region's air pollution continues to be a leading public health concern," said Shankar Prasad, health effects officer for the South Coast Air Quality Management District, which paid for the $145,000 study.

Although researchers expected to see some correlation between pollution and hospital admissions, they didn't expect such a significant increase, said district spokesman Sam Atwood.

The study comes just after the AQMD announced the region experienced the least-smoggy season on record.

Local environmentalists called the findings alarming.

"These are people hospitalized simply because they were breathing the air, not because they were doing anything harmful," said Tim Carmichael of the Coalition for Clean Air. "It's a tragic situation, and we've got to do everything we can to change that."

Indeed, the study and the symposium — hosted by the air quality agency — could have far-reaching effects on how Southern California deals with air pollution. After listening to the results of this and other health studies today, participants in the two-day symposium will discuss efforts to cut emissions from what many consider a major source of air pollution — diesel engines.

Although only 4 percent of California vehicles use diesel, those vehicles account for more than 30 percent of nitrogen oxide emissions and even more of the particulate pollution, according to the AQMD.

Two bills that would encourage truck-fleet operators and others to switch from diesel-burning engines were discussed in the state Legislature during the past session. And next year, the state's Air Resources Board will consider listing diesel exhaust as a toxic air contaminant, a step that could lead to further regulation.

Beau Biller, spokesman for the California Trucking Association, said he opposes such a classification because it would leave diesel users vulnerable to lawsuits from people claiming the exhaust made them sick.

The Kaiser study did not look at specific sources of pollution. Instead, it matched ozone levels and particulate emissions throughout 1995 with Kaiser records covering 1.6 million patients.

For every 10 microgram increase in the concentration of particulates, hospital admissions rose an average of 7 percent for chronic respiratory illnesses, 3 percent for cardiovascular disease and 3.5 percent for acute respiratory illnesses.

Ozone had a similarly hazardous effect. During the study, when the ozone concentration in the air rose by 10 parts per billion, an average of 2.7 percent more people with chronic respiratory problems, 5.7 percent more cardiovascular disease sufferers and 1.5 percent more people with acute respiratory diseases checked themselves into the hospital.

North Valley Coalition
Response to
SEIR 91-0377-/ZC/GPA
November, 1997

Exerpt from Daily News
Thursday, November 20, 1997
Exhibit (WH-2)

North Valley Coalition
Response to
SEIR 91-0377-/ZC/GPA
November, 1997

Exerpt from Los Angeles Times
Sunday, November 23, 1997
Exhibit (WH-3)



ROBERT A. JONES

A Quiz For Deep Breathers

Which of the following statements is true:

• Los Angeles' air pollution gets better year by year, so don't worry, be happy.

• Air pollution is more dangerous to your health, and your children's health, than anyone realized even 10 years ago.

My quiz is a setup, of course. Both statements are true.

Each year the smog levels drop, leaving the view a bit clearer. And each year scientists discover that the remaining filth in the air erodes our lungs in ways no one predicted when the war on smog began.

Nowhere have these paradoxical trends been so displayed as last week in Diamond Bar. The Air Quality Management District, which relentlessly praises its smog-fighting success, released a new study that should scare every parent in the basin and anyone else who has breathed L.A.'s air for long periods.

□

The study, conducted by the Kaiser Foundation Research Institute, found that modest increases in

Please see JONES, B6

Court Files reporter Ann W. O'Neill is on vacation.

JONES

Continued from B1

particulate pollution—we're talking here about construction dust, rubber tire grit and the like—produced sharp increases in hospitalizations at Kaiser hospitals.

Keep in mind that particulates once were regarded as so innocuous that little research was conducted into their impact on human health. After all, it was only dust. The heavy-duty research was directed at the more exotic pollutants such as ozone and nitrogen oxides.

Now we know different. A dozen studies over the past decade have established particulates as one of the most dangerous components in the air pollution mix. They work their way deep into the lungs, where they slowly do their damage. And Southern California, natcherly, has the highest particulate levels in the country.

The Kaiser study showed that the biggest jump in hospitalizations came for those who already suffer from chronic lung diseases such as bronchitis or asthma. If the particulate level rose from 40 micrograms per cubic meter to 50 micrograms—a common occurrence here—the number of hospitalizations among this group increased by 7%.

Shankar Prasad, the health effects officer for the AQMD, called the 7% figure "a big number." And indeed it is, almost twice as large as the increases found in cities back East.

Ronald White of the American Lung Assn. says such figures are sometimes dismissed by those who argue that they apply only to the dying and very sick.

That represents a misconception, he says. "This country has tens of millions of people with chronic lung and cardiovascular disease," White says. "Many of them go to work every day and lead productive lives. They are not lying in bed on a respirator."

And how did these people come by their chronic lung disease in the first place? Some of them smoke cigarettes, of course, or have a genetic predisposition. For others, the culprit may be the same air pollution that eventually delivers a knockout blow and puts them the hospit l.

□

In fact, one of the scariest studi of recent years involves t autopsies of 107 young accide victims in Southern California. described in a report by the Nat ral Resources Defense Council, t study found that 104 of the you people showed early signs of pe manent lung disease. Nearly had chronic low-level bronchit One-third had chronic interstit pneumonia, a form of the disea found deep within the lung tissue

Before their deaths, almost no of the young people showed ou ward signs of breathing disorde In other words, they didn't kno they were developing chronic lu disease. But they were movi inexorably toward that status of person who eventually gets pick off by an uptick in particulates.

"The dilemma is that peop keep hearing about the air gettir cleaner, and it is," says Whit "What they should also hear is th science has learned there's muc more to worry about even wi those lower levels."

As for particulates, the city Los Angeles could strike a quic blow for cleaner air by committir itself to enforcement of the month-old ban on leaf blowers. all of Southern California, son 420,000 leaf blowers now wor furiously to throw as much dust possible into the air so we can a breathe it.

That dust contains desiccate pesticides, animal feces, lead, as bestos and god knows what els And it gets thrown right int people's faces, especially the face of the men who must work wit the machines strapped to the backs.

The leaf-blower ban won't solv the particulate problem by an means, but it's a start. Wouldn't be pretty to think that one day w could drop off our kids at schoo watch them race across the play ground, and not feel that twinge c regret over raising them in th filthiest air in the country?

Ironically the new science ma help us get there. Knowledge i power, after all. If we use i correctly, this knowledge could ge us a long way.

North Valley Coalition
Response to
SEIR 91-0377-/ZC/GPA
November, 1997

Exerpt from Coalition For Clean Air
Spring 1997
Exhibit (WH-4)

CLEAR THE AIR

...TION for CL... ...air SPR... 1997

Special Edition:

Breathless

Warning: Breathing May Be Hazardous To Your Health

We all have to breathe. Unfortunately, breathing Southern California's air can leave us breathless. The symptoms are all too familiar: coughing, burning eyes, chest pains, wheezing, nausea and headaches.

Scientific studies have consistently linked air pollution to serious respiratory disease, cancer and even premature death. And, a growing body of medical evidence indicates that particulate pollution — tiny, microscopic particles in the air — may be the most harmful of all air pollutants.

For years, government, industry, environmental organizations and the community have been successfully working together to reduce air pollution. Our air *is* cleaner today than it was twenty years ago.

Unfortunately, however, people who live in the South Coast Air Basin — which includes Los Angeles, Orange and parts of Riverside and San Bernardino counties — still breathe the most polluted air in the country. In fact, you would have to combine the air pollution from more than 40 metropolitan areas including New York, Chicago, Houston, Philadelphia and Denver to equal the unhealthful exposure in the South Coast Air Basin.

This special edition of *Clearing the Air* provides an overview of the effects smog has on our health and closely examines the risks associated with particulate pollution.

Please read this and share it with your friends and family. It's filled with valuable information to help protect you and your family. Everybody has to breathe. It shouldn't hurt us to do it.

The Facts:

Every year approximately 8,700 people die prematurely from exposure to particulate matter pollution in the South Coast Air Basin alone, according to NRDC.

Children raised in Southern California have a reduced lung capacity compared to children raised in other cities such as San Francisco, Seattle or Houston.

Breathing air in Southern California can reduce one's life span by one to two years.

Asthma is the leading serious chronic illness among children in the U.S. and is the #1 cause of school absences.

A Serious Health Threat

What is PM? PM, or particulate matter, is air pollution in the form of very tiny particles that float in the air. It can be solid pieces or tiny liquid droplets that form from other kinds of air pollutants. Depending upon where you live, it is likely a combination of both. It can ruin our view by reducing visibility — but, most importantly, it is a serious threat to human health.

PM makes healthy people sick and can make sick people die prematurely. In fact, PM is probably the most harmful of all air pollutants. It affects more than 70 million people nationally and more than 20 million people in Arizona, California and Nevada.

Of greatest concern to public health are the particles small enough to be inhaled into the deepest parts of the lung. Normal body defense mechanisms, like coughing or sneezing, don't help to clear the particles from our lungs. These particles are less than 10 microns in diameter, about 1/7 the thickness of a human hair.

Health Effects

PM pollution causes serious health problems in people of all ages, although children and the elderly are most sensitive to PM. It causes respiratory disease, aggravates asthma and bronchitis and reduces lung function. It reduces our ability to fight infection. It can cause cancer. Most importantly, it can cause premature death in the elderly and people who already have heart or lung disease. These impacts result in more doctor and emergency room visits and more work for our health care system.

Facts About PM

Where Does It Come From?

PM can be any number of things. It's a grab bag of pollutants and it comes from many sources: from truck and automobile tail pipes; from oil refineries and power plants; from chimneys of wood-burning fireplaces and stoves; from brush and waste burning; and from exposed dry ground construction and agricultural activities. It is smoke, organic compounds, salts and heavy metals such as lead. It is cancer-causing agents as well as toxic chemicals. It is dust blown from cleared land, construction sites, storage piles and the sides of ditches and roads. PM is dirt tracked onto paved roads and thrown into the air by passing cars. Ever wonder what happens to the tread from your tires? PM is even rubber pieces from automobile tires and metal pieces from brake wear. PM comes from many places but for the most part, it is caused by human activity. We produce more than 420 tons of PM every day in the South Coast Air Basin simply by going about our business as usual. That is why it is up to all of us to do something about it.

> **"PM is probably the most harmful of all air pollutants."**

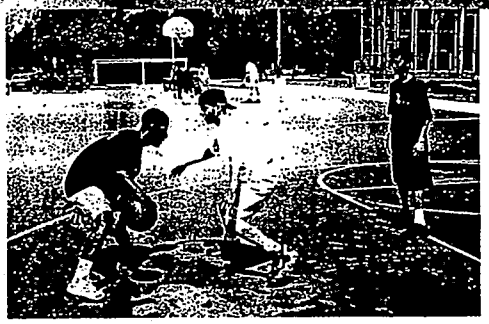
What Can PM Do?

The Natural Resources Defense Council (NRDC) calculates that approximately 64,000 people in the U.S. will die prematurely each year from exposure to particulate matter. 8,700 of these deaths occur in Los Angeles, Orange, Riverside and San Bernardino counties.

What Can I Do?

Read the next page, "Are You at Risk?" and "What You Can Do" (p.5) for tips on protecting yourself, your children and the air. Read the enclosed poster and keep it on your refrigerator. Most importantly, get involved! Call the Coalition for Clean Air to find out how you can help.

Are You At Risk?



Are you...
- a child
- elderly
- an infant
- an athlete

?

Do you have...
- allergies
- asthma
- heart disease
- chronic illness

?



Then you may be at extra risk.

Help yourself. Help your family.

Use air conditioning and air filter systems whenever possible.

Do not exercise outdoors on smoggy days.

Do not exercise during peak smog periods.

Check pollution levels in your area.
It's a toll free call to the South Coast Air Quality Management District. (see p.5)

Talking to Dr. Gong

Dr. Henry Gong is a Professor of Medicine at the University of Southern California School of Medicine and is Chairman of the Department of Medicine at the Rancho Los Amigos Medical Center.

People who live in Southern California breathe the dirtiest air in the country. We know that air pollution is bad for our health. Just how bad is California's smog for us?

There's been a noticeable reduction in air pollution over the past five years, especially in the number of Stage I Smog Alerts. Still, we have a significant amount of background ozone. In 1996, the days on which federal standards were exceeded were almost one-third of the year.

I hope that downward trend continues. However, it's possible — because of politics and legislation — that important regulations might be relaxed. This would result in more air pollution.

Lately we've been hearing a lot about particulate matter pollution. We hear that it may cause the most serious damage to our health. Please tell us what particulate matter is. Is it different from traditional smog? If so, how?

Particulate air pollution consists of fine, invisible particles that are easily inhaled into our lungs. Particle pollution consists of many substances, including road dust, sand, acids and metals.

Traditionally, in Southern California we have focused on the health effects of ozone pollution. Indeed, ozone is still a major problem in Los Angeles. However, particles and other pollutants are part of this mix in our air. Our concentration has shifted from time to time. Particle pollution has always been there. In the 1990's we have become more concerned about particulate pollution. In fact, because of premature death, asthma,



Dr. Henry Gong

breathing symptoms and other lung ailments, some experts view particulates as the most toxic of the air pollutants we measure.

How exactly do particles cause harm to human health?

We don't know how particles (particulates) harm our lungs. We're not sure if it's the total amount or the chemical type of particles that are responsible for adverse health effects.

Specifically, particles produce irritation of the airways and enhance asthma attacks or interfere with proper lung or heart function in more vulnerable persons. This occurs by processes involving immune cells or overloading the lung's defense mechanism.

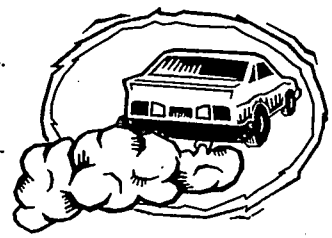
What are the most common and most dangerous health effects of particulates?

The most common health effects associated with breathing particles are respiratory symptoms in healthy persons such as coughing and chest tightness. And, they can cause wheezing in asthmatics. Serious breathing or heart problems caused by breathing particulate pollution may require one to see a doctor or be hospitalized.

The worst outcome is death. Epidemiologists have used death certificate information to determine that there are excess deaths associated with particulate matter pollution. In fact, the Natural Resources Defense Council has estimated that 64,000 people in the United States die each year because of particulate pollution.

Is there a cause and effect relationship between particulates and ill health or premature death?

So far, there is a strong, consistent and coherent association between particulate matter pollution and ill health and premature death. This



cont'd on page 7

Dr. Gong (from p.4)

association is based on numerous health risk studies of different groups of people, different ages, different cities conducted by different researchers. While we do not currently have a definite cause and effect relationship, there is weight of evidence which strongly indicates that there is a relationship.

Who is at greatest risk?

Elderly persons with chronic heart or lung illness and children receive the brunt of the effects of particulate pollution. Asthmatics of all ages are also at risk.

What level of exposure to particulates is considered unhealthy?

Concentrations above the current federal standard for PM indicate damage to lung health and life. Despite improved air quality today, there continues to be a finding of a direct or linear relationship between particulate matter concentrations and death. That there is not a known safe threshold level is of greater concern. In other words, we don't know if there is a safe threshold level. This means that even the current federal standard for PM may be insufficient for protecting public health.

What can we do to protect ourselves from particulate pollution?

Learn more about air pollution and its health effects. Support legislation aimed at improving air quality; support the use of clean, alternative fuels that pollute less than gasoline and diesel; and support research aimed at learning more about the health effects of PM pollution. During smog alerts or increased outdoor pollution, limit the time you spend outdoors; reduce your level of outdoor exercise; and exercise in the morning or evening. Also, use prescribed inhaled medication, if applicable, prior to going outside. Consider wearing masks with activated carbon filters and consult the air quality charts in local newspapers to see where and when air quality is predicted to be worse or better. Last, use air conditioners. You can probably remove most outdoor air pollution before it enters the home, which is desirable.

Special thanks to: The American Lung Association, Clean Air Network, Natural Resources Defense Council, Dr. Henry Gong, Lee Schneider, Toni Pogue and the PM 10 Best Available Control Measures Working Group.

CLEARING THE AIR

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Coalition for Clean Air Mission:
The Coalition for Clean Air is dedicated to restoring clean, healthy air to Southern Californians by organizing broad-based community involvement, advocating responsible public health policy and providing a source for technical and educational expertise.

Printed on recycled paper using soy-based inks

The South Coast Air Basin—which is Los Angeles, Orange and parts of Riverside and San Bernardino Counties, has the dirtiest air in the whole country.

To help keep you, your family and friends safe, please use this poster. Follow the tips inside—they really work!



If you have any questions about this information, please call the Coalition for Clean Air at 310.260.4770.

SOUTHERN CALIFORNIA'S SMOG: HARMFUL IF SWALLOWED

Southern California still has the dirtiest air in the country.

You would have to combine the air pollution from more than 40 metropolitan areas in the country, including New York, Philadelphia, Chicago, Denver and Houston, to equal the unhealthful air quality in Southern California.

Residents of the South Coast Air Basin (which includes Los Angeles, Orange and parts of Riverside and San Bernardino counties) breathe dirty air an average of one out of every three days.

Medical studies indicate that smog has short- and long-term effects on our bodies.

Women living in high particulate areas may have

While air pollution affects everybody, its effects are more severe on sensitive populations, including:

Infants & Children
Teenagers
Pregnant women
The elderly
Anyone who suffers from heart or lung disease or respiratory problems such as asthma
Healthy people who exercise vigorously.

Children probably suffer the most from smog:

Children raised in Southern California suffer a decrease in lung function compared to children who grow up in less-polluted cities such as Seattle, San Francisco or Houston.

Children are more susceptible because they breathe more and faster than adults and their bodies and lungs are still developing.

8,700 premature deaths in Southern California are linked to particulate matter each year, according to the NRDC.

It will take all of us working together to help us breathe a little easier.

Call the Coalition For Clean Air for more information or to help. 310.260.4770

Breathing Particulate Matter, Ozone, Carbon Monoxide, and Nitrogen Oxides causes:
Burning eyes
Coughing/wheezing
Chest pains
Headaches/Nausea
Lung damage
Tired feeling
Respiratory infections.

Fine Particles (PM) may be liquid droplets or solids—a mixture of human-made and natural substances. PM is finer than the width of a human hair. Certain types of PM can increase the risk of developing cancer.

PM makes healthy people sick and can make sick people die prematurely. In fact, PM is probably the most harmful of all air pollutants. It affects more than 20 million people in Arizona, California and Nevada.

Of all the pollutants in the air, those smaller than 10 microns (about 1/7 the size of a human hair) are the most dangerous. When PM is that small, we breathe it in, but we can't breathe it back out again. It gets stuck in the deepest part of our lungs and stays there. Normal body defense mechanisms, like coughing or sneezing, don't help.

Help yourself. Help your family. Help your friends.

- Do not exercise outdoors on smoggy days or during peak smog periods.
- Use air conditioning and air filter systems whenever possible.
- Avoid scheduling outdoor games and activities during smog episodes.
- If you have asthma, take your medication before going outdoors.

Check pollution levels in your area. It's a toll free call to the South Coast Air Management District (see below).

Doctor's number: _____

Coalition for Clean Air: 310.260.4770

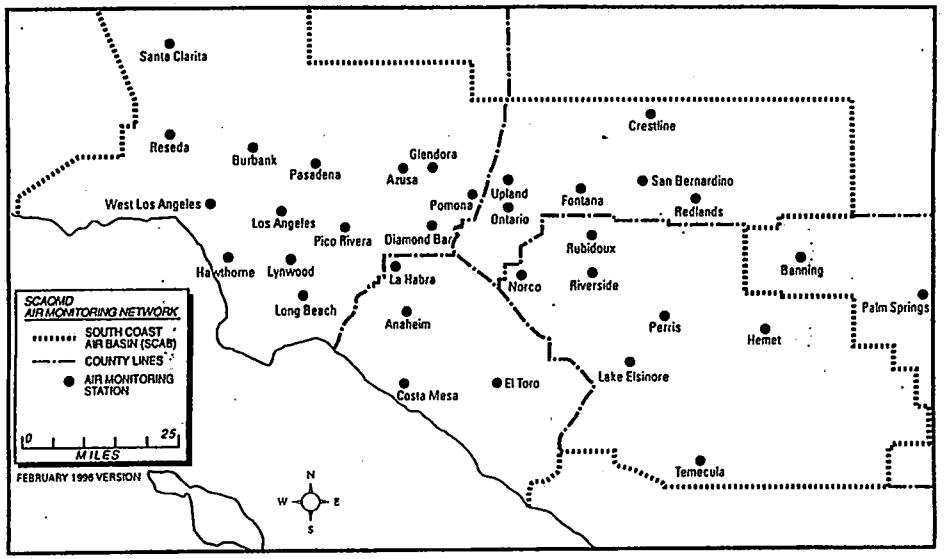
South Coast Air Quality Management District

Recorded Smog Information for:

Los Angeles/Orange Cos: 800.242.4022

Riverside/San Bernardino Cos: 800.367.4710

South Coast Air Basin



Please take this poster and hang it up in your house or classroom.

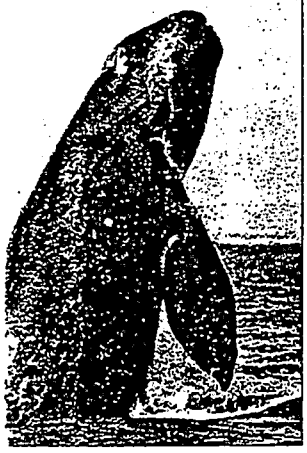
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Summer 1997
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Natural Resources Defense Council

About NRDC

NRDC is a national nonprofit organization dedicated to protecting the world's natural resources and ensuring a safe and healthy environment for all people. With more than 350,000 members and a staff of lawyers, scientists, and other environmental specialists, NRDC combines the power of law, the power of science, and the power of people in defense of the environment.

Editorial Purpose

The Amicus Journal is a quarterly of thought and opinion for the general public on environmental affairs, particularly those relating to policies of national and international significance. In keeping with NRDC's program of public-interest advocacy and its efforts to educate the public about environmental protection, this magazine offers essays, news analysis, features, profiles, reviews, and poetry; it also integrates news about NRDC, its staff and their work, with news about the environmental movement as a whole. To stimulate a creative exchange of ideas, **The Amicus Journal** is open to diverse points of view and belief; the opinions and views expressed in its pages (except those devoted to NRDC) by contributors and the editors are their own and not necessarily those of NRDC.

Amicus

Amicus (əmēkəs) is Latin for "friend." Its most common usage is in the phrase *amicus curiae*, meaning "friend of the court," an outside party who can comment on a lawsuit. NRDC has played this role on many occasions as an advocate for the environment.

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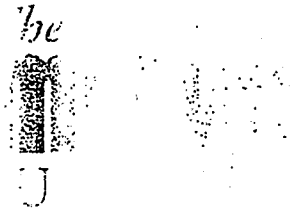
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Clearing the air

An epidemiologist takes on the worst air pollution problems of our time

by Renée Skelton

Joel Schwartz is clearly enjoying himself. Eyes lively, smile broad, he teases, jokes, hops across the front of the classroom to make a point, and endures the posturing of even the most annoying class showoff with good humor. This is "Advanced Regression Techniques for Environmental Epidemiology," and Schwartz is explaining how to mathematically filter out confounding factors in epidemiological data. Whether or not they're aware of it, the eighteen students packed into this small classroom are learning from one of the most eminent epidemiologists and biostatisticians in the United states today—a man who has been in the forefront of scientific research on two of the most important environmental health issues in recent years.

Now a professor at the Harvard School of Public Health, Schwartz spent his early career at the Environmental Protection Agency (EPA) during the environmentally challenged administrations of Ronald Reagan and George Bush. He gained a reputation for going the extra mile to explore the environmental health impacts of public policy decisions, sometimes even against the preferences of his superiors. His efforts were a major factor in establishing the final phaseout of lead from gasoline in the mid-1980s. Today, in one of the hardest-fought public health battles in U.S. history, he is one of many environmental health experts urging EPA to resist an avalanche of industry pressure and tighten the standards for fine airborne particles—currently the leading air pollution health threat in the country.

Schwartz began his scientific career in theoretical physics—great training, he says, in learning how to think—and entered the public policy arena as then-Representative Tim Wirth's legislative assistant for energy and the environment in 1977. In 1979



Harvard School of Public Health

Harvard's Joel Schwartz has done groundbreaking work on lead and particulates.

he joined EPA, where he worked at first on energy issues. But a brewing fight over the program to reduce the lead content of gasoline would become the central focus of his work for the next few years.

"When Ronald Reagan got elected, they set up a task force on regulatory reform, which put out a press release soliciting industry to nominate burdensome government regulations that ought to be abandoned," Schwartz remembers. "Since the basic screening protocol, as far as I can tell, was the number of letters they got that didn't like the regulations, [the lead phasedown] was right up there on their list."

In 1973, after a lawsuit brought by NRDC, EPA had created a five-year program to gradually reduce gasoline lead content. At the time, tetraethyl lead (TEL) was routinely added to lower-grade gasoline to make it burn efficiently enough to prevent the small explosions ("knock") caused by uneven combustion. For decades, the nation allowed the combustion of leaded gas to spew millions of tons of lead into the air, where it was breathed in or deposited in soil and dust.

But unlike many elements that are valuable at trace levels, lead is toxic, even in the smallest amounts. "Lead has absolutely no physiological function," notes physiologist Evelyn Mauss, who has been active in lead reduction efforts for several years. "Earliest human beings had almost no lead in their bodies. We didn't accumulate lead until it began to be mined out of the crust of the earth." Children with elevated blood-lead levels can suffer lower IQ, slower neural transmission, hearing loss, and disruption of the formation of hemoglobin in red blood cells. Acute lead poisoning wreaks massive physiological damage.

In the early 1970s, leaded gasoline was believed by many to be a route for lead exposure, but the connection was not yet proven. NRDC had had to bring its lawsuit for a lead phasedown on the grounds that it damaged catalytic converters and made other kinds of air pollution reductions difficult. By mid-decade, however, several leading environmental health scientists—notably Philip Landrigan, Paul Mushak, Herbert Needleman, Sergio Piomelli, Routt

---

Freelance writer Renée Skelton often covers health and the environment.

Reigart, and Ellen Silbergeld—had begun working to establish the physiological links between lead in gasoline and health problems in children.

But when Ronald Reagan took office in 1981, small refiners decided to ask for a complete abolition of the phasedown. And they got their wish. "We were told to propose getting rid of the lead standards," Schwartz recalls. His assignment was to calculate the cost of the standards to the refinery industry. But Schwartz remembered reading a study showing that the average blood-lead level of children in a New York City screening program precisely tracked the average amount of lead in gasoline for the New York metropolitan area. "So I asked around: 'Who's looking at the health end?' And everybody said, 'Not me, boss!'" Schwartz decided that, since the phasedown was under attack as a burdensome regulation with costs that outweighed benefits, he would not only start collecting health data, but also try to calculate the cost savings of reducing lead in gasoline.

When EPA formally proposed ending the phasedown in February 1982, reaction was swift and almost universally negative. Written testimony poured in from physicians, environmentalists, and public health experts. Congress held hearings; legal action was threatened. The Centers for Disease Control (CDC) reported that the decline in Americans' blood-lead levels since 1976 was directly attributable to the phasedown. Inside EPA, Schwartz's health and cost data were essential information in the agency's own reassessment. And by October, EPA had done a complete about-face: it proposed *strengthening* the lead standards.

Then, in 1985, EPA proposed even stricter regulations, with the goal of eliminating lead in gasoline entirely by the mid-1990s. Two main factors drove this development. One was new health data showing adverse effects at blood-lead levels previously accepted as safe. The other was Schwartz's analysis, which showed that it would cost industry about $575 million to meet the newest lead standards by 1986—but also that that sum was dwarfed by the $1.8 billion that would be saved during 1986 alone through reduced needs for medical care, lower pollution emissions from lead-damaged catalytic converters, reduced needs for vehicle maintenance, and greater fuel efficiency.

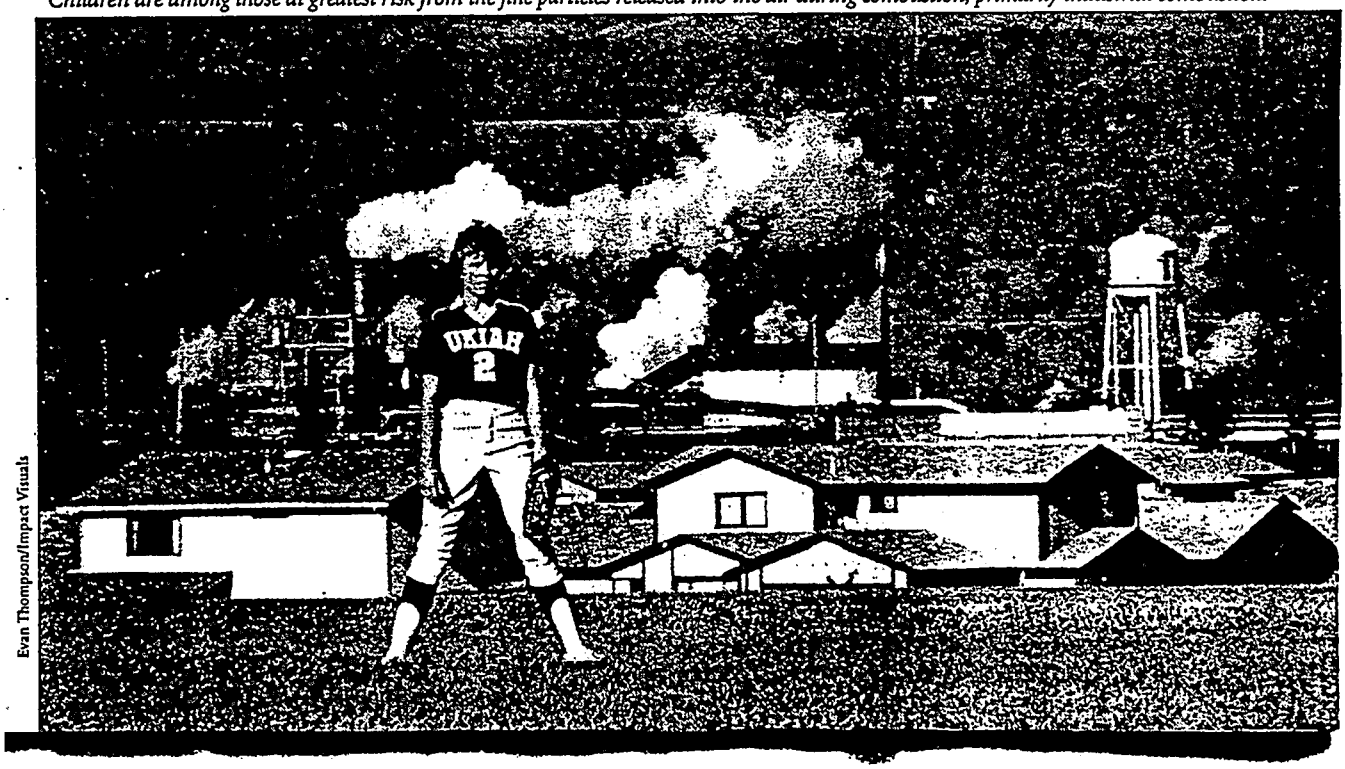
As of 1994, the CDC estimate is that 1 million children under six have blood-lead levels exceeding its threshold of concern. But the number is much lower than it used to be. And, looking back on Schwartz's career from the vantage point of 1991, then-EPA Administrator William Reilly commented, "Every time you fill up your car with gasoline, you can think of Joel Schwartz."

Schwartz's work on lead convinced him that he wanted to continue with epidemiology. "It's a calling," he explains. "Not in the sense of religion. But I think the old Protestant viewpoint that you should find your calling and do it has a bit of attraction.... That's not to say that a Pentium processor doesn't change the world. But there does seem to be a more direct line to the health and welfare of people, doing epidemiology."

Colleagues of Schwartz concur that he made the right choice. "He brings an extraordinary creativity to looking at complex data sets, and a real sense of how to make sense out of numbers," says Ellen Silbergeld, who teaches epidemiology at the University of Maryland Medical School. Indeed, in 1991 Schwartz won a MacArthur Fellowship, the prestigious "genius award" given annually by the John D. and Catherine T. MacArthur Foundation to several of the most creative and outstanding people in various fields.

The MacArthur Fellowship was

Children are among those at greatest risk from the fine particles released into the air during combustion, primarily industrial combustion.



Evan Thompson/Impact Visuals

still far in the future, however, when Schwartz finished his work on leaded gasoline and began looking for the next topic to investigate. He settled on air pollution. His reasoning: "Everyone breathes the air, and everyone is exposed to air pollution. It seemed like that's where the bodies were going to be."

He had good reason to think so. There had been several major air pollution disasters during the early part of this century—Meuse Valley, Belgium, in 1930; Donora, Pennsylvania, in 1948; London in 1950—that demonstrated that extremely high concentrations of air pollution could kill large numbers of people. By the late 1980s, there was growing evidence that the particulate matter (tiny suspended particles of soot, soil, mineral, or metal) in this pollution was closely associated with the illnesses and deaths.

Airborne particles are of different sizes and have several sources. The smallest particulates currently regulated by the federal government have a diameter of 10 microns or less; they are referred to as PM_{10}. The largest of these are dust and dirt. But it is $PM_{2.5}$, the smallest particles of all, that pose the greatest threat to health. These extremely fine particles are small enough to evade the body's clearance mechanisms and penetrate deep into the most sensitive areas of the lungs. Moreover, they are mostly the byproducts of combustion—in coal-fired power plants, industrial boilers, highway vehicles, and other sources—and many chemicals formed during combustion are themselves hazardous to health.

In 1971, EPA had put out its first air quality standard for particles, limiting the concentration of Total Suspended Particulates (TSP) permitted in air pollution—not only PM_{10}, but everything larger as well. But by the end of the decade, it was becoming increasingly clear that it was the smallest particulates in TSP that were most closely associated with health risks. In the wake of such evidence, EPA was preparing to set a new standard in the mid-1980s.

Schwartz had been doing some air pollution studies of his own when, in 1986, EPA's air pollution office asked him to analyze data covering fourteen winters of daily deaths and daily air pollution levels in London. Schwartz found the data in this and other studies intriguing. "It looked like there was an association between air pollution and daily deaths," he recalls, "and it looked like it was more the particles than the sulfur dioxide." Furthermore, "what I was seeing was that there was no threshold for this mortality effect." In other words, people were dying even at the lowest concentrations. And this was news. "EPA made believe at the time that there were thresholds for the health effects of air pollution," says Schwartz. "Clearly, they weren't going to set a very tight particle standard unless there was more evidence. So I figured it would be worth doing more stuff to look at whether particles were really associated with daily deaths."

Particulate air pollution is closely associated with illness and premature death.

EPA did set a PM_{10} standard in 1987, the first-ever limit on fine, inhalable particles. But there was increasing evidence that an even tighter standard was needed, and it was far from clear that EPA was ready to face up to that task. In general, "everybody was talking about the cost," Schwartz says. "There was one guy who thought we were spending too much money on air pollution. He said, 'Everyone knows there are no health effects below the ambient standard.'" In fact, the opposite was true, and for Schwartz it was something of a turning point. "That sort of convinced me that the time had come. We were finding effects [below the standard], yet we were getting all this nonsense. It occurred to me that if all decision-making was going to get poisoned by this, then I needed to move up my agenda on particulate air pollution."

Schwartz's strategy was to start "pumping out studies" as quickly as possible—"working very hard to dump out a lot of papers very fast, on the ground that if I just kept on pounding this out in the literature, people could not ignore it."

Schwartz did become incredibly prolific, releasing a number of important studies on the health effects of particles during the late 1980s and the 1990s. The papers, notes NRDC air pollution specialist Deborah Shprentz, were structured "so that each study answers the next question. If there were questions raised by one study about the effect of climate, for example, he'd develop the next study to address that." A number of other scientists, especially C. Arden Pope of Brigham Young University and Douglas W. Dockery of Harvard—who are widely acknowledged, along with Schwartz, as the leading researchers on particle pollution—were also publishing ground-breaking work on the issue. Scores of studies were coming out, and they showed strong associations between fine particle pollution and premature deaths, as well as hospitalizations for respiratory and cardiovascular problems.

Then, in 1991, Schwartz received the MacArthur Fellowship for his work on lead and particles. The nomination process is very secretive; Schwartz had had no idea that he was even under consideration. He was on vacation in Australia when a *Washington Post* reporter phoned him with the news. He was shocked, and, according to a press account of the time, quite speechless. "My first reaction," he says now, "was, 'Well, at least EPA won't be able to fire me!'"

The $275,000 award gave Schwartz the financial freedom to think seriously about making a job change. "It was getting harder and harder to get work done at EPA," he explains. "There were people who didn't like that I was finding health effects of air pollution at low levels." And so he applied for and won the position at Harvard.

In the meantime, the particulates

fight was heating up. EPA had seemed in no great hurry to review its particulate standards in light of the new evidence, as required by law, so the agency got a push from an American Lung Association lawsuit in 1993. That suit started EPA on a tortuous scientific and political process. As it was playing out, further studies gave weight to the thesis that the lives of thousands of Americans are being shortened by a year or two, on average, through exposure to particulates at levels well below the current standard.

In December 1993, Douglas Dockery and other Harvard School of Public Health researchers released the Harvard "Six City" study, which tracked the health of more than 8,000 people for fourteen to sixteen years; it showed that fine particles increased the risk of premature death for residents of the most polluted city by 26 percent over that for residents of the least polluted city. Two years later, the American Cancer Society Study, which tracked about 500,000 people in 151 cities, reported that people living in areas most polluted with fine particles had a 17 percent greater risk of mortality than those in areas with the lowest levels. And in 1996, the NRDC report *Breath Taking* applied these findings to 239 cities, and found that approximately 64,000 people may die prematurely from heart or lung disease every year due to particulate pollution.

Then, at long last, after reviewing hundreds of scientific studies, EPA proposed a tougher particulates standard in November 1996. It included the first-ever standard for the finest, most dangerous particulates, $PM_{2.5}$. But there is no knowing whether the $PM_{2.5}$ standard will survive in the final version, to be released on July 19.

Sitting in his small, cluttered office, fourteen floors above the streets of Boston's Back Bay, Schwartz contemplates the heavily politicized process of protecting the public health. One in four Americans is believed to be especially at risk from fine particles, including children (among them 5 million with asthma), the elderly, and people with heart or lung diseases. For this reason, many physicians and environmental health experts are backing the new standards; fourteen hundred doctors and other health professionals have signed a letter to President Clinton in support. However, EPA has endured an onslaught of pressure from industrial interests.

"They don't want to be regulated, and they have a semi-infinite amount of money," Schwartz says. "They're paying people to attack the studies and say the science is no good."

Since releasing its standard, EPA has endured an onslaught of pressure from industry.

One active player is the National Association of Manufacturers, which includes representatives of the oil, mining, auto, chemical, steel, and electric utility industries. It is leading a coalition of more than 600 members in a multimillion-dollar campaign. Often working through groups with benign-sounding names, such as Citizens for A Sound Economy, they argue that the tighter standards are unnecessary and costly and will jeopardize American freedoms. One radio ad, which ran for a time in Chicago, featured a son talking to his father about his fear that the standards would cost him his job. Then this exchange took place:

Son: *These new regulations would drive up the price of cars, force people into car-pooling, maybe even end up banning things like barbecue grills and lawnmowers.*

Father: *Force us to change the way we live, huh?... Amazing, since it can't be justified for health reasons.*

Politically, Schwartz observes, the campaign is "scoring some points. But so far, EPA has actually been hanging tough." He is cautiously optimistic that a new $PM_{2.5}$ standard will in fact emerge in July when the dust clears. But the outcome is by no means assured. According to an EPA spokesperson, even if the White House does issue EPA's new $PM_{2.5}$ standard, the Small Business Regulatory Enforcement Fairness Act of 1996 will allow Congress to review and possibly block the standard.

"Industry has lobbyists crawling all over down there [on the Hill]," says Robert Musil, executive director of Physicians for Social Responsibility. "But we're convinced that if we can get the message to the American people that the standards will protect health and save lives, it will be difficult for members of Congress to say, 'I don't care if people die. I just care about local industries.' After all, we're not just talking about slightly bluer skies and less sooty laundry."

Schwartz is still engaged in the particulates issue, testifying at hearings and appearing at news conferences to explain the science. However, with the scientific understanding of particulate pollution now largely in place, he is moving on to new projects in epidemiology. His next will be on water pollution.

"Waterborne disease was a very big source of mortal illness in the U.S. decades ago—typhoid, cholera. We've cleaned up water supplies, but are there residual sources of waterborne disease?" Schwartz asks. "It's either a big issue or small potatoes. We don't know. But it has never been looked at systematically. So we're gearing up to do a pilot project."

As long as there are major environmental health questions that need solving, chances are Joel Schwartz will be part of the quest for answers—probably making waves along the way. "This is different [from] doing research on semiconductors," Schwartz says of epidemiology. "You're trying to find out what makes people sick. To me, that should be coupled with a willingness to go out and make people aware about it enough that they do something about it." •

North Valley Coalition
Response to
SEIR 91-0377-/ZC/GPA
November, 1997

Letter from Leslie F. Harder, Jr., Chief, Division of Engineering,
Department of Water Resources, dated July 21, 1997
to
Mr. Rodney Nelson, Chief of Landfills Unit,
California Regional Water Quality Control Board
Exhibit (WH-6)

STATE OF CALIFORNIA—THE RESOURCES AGENCY PETE WILSON, Governor

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

July 21, 1997

97 JUL 24 PM 1:32

Mr. Rodney Nelson
Chief, Landfills Unit
California Regional Water Quality Control Board
Los Angeles Region
101 Centre Plaza Drive
Monterey Park, California 91754-2156

Dear Mr. Nelson:

Second Supplemental Review of Slope Stability of the Proposed Phase II Development for the Sunshine Canyon Landfill County Extension

INTRODUCTION

This memorandum presents the results of a supplemental review of slope stability analyses prepared for the proposed Phase II Development for the Sunshine Canyon Landfill County Extension. This supplemental review follows two earlier reviews for the subject landfill:

- **"Review of Seismic Slope Stability of the Proposed Sunshine Canyon Landfill County Extension,"** memorandum to Rodney Nelson from Leslie F. Harder, Jr., December 26, 1995.

- **"Supplemental Review of Seismic Slope Stability of the Proposed Sunshine Canyon Landfill County Extension,"** memorandum to Rodney Nelson from Leslie F. Harder, Jr., April 29, 1996.

The principal focus in the two earlier reviews was on stability issues affecting the Phase I development of the proposed landfill project. The earlier reviews found that the proposed designs for the Phase I development had adequate static and seismic stability. In the April 29, 1996 review, preliminary analyses of the proposed Phase II development were also examined. The preliminary evaluation performed in that review concluded that an adequate design was possible for the Phase II development provided that three-dimensional effects were properly included in the stability analyses.

Since the April 29, 1996 review, new static and seismic stability studies have been provided in support of the proposed Phase II landfill development (see Figure 1 for project plan). The new analyses for the Phase II construction are the subject of the current review. This supplemental review of the Phase II development was verbally requested by you and is authorized under Interagency Agreement No. B165496 between the Water Resource Control Board and the Department of Water Resources.

The new slope stability information in support of the Phase II development was provided in the studies and reports prepared by GeoSyntec Consultants for Browning-Ferris Industries of California, Inc. The Phase II development will contain a mix of both interim and permanent slopes. However, the studies completed by GeoSyntec Consultants generally treat interim slopes as permanent for the purposes of the stability analyses.

The static and seismic stability issues examined in the supplemental review for the Phase II development were as follows:

- Earthquake loading.
- Dynamic response analyses.
- Shear strengths of municipal waste and liner interfaces.
- Slope stability analyses.
- Displacement analyses and results.

In summary, the current review found that GeoSyntec Consultants had generally employed reasonable and/or reasonably conservative parameters in performing the analyses. However, a significant error was found in one of the GeoSyntec analyses for the permanent slope leading to the stability berm (Section F-F). Consequently, the actual factor of safety is much lower than that determined by the GeoSyntec analyses and the predicted amount of earthquake-induced deformation for this section is also higher than what would be considered acceptable. This might be resolved by properly accounting for three-dimensional effects as was recommended in my April 29, 1996 review memorandum. However, this has not yet been done and needs to be completed to resolve the stability issues that the stability computational error has created.

The additional materials reviewed and comments on specific stability issues are presented in subsequent sections of this memorandum.

SUPPLEMENTAL INFORMATION REVIEWED

The additional materials examined for this supplemental review were contained in the following reports and correspondence:

- **"STATIC AND SEISMIC STABILITY ASSESSMENT - SUNSHINE CANYON LANDFILL COUNTY EXTENSION - PHASE II CONSTRUCTION,"** report prepared for Browning-Ferris Industries of California, Inc.; Sunshine Canyon Landfill District, November 11, 1996.

- **"Supplemental Information on Seismic Response and Stability Analyses for Phase II Grading Design, Sunshine Canyon Landfill County Extension,"** memorandum from Ed Kavazanjian, GeoSyntec Consultants, to Dr. Les Harder, P.E., California Department of Water Resources, April 26, 1997.

EARTHQUAKE LOADING

Previous analyses by both GeoSyntec and the Department of Water Resources have shown that the critical seismic loadings come from potential large earthquakes (e.g. Magnitudes 6.9 - 7.5) that might occur on thrust faults within 10 kilometers of the landfill site. To represent these loadings, GeoSyntec has chosen two accelerograms for use in the dynamic response analyses:

- The Seed-Hayward Synthetic motion (M=7+) developed by H. Bolton Seed and scaled to have a peak acceleration of 0.7g. [This motion was one of the ones suggested for use by DWR in the previous reviews].

- The C-3 Synthetic motion (M=6.7) developed by Dr. W. Silva and scaled to have a peak acceleration of 1.06g.

Both of these accelerograms, when scaled at these peak accelerations, have adequately high spectral content and duration of shaking. The spectral accelerations of both motions at a period of 1 second exceeds 0.8g and would satisfy criteria for both the Maximum Probable Earthquake and the Maximum Credible Earthquake. Accordingly, the use of these two motions for analyzing the Phase II development is considered adequate.

DYNAMIC RESPONSE ANALYSES

The state-of-practice for conducting dynamic response analyses of landfills remains both rapidly changing and uncertain. The dynamic properties used by GeoSyntec two years ago for the Phase I studies (Kavazanjian et al., 1995) are no longer supported. Instead, GeoSyntec now advocates using properties recently developed by backanalyses of the response of the OII landfill. However, two other studies (Idriss et al., 1995 and Augello et al., 1997) also used backanalyses of the OII landfill response and obtained very different sets of properties.

The GeoSyntec analyses for the Phase II development also employed two-dimensional dynamic response analyses (Program QUAD4M) rather than one-dimensional dynamic response analyses (e.g. Program SHAKE) that have been the traditional state-of-practice. Although the use of two-dimensional dynamic response analyses is theoretically more correct and thus preferable, its use will probably lead to lower average accelerations in the waste mass being computed because this type of analysis can incorporate some of the effects of incoherence in the response of the waste mass over large distances. This in turn will complicate some of our judgements because most of our experience in back calculation of in situ landfill and liner strengths (e.g. Augello et al., 1995) have generally relied upon the use of one-dimensional response analyses.

The current review for the Phase II development examined the responses for Sections F-F and G-G calculated by GeoSyntec using QUAD4M for the two critical accelerograms (Seed-Hayward and C-3 Synthetic motions). The results showed relatively high peak accelerations computed at the top of the waste fill, typically between 0.6 and 1.3g. The peak average accelerations for potential sliding masses in Section G-G were generally high, typically between 0.33 and 0.41g. However, the peak average accelerations for potential sliding masses in Section F-F were only about 0.26g. Presumably, the lower average acceleration for the southeast mass in Section F-F is associated with its very long length and incoherence effects along that length. However, it is not certain why the northwest mass in Section F-F was also so low as it has thicknesses and lengths comparable to those in Section G-G. Further, the peak accelerations at the surface of Section F-F are higher than those calculated for the surface of Section G-G.

The QUAD4M dynamic response analyses generally seem reasonable, with the exception of the low average accelerations calculated for Section F-F. In light of the uncertainties and the results from previous studies, including those by Makdisi and Seed (1978), it seems prudent for the evaluation of the Phase II development to use average peak accelerations in potential sliding masses of at least 0.3-0.35g. Accordingly, the average accelerations calculated by GeoSyntec for Section G-G are considered reasonably conservative, but those for Section F-F should be increased by at least 20 percent.

SHEAR STRENGTHS OF MUNICIPAL WASTE AND LINER INTERFACES

The shear strengths adopted by GeoSyntec for the waste and liner interfaces in the Phase II analyses are all higher than those used two years ago for the Phase I

analyses. Presented below are comparisons between the different strength values in the two sets of GeoSyntec evaluations:

Material/Interface	GeoSyntec Phase I	GeoSyntec Phase II	Adopted for review purposes by DWR
Municipal Waste	C = 100 psf PHI = 28 deg.	C= 900 psf PHI = 31 deg.	C = 500 psf/0 psf PHI = 0 deg./33 deg.
Base Liner	C = 0 psf PHI = 19 deg.	C= 665 psf * ✓ PHI = 15 deg. ✓	C = 665 psf PHI = 15 deg.
Slope Liner	C = 0 psf PHI = 8 deg.	C= 35 psf ✓ PHI = 10 deg.✓	C = 35 psf PHI = 10 deg.

Note: * GeoSyntec actually employed three alternative sets of revised shear strengths for the base liner. The values shown gave the lowest factors of safety for the three alternative strengths.

The use of the higher shear strengths in the Phase II analyses by GeoSyntec results in factors of safety that are generally between 0 and 20 percent higher than those that would have been calculated using the Phase I strengths, depending on the potential sliding surface being analyzed. Also shown above are the shear strengths adopted by DWR in performing review analyses. For the most part, GeoSyntec was able to reasonably justify the higher shear strengths on the basis of laboratory test results. Figures 2 and 3 illustrate the higher strengths justified by the post-peak resistances determined in the laboratory.

DWR does not believe, however, that GeoSyntec was able to justify the significantly higher shear strengths (C=900 psf, PHI = 31 deg.) for waste fill in the Phase II analyses. This is because these strengths are estimated for the waste fill at the Oil landfill, a landfill thought by many to have a higher component of soil in the waste than in many other landfills. Accordingly, we adopted the more common bilinear strength envelope (C=500/0 psf, PHI = 0, 33 deg.) for use in the review analyses. This bilinear strength envelope is derived from the studies by Kavazanjian et al. (1995), and while not as high as what was proposed for the Phase II analyses, it is still higher than that adopted for the Phase I studies (see Figure 4).

SLOPE STABILITY ANALYSES

DWR reviewed the slope stability analyses performed for the Phase II development and performed several independent check analyses using the waste strengths adopted by GeoSyntec and the waste strengths assumed by DWR. Only

the most critical potential sliding surfaces were checked. The results of the DWR check analyses are summarized below:

SECTION	GEOSYNTEC GeoSyntec Waste Strength Program STABL (Spencer's M.)	DWR GeoSyntec Waste Strength Program SLOPEW (Spencer's M.)	DWR DWR Waste Strength Program SLOPEW (Spencer's M.)
SECTION F-F (Southeast)	Static F.S.= 2.32 ** ky = 0.21g **	Static F.S.= 1.88 ky = 0.15g	Static F.S.= 1.83 ky = 0.14g
SECTION G-G (Interim SW)	Static F.S.= 1.79 ky = 0.21g	Static F.S.= 1.64 ky = 0.21g	Static F.S.= 1.44 ky = 0.19g
SECTION G-G (Interim NE)	Static F.S.= 3.02 ky = 0.20g	Static F.S.= 2.50 ky = 0.25g	Static F.S.= 2.38 ky = 0.23g

Note: ** Denotes that the GeoSyntec analysis for Section F-F contained an error in the analysis. After correction, the Static F. S. = 1.87, and ky=0.14g.

The slope stability check analyses performed by DWR using the DWR strengths are summarized in Figures 5 through 10. In general, the DWR analyses showed lower factors of safety and yield accelerations (ky) than did the GeoSyntec analyses. In particular, the results for Section F-F (Southeast) determined by DWR were significantly lower than those determined by GeoSyntec. The reason for this is that an apparent error was found in the GeoSyntec analyses of Section F-F that caused the potential sliding surface to pass through the waste fill rather than through the base liner interface. After correcting the GeoSyntec STABL input file for this error, the analysis by computer program STABL gave the same answer as the DWR analyses using program SLOPEW. Details of these analyses and the error were previously telefaxed to both Ed Kavazanjian of GeoSyntec and you on May 25, 1997. Due to the resource limitations of this review, DWR was not able to determine how many of the GeoSyntec analyses have this type of error, or whether it is limited to only Section F-F.

DISPLACEMENT ANALYSES AND RESULTS

DWR has been using a maximum limit of 6 inches for acceptable earthquake-induced displacements within a base liner system. In the analyses for the Phase II development, GeoSyntec results indicated a minimum yield acceleration of 0.20g. With a yield acceleration of 0.20g, GeoSyntec calculated a maximum earthquake-induced deformation of 5.3 inches. At face value, this would have been reasonably conservative and considered adequate. However, the slope stability check analyses performed by DWR generally resulted in lower yield accelerations. This in turn results in higher earthquake-induced displacements being calculated. Presented below are estimates of the potential earthquake-induced displacements for the three sections analyzed:

Section	kmax (g)	DWR ky (g)	DWR Est. EQ-Induced Displacement (inches)
Section F-F (Southeast)	~0.33***	0.14	10
Section G-G (Interim SW)	0.41	0.19	8
Section G-G (Interim NE)	0.33	0.23	< 2

Note: *** Denotes minimum value for kmax estimated by DWR as discussed in previous section. All other values of kmax obtained from Table 5-5 in the November 11, 1996 report prepared by GeoSyntec.

The results for the most critical sections indicate that both the interim southwest slope of Section G-G and the southeast slope of Section F-F would exceed the 6-inch criterion. For Section G-G, this is probably acceptable because the exceedance is only a small amount and this slope has been identified as an interim slope rather than a permanent slope.

For the southeast slope of Section F-F, however, the 6-inch criterion has been seriously exceeded and this slope has been understood to be a permanent slope. Consequently, additional work and information will be needed to confirm that the

proposed design in this area meets the stability criteria required for landfills. As stated previously, my April 29, 1996 review report to you indicated that the apparent low stability of this slope could probably be resolved by appropriately considering three-dimensional effects. To date this has not been submitted, presumably because GeoSyntec believed that the two-dimensional analyses alone demonstrated adequate stability. However, in light of the error found in their stability calculations for Section F-F, consideration of three-dimensional effects would now seem to be necessary. As suggested in our previous review, DWR believes that the Section F-F slope should have an overall minimum yield acceleration of approximately 0.18g in order to meet the 6-inch criterion.

SUMMARY OF FINDINGS AND CONCLUSIONS

1. The earthquake loading parameters and accelerograms used by GeoSyntec in the Phase II analyses are considered reasonably conservative and adequate.

2. The results of the dynamic response analyses appear to be generally reasonable for most of the sections considered. DWR believes that a minimum kmax of 0.33g should be used in light of the very high seismic loadings at this site and the uncertainties associated with the rapidly changing state-of-practice associated with dynamic response analyses.

3. The shear strengths used by GeoSyntec in the Phase II analyses are generally higher than those used for the GeoSyntec analyses of the Phase I development. With the exception of the shear strength adopted for the waste fill, the higher strengths are based on laboratory test results and are considered reasonable. DWR assumed a somewhat lower shear strength for the waste fill in the stability check analyses performed in this review.

4. The stability check analyses performed by DWR resulted in lower factors of safety and yield accelerations than those determined by GeoSyntec. In particular, the results for Section F-F were found to be significantly lower. The reason for this is an error in the GeoSyntec analyses which causes the potential sliding surface to pass through the waste fill rather than through the base liner. It is not known how many of the GeoSyntec analyses have this type of error.

5. Even with the lower computed factors of safety and yield accelerations, DWR found adequate stability for most of the sections analyzed. The stability of the

southwest slope of Section G-G was found to be marginal, but probably acceptable due to its interim nature. The results for the southeast slope of Section F-F do not meet the earthquake-induced deformation criterion previously established for other landfills.

6. The analyses performed by both GeoSyntec and DWR did not consider three-dimensional stability. It may be that appropriate consideration of three-dimensional slope stability effects may show that the proposed Section F-F would have adequate stability. This was suggested to be done in a previous review, but has not yet been submitted to date.

RECOMMENDATIONS

1. It is recommended that the southeast slope of Section F-F be reanalyzed to consider three-dimensional effects, or be redesigned to meet earthquake-deformation criteria.

2. It is recommended that the analyses for other sections be checked to verify that the apparent error discovered in Section F-F did not occur in these other analyses.

3. As for all landfill developments, conclusions regarding stability are heavily dependent on the shear strengths assumed. These conclusions are only valid as long as the materials to be used have engineering properties comparable to the values assumed in the analyses. Accordingly, we continue to endorse quality assurance testing during construction of all landfill liner elements and recommend that such testing be carried out during the construction of the Phase II development. We note that the higher strengths adopted for the base and slope liner interfaces were justified on the basis of such testing for the Phase I construction.

FINAL COMMENT

It is beyond the DWR scope of work for DWR staff to either accept or reject applications and/or specific engineering analyses. The purpose of this supplemental review was to determine if the proposed Phase II development would have adequate stability. Unfortunately, it appears that additional effort will be needed to resolve

stability questions on the southeast slope of Section F-F. When additional information is submitted, we would be happy to assist in reviewing the studies.

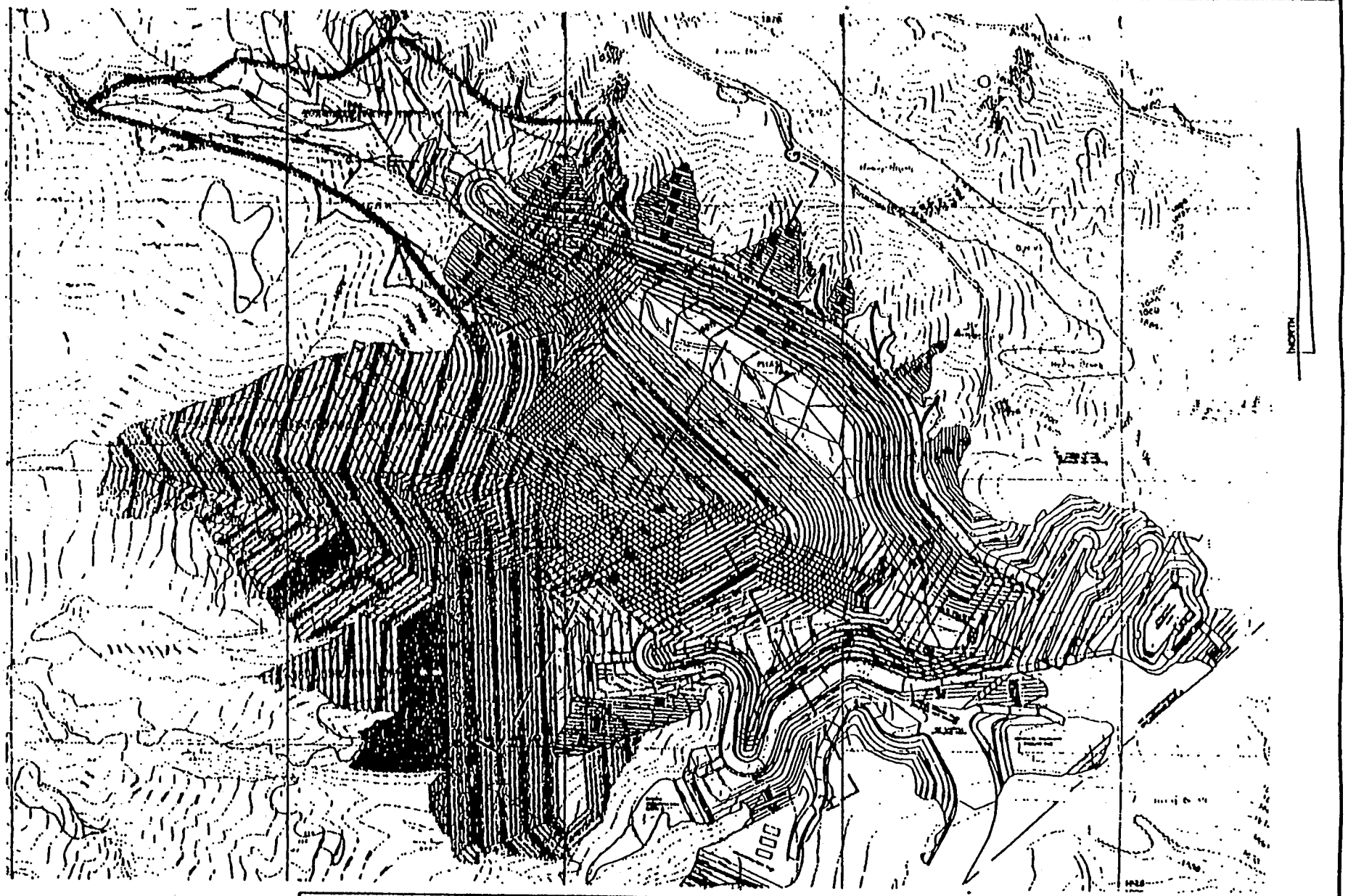
I hope this provides the review and information you requested. If you have any questions, please call me at (916) 653-3927.

Sincerely,

Leslie F. Harder, Jr., Chief
Division of Engineering

Attachments

cc: Ms. Elizabeth Haven
Senior Engineering Geologist
Clean Water Programs
State Water Resources Control Board
2014 T Street
Sacramento, California 95814



500 250 0 500

SCALE IN FEET

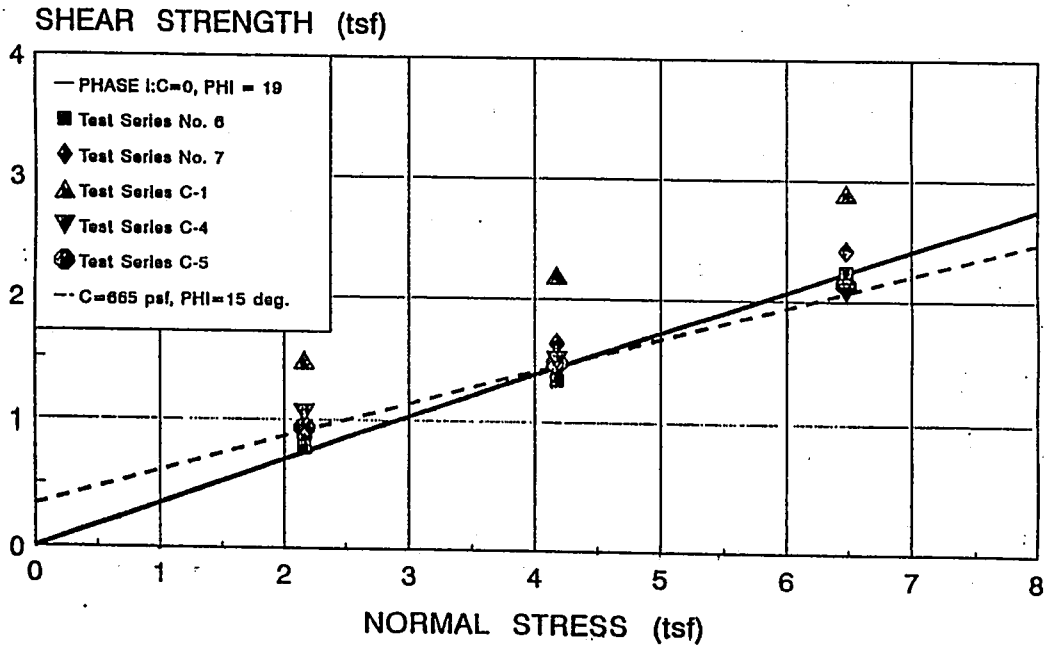
GeoSyntec Consultants

CROSS SECTIONS FOR PHASE II LINER STABILITY ANALYSES
SUNSHINE CANYON [illegible]NTY EXTENSION LANDFILL
SYLMA[illegible] CALIFORNIA

FIGURE 1

FIGURE NO.	
PROJECT NO.	CE[illegible]5-23
DATE:	NOV-07-96

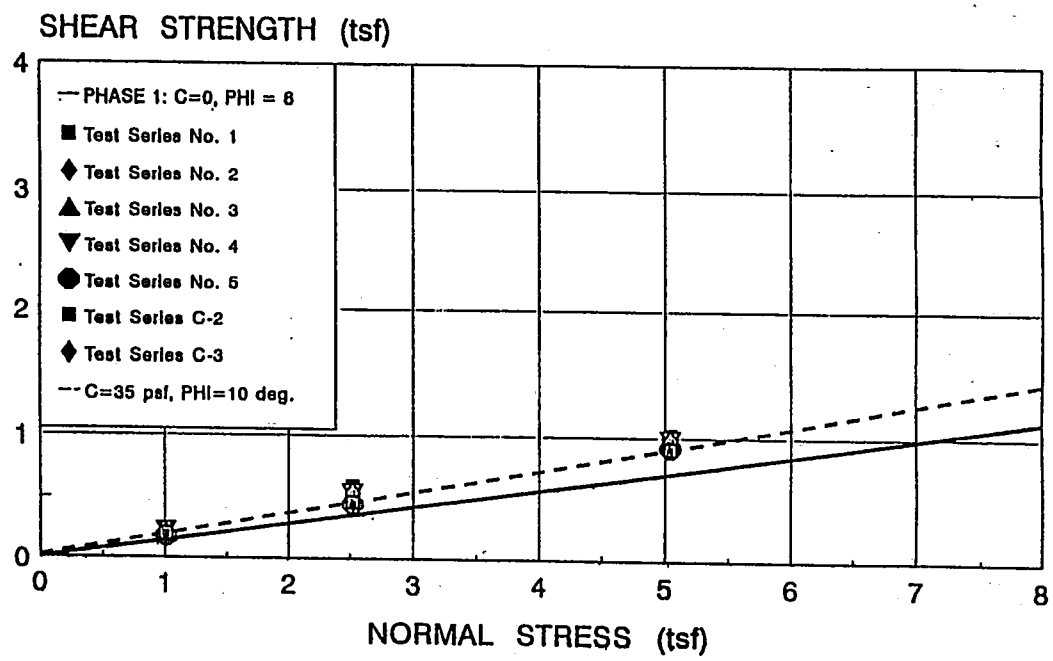
SUNSHINE CANYON LANDFILL EXTENSION - PHASE II CONSTRUCTION
INTERFACE SHEAR STRENGTH FOR BASE LINER (TEXT. GEOMEMBRANE/CLAY LINER)



REFERENCES: 1) GeoSyntec (1996)
2) DWR (1995)

FIGURE 2

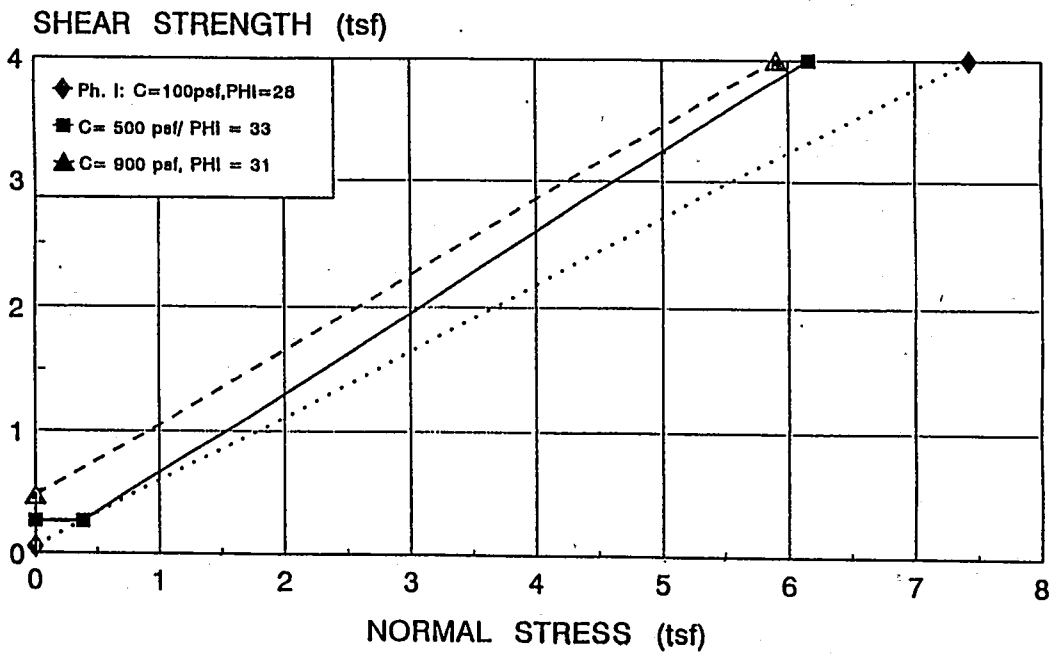
SUNSHINE CANYON LANDFILL EXTENSION - PHASE II CONSTRUCTION
INTERFACE SHEAR STRENGTH FOR SLOPE LINER (SMOOTH GEOMEMBRANE/GEONET)



REFERENCES: 1) GeoSyntec (1996)
2) DWR (1995)

FIGURE 3

SUNSHINE CANYON LANDFILL EXTENSION - PHASE II CONSTRUCTION
SHEAR STRENGTH FOR MUNICIPAL WASTE



REFERENCES: 1) GeoSyntec (1996)
2) DWR (1995)

FIGURE 4

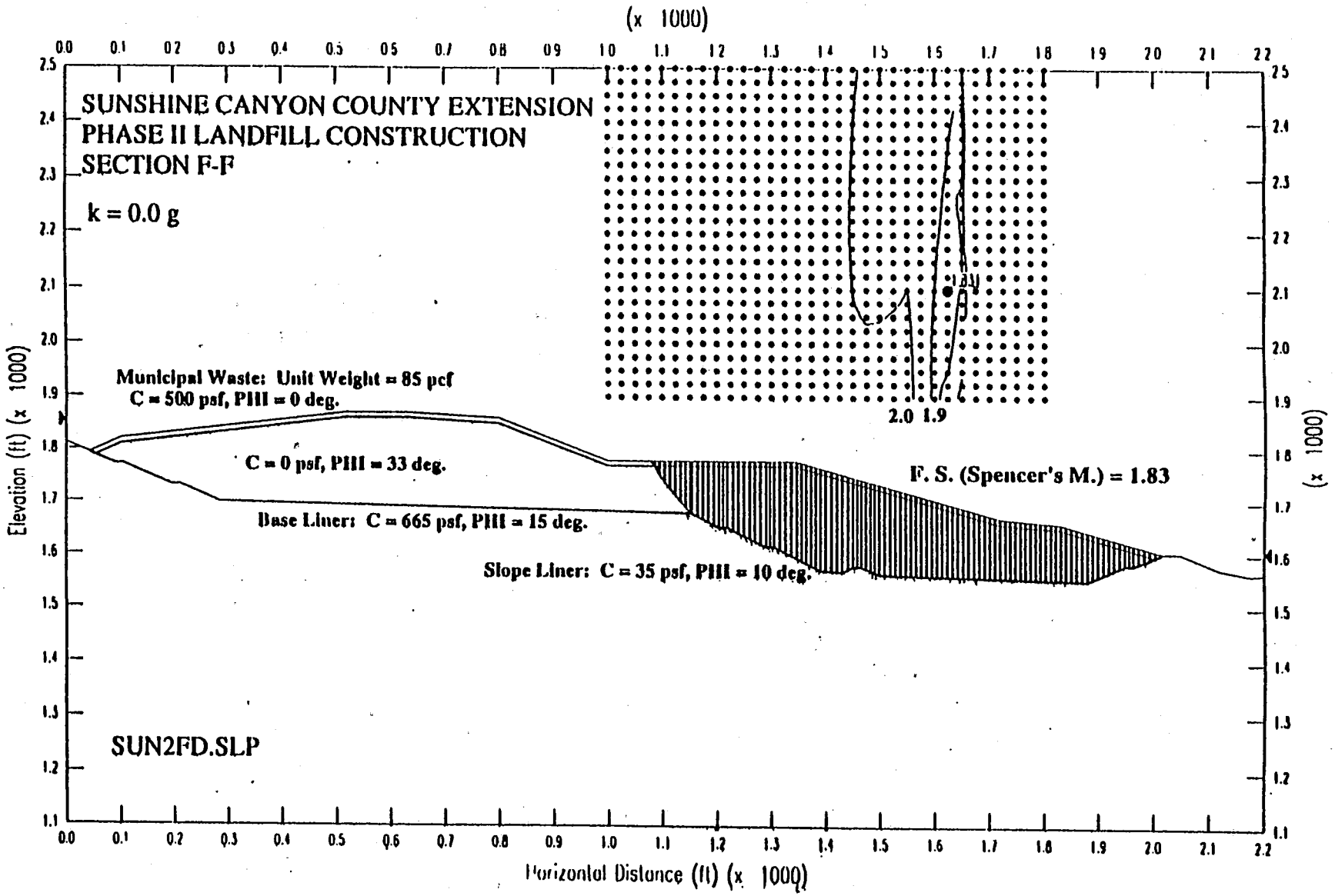

(x 1000)
SUNSHINE CANYON COUNTY EXTENSION
PHASE II LANDFILL CONSTRUCTION
SECTION F-F
k = 0.0 g
Municipal Waste: Unit Weight = 85 pcf
C = 500 psf, PHI = 0 deg.
C = 0 psf, PHI = 33 deg.
Base Liner: C = 665 psf, PHI = 15 deg.
Slope Liner: C = 35 psf, PHI = 10 deg.
2.0 1.9
F. S. (Spencer's M.) = 1.83
SUN2FD.SLP
Elevation (ft) (x 1000)
Horizontal Distance (ft) (x 1000)

FIGURE 5

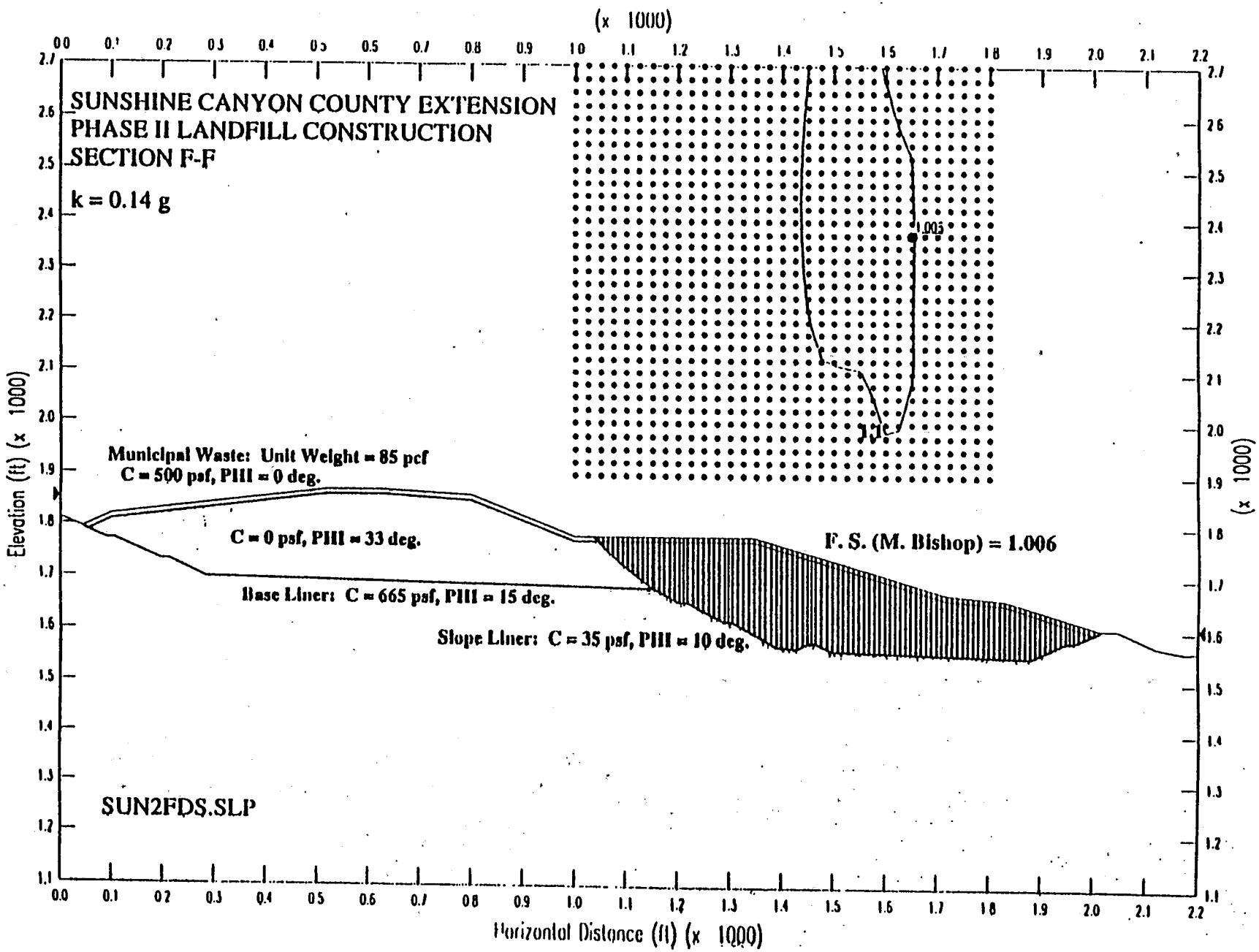

(x 1000)
SUNSHINE CANYON COUNTY EXTENSION
PHASE II LANDFILL CONSTRUCTION
SECTION F-F
k = 0.14 g
1.005
Municipal Waste: Unit Weight = 85 pcf
C = 500 psf, PHI = 0 deg.
C = 0 psf, PHI = 33 deg.
F. S. (M. Bishop) = 1.006
Base Liner: C = 665 psf, PHI = 15 deg.
Slope Liner: C = 35 psf, PHI = 10 deg.
SUN2FDS.SLP
Elevation (ft) (x 1000)
(x 1000)
Horizontal Distance (ft) (x 1000)

FIGURE 6

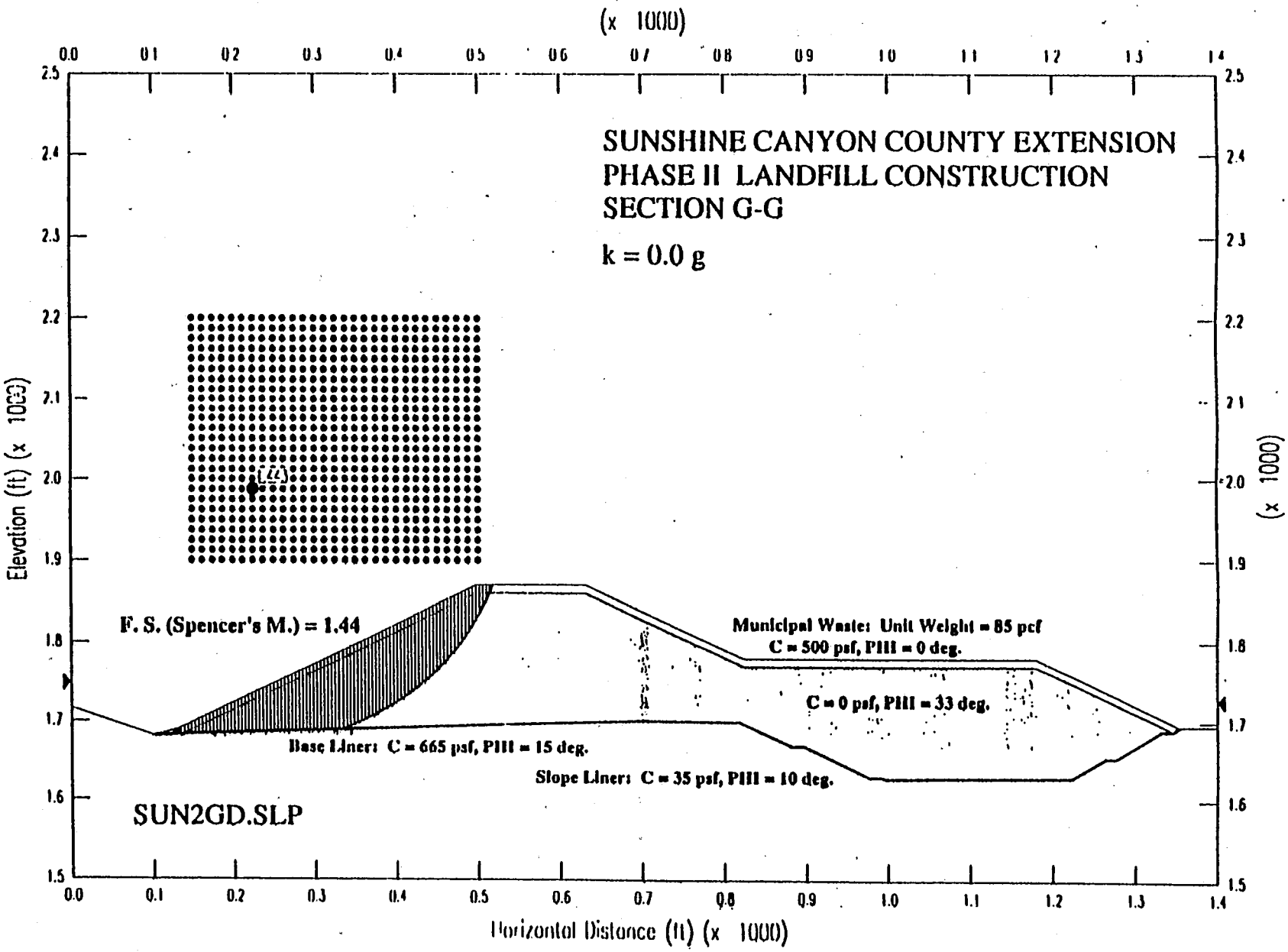

(x 1000)
SUNSHINE CANYON COUNTY EXTENSION
PHASE II LANDFILL CONSTRUCTION
SECTION G-G
k = 0.0 g
F. S. (Spencer's M.) = 1.44
Municipal Waste: Unit Weight = 85 pcf
C = 500 psf, PHI = 0 deg.
C = 0 psf, PHI = 33 deg.
Base Liner: C = 665 psf, PHI = 15 deg.
Slope Liner: C = 35 psf, PHI = 10 deg.
SUN2GD.SLP
Elevation (ft) (x 1000)
Horizontal Distance (ft) (x 1000)

FIGURE 7

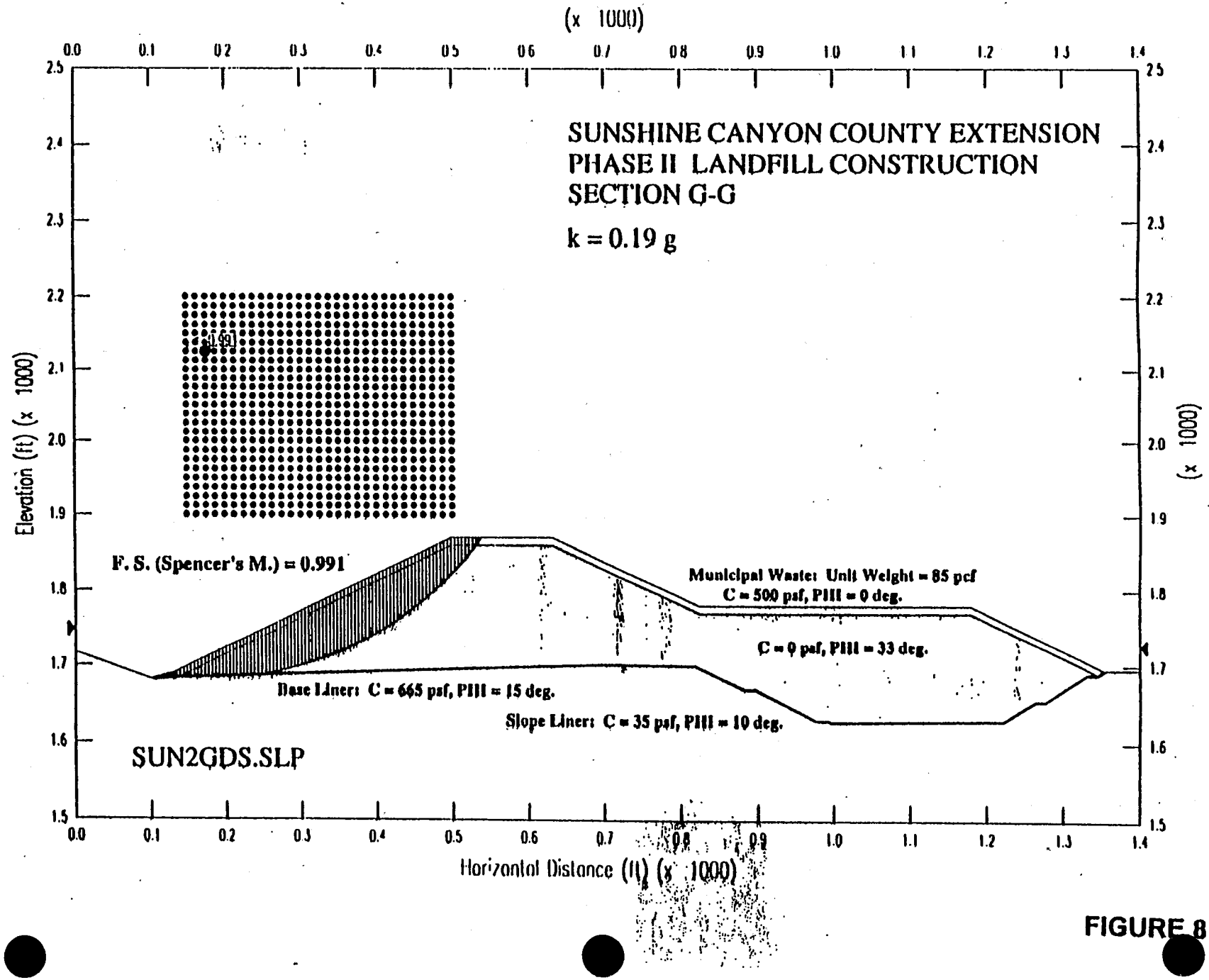

(x 1000)
SUNSHINE CANYON COUNTY EXTENSION
PHASE II LANDFILL CONSTRUCTION
SECTION G-G
k = 0.19 g
F. S. (Spencer's M.) = 0.991
Municipal Waste: Unit Weight = 85 pcf
C = 500 psf, PHI = 0 deg.
C = 0 psf, PHI = 33 deg.
Base Liner: C = 665 psf, PHI = 15 deg.
Slope Liner: C = 35 psf, PHI = 10 deg.
SUN2GDS.SLP
Elevation (ft) (x 1000)
Horizontal Distance (ft) (x 1000)

FIGURE 8

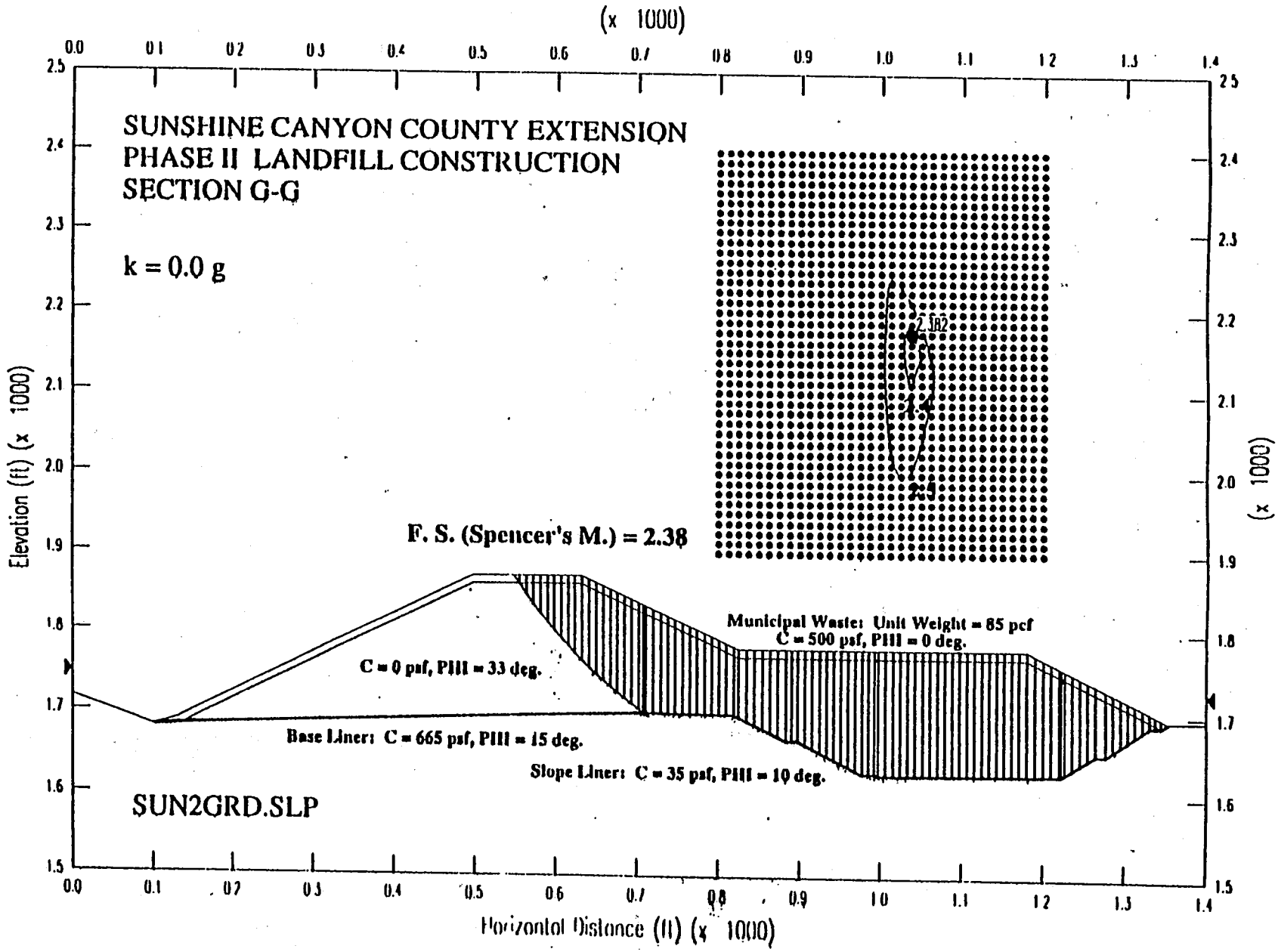

(x 1000)
SUNSHINE CANYON COUNTY EXTENSION
PHASE II LANDFILL CONSTRUCTION
SECTION G-G
k = 0.0 g
F. S. (Spencer's M.) = 2.38
Municipal Waste: Unit Weight = 85 pcf
C = 500 psf, PHI = 0 deg.
C = 0 psf, PHI = 33 deg.
Base Liner: C = 665 psf, PHI = 15 deg.
Slope Liner: C = 35 psf, PHI = 10 deg.
SUN2GRD.SLP
Elevation (ft) (x 1000)
Horizontal Distance (ft) (x 1000)

FIGURE 9

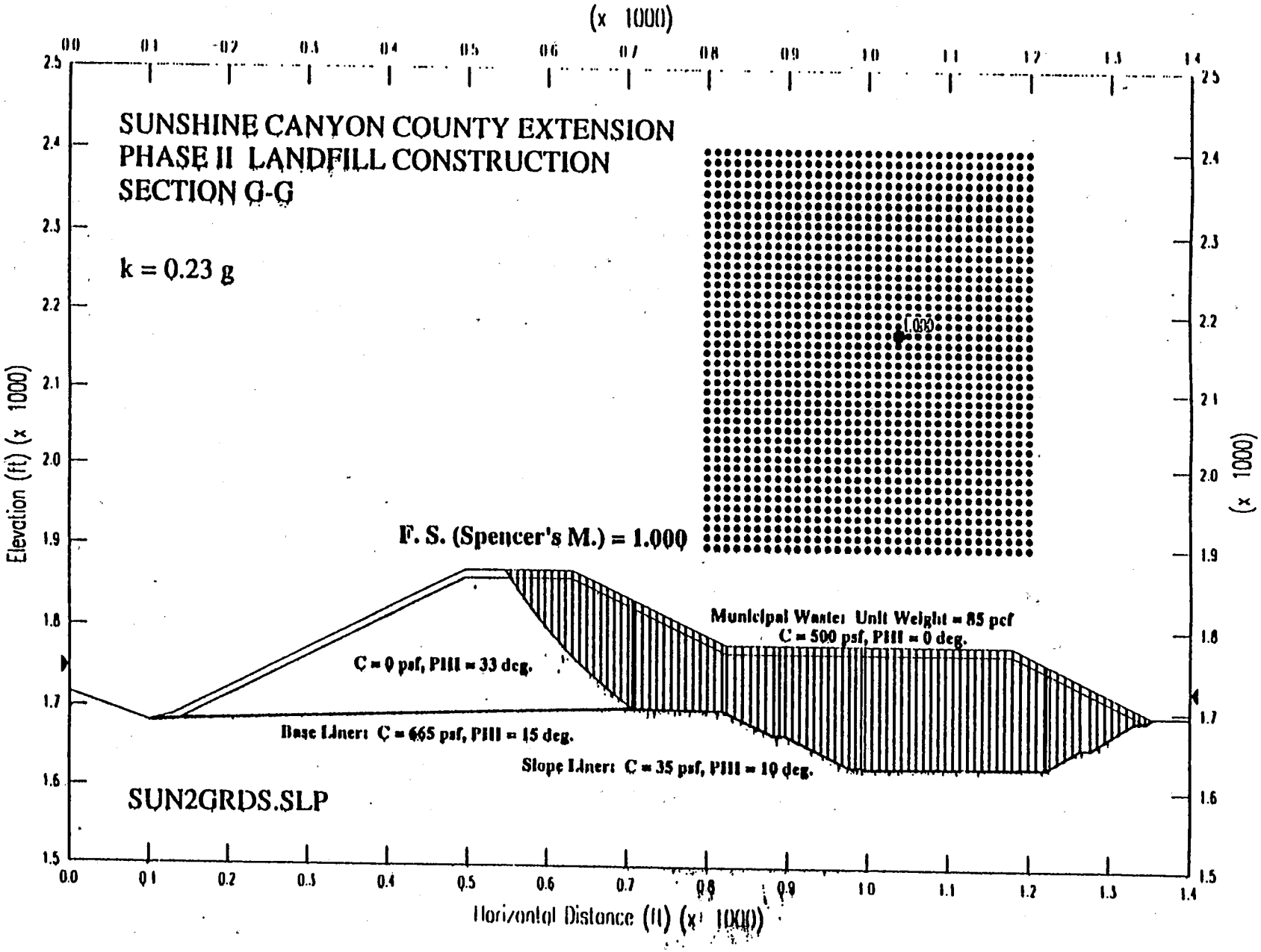

(x 1000)
SUNSHINE CANYON COUNTY EXTENSION
PHASE II LANDFILL CONSTRUCTION
SECTION G-G
k = 0.23 g
F. S. (Spencer's M.) = 1.000
Municipal Waste Unit Weight = 85 pcf
C = 500 psf, PHI = 0 deg.
C = 0 psf, PHI = 33 deg.
Base Liner: C = 665 psf, PHI = 15 deg.
Slope Liner: C = 35 psf, PHI = 10 deg.
SUN2GRDS.SLP
Elevation (ft) (x 1000)
Horizontal Distance (ft) (x 1000)

FIGURE 10

North Valley Coalition
Response to
SEIR 91-0377-/ZC/GPA
November, 1997

Second Draft
Hearings and Conditions
Exhibit (WH-7)

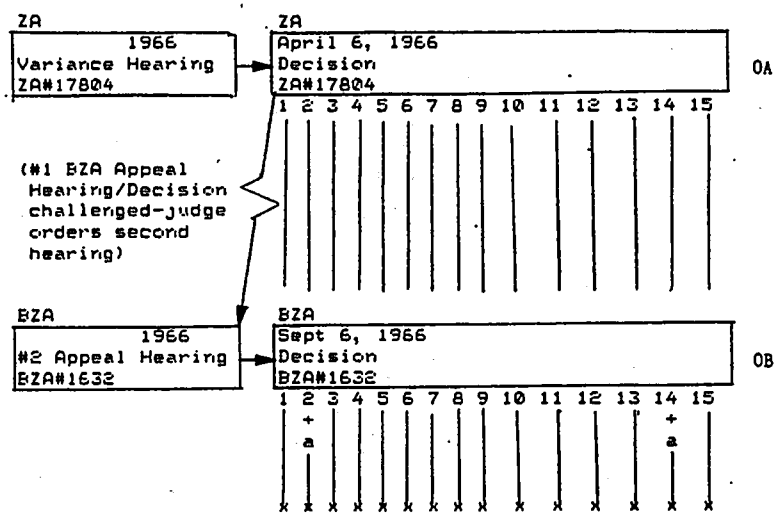
SECOND DRAFT

HEARINGS AND CONDITIONS

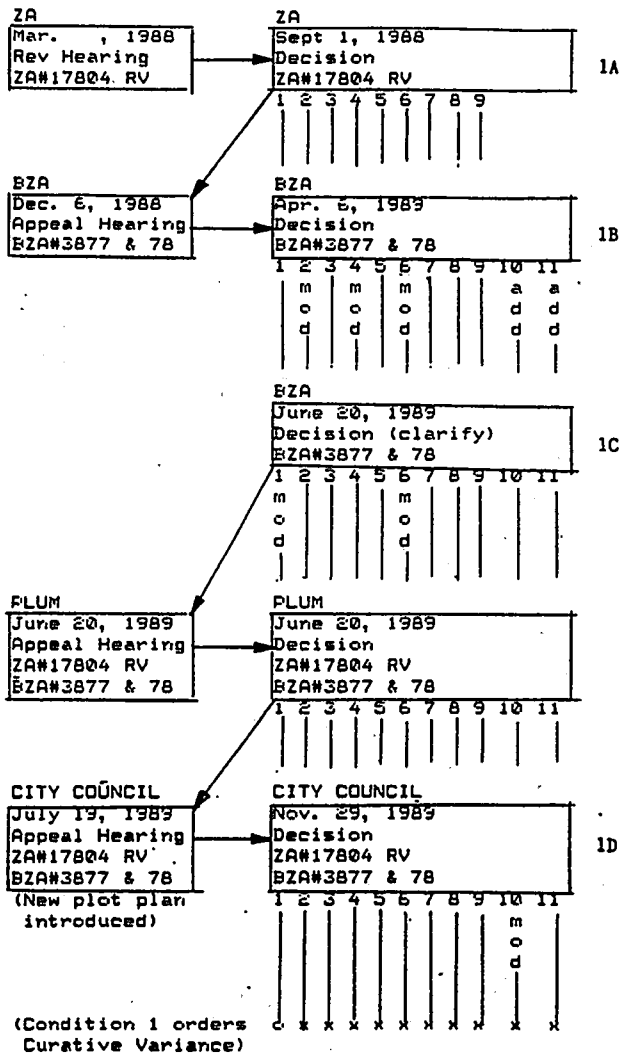
SEPTEMBER 1991

Note: Exhibits (0A thru 6C) are marked with a star(s) to indicate which Condition(s) of any individual Zoning action(s) is current.

ZONE VARIANCE HEARINGS AND CONDITIONS



REVOCATION HEARINGS AND CONDITIONS



ITY OF LOS ANGE :S

CALIFORNIA

HUBER E. SHUTZ
CHIEF ZONING ADMINISTRATOR
ASSOCIATE ZONING ADMINISTRATORS
CHARLES V. CADWALLADER
ARTHUR GVORKIN
MANUS D. O'GRADY
E. A. HUESER

SAM YORTY
MAYOR

DEPARTMENT OF CITY PLANNING
OFFICE OF ZONING ADMINISTRATION
CITY HALL
LOS ANGELES, CALIF. 90012
MADISON 4-9211

April 18, 1966

North Valley Land Development Corp.
ATTENTION: Marshall A. Rabins, Presicent
14747 San Fernando Road
San Fernando, California

Re: Z. A. CASE NO. 17004
14735-51 San Fernando Road
Sylmar District
D. M. Nos. 7748, 7750 & 7756

Department of Building and Safety

Greetings:

In the matter of the application of North Valley Land Development Corporation for Variance from the provisions of Zone A1-1-O, please be advised that based upon the Finding of Facts hereinafter set forth and by virtue of authority contained in Section 96 of the City Charter and Section 12.27-B, 1 of the Municipal Code, the Associate Zoning Administrator, to whom the matter was assigned, hereby grants a Variance from the provisions of Article 2, Chapter 1 of said Code on an approximate 300-acre site including portions of Lots 9 and 10, Tract No. 10422 and portions of Tract No. 9813, as more particularly described in the application which by reference is made a part hereof, located at 14735-51 San Fernando Road, Sylmar District, but only insofar as such Variance is necessary to permit the continued operation of the existing dump facilities and its expansion for the disposing of rubbish and trash by the cut and cover land fill and reclamation method, upon the following terms and conditions:

1. That all dumping, cut and cover, grading and compaction operations, as well as all activities related to the operation herein authorized on the property, shall be conducted in accordance with the "Minimum Regulations for Dumps in the City of Los Angeles", adopted by the Board of Public Works on August of 1959 and amended on March 22, 1965 and with any subsequent amendments thereto, except as herein specifically permitted, required or modified. Further, said requirements shall have the same effect as if herein stated in detail as conditions of this authorization.

2. That so long as Bradley Avenue is a secondary highway on the City's Master Plan of Highways and traversing the property, there shall be no land fill operations within 80 ft. of either side of the present traveled roadway or natural drainage course along the canyon bottom. If practical difficulties result from the reasonable enforcement of this condition, modification may be made by a Zoning Administrator in keeping with Exhibit "A" attached to the file.

3. That complete plans for all new buildings or structures or any relocation of said buildings or structures, together with a detailed plot plan showing the exterior portions of the property, the location of all proposed buildings or structures, driveways, parking areas, type of surfacing, enclosing fixtures, drainage channels, water mains, fire hydrants, fire breaks or ridges, signs, etc., be submitted to and approved by a Zoning Administrator prior to the issuance of any permits or use of the property for the purposes herein authorized. Further, that prior to the submission of the above-referred to plan or plans to a Zoning Administrator, such shall first be submitted to the Bureau of Engineering, City Fire Department and the Department of Water and Power for consideration and recommendations which shall be noted on said plans or on separate letter.

4. That a Zoning Administrator hereby reserves the right to modify Condition No. III, B. of the Board's Minimum Dump Regulations which states, "all deposited waste material shall be covered as required in "C" by midnight of the day when the waste material is dumped or deposited", to an earlier hour in the event that either additional urbanization takes place within a closer proximity to the operations or this late activity results in a nuisance to the adjoining areas.

5. That no new dumping operations shall be started on the property until a permit has first been secured from the Board of Public Works.

6. That there be no vehicular entrance or exits provided to the property, except from San Fernando Road using essentially the present road entering the property, and that any necessary parking of automobiles, trucks or other motor vehicles be confined to the canyon portion of the premises herein authorized for rubbish disposal purposes. In no event shall parking of any motor vehicles or mechanical equipment used in the operations be permitted on the front

portion of the property where same would be visible to adjacent or surrounding properties or persons using the public ways. Further, that all entrance and exit driveways or roadways and all parking areas be suitably surfaced with a concrete or asphaltic surfacing of adequate thickness to withstand heavy trucking operations and shall be maintained in good condition at all times to prevent dust nuisance.

7. That there shall be no grading, earth moving or dumping operations within the area proposed to be acquired by the State for freeway construction as indicated on Exhibit "B" attached to the file. Further, any such operations within horizontal 50 ft. of such area or any grading operations which might create an unsuitable condition to the proposed State property shall first be submitted to the State Division of Highways for approval prior to the commencement of such operations.

8. That prior to the commencement of any grading or land fill operations less than 50 vertical feet from any existing ridge, plans for the proposed grading, indicating finished elevations, shall be submitted to and approved by a Zoning Administrator. Further, that any fill above any existing ridge elevation shall be face with unmixed natural soil and in no event contain any rubbish of any kind and the finished elevation shall be in keeping with Exhibit "B".

9. That there shall be no dumping in the two canyons draining to the east to San Fernando Road and any filling shall be done only with unmixed natural soil. Further, prior to any filling operations in the area, final plans shall be submitted to the State Division of Highways for comments and recommendations and to a Zoning Administrator for final approval.

10. That this variance shall be valid and in full force and effect for a period of twenty-five (25) years from the effective date hereof and shall be null and void thereafter.

11. That there shall be no dumping operations on the property between sundown of any one day and 6:00 a.m. the following day. This authorization provides that the dump may be operated seven (7) days a week, except dumping privileges shall not be extended on Sunday to licensed rubbish collectors, grading or earth hauling contractors or governmental agencies, but such privileges shall only be extended to the general public. Further, covering and compaction operations shall be held to a minimum on Sundays.

12. That an attendant, properly instructed as to the terms and conditions of this variance, be on duty at all times the property is open for rubbish disposal activities and that at other times the gates leading to the rubbish disposal area of the premises be kept closed and locked so that materials cannot be brought onto any portion of the premises.

13. That the Zoning Administrator reserves the right to impose additional conditions or require corrective measures to be taken, if, in his opinion, or in the opinion of the concerned public agencies, the activities conducted on the property prove to be materially detrimental to the occupants of surrounding property or if such measures or conditions are necessary to protect public health, safety, and general welfare.

14. That at the expiration of this grant or the completion of the land reclamation operations, the premises shall be left in a neat and orderly manner with no uncovered material, debris or waste products left on the premises. Further, upon the completion of the project, the applicant or owners shall advise the City and County Recreation and Parks Department that the property is available for recreational purposes.

15. The variance hereby allowed is conditional upon the privileges being utilized within one hundred-eighty (180) days after the effective date hereof, and if they are not utilized or construction work is not begun within said time, and carried on diligently to completion of at least one usable unit, this authorization shall become void, and any privilege or variance granted hereby shall be deemed to have lapsed, unless a Zoning Administrator has granted an extension of the time limit, after sufficient evidence has been submitted that there was unavoidable delay in taking advantage of the variance. Once any portion of the variance privilege is utilized, the other conditions thereof become immediately operative and must be strictly complied with.

The applicant's attention is called to the fact that this variance is not a permit or license, and that any permits and licenses required by law must be obtained from the proper public agency. Furthermore, that if any condition of this grant is violated, or if the same be not complied with in every respect, then this variance shall be subject to revocation, as provided in Section 12.27 of the Municipal Code. In the event the property is to be sold, leased, rented, or occupied by any person or corporation other than yourself, it is incumbent that you advise them regarding the

conditions of this grant. The Associate Zoning Administrator's determination in this matter will become effective after an elapsed period of ten (10) days from the date of this communication, unless an appeal therefrom is filed with the Board of Zoning Adjustment.

FINDING OF FACTS

After thorough consideration of the statements contained in the application, the report of the Planning Associate thereon, the statements made at the hearing before the Associate Zoning Administrator on October 29, 1965, proceedings in connection with Z. A. Case No. 14544 which authorized 45 acres of the subject property for dumping purposes and Z. A. Case No. 15925 which modified conditions of the previous case to permit the dumping of garbage, as well as B.Z.A. Case No. 1251, all of which are by reference made a part hereof, as well as personal inspection of the subject property and surrounding district, I find that practical difficulties, unnecessary hardships or results inconsistent with the general purpose of the A1-1-O Zone would result from a strict enforcement thereof, and that the four requirements and prerequisites for granting a variance as enumerated in the City Charter and in Section 12.27-D, 1 of the Municipal Code have been established by the following facts:

1. The subject property involves 300 acres of an approximate 500-acre ownership located at the extreme northerly tip of the city, southwesterly of San Fernando Road. The topography of the property and ownership consists of steep hills and canyons, with the principal drainage being into Sunshine Canyon. Approximately 45 acres of this area on the southerly side of the canyon bottom was authorized for similar operations in March of 1958 under Z. A. Case No. 14544. This authorization contained some 22 conditions to provide for the proper orientation of the use within the area and which included several conditions imposed by the Board of Public Works as outlined in its "Minimum Regulations for Dumps in the City of Los Angeles". The canyon in which the existing dump is being operated is almost filled to capacity and to continue the public service being performed by the operators, the subject expansion was requested. As outlined in Z. A. Case No. 14544, this area of Sunshine Canyon was considered acceptable for cut and cover dumping operations in view of its remoteness and isolation from all adjoining and developed areas, except the canyon mouth itself where access is taken to San Fernando Road. The property has been expanded however, to include an area bordering San Fernando Road and the subject property has a frontage along the southwesterly side thereof of approximately 4800 ft. This area contains two relatively large box canyons with the highest point

(Ø3)

B. Z. A. Case No. 1632 September 6, 1966

- 2 -

Section 12.28 of the Municipal Code, sustained the Associate Zoning Administrator's determination on the matter and denied the appeal. The Board did, however, impose additional conditions to read as follows:

2-A - That in no event shall any toe or cut and fill operations of any type be permitted on that portion of the property in question lying within 600 ft. of San Fernando Road as shown on Exhibit "B" attached to Z. A. Case No. 17804 or within that portion of the property considered for acquisition by the California State Division of Highways as shown on Exhibit A-1 attached to the file.

14-A - That in the event the grantee is aggrieved by any determination by any Zoning Administrator in connection with this grant or conditions herein imposed, such matter shall be forthwith appealable to this Board.

All other conditions and requirements under Z. A. Case No. 17804 not in conflict with the above mentioned condition shall remain in full force and effect, except that the date of this communication shall be considered as the effective date of this authorization.

The applicant's attention is called to the fact that this variance is not a permit or license, and that any permits and licenses required by law must be obtained from the proper public agency; that if any condition of this variance is violated or not complied with in every respect, the variance shall be subject to revocation as provided in Section 12.27 of the Municipal Code; and that in the event the property is sold, leased, rented or occupied by any other person or corporation, it is incumbent on the owner to give notice of the conditions of this grant.

Very truly yours,

Roger S. Hutchinson
Chairman

Ralph O. Romero
Ralph O. Romero
Secretary

RSH:ROR:cd

cc: Stephen W. Cunningham & Assoc., Inc.
Horley E. Kempler
L.A. County Assessor
Branch Office - Valley

EXHIBIT #5

8. The appropriate mechanism to cure the violations relating to the height of the fill and operations beyond the variance application boundaries is to file a new variance over the entire operation, with a closure date identical to the extant variance. In the meantime, any activities which would exacerbate or continue the violations must cease.

To cure the violations of filling less than 50 vertical feet from existing ridges and filling too close to Bradley Avenue and the drainage course, plans for the proposed grading, indicating finished elevations, must be submitted to the Zoning Administrator, under the authority in Condition No. 8 of the grant. Such a submission cannot occur until a final action on the required new variance has been made.

Additional conditions are necessary to address the continuing impacts from dust, and rubbish blowing from the landfill.

While the allegations regarding the health concerns remain unproven, it is desirable to conduct further investigations to settle this aspect.

NEED FOR ADDITIONAL CONDITIONS:

Pursuant to Section 12.27-B,5 of the Municipal Code, the Administrator finds that certain conditions of the variance have not been complied with, and pursuant to Condition No. 13 of extant Case No. ZA 17804, that certain activities on the property have proven to be materially detrimental to the occupants of surrounding property, and that additional conditions are necessary to protect the public health, safety and general welfare.

For the reasons discussed above and expanded further in this report and in order to bring about compliance with the applicable regulations in this case, the landfill shall be subject to the following additional conditions of operation.

ADDITIONAL CONDITIONS

1. That within 60 days of the effective date of this determination, the operator of the landfill shall file a zone variance over the property covered by extant Case No. ZA 17804, and any additional areas necessary to incorporate filling and/or grading which has occurred beyond the original application boundaries. This variance shall be filed with a request for the same expiration date as under extant Case No. ZA 17804. The primary intent of this filing shall be to seek to cure any violations of the original grant which have occurred with respect to elevation of fill (original Condition No. 8 and original Exhibit C), filling and/or grading beyond the original variance boundaries, filling and/or grading in close proximity to Bradley Avenue and the adjacent drainage course (original Condition No. 2), filling and/or grading operations less than 50 vertical feet from any existing ridge (original Condition No. 8), and any other matters deemed appropriate by the Zoning

Administrator. Also, Condition No. 2a under BZA Case No. 1632 (dated September 6, 1966) shall be evaluated as to conformity, requiring that no cut and fill operations occur within 600 feet of San Fernando Road.

2. Prior to a final determination on the refiled zone variance required in Condition No. 1, the operator shall cease immediately all activities which continue or exacerbate violations of ZA Case No. 17804, with the conditions and exhibits attached thereto. This shall include, but not be limited to, any grading and/or filling outside the original application boundaries; any filling and/or grading within less than 50 vertical feet from any existing ridge; any grading and/or filling operations within less than 80 feet of Bradley Avenue and the adjacent water course; and any filling in excess of the elevations indicated on Exhibit C in the ZA 17804 case file. To establish a baseline for this condition, the survey by the Bureau of Engineering dated April 28, 1988 shall be used.

3. Should the newly filed zone variance under Condition No. 1 be approved, within 90 days of the effective date of the determination the operator shall submit to the Office of Zoning Administration plans for the proposed final contours, in conformity with the conditions of the new variance governing boundaries, elevations, distances from features and any other relevant conditions contained therein. Such plans shall accurately identify all areas of finished grade which exist at that time. The Office of Zoning Administration, in consultation with the Office of Council District No. 12 and the Bureau of Sanitation, shall certify the accuracy of the final contour plans prior to approval.

The operator of the landfill shall continue to submit such final contour plans to the Office of Zoning Administration every six months thereafter until the termination date of the grant. Should such plans indicate that the limits of a new approval have been reached at all points, then closure shall occur immediately.

4. Should the newly filed zone variance under Condition No. 1 be denied, closure of the landfill shall occur immediately. The operator of the landfill shall file final contour plans with the Office of Zoning Administration within 90 days of the effective date of such denial. Such plans shall accurately reflect conditions as they exist at that time, including any violations of the extant zone variance 17804, and all areas of finished grade. The Office of Zoning Administration shall certify as in Condition No. 3.

5. That when proposed final contours plans are submitted pursuant to Condition Nos. 3 or 4, a closure plan shall be submitted including, but not limited to, final landscaping; gas flaring and/or distribution; and maintenance and monitoring of physical conditions on the site.

6. That in order to control airborne dust and litter, the following shall be required in addition to any requirements of the Bureau of Sanitation or other regulatory agencies:

   a. Maintain a daily written log, available at all times to authorized personnel of any regulatory agency, which includes notation of time of observation, average wind speed and wind direction as follows: once in the morning before opening the gate for receipt of refuse, once between 11 a.m. and 1 p.m., and once in the late afternoon before closing. The average wind speed determination shall be based upon a minimum 15 minute period of observation.

   b. When refuse is being actively received, operate a minimum of three water trucks to prevent fugitive dust emissions. When refuse is not being actively received, operate a minimum of one truck.

   c. Obtain and maintain a generator of sufficient power and capacity to maintain the water pumping system during power outages.

   d. Spray soil sealant over the inactive landfill areas to control dust emissions. Prior to each day when the landfill will be closed to refuse receipt, apply soil sealant to the previous active cut area that has not already been sealed.

   e. Maintain in good operating condition the water delivery line at the top of the landfill to reduce turnaround time for water tank refill.

   To the extent that the operator has already complied with any of the foregoing conditions, documentation of same shall be supplied to the Zoning Administrator.

7. That within 60 days of the effective date of this determination, the operator shall initiate the following to evaluate the impacts, if any, upon health by the landfill operation: A systematic sampling and analysis of air and soils in the area west of the Golden State/San Diego Freeways, north of Rinaldi Street, east of Reseda Boulevard and to the City limits on the north.

   The study design of such survey shall be submitted to the Los Angeles County Health Department for review and approval prior to implementation, in consultation with the Office of Zoning Administration and the Office of Council District 12. The results of the sampling and analysis shall be submitted to the same agencies and offices.

8. That all of the terms and conditions of extant ZA Case No. 17804 shall remain in effect as if restated herein except for any modifications or amplifications as authorized herein.

9. That should failure to comply with any condition herein be sufficiently documented to the satisfaction of the Office of Zoning Administration, a public hearing shall be scheduled to determine whether the extant variance and authority to operate the site should be repealed or rescinded.

The Zoning Administrator's determination in this matter will become effective after September 16, 1988, unless an appeal therefrom is filed with the Board of Zoning Appeals. Any appeal must be filed on the prescribed forms, accompanied by the required fee and received and receipted at a Public Office of the Department of City Planning on or before the above date or the appeal will not be accepted.

FINDINGS OF FACT

After thorough consideration of the statements and correspondence contained in the file, the statements made at the public hearing before the Zoning Administrator on March 14, 1988, all of which are by reference made a part hereof, as well as personal knowledge of the property and the surrounding district, I find that there is cause for additional conditions to be placed on the property under Section 12.27-B,5 of the Municipal Code and Condition No. 13 of Case No. ZA 17804, as established by the following facts:

I. BACKGROUND

On March 14, 1988, this Office conducted a public hearing to solicit testimony and gather information bearing upon the existence for cause to consider the revocation, modification or discontinuance of the zone variance approval for the existing Sunshine Canyon Landfill. Revocation consideration was sought by Councilman Hal Bernson.

In a letter to Franklin P. Eberhard, Chief Zoning Administrator, dated October 30, 1987, Councilman Bernson stated: "It is my intention and that of the 7,000 residents of the homes next door to the dump not to have any additional approvals or variances from the 1966 conditions. We have reviewed the maps and taken some surveys and believe that the dump is technically full and should be closed. Any further growth of this dump, should be considered in light of their permit requests now pending with the County of Los Angeles, who is reviewing the application for expansion and EIR. To allow further conditions or growth is a violation of the City's intent in the 1966 permit and should only be considered under full public scrutiny with public hearings ordered."

The Chief Zoning Administrator instructed that proceedings be initiated under Section 12.27-B,5 of the Los Angeles Municipal Code and under Condition No. 13 of Case No. ZA 17804 to determine validity for cause to modify or revoke said operation. Hearing notices were mailed on February 4, 1988 to the owner of record of the site, representatives of the owner, representatives of the North Valley Coalition, the Granada Hills Chamber of Commerce and the Granada Hills Homeowners Association. Additional copies were

On November 29, 1988, the Board of Zoning Appeals was to have conducted a public hearing on the above-referenced matter. However, the hearing was rescheduled to December 6, 1988 because the Board was unable to convene a quorum to consider this matter on November 29, 1988.

Accordingly, after thorough consideration of all available records and evidence previously introduced before the Zoning Administrator, his findings and determination and subsequent arguments and comments, the Board of Zoning Appeals, after conducting a public hearing, found that the Zoning Administrator did not err or abuse his discretion in his determination and denied the appeals, subject to modification of the conditions imposed in the determination as follows:

Condition No. 2 (modified)

That, prior to a final determination on the refiled zone variance required in Condition No. 1 of the Zoning Administrator's determination, dated September 1, 1988, the operator shall cease immediately all activities that continue or exacerbate violations of ZA Case No. 17804, with the conditions and exhibits attached thereto. This shall include, but not be limited to, any grading and/or filling outside the original application boundaries; any filling and/or grading within less than 50 vertical feet from any existing ridge; any grading and/or filling operations within less than 80 feet of Bradley Avenue and the adjacent water course and any filling in excess of the elevations indicated on Exhibit C in the file of ZA 17804.

Condition No. 4 (modified)

That, should the newly filed zone variance under Condition No. 1 of the determination of the Zoning Administrator, dated September 1, 1988, be denied, closure of the landfill shall occur immediately. The operator of the landfill shall then file final contour plans with the Office of Zoning Administration within 90 days of the effective date of such denial. Such plans shall accurately reflect conditions as they exist at that time, including any violations of the extant zone variance under ZA 17804, and all areas of finished grade, based on a current baseline survey. The Office of Zoning Administration shall certify as in Condition No. 3 of determination, dated September 1, 1988.

Condition No. 6 (modified)

That, in order to control airborne dust and litter, the following shall be required in addition to any requirements of the Bureau of Sanitation or other regulatory agencies.

a. That the operator of the landfill shall install and maintain, in good operating condition, an anemometer at an exposed location on the landfill, as approved by the Executive Officer of the South Coast Air Quality Management District. Further, that in the event of a breakdown in the operation of the anemometer, the District shall be notified within 24 hours, and repairs shall be undertaken promptly.

b. That the operator of the landfill shall maintain a written log, available at all times to inspectors of the South Coast Air Quality Management District, which includes notation of time of observation, wind speed and wind direction (read and recorded three times per day) as follows:

1) once in the morning before opening the gate for receipt of refuse (or before 10:00 a.m. when there is no receipt or refuse);

2) once between 11:00 and 1:00 p.m. and

3) once in the late afternoon before closing (or after 3:00 p.m. when there is no receipt of refuse).

c. That water trucks shall be operated during daylight hours to prevent dust emissions in violation of South Coast Air Quality Management District Rules and Regulations and California Health and Safety Code Section 41700; it shall not be necessary to operate said water trucks on rainy days. A minimum three water trucks shall operate on the landfill unless such trucks are broken down or are in need of repair. The South Coast Air Quality Management District shall be notified within 24 hours of such breakdowns or need for repair. When there is no receipt of refuse, a minimum of one water truck shall be operated throughout the landfill. "Operate" shall mean that normal rest and lunch breaks shall be observed and refueling and other normal vehicle maintenance will occur.

d. That the landfill operator shall ~~investigate~~ seek (mod. June 2089) acquisition of a generator of sufficient power capacity to maintain a water pumping system during power outages.

e. That the landfill operator shall maintain in good operating condition the water delivery line at the top of the landfill to reduce turnaround time for water truck refill.

f. That the landfill operator shall cover all exposed refuse at the working faces by the end of each day.

g. That the landfill operator shall spray encapsulate material (soil sealant) over the inactive landfill areas to control dust emissions. Further, that prior to each day when the landfill will be closed to refuse receipt, soil sealant shall be applied to the previous active cut area that has not already been sealed. To the extent that the operator has already complied with any of the foregoing conditions, documentation shall be supplied to the Zoning Administrator (mod. June 2089)

Condition No. 10 (added)

That, effective immediately, no additional deposition of refuse shall take place in the easterly portion of the southern fill area northerly of the berm; and after December 31, 1989, all refuse deposition shall cease in the entire southern fill area, as such area is depicted on Exhibit C, attached to the file of ZA 17804. Further, that after December 31, 1989, a final contour plan, consistent with the requirements of Condition No. 5 of the Zoning Administrator's determination, dated September 1, 1988, shall be prepared and implemented.

Condition No. 11 (added)

That landfill activity shall be permitted in the northern fill area, as depicted on Exhibit C, attached to the file of ZA 17804, until termination of the grant on September 21, 1991, or until the elevations depicted on Exhibit C, have been reached, whichever shall occur first.

SUMMARY OF PUBLIC HEARING

The Board first considered testimony in support of BZA Case No. 3877, the appeal filed by the operator of the landfill, which contends that the entire decision of the Zoning Administrator was in error and constituted an abuse of discretion in finding that there were violations of existing conditions and detrimental effects on surrounding property. The Board then considered BZA Case No. 3878, the appeal of some neighboring residents, who urged the Board to overturn Finding No. 6 of the Zoning Administrator, revoke the existing variance and close the site immediately.

Testimony in Support of BZA Case No. 3877

The operator's attorney, the manager of the landfill site, a consulting engineer and a consulting surveyor appeared at the public hearing and provided the principal testimony in support of the appeal of BZA Case No. 3877. Additional testimony concerning limited aspects of the case was provided by experts in air quality regulations, revegetation and survey research. Their verbal testimony was supported by the attorney's brief, dated November 30, 1988, and technical reports issued by Purcell, Rhoades and Associates on November 28, 1988, and by James Dorsey and Associates and Handelman-Katherman and Associates on November 30, 1988. These technical reports detailed inconsistencies and inaccuracies in early surveys.

The landfill was described as a well-run and thoroughly regulated component of an increasingly constrained solid waste disposal system. The manager of the site stated that the landfill served an area with a population of approximately 3 million and maintained contracts with the City of Los Angeles and numerous other municipalities for rubbish disposal, as well as being open to the general public. It was observed that the importance of the site had increased dramatically, in large part because of the closure of several local landfills in recent years, as exemplified by the dramatic increase in disposal from 3,000 tons per day in 1982 to 7,000 to 10,000 tons per day at the present and the concurrent increase of on-site employees from 25 to 45. To underscore the importance of keeping the site in operation, numerous nearly identical letters of support for the appeal were received from users, including the City of Santa Monica, waste haulers and construction companies, as well as local residents and business operators, civic and fraternal organizations and the County Department of Health.

1C

The Board considered requests by Antonio Cosby-Rossman, attorney for protestants, dated April 12, 1989, and by Linda J. Bozung, attorney for applicant, dated April 21, 1989, for clarification of the Board's determination, dated April 6, 1989. In addition, the Board considered comments by the Zoning Administrator relating to requested clarifications.

After consideration of these requests, the Board clarified its report as follows:

Condition No. 1 (modified)

That within 60 days of the effective date of this determination, the operator of the landfill shall file a zone variance and separate plan approval over the property covered by extant Case No. ZA 17804, and any additional areas necessary to incorporate filling and/or grading which has occurred beyond the original application boundaries. The variance and plan approval request shall be filed with the same termination date as under extant Case No. ZA 17804. The primary intent of the variance request shall be to seek to cure any violations of the original grant which have occurred with respect to elevation to fill (original Condition No. 8 and original Exhibit C), filling and/or grading beyond the original variance boundaries, filling and/or grading operations less than 50 vertical feet from any existing ridge (original Condition No. 8), and any other matters deemed appropriate by the Zoning Administrator. Also, Condition No. 2a under BZA Case No. 1632 (dated September 6, 1966) shall be evaluated as to conformity, requiring that no cut and fill operations occur within 600 feet of San Fernando Road. The plan approval request shall be filed to seek to cure violations with respect to filling and/or grading in close proximity to Bradley Avenue and the adjacent drainage course.

2. Page 3, Condition No. 6d, line 1 - change "investigate" to "seek"

3. Page 3, after Condition 6g - add

"To the extent that the operator has already complied with any of the foregoing conditions, documentation shall be supplied to the Zoning Administrator."

4. Page 8, paragraph 2, 4th sentence - delete.

5. Page 9, paragraph 4, line 9 - change "27" to "24"

6. Page 10, carry-over paragraph, line 2 - change 1,727 to 1,724

These changes shall serve to clarify the Board's intent in this matter; they shall become effective upon the issuance of this letter.

CHANGES SHOWN ON EXHIBIT 1B FOR CLARITY

FRANKLIN P. EBERHARD
CHIEF ZONING ADMINISTRATOR

ASSOCIATE ZONING ADMINISTRATORS
JAMES J. CRISP
DARRYL L. FISHER
ROBERT JANOVICI
WILLIAM LILLENBERG
JOHN J. PARKER, JR.
JON PERICA
JACK C. SEDWICK

CITY OF LOS ANGELES
CALIFORNIA

TOM BRADLEY
MAYOR

HAL BERNSON
Councilman, 12th District

DEPARTMENT OF
CITY PLANNING
KENNETH C. TOPPING
DIRECTOR

KEI UYEDA
DEPUTY DIRECTOR

OFFICE OF
ZONING ADMINISTRATION

Room 600, City Hall
Los Angeles, CA 90012-4801
(213) 485-3851

November 29, 1989

Los Angeles City Council
Los Angeles City Hall
200 North Spring Street
Los Angeles, CA 90012

Re: CASE NO. ZA 17804(ZV)
TIME EXTENSION TO JANUARY 31, 1990--ZONING ADMINISTRATOR FINDING
14747 San Fernando Road
Granada Hills-Knollwood Planning Area
Zone A1-1-O
D.M. 228-133
C.D. 12
Legal Description:
Portions of Lots 9 and 10 of Tract No. 10422 and portions of Tract No. 9613

SUNSHINE CANYON LANDFILL - ZONING ADMINISTRATOR FINDING FOR TIME EXTENSION TO JANUARY 31, 1990

On July 19, 1989, the City Council imposed additional conditions on the operation of the Sunshine Canyon Landfill, under Case No. ZA 17804(ZV). Condition No. 11 therein states:

> "That landfill activity shall be permitted in the northern fill area, as depicted on Exhibit C, attached to the file of ZA 17804, until termination of the grant on September 21, 1991, or until the elevations depicted on Exhibit C, have been reached, whichever shall occur first."

Condition No. 10 therein states in part:

> "That after December 31, 1989, all refuse deposition shall cease in the entire southern fill area, as such area is depicted on Exhibit C, attached to the file of ZA 17804. ... However, if the landfill operator ... by December 31, 1989, has been unable to obtain the required approvals and complete the site preparation necessary to allow landfill activity in the northern fill area, in general conformity with the modified plot plan on file with the City as filed in June 1989 subject to the approval of the Zoning Administrator consistent with Condition No. 11 hereof, refuse deposition shall be allowed to continue in the southern fill area on a month-by-month extension, but only if prior to each month's extension the Zoning Administrator finds that the operator to date

AN EQUAL EMPLOYMENT OPPORTUNITY - AFFIRMATIVE ACTION EMPLOYER

> has in good faith pursued the necessary approvals and site preparation and otherwise is in compliance with the existing variance except as otherwise found to exist; and further provided that no such extensions shall be granted for deposition beyond June 30, 1990."

Documentation submitted by representatives of Browning-Ferris Industries ("Plot Plan Meeting/Contacts Log") indicates pursuit in good faith of the approvals necessary for the northern fill area. The plot plan was filed with the Zoning Administrator on June 15, 1989 and was approved on October 10, 1989. Part of that time period involved 1) withdrawal of an appeal by BFI on an earlier Zoning Administrator action to clear the way for the instant action and 2) the noticing and conduct of a public hearing. On November 6, 1989, the North Valley Coalition appealed the plot plan approval. It is unlikely that a final decision will be issued on the appeal before the end of December. Further, additional City approvals must be acquired and it is unlikely that construction of the project will begin until well after the end of this year.

The Bureau of Sanitation, the lead enforcement agency for Sunshine Canyon Landfill, has indicated that the operation is in compliance with the existing variance, except as otherwise found to exist previously by the City Council.

I therefore find that the operator to date has in good faith pursued the necessary approvals and site preparation and otherwise is in compliance with the existing variance except as otherwise found to exist, and recommend that the City Council allow refuse deposition to continue in the southern fill area until January 31, 1990.

JOHN J. PARKER, JR.
Associate Zoning Administrator

JJP:lmc

cc: Councilman Hal Bernson
Room 236, City Hall
200 North Spring Street
Los Angeles, CA 90012

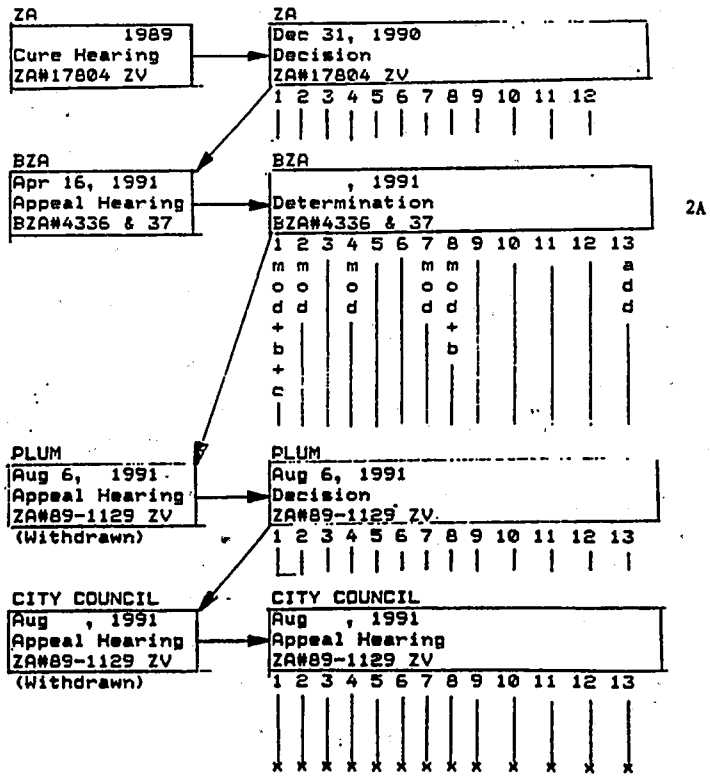
Delwin Biagi
Bureau of Sanitation
Room 1400, City Hall East
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Los Angeles, CA 90012

Linda Bozung
Jones, Day, Reavis & Pogue
355 South Grand Avenue, #3000
Los Angeles, CA 90071

Penny Weland
Bureau of Sanitation
4600 Colorado Boulevard
Los Angeles, CA 90039

CURATIVE VARIANCE AND CONDITIONS

(Condition 1 of BZA#3877 & 78 orders variance hearing)



2A

CONDITIONS OF APPROVAL

The conditions and requirements of Zoning Administration Case No. 89-1129-ZV have not been modified substantially, except as indicated below.

1. Survey (modified).

   a. The applicant shall prepare a survey of the boundaries and elevations of the approved variance, in conformity with Condition Nos. 2 and 3 herein. Said survey shall be conducted by an independent surveyor mutually acceptable to the applicant and the Office of Zoning Administration, which latter shall act in consultation with the Office of Council District 12, the Bureau of Sanitation and the Bureau of Engineering. Until such survey is completed and certified to the satisfaction of the aforementioned parties, the Bureau of Sanitation shall continue to enforce the boundaries and elevations which have been so utilized since the City Council action of July, 1989.

   b. (Added). Said independent surveyor shall be selected by the applicant within two weeks of the effective date of the subject variance action.

   c. (Added). Said survey shall be provided to the aforementioned City parties for review within ten weeks following the effective date of the subject variance action.

2. Boundary (modified). The herein approved boundaries of the variance shall not exceed the following, whichever incorporates a more extensive area: the extent of any landfill-related activities of any type as they existed at the time of the City Council action of July, 1989, including the "earthwork operations," and the previously established variance boundary line under ZA Case No. 17804.

3. Elevations. The elevations of landfill activities, including those less than 50 vertical feet from any existing ridge, shall not exceed those in existence within the southern fill area as they existed as of June 30, 1990, except as is necessary for purposes of additional cover; nor shall elevations exceed those within the northern fill area as depicted on Exhibit "C" of extant Case No. ZA 17804.

4. Activities (modified). No refuse deposition, no landfilling activities, grading, building or road construction shall be permitted under this action, other than in the northern fill area, pursuant to limitations imposed by Exhibit C of ZA 17804 and subject to the conditions of the approval of plans by the Board of Referred Powers on August 3, 1990.

   Exception (added). Covering of existing landfill with dirt is permitted only if said covering is required in writing by the State of California. Before such covering operation is initiated, said written requirement, including specifications for the covering operation, must be provided to the satisfaction of the Zoning Administrator for placement in the subject BZA 4336 case file.

B.Z.A. CASE NOS. 4336 and 4337 EXHIBIT NO. B-1

5. Oak trees. No oak trees shall be removed from within the area of the variance, except within the northern fill area. Oak trees within that area shall be counted prior to displacement, and replaced at a ratio of two trees for every one removed in strict compliance with the Oak Tree regulations of Section 17.05-R of the Los Angeles Municipal Code.

6. Contours. Within 90 days of the effective date of this determination, the operator shall submit to the Office of Zoning Administration plans for the proposed final contours, in conformity with the conditions of this variance and all other governing extant actions. Such plans shall accurately identify all areas of finished grade which exist at that time. The Office of Zoning Administration, in consultation with the Office of Council. District 12 and the Bureau of Sanitation, shall certify the accuracy of the final contour plans prior to approval. The operator of the landfill shall continue to submit such final contour plans to the Office of Zoning Administration every three months thereafter until the termination date of the grant. Should such plans indicate that the limits of the new approval have been reached at all points, then closure shall occur immediately.

7. Sedimentation basin (modified). Should the applicant proceed with construction of the sedimentation basin, said basin shall be constructed at a size which is adequate to the needs of the existing site, but which is not larger than necessary for the purpose of closure of the existing landfill. The construction shall be designed to meet minimum regulations, and the determination of the final need and size shall be made by the Zoning Administrator in consultation with the appropriate regulatory agencies.

8. Closure (modified).

   a. Within six months after the landfill is full or after September 21, 1991, whichever occurs first, all landfill buildings, scales, checking stations, recycling center and facilities to accept trash shall be dismantled and removed from the site, except for offices and facilities necessary to monitor the closure plans.

   b. (Added). Prior to establishment or continuance of said facilities after September 21, 1991, a plan(s) shall be submitted to the Zoning Administrator along with evidence that said facilities are strictly for the purpose of monitoring the closure plans for the City landfill portion of the site. The Zoning Administrator shall consult with the various regulatory agencies to verify that the facilities are for said purpose before authorizing the continuance or establishment of said facilities. Further, the Zoning Administrator may condition the authorization of said facilities.

9. Compliance with prior cases. All of the terms and conditions of extant ZA Case ZV 78-463 and No. 17804, including the revocation consideration. action of July, 1989, and all granted approvals of plans shall remain in effect as if restated herein except for any modifications or amplifications as authorized herein.

10. Plan approval procedure. The applicant shall be permitted to file an approval of plans under this action to modify the terms and conditions of this grant, and any prior grant governing the variance area, for the

OLD PLOT PLAN AND CONDITIONS

ZA
May 1, 1989
Old Plan Hearing
ZA#17804 PAD

→

ZA
June 5, 1989
Decision
ZA#17804 PAD

(Denied)

NEW PLOT PLAN AND CONDITIONS

(Introduced at
City Council
Appeal Hearing
17804 RV
BZA#3877 & 78)

ZA
Aug 31, 1989
New Plan Hearing
ZA#17804 PAD

→

ZA
Oct 10, 1989
Decision
ZA#17804 PAD

BRP
Jan 3 & 12, 1990
Appeal Hearing
BZA#4148
BRP#1046

→

BRP
1990
Decision
BZA#4148
BRP1046
(procedural error)

ZA
April 12, 1990
Decision
ZA#17804 PAD

4A

1 2 3 4 5 6 7 8 9 10 11

BRP
1990
Appeal Hearing
BRP#1046 & 46A

→

BRP
Aug 3, 1990
Decision
BRP#1046 & 46A

4B

1 2 3P 4P 5 5P 6 7 8 9 10 11

4A

subject to the following terms and conditions:

1. That the use and development of the property shall be in substantial conformance with the plan submitted with the application and marked Exhibit "A" dated December 20, 1989, except as modified herein.

2. That the sedimentation basin shall be constructed at a size specifically designed to meet the needs of the instant authorization, including capturing, containing and reducing the velocity of water from the stream watershed. The determination of such need and size will be made by the Regional Water Quality Board and any other agencies having permit authority with respect to hydrology.

3. That within six months after the landfill is full or after September 21, 1991, whichever occurs first, all landfill offices, checking stations and other buildings shall be dismantled and removed from the site.

4. That oak trees within the northern area shall be counted prior to displacement, and replaced at a ratio of two trees for every one removed.

5. That any fill permitted under this authorization shall be not closer than 600 feet to San Fernando Road, pursuant to BZA Case 1632, and 50 horizontal feet from State property, pursuant to Condition No. 7 under ZA 17804.

6. That the applicant shall conform with all conditions imposed by the Department of Building and Safety with respect to grading, seismic safety and mitigation of construction noise, including but not limited to sound restricted construction equipment and compliance with the applicable provisions of Noise Ordinance No. 144,331.

7. That entry area and access road plans shall be submitted to the City Department of Transportation for approval prior to the issuance of building permits.

8. That prior to the issuance of building permits, the applicant shall obtain a letter from the Fire Department indicating that fire protection measures on the site are to its satisfaction.

9. That, pursuant to Section 6-C,2(b) of the Flood Hazard Specific Plan, the applicant shall submit the instant plans to the Director of Sanitation for assurance of compliance with the provisions of said specific plan.

10. That all other use, height and area regulations of the Municipal Code be strictly complied with in the development and use of the property, except as such regulations are herein specifically varied or required.

11. That the authorized use shall be conducted at all times with due regard for the character of the surrounding district, and the right is reserved to the Zoning Administrator to impose additional corrective conditions, if, in his opinion, such conditions are proven necessary for the protection of persons in the neighborhood or occupants of adjacent property.

The applicant is advised that the above approval of plans is from a zoning standpoint only. Any necessary permits or certificate of occupancy must be obtained from the proper City departments, and the applicant must comply with all other public regulations.

The authorization hereby allowed is conditional upon the privileges' being utilized (i.e., in the case of a use variance, the use approved being lawfully conducted on the site) within one year after the effective date hereof, and if they are not utilized or construction work (i.e., actual substantial physical improvements installed) is not begun within said time and carried on diligently to completion, this authorization shall become void and any privilege or authorization granted hereby shall be deemed to have lapsed unless a Zoning Administrator has granted an extension of the time limit (the request for the extension having been submitted prior to the expiration of the grant and accompanied by the appropriate fee) after sufficient evidence has been submitted indicating that there was unavoidable delay in taking advantage of the authorization. Once any portion of the variance privilege is utilized, the other conditions thereof become immediately operative and must be strictly observed.

The Zoning Administrator's determination in this matter will become effective after April 27, 1990, unless an appeal therefrom is filed with the Board of Zoning Appeals. Any appeal must be filed on the prescribed forms, accompanied by the required fee and received and receipted at a Public Office of the Department of City Planning on or before the above date or the appeal will not be accepted.

FINDINGS OF FACT

After thorough consideration of the statements contained in the application, the statements made at the public hearing before the Zoning Administrator on September 25, 1989, all of which are by reference made a part hereof, as well as personal knowledge of the property and the surrounding district, I find as follows:

1. The original action in the instant case was issued by the Zoning Administrator on October 10, 1989. That action was appealed to the Board of Referred Powers, which considered the matter on January 3, 1990 and January 12, 1990. On the advice of the City Attorney that several procedural requirements of CEQA had not been followed, including a requirement for a 30-day comment period when an action involves State agencies, the Board remanded the matter to the Zoning Administrator pursuant to LAMC Section 12.28-A,7(b). The earliest feasible date for republication of the Mitigated Negative Declaration was January 25, 1990 and the 30-day comment period ended on February 23, 1990. Comments received and the City's

CITY OF LOS ANGELES
CALIFORNIA

(4B)

ELIAS MARTINEZ
CITY CLERK

WHEN MAKING INQUIRIES RELATIVE TO THIS MATTER, REFER TO FILE NO.

OFFICE OF
CITY CLERK
ROOM 395, CITY HALL
LOS ANGELES, CA 900
485-3705

TOM BRADLEY
MAYOR

BRP 1046 & 1046A
BZA 4221
(BZA 4148)
ZA 17804 (PAD)
CD 12

August 15, 1990

Board of Zoning Appeals
Attn: Anne V. Howell
City Planner
Room 504, City Hall

Dear Ms. Howell:

The Board of Zoning Appeals transmitted an appeal by Wayde Hunter, aggrieved party, from the entire decision and environmental clearance relative to the Zoning Administrator's conditional approval of plans to permit (1) raising in elevation of existing private access road and modification of proximity of northern fill area thereto, pursuant to Exhibit A of ZA Case No. 17804; (2) enclosure of existing watercourse in an underdrain drainage system and installation of a sedimentation basin; (3) relocation of entrance control stations and landfill offices; and (4) installation of a leachate control and treatment system, within existing Sunshine Canyon Landfill site in the A1-1-0 Zone located at 14747 San Fernando Road.

A similar appeal was heard previously on January 3 and 12, 1990, by the Board of Referred Powers under BRP Case No. 1046 (BZA No. 4148). Following a brief discussion with William Waterhouse, Deputy City Attorney, regarding a Negative Declaration for the subject property involving the Sunshine Canyon Landfill site, the Board continued the matter and instructed that the matter be remanded to the Zoning Administrator for further determination pursuant to Section 12.28A7(b of the L.A.M.C.

This is to certify that at a special meeting of the Board of Referred Powers held on August 3, 1990, said Board acting instead of the Board of Zoning Appeals (BZA New File No. 4221), following a public hearing granted the subject appeal in-part. The Board of Referred Powers overruled the Zoning Administrator's action of April 12, 1990 by denying that portion of the request to raise the elevation of an existing water course in an underdrain drainage system and approved plans for the Sunshine Canyon Landfill site to allow the:

North Valley Coalition
Response to
SEIR 91-0377-/ZC/GPA
November, 1997

U.S.Geological Survey Open-File Report 96-517
Exhibit (WH-8)

Damage and Restoration of Geodetic Infrastructure Caused by the 1994 Northridge, California, Earthquake

Kathleen M. Hodgkinson, Ross S. Stein, and Kenneth W. Hudnut
U.S. Geological Survey
Menlo Park and Pasadena, California

Jay Satalich
California Department of Transportation
Los Angeles, California

John H. Richards
National Geodetic Survey, NOAA
Silver Spring, Maryland



U.S. Geological Survey Open-File Report 96-517 [1996] (text, map, CD-ROM)
CALTRANS District 7 Survey Requests SR 94-160 and SR 94-198
FEMA Mission Assignment DR-1008-CA, USGS-002

Report and data also available on http://www-socal.wr.usgs.gov/fema/

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards. Any use of trade, product or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

EXECUTIVE SUMMARY

Deformation. The January 17 1994, M=6.7, Northridge earthquake permanently deformed the ground surface in the Los Angeles urban region, increasing the elevation of the ground by as much as 20 inches (50 cm), and changing horizontal positions by up to 8 inches (20 cm). The network of geodetic monuments used by engineers and surveyors was thus distorted and rendered inaccurate. The monuments are used for construction and monitoring of the urban infrastructure, including dams, levees, aqueducts, and storm drains; bridges, buildings, and heavy machinery; road and rail transportation routes, communication conduits and pipelines; and property boundaries. We resurveyed the height of 979 leveling bench marks (BMs) and the positions and heights of 66 Global Positioning System (GPS) monuments; emplaced 252 new BMs where the previous monuments were lost or unrecoverable, and added 128 new GPS monuments along critical highways for rapid damage assessment to the main traffic arteries after future earthquakes. In total, 496 monuments were added to the national network. All surveyed monuments are shown on the map; new coordinates and heights are given in the appendix.

Shaking. The Northridge earthquake also strongly shook the ground, with peak shaking exceeding the acceleration of gravity (>1 *g*), and with peak ground velocities of 65 inches per second (or 165 cm/sec). Such sustained shaking and high ground velocities damaged structures and caused surface cracking, liquefaction, ground slumping, settlement, and landslides, which further contributed to damage. Because half of the BMs are located on engineered structures, their displacement not only records the permanent change in height caused by the earthquake to the geodetic network, but also any disturbance of the structures caused directly or indirectly by shaking. We developed a geophysical model of the permanent ground deformation that is consistent with the movement of the geodetic monuments. All BMs with vertical displacements that differ from this model by more than 1.2 inches (3 cm) are considered to be anomalous. The 40 such anomalous or disturbed BMs are shown in the map and listed in the report. Those in engineered structures include railroad and highway bridge abutments and spans, tower and building foundations, catch basins, retaining walls, and culverts; the remainder are typically in engineered fill. The anomalous BMs are identified on the map; driving directions and preliminary site inspections to each anomalous BM are included.

Recommendations. Structures associated with anomalous BMs may be in a weakened state, making them vulnerable to shaking during future earthquakes. Because few structures have been assessed for earthquake effects except by visual inspection, subtle or hidden damage suggested by the settlement or uplift of the structures merits re-inspection. We further suggest that more geodetic monuments be placed on critical transportation arteries, structures, and lifelines, to ensure faster and more accurate post-earthquake damage assessments in the future.

This report includes an analysis, a CD-ROM containing the data files in several GIS (Geographic Information System) and illustration formats, a large-scale color map, and an appendix giving driving instructions to the sites of anomalous bench marks. All files are accessible on a World Wide Web, http//www-socal.wr.usgs.gov/fema .

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APPENDIX V Map ..... (In flap)
APPENDIX VI CD-ROM containing data, text and map ..... (In flap)

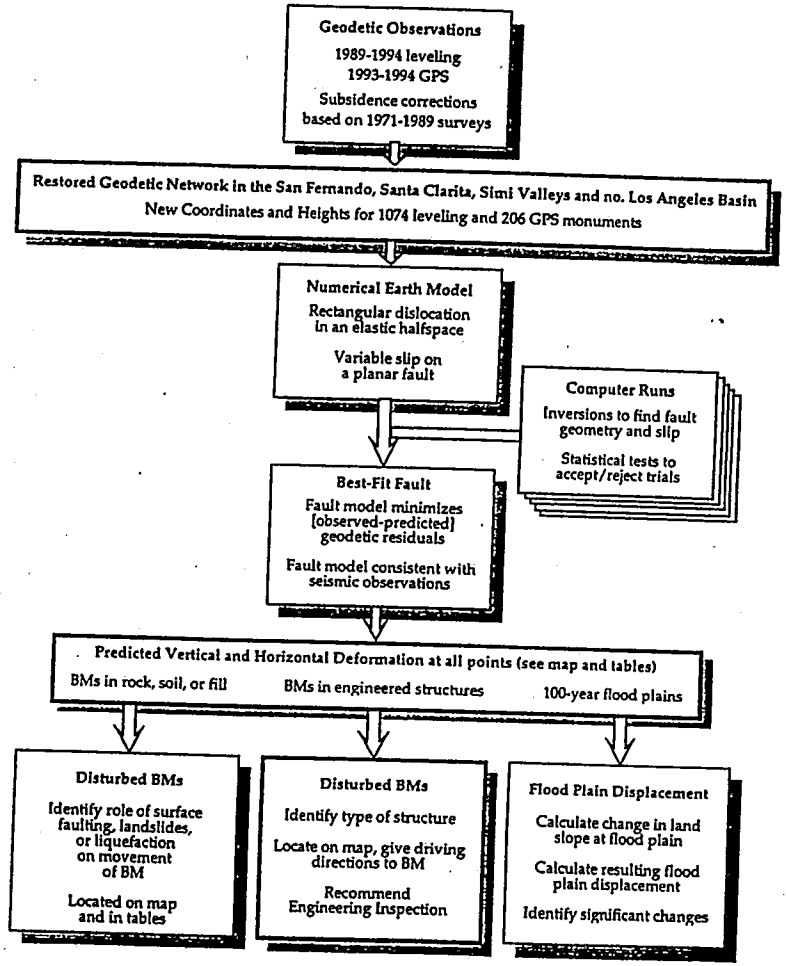


Figure 1. Schematic illustration of process followed in this study. Key results are framed by a bold box. Also see color map in the flap.

INTRODUCTION

We seek to restore the integrity of the geodetic network in the San Fernando, Simi, Santa Clarita Valleys and in the northern Los Angeles Basin by remeasurement of the network and identification of BMs which experienced non-tectonic displacements associated with the Northridge earthquake. We then use the observed displacement of BMs in the network to portray or predict the permanent vertical and horizontal deformation associated with the 1994 Northridge earthquake throughout the area, including sites where we lack geodetic measurements. To accomplish this, we find the fault geometry and earthquake slip that are most compatible with the geodetic and independent seismic observations of the earthquake. We then use that fault model to predict the deformation everywhere at the earth's surface, both at locations where geodetic observations exist and also where they are absent.

We compare displacements predicted for a large number of numerical models of the earthquake faulting to the coseismic displacements, treating the earthquake fault as a cut or discontinuity embedded in a stiff elastic solid. This comparison is made after non-tectonic deformation has been removed from the measured elevation changes. The fault slip produces strain in the medium and deforms the ground surface. The model compatible with seismic observations that best fits the geodetic data within their uncertainties is selected. The acceptable model fault bisects the mainshock focus, and the earthquake size , magnitude, is compatible with the earthquake size measured seismically. Our fault model was used to identify geodetic monuments on engineered structures that were anomalously displaced by the earthquake (Figure 1).

1. LEVELING ANALYSIS

1.1 Overview

Leveling measures the height difference between two points along a horizontal line of sight. Summing the relative height differences along a leveling line yields the elevation of those BMs with respect to the height of the first BM. Repeated measurements of height enables measurement of deformation of the Earth's surface with time. Such deformation can occur gradually, such as by land subsidence due to groundwater or oil withdrawal, or by sudden geologic events such as earthquakes. The vertical deformation caused by an earthquake is calculated by subtracting the elevation of points measured before the earthquake from the elevation of the point measured after the event.

Table 1. Preseismic and postseismic leveling surveys analyzed in this study.

POSTSEISMIC DATA				
Line	Order	Date (m/yr)	α	Survey Name
L25468/16	I/II	08/94	0.69	Torrance To Seal Beach
L25468/15	I/II	08/94	0.91	Huntington Park To Buena Park
L25468/14	I/II	07/94	1.17	Santa Monica Via Redondo Beach To San Pedro
L25468/13	I/II	08/94	0.70	Woodland Hills Via Cahuenga Blvd To I-10
L25468/12	I/II	08/94	1.03	Thousand Oaks Via Rt-101 to Woodland Hills
L25468/11	I/II	09/94	0.66	Woodland Hills via Ventura Fwy to Glendale
L25468/10	I/II	09/94	0.70	San Fernando via 405 Freeway to Hollywood
L25468/9	I/II	09/94	0.65	Releveling in the Northridge EQ Area Ca
L25468/8	I/II	06/94	0.89	Chatsworth via Woodland Hills to S. Monica
L25468/7	I/II	08/94	0.70	Chatsworth via Balboa Blvds to San Fernando
L25468/6	I/II	06/94	1.27	Fillmore via Moorpark to Thousand Oaks
L25468/5	I/II	08/94	1.06	Saugus to Forest Park
L25468/4	I/II	06/94	1.38	Moorpark via Route 118 to San Fernando
L25468/3	I/II	06/94	1.11	Saugus via Route 126 to Fillmore
L25468/2	I/II	07/94	1.29	Pyramid Lake to Castaic
L25468/1	I/II	07/94	0.79	Castaic via San Fernando and LA to San Pedro
PRESEISMIC DATA				
Line	Order	Date (m/yr)	α	Survey Name
L25020	I/II	05/89	1.01	Newport Beach via Long Beach to San Pedro
L25203	I/II	06/89	0.96	Santa Ana via Anaheim and Downey to LA
L25180	I/II	06/89	0.99	Ventura via Santa Monica to San Pedro
L23641	I/I	05/74	1.06	Line 304 City of Los Angeles
L25206	I/II	06/89	0.77	Topanga Beach to Chatsworth
L23629	I/II	06/74	1.21	Line 304 City of Los Angeles
L24301/10	I/I	04/78	1.50	Southern California Releveling Program
L24301/12	I/I	05/78	1.50	Southern California Releveling Program
L24905/2	I/II	04/85	0.41	Earthquake Monitor Leveling in LA County
L25205	I/II	06/89	1.89	San Fernando via Hwy 118 to Chatsworth
L25204	I/II	05/89	1.16	Oxnard via Simi Valley to 3 km of Chatsworth
L24983/1	I/II	06/86	1.22	Glendale via Saugus to Lebec
L25207	I/II	07/89	1.03	Montalvo via Fillmore to 13 Km West of Saugus
L25179	I/II	07/89	0.53	Glendale via Saugus to Lebec
L25061	I/II	07/87	1.00	San Pedro via Los Angeles to Glendale

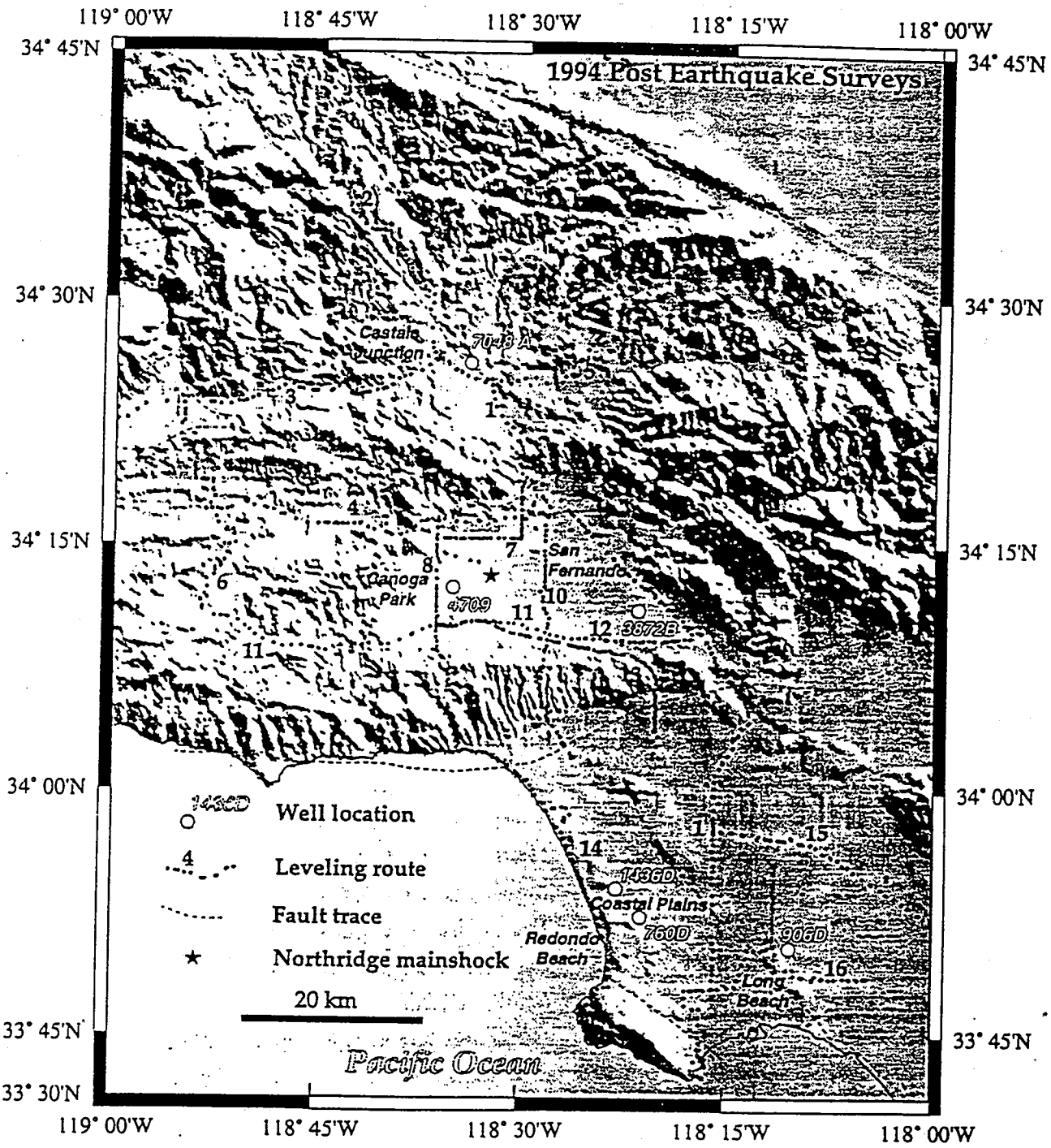


Figure 2. Leveling routes measured as part of this study by the National Geodetic Survey in the San Fernando Valley, Simi Valley and Los Angeles (Survey L24568 parts 1 to 16). Benchmarks are shown as small black dots and each route is labeled 1 to 16 corresponding to Table 1.

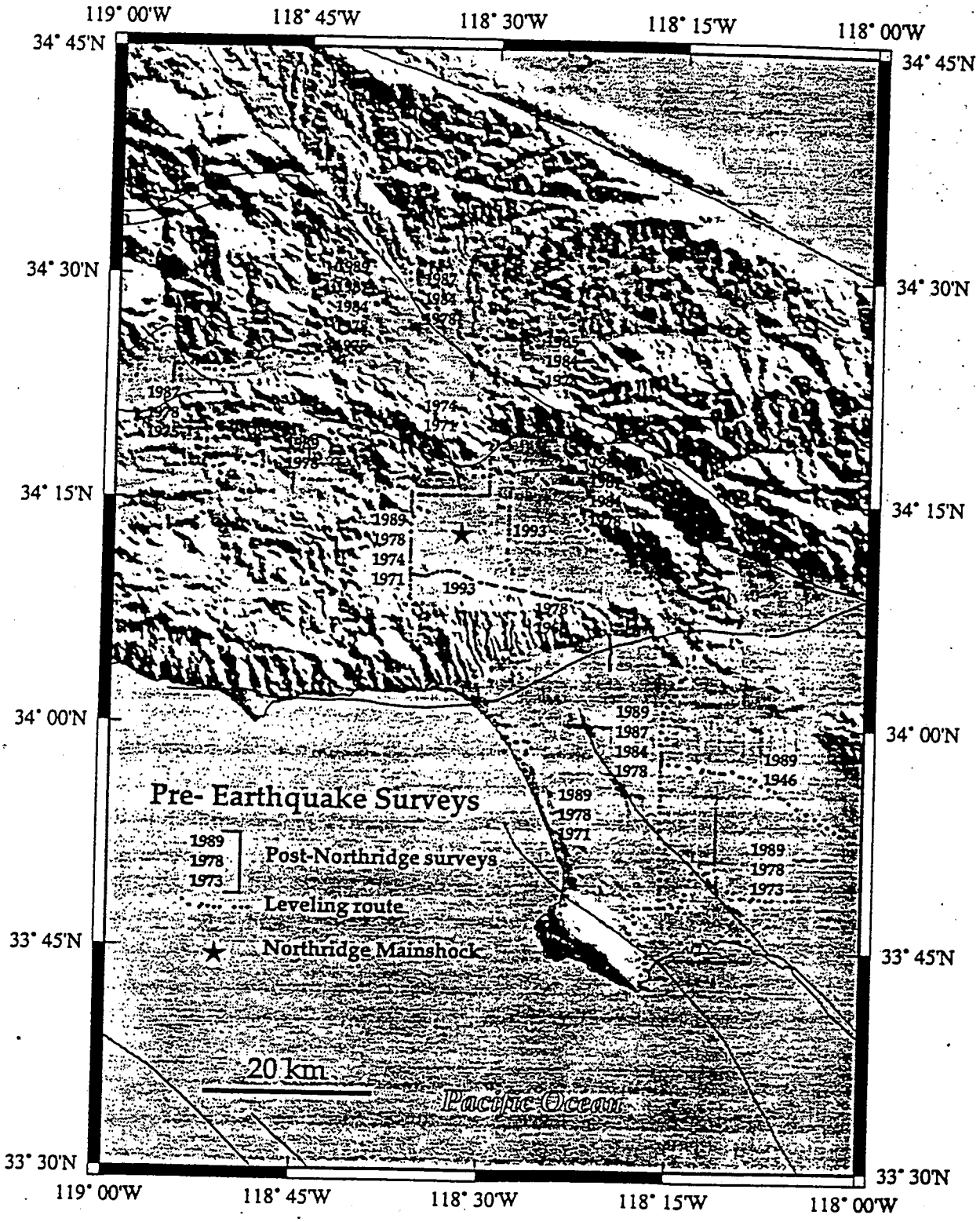


Figure 3. The coseismic leveling data set. Each route is annotated with the years of surveys used to study the possibility of subsidence.

While the earthquake deformation signal is ideally calculated by subtracting surveys made immediately before and immediately after the earthquake, this is rarely possible in practice, and thus non-tectonic effects must be quantified and removed. In the Los Angeles basin, ground subsidence caused by groundwater, natural gas, and oil withdrawal is a continuing source of surface deformation that must be removed from the earthquake elevation changes. We determine the rate of non-earthquake effects by comparing at least three surveys of the leveling route made at different times before the earthquake.

After the Northridge earthquake, between June and August 1994 the National Geodetic Survey, as part of this study, conducted high-precision leveling surveys along 16 leveling routes in the Los Angeles area (Table 1 and Figure 2). To infer the vertical deformation associated with the 1994 Northridge earthquake, surveys of the routes made between 1971 and 1989 were subtracted from the 1994 measurements. The 1994 leveling surveys are referred to as the postseismic data set and the surveys made before the Northridge earthquake referred to as the preseismic data set (Figure 3). Elevations measured at BMs in both pre- and postseismic surveys form the basis of the coseismic data set .

1.2 Non-tectonic deformation: Subsidence

1.2.1 Causes of subsidence in Los Angeles County

A major cause of land subsidence is the withdrawal of groundwater from compressible sediments. As water is withdrawn and the water table lowered, the effective pressure in the drained sediments is increased. Compressible layers then compact under the over-pressure burden that is no longer compensated by hydrostatic pressure. The resulting land subsidence is most pronounced in uncompacted sediments Throughout Southern California oil and gas extraction is also a cause of subsidence. In particular, the Torrance oil field extends from Redondo Beach in the northwest to Long Beach in the southeast. Subsidence at a rate of ~3 cm/yr at Redondo Beach has been attributed to petroleum extraction.

Several criteria were applied in this study to define subsidence features. Subsidence was identified where the elevation decreased between two or more pre-earthquake surveys more than the allowable random survey error. The subsidence feature had to occur over several BMs and, a consistent temporal and spatial pattern of deformation had to exist between the surveys. Subsidence rates were calculated relative to a BM which was adjacent to the subsidence feature and in incompressible rock. This stable BM thus formed a local base level. Dividing the amount of

subsidence below the base level by the time interval yields the subsidence rate. Since subsidence is a dynamic process and its magnitude and extent is affected by water use, rainfall and urban development, the derived rates reflect the average trend of subsidence in the area. Where possible more than two surveys of the route were examined to ensure the trend was not a short term effect.

1.2.2 Water fluctuations in Los Angeles County

Most of the run-off from the San Gabriel and Santa Susana Mountains flows through the San Fernando Valley. The entire Valley is drained by the Los Angeles River system. Since the 1940s, water flow has been controlled by the Hansen and Sepulveda Flood Control basins. Unconsolidated deposits, between 1.5 million and 10,000 years old, underlie the valley floor and are the main water bearing units of the San Fernando Valley. The Saugus Formation, around the northern margin of the Valley and south side of the Santa Susana Range, is composed of continental and marine sediments which also contain water-bearing units. Consolidated rock units in the surrounding mountains define the boundary between water bearing and non-water bearing units. Groundwater is drawn from the unconsolidated sediment aquifer systems that underlie the San Fernando Valley, Los Angeles and Long Beach areas. The main demands for water arise from industrial and urban residential usage.

Water levels in the San Fernando Valley and Los Angeles area have been recorded since the early 1900's. Fluctuations in water levels are influenced by periods of drought and increases in water usage. In the Castaic junction area the depth to water decreased 15 m during 1969 (Well 7048 [*DPW*, 1992]), (Figure 2). From 1969 to 1984 water levels rose another 4.5 m. The period 1984 to 1991, however, saw the water-level drop to the 1969 level. A monitoring well in Canoga Park, west of Balboa Boulevard, has shown little fluctuation in water-level between 1960 and 1991. The general trend at the Canoga Park well, though, has been one of water-level decline (Well 4709, [*DPW*, 1992]). Over a 31-year period the depth to water has increased by 3 m (Figure 4). A second well in the San Fernando Valley (Well 3872B, North Hollywood) has shown much greater fluctuations. The depth to water below the ground surface increased by 24 to 57 m between 1944 and 1967 [*Watermaster*, 1981]. Between 1967 and 1984, however, water levels rose to almost that of the 1940's level (Well 3872B, Figure 2)[*DPW*, 1992]. Water-levels in the well then dropped again by 6 m between 1987 and 1991. In the coastal plains, ground-water fluctuations vary greatly between localities. Two wells, 706C and 1346D, separated by 5 km (Figure 2), indicate the depth to the water-table has decreased. Water-levels have steadily risen by 12 m at well 706C since 1964.

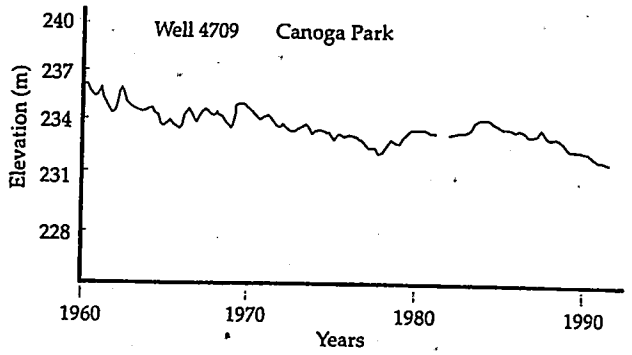


Figure 4 Water level fluctuations at Well 4709 in Canoga Park, *Watermaster* [1981].

At well 1346D the 1964 and 1991 water-levels are about the same [*DPW*, 1992]. Fluctuations over the 27-year period at well 1346D, however, have been large, rising 12 m above the 1964 level by 1976 and then dropping almost 15 m by 1978. In the Long Beach area, water levels remained constant between 1965 and 1974 (Well 906). Between 1975 and 1977 water levels dropped by an average of 9 m and remained at that level until 1982, when water levels began to increase again. Since 1985 the water levels have been close to the 1965-74 level.

1.2.3 Subsidence in the San Fernando Valley and the Los Angeles Area

Subsidence was examined along each of the following leveling routes. The route numbers and names below are keyed to Figure 2 and the National Geodetic Survey line L25468 part numbers. The deduced subsidence rates are summarized as a contoured map in Figure 5. Where the data is insufficient to identify subsidence the contours are dashed e.g., in the San Gabrielle Mountains or the Santa Susana Range.

(1) Castaic via San Fernando and Los Angeles to San Pedro .
Subsidence at a rate of about 4 mm/yr is occurring from Castaic Junction to San Fernando. The trend is evident in surveys made in 1985, 1984 and 1978. Subsidence is concentrated in the Newhall area and the Santa Clarita Valley. North of Castaic Junction, where the route lies in the bedrock of the San Gabriel Mountains, subsidence is absent. In the City of San Fernando, subsidence rates are 3 to 4 mm/yr. This rate decreases gradually southward along the Verdugo Mountains and towards the Santa Monica Mountains. Four leveling surveys made between 1971 and 1994 show that the vertical deformation across the Los Angeles Basin is complex.

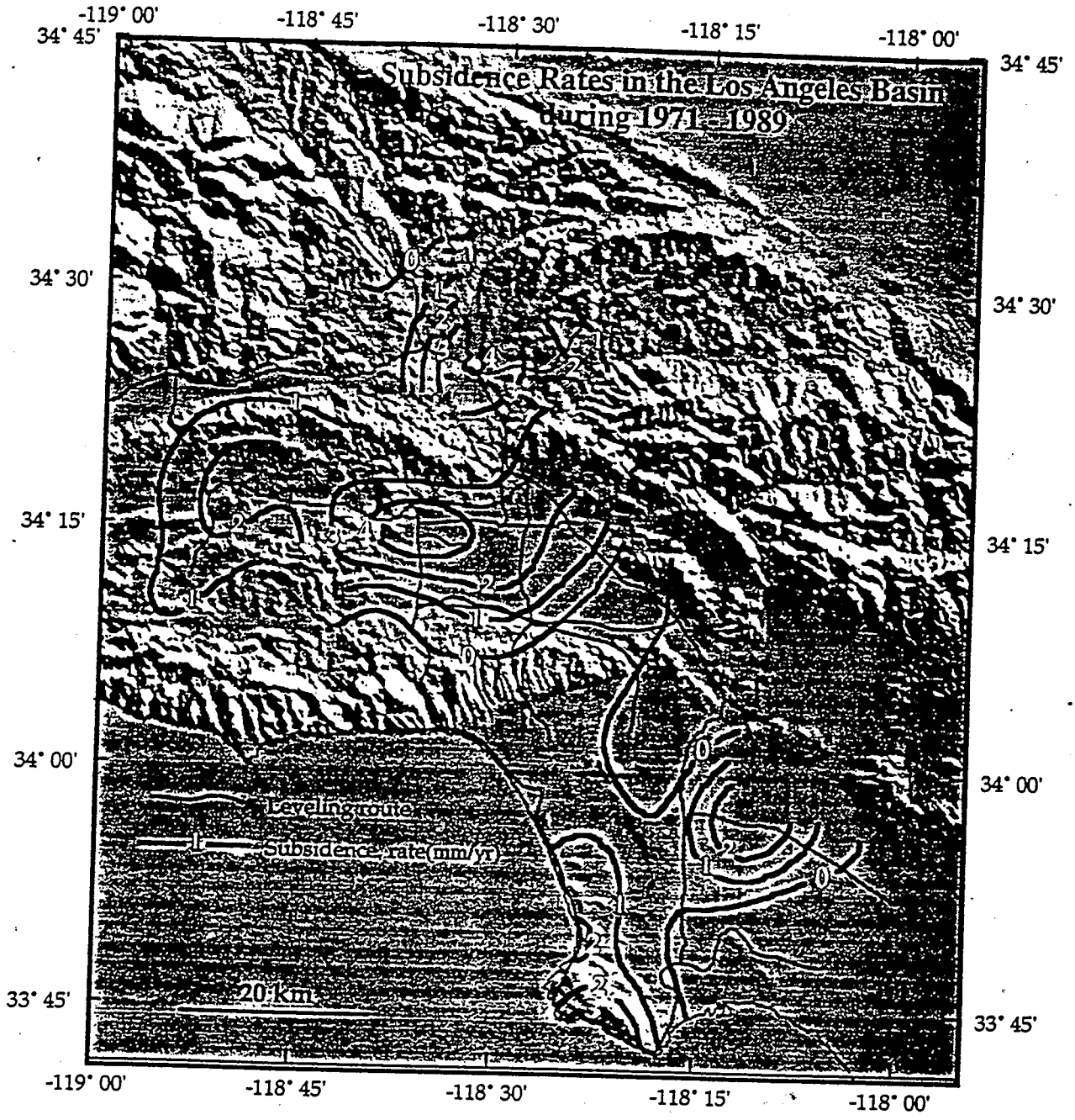


Figure 5. Subsidence rates in the Los Angeles Basin derived from leveling surveys made between 1971 and 1989. Solid black contours show where the data constrain the subsidence rate.

Subsidence at a rate of 15 mm/yr occurred between 1971 and 1989, relative to BMs outside the basin and south of the San Gabriel Mountains. In contrast, no such deformation occurred between 1989 and 1994. These observations agree well with water-levels measured at Well 906 (Figure 2), where low water levels were measured between 1975 and 1982, after which water levels rose and maintained a steady level.

(3) Saugus via Route 126 to Fillmore .

Leveling surveys made along this route between 1978 and 1975 indicate that up to 60 mm of subsidence occurred. The subsidence zone was 20 km wide and centered in the town of Piru. This deformation appears to have ceased after 1978. The difference between a 1989 and 1975 survey of the route shows at most 1.5 cm of deformation, where the greatest subsidence was observed between 1975 and 1978. The possibilities are that subsidence followed by recharge occurred and water levels have again reached those of 1975, or, that the 1978 survey contains systematic errors. A subsidence correction of only 1 mm/yr was applied to a 10 km section of the line based on the 1989 to 1975 elevation changes to remove the subsidence feature from the elevation changes. This results in a set of elevation changes which can then be attributed solely to the Northridge earthquake.

(4) Moorpark via Route 118 to San Fernando .

Observed subsidence along this route varied from 2 to 4 mm/yr and was greatest on the west side of the San Fernando Valley. A maximum subsidence correction of 4 mm/yr was applied along this leveling route. The observed subsidence corresponds to that measured along Interstate 5 where the two survey lines intersect (Figure 6).

(6) Fillmore via Moorpark to Thousand Oaks .

The subsidence along this leveling route ranged from 0.6 mm/yr at Fillmore to 2.5 mm/yr at Thousand Oaks. This was consistent with that observed along leveling routes Saugus to Fillmore and Moorpark to San Fernando.

(7) Chatsworth via Devonshire and Balboa Boulevards to San Fernando.

Subsidence was observed along this line from Chatsworth to about 3 km west of San Fernando. The subsidence rate increased from east to west across the San Fernando Valley and was greatest at Chatsworth where it was ~ 4 mm/yr.

(8) Chatsworth via Woodland Hills and Topanga Beach to Santa Monica.

Surveys made in 1974 and 1989 indicate subsidence along this route in the San Fernando Valley. The deformation is greatest from Chatsworth to Canoga Park and decreases as the leveling route rises into the Santa Monica Mountains. A hydrograph from Well 906 in Canoga Park (Figure 2) records a steady decline in water-level at

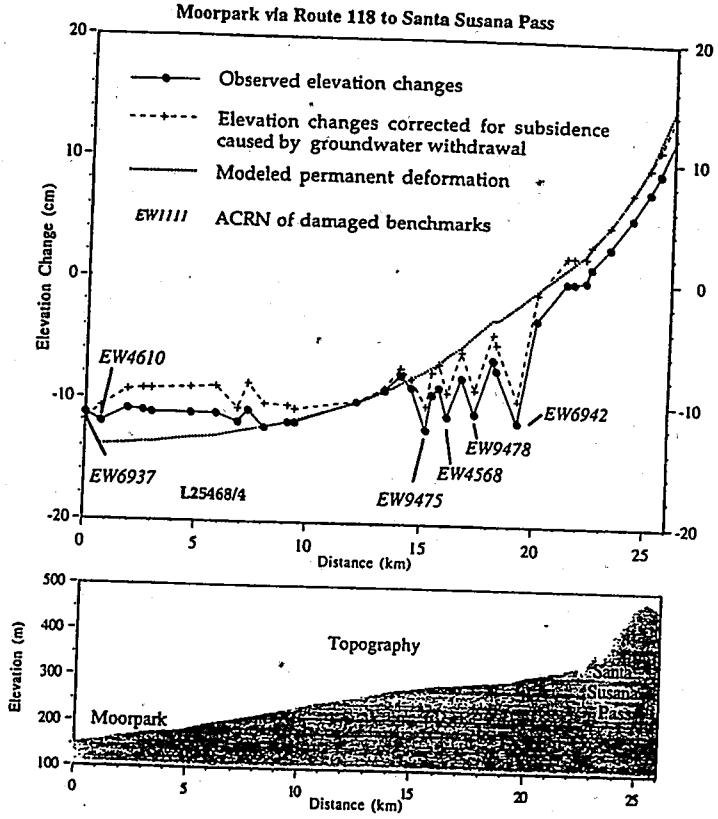


Figure 6. The observed, predicted and subsidence corrected elevation changes in Simi Valley along Route 118 (L25468/4). The PIDs (serial number) of benchmarks with an elevation changes which differs from the predicted coseismic elevation changes by more than 3 cm are labeled.

about 3 m in 30 years. Subsidence or deformation caused by landslides occurred along a 4-km-long section of the leveling route from Glenview to 3 km north of Topanga on Highway 27 between 1974 and 1989. The deformation is not, however, evident in the coseismic elevation changes which were formed by differencing surveys made in 1994 and 1989.

(13) Woodland Hills via Ventura to Cahuenga Boulevards to Interstate-10.
Localized subsidence occurred at a rate of about 1 mm/yr in the Sepulveda Dam Recreation Area between 1968 and 1974. One BM close to the Recreation area indicated subsidence as high as 3 mm/yr for that period. Subsidence is concentrated near the Dam and is negligible at distances of 5 km from it.

(14) Santa Monica via Redondo Beach to San Pedro.
There is evidence for subsidence in the vicinity of Redondo Beach. The deformation is evident over a 23-year period. The 1994 to 1989 elevation changes show that the feature is bowl shaped, centered at Redondo Beach and disappears towards Palos Verdes (Figure 7). The correction applied to this line is based on the 1994 to 1989 elevation changes, since the postseismic surveys yield high rates of subsidence which are not evident in the two most recent surveys of the area. The subsidence rate was thus estimated to be about 2 mm/yr at Redondo Beach. Redondo Beach lies at the northeast side of the Torrance oil field and it is probable that subsidence in Redondo Beach is due to oil and gas extraction [*U.S. Army Corp of Engineers*, 1990]. Groundwater levels have not declined significantly at Redondo Beach since 1975. Although groundwater pumping was extensive in the area, especially in the 1960's the effects have been diminished by sea water intrusions which helped recharge the aquifers [*U.S. Army Corp of Engineers*, 1990]. Non-tectonic deformation is also evident on the Palos Verdes peninsula. Surveys made in 1971, 1978 and 1989 revealed subsidence rates as high as 8 cm/yr in the vicinity of the Portuguese Bend landslide. Between 1994 and 1989 however, the deformation rate had decreased to 2.7 cm/yr.

(15) Huntington Park to Buena Park.
Subsidence is occurring west of the San Gabriel River at a maximum rate of 4 mm/yr. East of the river there is no subsidence. The correction applied to this line was determined from the 1994 to 1989 elevation changes since it was difficult to establish a zero subsidence level using the only other preseismic survey which was made in 1946.

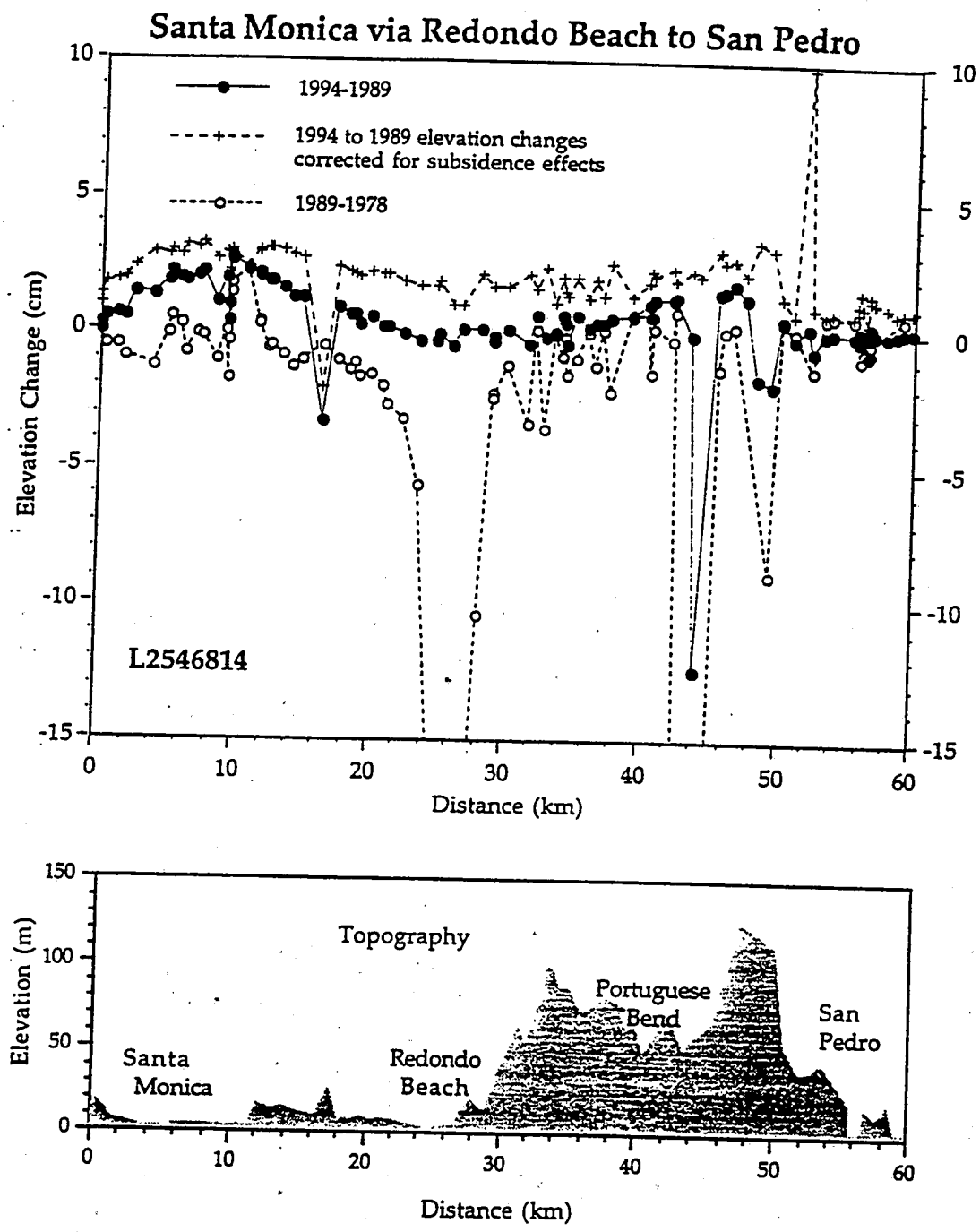


Figure 7. Leveling surveys made between 1978 and 1994 from Santa Monica to San Pedro (L25468/14) indicates subsidence at Redondo Beach.

1.3 Leveling Error Analysis

1.3.1 Random and systematic errors

To assign appropriate weight to each leveling measurement in the modeling process it is necessary to asses the accuracy of the data. This is accomplished by examining the difference between forward and backward leveling runs of each section between bench marks., or misclosures of the entire circuit of bench marks. Leveling surveys contain both systematic and random errors. Standards and practices for precision leveling are designed to reduce both types of errors [*Federal Geodetic Control Committee*, 1984]. The NGS classifies three standards of leveling; first, second and third-order. The most precise leveling is first-order. First and second order leveling has three subdivisions class 0, class 1, and class 2, class 1 being of higher precision than class 2. Procedures, equipment details, and precision are defined for each order and class.

Random errors.
The random error allowed to accumulate along a leveling line is expressed as $\alpha\sqrt{L}$, where L is the length of the line in kilometers. The value of α can be calculated in two ways. First, through agreement of the forward and backward measurements of the height differences between BMs and secondly through the misclosure of a leveling circuit. Using the former method, α is the standard deviation computed from several double run sections and is calculated as

$$\alpha = \frac{1}{N}\sum_{j}^{N}\sqrt{\frac{var_j}{D_j}} \qquad (1)$$

where N is the number of double run sections, D_j is the length in kilometers of the j^{th} double-run section, and var_j is the variance of that section. Double run sections are measured twice or more in a forward and backward direction. The variance is calculated as

$$var_j = \frac{1}{n}\sum_{i}^{n}\left(\bar{h} - h_i\right)^2 \qquad (2)$$

where n is the number of measurements of the j^{th} double-run section, h_i is the observed height and $\bar{h}$ is the average height of the observed runnings.

An alternative way to assess the accuracy of a leveling survey is to determine the cumulative height difference for the measurements associated with a loop in a survey. This is referred to as the misclosure of a leveling loop. Here α is calculated as $\alpha = E/\sqrt{L}$, where E is the misclosure in millimeters. In the absence of systematic errors the values of α calculated from the forward and backward differences and from misclosures should be about equal.

Systematic errors.
The principle sources of systematic errors in leveling data arise from incorrectly calibrated leveling rods and from atmospheric refraction effects. All surveys were tested for rod miscalibration by regressing the gradient of the topography against the elevation distance per kilometer [*Stein*, 1981]. If the survey was found to be contaminated by rod miscalibration errors then it was not used in this study. For example, a 1978 survey from Chatsworth to Woodland Hills showed a significant correlation between topography and elevation change. A 1974 survey of this route was therefore used to for the coseismic elevation changes along this line. All surveys in this analysis contained corrections for known systematic errors which occur in leveling, i.e., refraction, rod miscalibration, thermal expansion of the rods, collimation, and orthometric corrections.

1.3.2 Error assignment

For the first Order Class II leveling surveys made in 1994, the α values calculated using equation (1) ranged from 0.69 to 1.29 mm/km$^{1/2}$ (Table 1). The α values for the preseismic data set where calculated from the difference between the forward and backward leveling measurements (equation 1) and ranged from 0.93 to 1.89 mm/km$^{1/2}$ (Table 1).

The uncertainty in elevation change at a BM, δ_i, is given as

$$\delta_i^2 = \alpha_{pre}^2 + \alpha_{post}^2 + \left(0.3S_i\right)^2 \qquad (3)$$

where α_{pre} and α_{post} are the preseismic and postseismic α values respectively, and S_i is the subsidence rate at that point. The uncertainty in relative elevation change between two BMs, $\sigma_{(i,i+1)}$, is then

$$\sigma_{(i,i+1)} = \left[\left(\frac{\delta_i + \delta_{i+1}}{2}\right)^2 L\right]^{1/2} \qquad (4)$$

where L is the distance between BMs i and $i+1$.

2. NUMERICAL MODELING OF THE EARTHQUAKE DEFORMATION

2.1 Modeling Method

Our approach was first to find a model of the earthquake source that is most consistent with the displacement of the leveling BMs and GPS monuments and with independent seismological data, and then to identify the bench marks. that depart the most from the model (Figure 8). Bench marks with elevation changes that differed from the model by more than 3 cm (1.2 inches) were then visited for a preliminary site inspection by a Caltrans survey team.

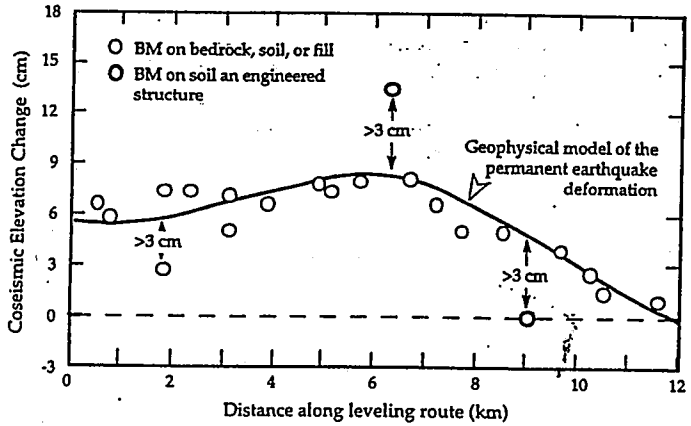


Figure 8. Schematic strategy to identify anomalous BMs. A geophysical model of the permanent earthquake deformation (*bold curve*) is consistent with the displacement of most BMs (*circles*). The subset of adjacent BMs displaced more than 3 cm (1.2") from the model are classed as 'disturbed' or anomalous, and those on engineered structures further distinguished (*bold circles*). Note that a BM with no coseismic elevation change (at km≈9) is nevertheless recognized as anomalous, because it has subsided more than 3 cm with respect to the model.

We treat the earth as a homogeneous elastic halfspace, a medium with a flat upper surface that extends to infinite depth, and assign elastic modulii (or stiffness) that approximate observed earth behavior. Into this medium we embed an elastic dislocation—a rectangular cut or fault—at a given location with a specified length, width, inclination, and orientation. We then calculate how slip (shear displacement)

of the fault will deform the earth's surface. This is comparable to making a cut inside a stiff block of rubber, displacing the two sides of the cut past each other a fixed amount, and measuring how the surface of the rubber block has deformed as a result of the internal cut. At every point where we have a geodetic observation of the earthquake deformation (vertical or horizontal), we calculate the predicted deformation per meter of slip on the fault. We then find the value of fault slip which minimizes the difference between the predicted and observed surface displacements. The observations are weighted such that the most precise observations carry the most weight, following *Marshall* [1991].

This method works well principally because the earthquake displacement field is predominantly long wavelength (smooth), whereas the displacements associated with structural damage or ground failure tend to be localized (Figure 8). In addition to the GPS and leveling observations, interferometric synthetic aperture radar satellite images confirm the simplicity of the overall spatial pattern of deformation [*Murakami et al.*, 1995; *Massonnet et al.*, 1993]. Because the Northridge earthquake struck on a 'blind' thrust fault [*SCEC & USGS*, 1994], in which the main fault slip does not reach the ground surface, the deformation field is relatively smooth everywhere .

The 617 leveling observations and 66 GPS-derived displacement vectors were simultaneously inverted to estimate the fault slip that occurred during the Northridge earthquake, which best satisfied the geodetic data [*Hudnut et al.*, 1996]. Since each GPS observation consists of three components of displacement there are thus 815 total observations. This modeling approach is based on elastic dislocation theory, which can be used to compute the displacements at a given point on the ground surface from a slip distribution model [*Okada*, 1992].

The modeled slip on the fault that caused the Northridge earthquake is shown in Figure 9 and the location of the fault, identical to that used by *Hudnut* [1996], is shown in Figure 10. This study differs from its predecessors [*Hudnut* et al., 1996],in that leveling observations were first corrected for subsidence and then introduced into the inversion as section elevation changes weighted by their uncertainty. The benefit in modeling section elevation changes is that no datum offset between the pre- and postseismic deformation need be identified. The uncertainty ascribed to each observation reflected the quality of the survey and error in any subsidence correction that had been applied to the data. The spatial coverage and density of the leveling data, in addition to the large number of sampled leveling sections, contribute substantial new information to the source inversion.

Distribution of coseismic slip on the Northridge fault

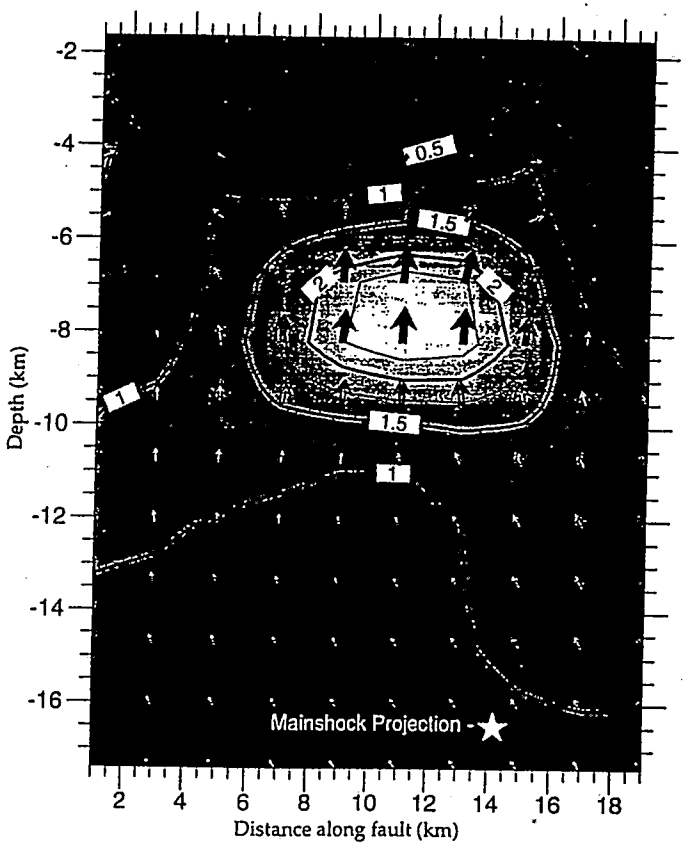


Figure 9. Model fault geometry used in the geodetic inversion and coseismic slip distribution. Slip amplitude (in meters) is shown by gray shading and contour intervals. Direction of slip is shown by the arrows.

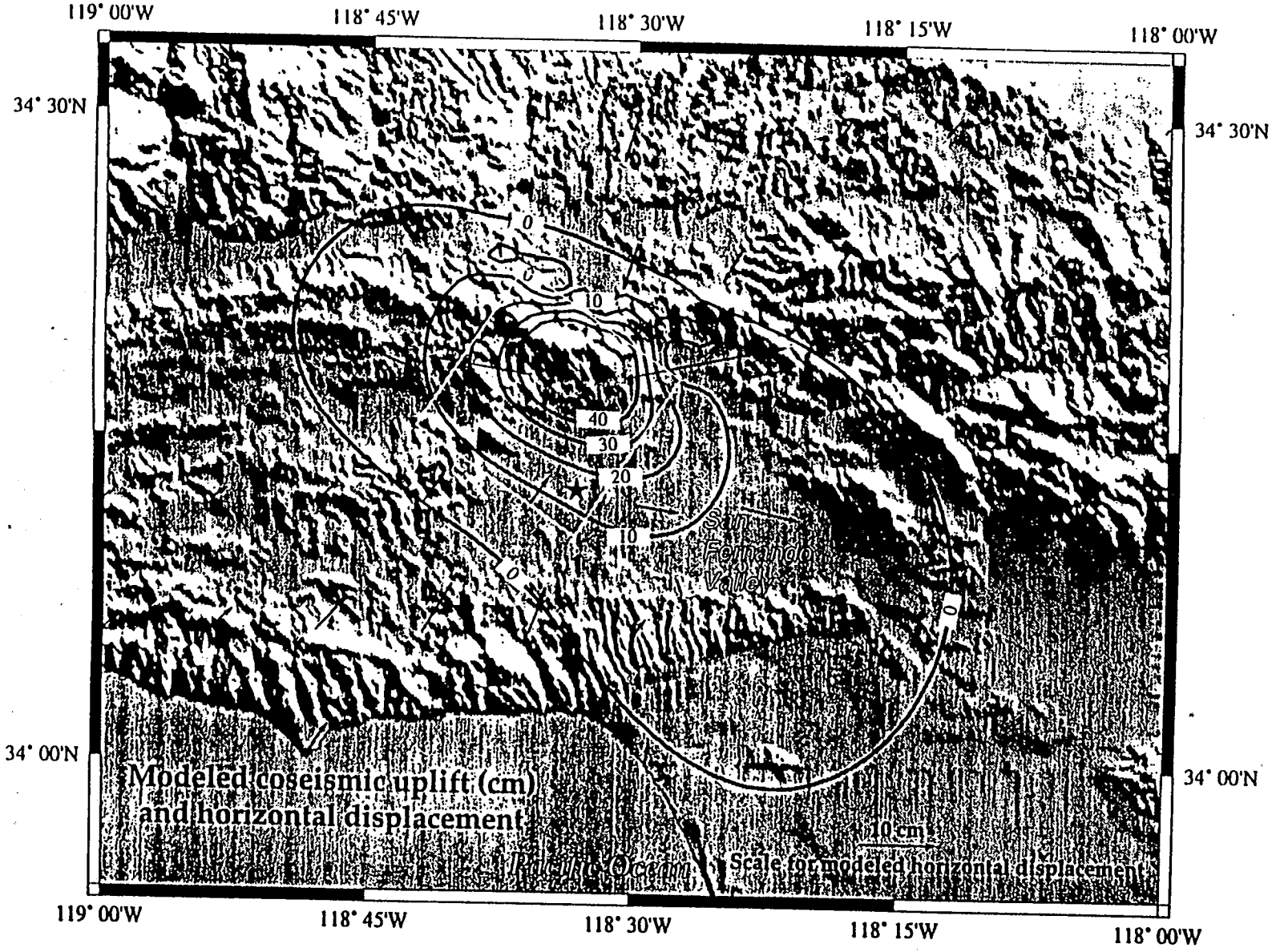


Figure 10. The predicted coseismic uplift (contours) and horizontal motion (vectors).

To isolate and remove leveling sections with large residuals, we first inverted all of the leveling and GPS data together, and then removed from the inversion leveling sections with residuals greater than 40 mm. The typical uncertainty of a section elevation observation (in other words, the uncertainty of the height change of one BM compared to an adjacent BM about 1 km away) was 10-15 mm, so 40 mm is about the 3σ or 95% confidence level of the section elevation change. We then re-ran the inversion. Any new 40 mm outliers were then removed from the revised model until the final model incorporated no residuals greater than 40 mm. Finally, this process was repeated with a 30 mm criteria, which represents the 90% confidence level.

2.2 Singular Value Decomposition Method

To estimate the slip distribution on an assumed fault plane, we applied Singular Value Decomposition or SVD. The displacement at a point on the Earth's surface caused by slip on a number of faults can be written as

$$\mathbf{u} = \mathbf{Gm} \qquad (5)$$

where G is a partial derivative matrix of functions that describes the fault geometry and elastic properties of the crust. The geodetic data, u, is a column vector that contains the measured coseismic displacements, and the matrix, m, is a column vector of slip values that must be estimated. To solve for m, both sides of equation (5) are multiplied by a matrix G^{-g} such that:

$$\hat{\mathbf{m}} = \mathbf{G}^{-g}\mathbf{u} = \mathbf{G}^{-g}\mathbf{Gm} \qquad (6)$$

where $\hat{\mathbf{m}}$ is the solution matrix, i.e., the coseismic slip. G^{-g} is the 'inverse' of G and SVD is used to estimate parameters in the G^{-g} matrix.

All geodetic inversions share the deficiency, that while displacement observations are made at the Earth's surface, we seek to resolve the fault geometry and slip at depth. The SVD matrix decomposition technique is used to estimate parameters when the data is insufficient to yield information and slip on certain parts of the fault . When the number of singular values in the matrix G^{-g} equals the number of unknown parameters (in this case, slip on the fault), then the technique is equivalent to least squares inversion of the data. Using a small number of singular values means that only those parts of the model that are well mapped by the data will be estimated.

We inverted the leveling section changes and their errors, along with the GPS estimates of displacement vector components and their associated errors (from Table 1 of [*Hudnut, et al.*, 1996]) to estimate the thrust and strike-slip components of slip on each subfault [*Larsen*, 1991]. The number of model parameters estimated was 260, and the number of data was 815 (617 section changes from leveling, plus 198 data from GPS, since each GPS displacement vector contains 3 components).

Rupture occurred on a plane 15 km long and 20 km down-dip. Slip was concentrated between 6 and 10 km depth where is was almost purely up-dip (Figure 9). The peak slip was about 3 m on the fault. We did not employ positivity or slip constraints in the inversions; in other words, slip was permitted to be positive or negative at all sites on the fault surface. In the SVD method, when the eigenvalue matrix is truncated, a form of smoothing is implemented; no other smoothing was implemented [*Larsen*, 1991]. We retained 29 singular values, fitting the geodetic data well and, producing a solution in accord with seismic evidence, and yielding a total seismic moment of 1.5×10^{19} N-m (equivalent to a moment-magnitude M=6.75). Other solutions yielded qualitatively similar slip distributions in the range $26 < k < 31$, where k is the number of retained singular values. Within this stable range, the seismic moment increased from 1.54 to 1.74×10^{19} N-m, and the normalized-root-mean-square (nrms) residuals decreased slightly. Although a more rigorous selection of the optimal result from this approach is possible using an F-test [*Parker*, 1977] we made our selection by inspection, in an attempt to fit the largest number of BMs as closely as possible while avoiding mapping errors or anomalous, BMs into the slip values. This minimized the number of BMs falsely identified as anomalous,.

3. FINDINGS

3.1 Surface deformation and slip distribution

The predicted permanent surface displacements calculated from the model are shown in Figure 10 and on the map. The model can be used to estimate the displacement, tilt, strain, or stress of any point in the greater Los Angeles region. The predicted surface deformation field is dominated by northeast-southwest contraction and east-west expansion (Figure 10). The Santa Susana Range and the San Fernando Valley were elevated by 10 to over 40 cm. The amount of uplift increased from south to north across the valley and was greatest in the Santa Susana Range where it was up to 50 cm. The vertical deformation decreases to zero within 15 to 20 km of the epicentral area and is almost absent in the Santa Monica Mountains.

3.2 Anomalous bench marks in the Los Angeles basin

Each bench mark in the coseismic data set was classified by the type of structure upon which it is located (Table 2). The five classifications are: bridges, bridge piers and abutments (class B), culverts and retaining walls (class S), electrical towers (class T), buiiding foundations (class F), catchment basins (class C), and all others, such as BMs set in roads, curbs, bedrock, sediment or engineered fill (class N), (see Tables 2 and 3).

The deformation observed at 997 of the coseismic leveling BMs could be explained exclusively by the permanent coseismic deformation of the Northridge earthquakes. Residuals in excess of 3 cm or more were observed at 40 BMs, and these BMs suggest that shaking effects contributed to their movement. The few GPS monuments showing residuals greater than 3 cm are discussed in detail by *Hudnut et al.*, (1996), few of the GPS stations are placed in engineered structures or fill. Possible causes of the disturbance to leveling BMs include ground shaking [*Wald & Heaton*, 1994], surface cracking and faulting [*Hecker, et al.*, 1995], landslides [*Harp & Jibson*, 1995], settlement and liquefaction [*Holzer, et al.*, 1996], or damage to structures where BMs are situated [*Buckle*, 1994; *Caltrans*, 1994]. Culverts and retaining walls displayed the largest percentage of damaged BMs (Table 3). Only one BM near an electricity tower had a residual of 3 cm or greater. Although not on the tower itself, the BM was within 30 m of the structure. Each of the BMs that had significant residuals is listed in Table 3 and driving directions and access instructions are given in Appendix I.

Table 2. Infrastructure on which the BMs where placed. 'Number Damaged' is the number of BMs with observed deformation that differs by 3 cm from the predicted deformation.

Infrastructure	Class	Total Number	Number Damaged
Bridges, piers and abutments	B	226	5
Culverts and retaining walls	S	144	9
Electricity towers	T	12	1
Catchment basins	C	113	6
Building foundations	F	27	1
Others	N	457	18

Table 3. Anomalous BMs. For these BMs, the difference between modeled and predicted elevation change between adjacent BMs exceeds 3 cm. Site classes: B, bridges, bridge piers and abutments; S, culverts and retaining walls; T, electrical towers; F, building foundations; C, catchment basins; N, all others.

Identifier on Map	PID	BM Site Class	Disturbance (cm)	Latitude and Longitude (°)
1	EW9445	F	-3.6	34.4181 -118.7942
2	EW4667	N	4.3	34.4061 -118.6917
3	EW6895	N	8.0	34.3989 -118.5369
4	EW2515	N	3.3	34.2869 -118.4450
5	EW2473	N	-4.3	34.2519 -118.4064
6	EW4850	N	4.3	34.2867 -118.5008
7	EW4854	N	4.1	34.2967 -118.5014
8	EW4792	B	-3.4	34.2569 -118.5961
9	EW4427	N	-3.9	34.2450 -118.6064
10	EW9478	N	4.0	34.2717 -118.7083
11	EW9475	N	-3.0	34.2714 -118.7317
12	EW4610	N	5.0	34.2856 -118.8803
13	EW4326	N	3.5	34.1681 -118.5989
14	EW4366	N	3.2	34.1472 -118.6044
15	EW2212	N	4.6	34.1489 -118.4383
16	EW2256	N	-9.1	34.1406 -118.3869
17	EW2201	C	-8.3	34.1458 -118.4203
18	DY2495	C	-4.8	33.9181 -118.4275
19	DY2535	C	-11.6	33.8192 -118.1669
20	DY2538	C	-4.6	33.8106 -118.1075
21	EW4960	T	-8.1	34.4225 -118.5711
22	EW4670	S	-9.6	34.4058 -118.6964
23	EW6986	S	3.1	34.4086 -118.7714
24	EW5003	S	6.2	34.4192 -118.5408
25	EW5006	S	6.2	34.4169 -118.5297
26	EW7051	S	7.5	34.4064 -118.5389
27	EW4865	B	-11.6	34.3236 -118.5014
28	EW6899	S	-11.6	34.3050 -118.4644
29	EW6942	B	5.8	34.2681 -118.6911
30	EW4568	S	3.1	34.2717 -118.7219
31	EW6937	S	5.0	34.2850 -118.8875
32	EW4321	S	-4.1	34.1669 -118.5917
33	EW5012	B	-4.4	34.4175 -118.5086
34	EW9501	B	-3.5	34.2739 -118.5708
35	AA3228	N	-9.2	34.2403 -118.4731
36	AA3231	C	-11.9	34.2961 -118.4731
37	AA3234	N	-11.9	34.2714 -118.4722
38	AA3236	N	-10.4	34.2553 -118.4725
39	EW4844	N	-13.9	34.2756 -118.5014
40	AA3256	C	4.1	34.1708 -118.4675

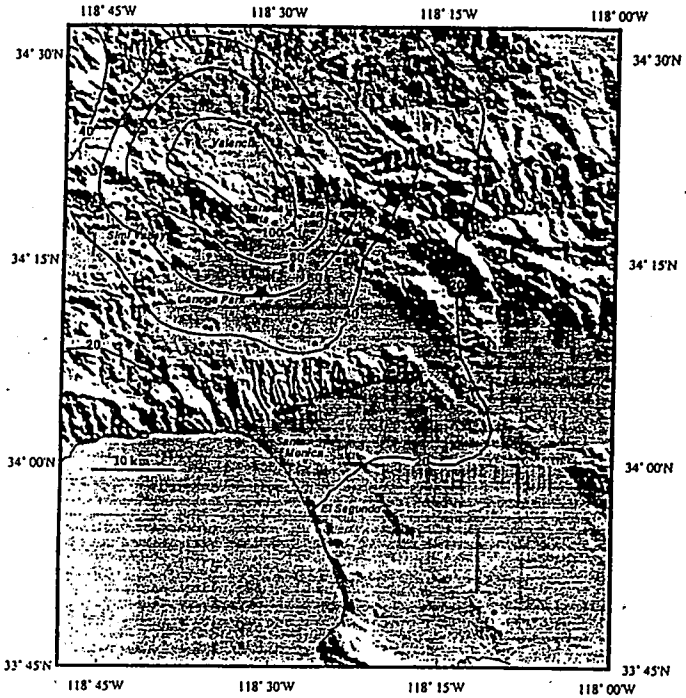


Figure 11. Contours of observed rotated peak ground velocity (cm/sec) *Wald et al.* [1996]. Black dots indicate damaged benchmarks and the star shows the location of the mainshock

The majority of the disturbed, or anomalously displaced, BMs are concentrated in the Granada Hills, Santa Clarita Valley and along Route 118 between Fillmore and the junction of Route 118 with Interstate 5 (Map 1). These are areas where the peak ground velocity was calculated to be greatest, between 80 to 100 cm/second [*Wald, et al.*, 1996] (Figure 11). The majority of landslides occurred in these foothill areas. In contrast, only three BMs south of downtown Los Angeles had large residuals. The coseismic displacements caused by the Northridge earthquake were quite small at these distances. One BM at El Segundo (No. 18, Map 1), where the peak ground velocity was about 20 cm/second, is located in sandy soil and may have shifted as a result of ground shaking and settlement. BMs 19 and 20 (DY2538 and DY2535, see map) are located in Long Beach; both are situated on or near concrete catchment basins which may have been damaged in the earthquake.

3.3 Disturbance related to landslides and liquefaction

Some 15,000 landslides were mapped following the Northridge earthquake [*Harp & Jibson*, 1995]. Five of the anomalous BMs are found on or within several hundred meters of the slides, suggesting that the BMs were moved downslope with the underlying material (BMs 1, 2 , 22, 23, and 27 on the map and in Table 3). BM 1 (EW9445) is in a building foundation that may have suffered from shaking or landslide effects. Roads, pipelines, and structures sited near the slides may also be affected by continuing downslope movement of the landslides, particularly during periods of heavy rainfall. BM 27 (EW4865) is in the headwall a concrete bridge, and might indicate incipient damage to the bridge.

Eighteen sites where near surface materials were subject to shaking-induced liquefaction were identified following the earthquake, as well as 4 additional sites of possible liquefaction [*Holzer et al., 1996; U.S. Geological Survey Staff*, 1996]. Two BMs are located close to the liquefaction regions (BMs 29 in Simi Valley, and BM 35 in the northern San Fernando Valley, Table 3 and map). BM 29 (EW6942) is located in railroad bridge 38.40, above a double flood-control culvert in Simi Valley. Thus the bridge and culvert may have settled or been damaged as a result of shaking-induced liquefaction. In contrast, some twelve BMs located within 300 m of the mapped liquefaction sites were undisturbed, demonstrating that liquefaction is generally a localized phenomenon.

3.4 Disturbance related to ground fractures

Of the three principal sites of surface faulting or cracking (Granada Hills, Northridge-Reseda, and Potrero Canyon), only the Granada Hills are crossed by the precision leveling lines used in this study (Figure 12). Three routes traverse the Granada Hills faulting zone; 8 BMs locating within 500 m of the mapped zone of faulting [*Hecker, et al.*, 1995]. None of the BMs located near the ground cracking are disturbed (Figure 13). BM 39 (EW4844), located in sediment 0.5 km north of the cracking, subsided by 13 cm, and BM 38 (AA3236), 2 km south of the cracking, is disturbed by 3 cm. The absence of any consistent offset of the elevation change profile across the Granada Hills faulting zone demonstrates that the faulting is superficial, a finding in accord with the conclusions of *Hecker et al* [1995]. If the fault slip extended to a depth of a few kilometers, most of these BMs would be displaced, and the elevation change would diminish with distance from the fault zone.

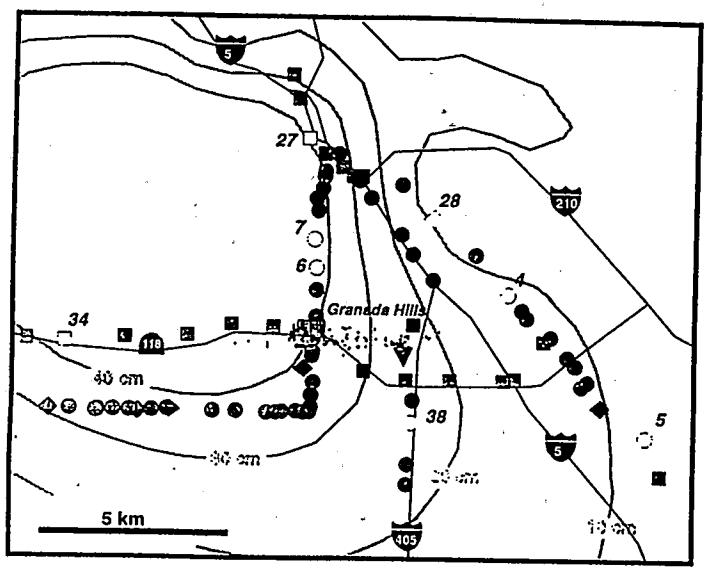


Figure 12. Granada Hills. Damaged bench marks are shown as white circles and numbered as shown in Map 1. Gray lines indicate the modeled uplift contours and small black dots indicate ground cracking (*Hecker et al.*, 1995).

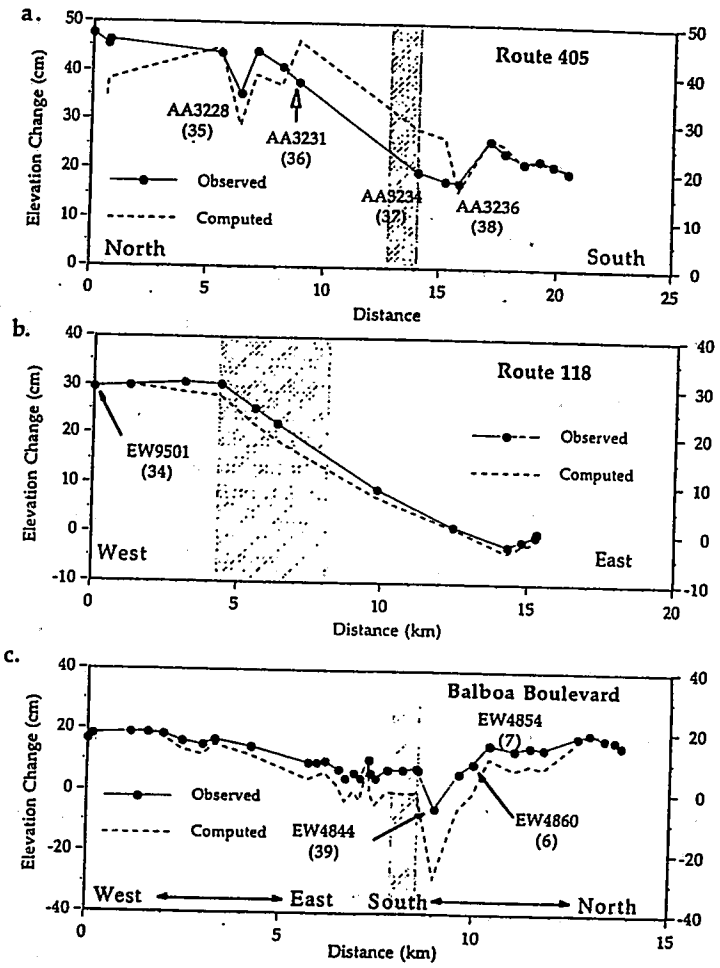


Figure 13. Computed and observed vertical deformation in Granada Hills. a) Route 405, b) Route 118 and c) along Balboa Boulevard. Damaged benchmarks are labeled as shown in Map 1 and gray shading represents areas where surface cracking was mapped.

3.5 Disturbance related to fault zone materials

Five anomalous BMs are located within or very near fault zones (BM 4, 5, 24, 25, and 34 in Table 3 and the map). Because the material in a fault zone is often quite weak, small amounts of "triggered" or "sympathetic" slip are often found to accompany large earthquakes. BM 4 (EW2515) lies in the Santa Susana fault zone that ruptured during the 1971 San Fernando earthquake. The 3.3-cm disturbance may indicate a small amount of near-surface slip on the Santa Susana fault triggered by the Northridge earthquake. Several studies have pointed out that the 1971 and 1994 earthquakes are in several respects closely related [*Mori et al.*, 1995; *Stein et al.*, 1994]. BM 24 and 25 lie in the San Gabriel fault zone; while the fault itself is believed to be inactive, pulverized rock or "gouge" in the fault zone may settle when shaken.

3.6 Change of flood plain boundaries

Vertical elevation changes associated with an earthquake cause the topographic slope to be altered and this in turn can result in shifts in flood plain boundaries. The elevation changes created by the Northridge earthquake caused minor changes in flood plain levels. The horizontal shift in flood plain boundaries, dx, is determined by subtracting the postseismic position of the flood plain boundary from its preseismic position. This is calculated using

$$dx = x - x' = y\left(\frac{1}{\tan\alpha} - \frac{1}{\tan(\alpha+\beta)}\right)$$

where x is the preseismic and x' the postseismic position of the flood boundary, α is the preseismic topographic slope, β is the change in slope caused by the Northridge earthquake and y is the original height of the flood surface above a certain point (Figure 14). In the Northridge area the topography generally became steeper as a result of the thrust earthquake. The horizontal shift in flood plain level is greatest where the topographic slope is most gentle and where the earthquake-associated ground tilt is largest.

In the Canoga Park, Reseda and Sepulveda Dam areas, where the topography is very gentle, flood plain changes were small since the elevation changes were less than 10 cm. Where elevation changes were large, the topography was steeper and the effect of the coseismic uplift on the topography was small. Elevation changes were greatest in the Granada Hills area and the Santa Susana Mountains. The 300 m topographic contour level, which runs through Chatsworth and Granada Hills and borders the Hansen Dam and Chatsworth Reservoir, received the largest shifts. The topographic

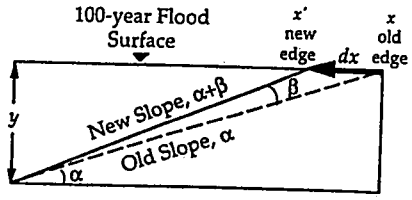


Figure 14. The tilt β of the basin, associated with the permanent earthquake deformation, causes the border of the 100-year flood plane to shift by distance dx.

gradient ranged from 1/41 (1.4°) to 1/115 (0.5°) and the corresponding northward shift in the 300 m contour level ranged from one meter to 28 meters. The change in the flood plain boundary around the Chatsworth Reservoir was at most 12 meters while at the Hansen Dam the shift in contour level was less than one meter and insignificant. The change in tilt (metres per kilometer) across the San Fernando Valley and the Santa Susana Mountain Range are contoured in Figure 15. The tilt is positive towards the north, i.e., uplifted towards the north in the valley, and negative on the north side of the Santa Susana Mountain range.

Flood plain areas are affected by the rate of delivery of floodwater to the plain. Since the Northridge earthquake altered the gradient of stream channels the change in gradients for streams flowing into the San Fernando Valley were also calculated. The Browns Canyon, Limekiln and Aliso Canyon are three main stream channels which drain into the San Fernando Valley from the Santa Susana Mountain Range. The change in gradient for the Brown Canyon is about 4.2 to 5 cm/km (0.0025°) in the foothills and as far as Chatsworth. Gradient changes along the Limekiln Canyon were slightly larger at ~6.5 cm/km (0.0037°). Between the 500 m and 300 m contour intervals, the change in gradient along the Aliso Canyon and Aliso Canyon Wash was 5 to 7 cm/km (0.0028° to 0.004°). The gradient change in stream channels in the Santa Susana Mountains was therefore very small.

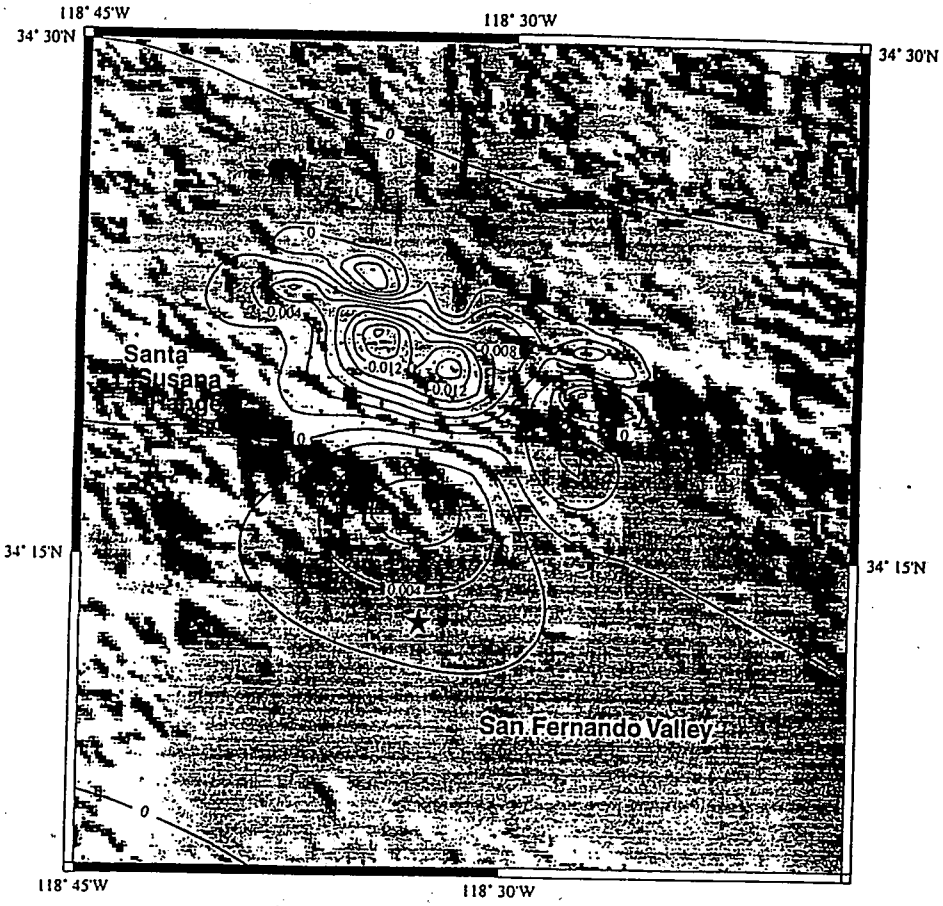


Figure 15. The change in gradient caused by the Northridge earthquake. Positive tilt implies the ground was uplifted towards the north. Units are meters pre kilometer.

4. VALUE OF THE REPORT

Prior to publication of this report, several agencies have requested data from us or asked for assistance in interpreting our findings for engineering or surveying purposes. Briefly, these include the following:

- The National Geodetic Survey has so far received and filled about 100 requests for new heights and coordinates in southern California from the restored network.
- Caltrans used the pre- and post-earthquake elevation changes to assess subsidence and deformation associated with tunneling for the Metropolitan Transit Authority's subway extension [*Satalich*, 1996]. Such use of the restored network will continue as the MTA expands, and thus the restored leveling network promises to improve the safety of the drilling operations.
- NASA's Jet Propulsion Laboratory has requested and received our map of long-term subsidence in metropolitan Los Angeles to evaluate and interpret deformation inferred from a new generation of radar satellites, which measure height change by forming an interferogram with three successive radar images of the topography [e.g., *Massonnet, et al.*, 1993].
- The City of Simi Valley has used the anomalous BM listing and the sites of liquefaction and landslides to assess damage and urban reconstruction issues. The U.S. Geological Survey prepared a set of deformation profiles and maps with the surface street grid included at their request, which aided the Simi Valley deliberations.
- The California Seismic Safety Commission requested and received a preliminary version of the map to compare elevation change measured by surveying with the distribution of ground cracking mapped by its members and independent geologists. The Commission seeks to evaluate the extent and cost of damage to the built environment directly attributable to surface faulting in a blind earthquake.
- Scientists at the U.S. Geological Survey and the California Institute of Technology used the coseismic elevation changes developed in this report to study the earthquake source and rupture propagation. This effort has lead to improved models of earthquake hazards, and a better understanding of the causes of earthquake shaking [*Wald, Heaton, & Hudnut*, 1996].
- Geologists at the U.S. Geological Survey are using the coseismic elevation changes along with detailed surface mapping to determine if ground cracks in the Granada Hills were caused by slip on a fault or by shaking and liquefaction.

5. RECOMMENDATIONS

Immediately after the Northridge earthquake, the vast majority of structures were assessed for earthquake effects solely by visual inspection. Thus subtle or hidden damage may have escaped detection. The settlement or uplift of the structures deduced from the movement of bench marks (BMs) offers a new tool to identify potentially weakened structures. A similar approach was followed after the M=7 Cape Mendocino earthquake in northernmost California [*Stein, et al.*, 1996]. BM disturbance revealed damage to a major bridge crossing the Eel River, as well as road and rail embankment failures caused by landslides and liquefaction. The structures identified by anomalous BMs in the Los Angeles area may thus be in a weakened state, making them vulnerable to shaking during future earthquakes. Thus we strongly recommend that all 40 sites of anomalous BMs be examined by structural engineers for follow-up evaluation. Driving directions and a preliminary inspection of each BM is included in Appendix I.

In addition, we suggest that a higher percentage of geodetic monuments be emplaced and measured precisely on critical transportation arteries, structures, and lifelines. This will ensure faster and more accurate post-earthquake damage assessments in the future. Traditionally, BMs are placed on frontage roads and less traveled road and rail routes to ensure the ease of access by surveyors and engineers. BMs have been located in bridge abutments and approaches when convenient for surveyors. Instead we argue that the need to identify a weakened structure supersedes the ease of access, and thus freeways and overpasses should be monumented so that rapid post-earthquake evaluation is possible. To be most effective, BMs should be placed on both sides of each bridge or overpass, and also within 500 m of the ends of the bridge to provide a stable reference site for comparison to the bridge.

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APPENDIX I

NGS Descriptions of damaged BMs listed in Table 3

PID: EW4366 Residual = 3.2 cm
NAME: 56 19 B Type N
1.6 MI S FROM WOODLAND HILLS.
WOODLAND HILLS, 1.6 MI S OF THE VENTURA FREEWAY, TOPANGA CANYON BLVD. AND CEZANNE AVE, 303 FT N OF THE CENTER LINE OF CEZANNE AVE AND 43 FEET E OF THE CENTER LINE OF TOPANGA CANYON BLVD, AT THE S END OF THE BLVD AND SERVICE RD DIVIDER STRIP. SET IN THE CONCRETE BASE FOR A STREET LIGHT 1 FT W OF THE STREET LIGHT POST. RECOVERED IN GOOD CONDITION WITH THE FOLLOWING EXCEPTION. ADD–0.2 M (0.7 FT) ABOVE THE LEVEL OF THE HIGHWAY. 0.3 KM (0.20 MI) WESTERLY ALONG SHERMAN WAY FROM THE POST OFFICE IN CANOGA PARK, THENCE 6.0 KM (3.70 MI) SOUTHERLY ALONG STATE HIGHWAY 27 (TOPANGA CANYON BOULEVARD), NEAR THE WEST EDGE OF THE CONCRETE FOOTING FOR A STREET LIGHT POLE IN A MEDIAN, 94.3 M (309.4 FT) NORTH OF THE CENTER OF CEZANNE AVENUE, 5.7 M (18.7 FT) WEST OF THE CENTER OF A SERVICE ROAD, 5.0 M (16.4 FT) EAST OF THE CENTERLINE OF THE NORTHBOUND LANES OF THE HIGHWAY, 1.0 M (3.3 FT) NORTH OF THE SOUTH END OF THE MEDIAN, 0.3 M (1.0 FT) ABOVE THE LEVEL OF THE HIGHWAY, 0.2 M (0.7 FT) EAST OF THE WEST EDGE OF THE FOOTING, AND 0.1 M (0.3 FT) WEST OF THE POLE.
March 1996 Caltrans Inspection: Mark disturbed, apparently hit by a car.

PID: EW2515 Residual = 3.3 cm
NAME: D 1142 Type N
AT SAN FERNANDO, ALONG SAN FERNANDO ROAD MIDWAY BETWEEN HUNTINGTON AND WORKMAN STREETS, SET VERTICALLY IN THE SOUTHWEST FACE OF THE GOODYEAR SERVICE BUILDING, 41 FEET NORTHEAST OF THE CENTER LINE OF THE ROAD, 38 FEET SOUTHEAST OF THE EXTENDED CENTER LINE OF THE DOORWAY INTO BUILDING, 0.9 FOOT NORTHWEST OF THE SOUTHEAST CORNER OF THE BUILDING, 9 1/2 FEET NORTH OF A FIRE HYDRANT, AND 0.9 FOOT ABOVE THE SIDEWALK.
IN SAN FERNANDO, SET VERTICALLY IN THE SOUTHWEST FACE OF THE SOUTHEAST CORNER COLUMN OF THE GOODYEAR TIRE STORE AT 1431 SAN FERNANDO ROAD, 12.5 M (41.0 FT) NORTHEAST OF THE CENTER OF THE ROAD, 0.3 M (1.0 FT) NORTHWEST OF THE SOUTHEAST CORNER OF THE STORE, AND 0.3 M (1.0 FT) ABOVE THE LEVEL OF THE SIDEWALK. COLUMN SHOWS SIGNS OF EARTHQUAKE DAMAGE.
March 1996 Caltrans Inspection: Substantial damage to building.

PID: EW9445 Residual = 3.6 cm
NAME: P 1451 Type F
IN PIRU, AT 829 PARK STREET, IN TOP OF A PATIO OVER A CONCRETE FOUNDATION INTO A BASEMENT OF A VICTORIAN MANSION, RESIDENCE OF MR. SCOTT NEWHALL, AT THE NORTHWEST CORNER OF THE MANSION. 12.2 M (40.0 FT) NORTH OF THE NORTH END OF A CONCRETE AND STONE COLUMN, 5.8 M (19.0 FT) SOUTHEAST OF THE CENTER OF A STAIRWAY LEADING UP A GENTLE SLOPE, 1.3 M (4.3 FT) SOUTH OF THE CENTER OF A STAIRWAY LEADING EAST DOWN TO A BASEMENT, 0.4 M (1.3 FT) WEST OF THE WEST FACE OF A WALL OF THE MANSION, 0.4 M (1.3 FT) SOUTH OF THE SOUTH FACE OF A WALL OF THE MANSION AND LEVEL WITH THE PATIO SURFACE.

IN PIRU. IN THE TILE PATIO DECK NEAR THE NORTHWEST CORNER OF THE MANSION AT 829 PARK STREET, 1.3 M (4.3 FT) SOUTH OF THE CENTER OF A STAIRWAY LEADING TO THE BASEMENT, 0.4 M (1.3 FT) WEST OF THE WEST WALL OF THE BUILDING, AND 0.3 M (1.0 FT) SOUTH OF THE NORTH WALL OF THE BUILDING. NOTE--THE MARK IS ON PROPERTY OWNED BY RUTH NEWHALL, POST OFFICE BOX 409, PIRU, CA 93040, TELEPHONE NUMBER (805) 521-1441.
March 1996 Caltrans Inspection: Substantial damage to building

PID: EW6986 **Residual = 3.1 cm** **Type S**
NAME: Z 1293
RECOVERED IN GOOD CONDITION. NEW DESCRIPTION FOLLOWS. 1.4 KM (0.85 MI) SOUTHEASTERLY ALONG CENTER STREET FROM ITS JUNCTION WITH VIA FUSTERO IN PIRU, THENCE 0.9 KM (0.55 MI) EASTERLY ALONG STATE HIGHWAY 126, THENCE 0.1 KM (0.05 MI) NORTHWEST ALONG A DIRT DRIVEWAY TO A HOUSE. 57.0 M (187.0 FT) EAST OF THE NORTHEAST CORNER OF A GARAGE, 52.1 M (170.9 FT) EAST OF THE CENTER OF THE DRIVEWAY, 39.3 M (128.9 FT) EAST OF THE EAST END OF THE NORTH CONCRETE HEADWALL OF A PIPE CULVERT, 14.0 M (45.9 FT) NORTH OF THE CENTER OF THE OLD ABANDONED HIGHWAY, 10.5 M (34.4 FT) NORTHWEST OF THE NORTHWEST FENCE CORNER OF A CHAIN LINK FENCE AROUND THE TEXACO CAMULOS PUMPING STATION, 0.35 M (1.1 FT) WEST OF A WITNESS POST AND 0.15 M (0.5 FT) BELOW THE GROUND SURFACE. 1.1 KM (0.70 MI) SOUTHERLY ALONG MAIN STREET FROM THE POST OFFICE IN PIRU, THENCE 2.5 KM (1.55 MI) EASTERLY ALONG STATE HIGHWAY 126, THENCE 0.1 KM (0.05 MI) NORTHWESTERLY ALONG A DRIVEWAY, THENCE 0.05 KM (0.05 MI) EASTERLY ALONG A RAILROAD GRADE (TRACK REMOVED), 57.4 M (188.3 FT) NORTHEAST OF THE NORTHEAST CORNER OF A GARAGE, 39.2 M (128.6 FT) EAST OF THE EAST END OF THE NORTH HEADWALL OF A CULVERT UNDER A DIRT ROAD, 10.6 M (34.8 FT) NORTHWEST OF THE NORTHWEST CORNER OF A CHAIN-LINK FENCE ENCLOSING A TEXACO PUMPING STATION, 9.8 M (32.2 FT) NORTH OF THE CENTER OF THE GRADE, 4.3 M (14.1 FT) NORTH OF AND LEVEL WITH THE CENTER OF THE ROAD, AND 0.3 M (1.0 FT) WEST OF A WITNESS POST. NOTE--THE DISK IS ENCASED IN A 4-INCH PVC PIPE WITH A SCREW CAP AND IS RECESSED 0.1 M (0.3 FT) BELOW THE GROUND SURFACE.
March 1996 Caltrans Inspection: No visible damage

PID: EW9475 **Residual = -3.0 cm** **Type N**
NAME: 54 6
IN SIMI, AT THE INTERSECTION OF LOS ANGELES AVENUE AND CRATER STREET, IN TOP OF A CONCRETE CURB. 32.2 M (105.6 FT) SOUTH OF THE CENTERLINE OF THE EAST BOUND LANES OF THE AVENUE, 21.1 M (69.2 FT) NORTH-NORTHWEST OF THE SOUTHWEST CORNER OF REEDS FURNITURE STORE BUILDING, 9.2 M (30.2 FT) WEST OF THE WEST FACE OF THE BUILDING, 6.1 M (20.0 FT) EAST OF THE CENTER OF THE STREET, 0.2 M (0.7 FT) ABOVE THE STREET SURFACE AND ABOUT LEVEL WITH A SIDEWALK.
IN SANTA SUSANA, AT THE INTERSECTION OF LOS ANGELES AVENUE AND CRATER STREET, IN THE EAST CONCRETE CURB OF THE STREET, 32.2 M (105.6 FT) SOUTH OF THE CENTERLINE OF THE EASTBOUND LANES OF THE AVENUE, 21.1 M (69.2 FT) NORTH-NORTHWEST OF THE SOUTHWEST CORNER OF A BUILDING, 15.3 M (50.2 FT) NORTH OF A UTILITY LIGHT POLE, AND 6.1 M (20.0 FT) EAST OF AND LEVEL WITH THE STREET CENTER.
March 1996 Caltrans Inspection: No visible damage

PID: EW4568 **Residual = 3.1 cm** **Type S**
NAME: Z 609
1 MI W FROM SANTA SUSANA.
0.95 MILES WEST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD FROM THE STATION AT SANTA SUSANA, IN THE TOP OF THE WEST END OF THE SOUTH CONCRETE HEAD WALL OF CULVERT 436.56, 7.0 FEET SOUTH OF THE SOUTH RAIL, AND LEVEL WITH THE TRACK. RECOVERED IN GOOD CONDITION, A NEW TO REACH FOLLOWS. 1.1 KM (0.70 MI) WESTERLY ALONG THE SOUTHERN PACIFIC RAILROAD FROM THE POST OFFICE IN SANTA SUSANA. CHANGE AND LEVEL WITH THE TRACK TO 0.9 M (3.0 FT) BELOW THE RAILROAD TRACKS.
IN SANTA SUSANA, AT THE INTERSECTION OF LOS ANGELES AND DARRAH AVENUES, IN TOP OF AND 0.3 M (1.0 FT) NORTH OF THE SOUTH END OF THE WEST CONCRETE HEADWALL OF A BOX CULVERT UNDER THE SOUTHERN PACIFIC RAILROAD, 20.8 M (68.2 FT) NORTH OF THE CENTERLINE OF THE WESTBOUND LANES OF LOS ANGELES AVENUE, 4.8 M (15.7 FT) EAST OF THE EXTENDED CENTERLINE OF DARRAH AVENUE, 1.5 M (4.9 FT) SOUTH OF THE NEAR RAIL, 0.4 M (1.3 FT) BELOW THE LEVEL OF THE TRACK, AND 0.1 M (0.3 FT) NORTH OF A WALL.
March 1996 Caltrans Inspection: Structure shows cracking of unknown vintage

PID: EW9501 **Residual = -3.5 cm** **Type B**
NAME: T 1452
3.4 KM (2.10 MI) EASTERLY ALONG STATE HIGHWAY 118 FROM ITS JUNCTION WITH STATE HIGHWAY 27 IN CHATSWORTH, SET VERTICALLY IN THE WEST FACE OF THE MOST EASTERLY 1 OF 2 COLUMNS OF THE CENTER PIER OF THE AVENUE OVERPASS OF THE HIGHWAY, 8.3 M (27.2 FT) SOUTH OF THE SOUTH CONCRETE EDGE OF THE HIGHWAY, AND 1.0 M (3.3 FT) ABOVE THE LEVEL OF THE HIGHWAY.
12.1 KM (7.50 MI) WESTERLY ALONG FREEWAY 118 FROM THE JUNCTION OF INTERSTATE HIGHWAY 5 IN LOS ANGELES, SET VERTICALLY IN THE WEST FACE OF THE MOST EASTERLY OF 2 CONCRETE COLUMNS OF THE CENTER PIER OF THE WINETKA AVENUE OVERPASS OF THE FREEWAY, 14.3 M (46.9 FT) NORTH OF THE CENTER OF THE EASTBOUND LANES OF THE FREEWAY, AND 1.4 M (4.6 FT) ABOVE THE GROUND SURFACE.
March 1996 Caltrans Inspection: No visible damage

PID: EW4792 **Residual = -3.4 cm** **Type N**
NAME: 05 00362
AT LOS ANGELES.
IN WEST CURB OF CANOGA AVENUE, 2 FT. SOUTH OF BC CURB. SOUTH OF DEVONSHIRE ST. IN CHATSWORTH, AT THE INTERSECTION OF DEVONSHIRE STREET AND CANOGA AVENUE, A SPIKE IN THE WEST CONCRETE CURB OF THE AVENUE, 15.7 M (51.5 FT) SOUTH OF THE CENTERLINE OF THE EASTBOUND LANES OF THE STREET, 8.5 M (27.9 FT) WEST OF AND LEVEL WITH THE CENTERLINE OF THE AVENUE, 1.5 M (4.9 FT) SOUTH-SOUTHEAST OF A TRAFFIC SIGNAL POLE, 0.7 M (2.3 FT) EAST OF THE SIGNAL CONTROL BOX, AND 0.6 M (2.0 FT) SOUTH OF THE NORTH END OF THE OF THE CURB.
March 1996 Caltrans Inspection: No visible damage, however, this mark lies approximately at the middle bridge spanning a flood control channel.

PID: EW4321 Residual = -4.1 Type S
NAME: 06 05942
IN LOS ANGELES.
CITY OF L.A. BOLT IN EAST CURB OF ALHAMA DRIVE, 4 FEET NORTH OF BOX CULVERT CURB RETURN NORTH OF VENTURA BLVD. IN WOODLAND HILLS, AT THE INTERSECTION OF VENTURA BOULEVARD AND ALHAMA DRIVE, A BOLT IN THE EAST CONCRETE CURB OF THE DRIVE, 17.6 M (57.7 FT) NORTH OF THE CENTER OF THE WESTBOUND LANES OF THE BOULEVARD, 6.0 M (19.7 FT) EAST OF THE CENTERLINE OF THE DRIVE, 2.9 M (9.5 FT) NORTH OF A SIGNAL LIGHT POLE, AND 0.2 M (0.7 FT) ABOVE THE LEVEL OF THE DRIVE.
March 1996 Caltrans Inspection: No visible damage

PID: EW2212 Residual = 4.6 cm Type N
NAME: 08 15840
AT LOS ANGELES.
WIRE SPIKE IN THE SOUTH CURB OF VENTURA BOULEVARD, 4 FEET EAST OF THE BEGINNING OF CURB RETURN EAST OF HAZELTINE AVENUE TO THE SOUTH. IN SHERMAN OAKS, AT THE INTERSECTION OF VENTURA BOULEVARD AND HAZELTINE AVENUE, A SPIKE IN THE SOUTH CONCRETE CURB OF THE BOULEVARD, 11.9 M (39.0 FT) EAST OF THE CENTER OF THE AVENUE, 6.2 M (20.3 FT) SOUTH OF THE CENTERLINE OF THE EASTBOUND LANES OF THE BOULEVARD, 1.8 M (5.9 FT) EAST OF A SIGNAL LIGHT POLE, AND 0.2 M (0.7 FT) ABOVE THE LEVEL OF THE AVENUE.
March 1996 Caltrans Inspection: Marked disturbed. Curb has been run over repeatedly by buses.

PID: EW2201 Residual = -8.3 Type N
NAME: 08 15582
AT LOS ANGELES.WIRE SPIKE IN THE EAST CURB OF LONGRIDGE AVENUE AT THE BEGINNING OF CURB RETURN SOUTH OF VENTURA BOULEVARD SOUTH ROADWAY, NORTH END OF CATCH BASIN. IN SHERMAN OAKS, AT THE INTERSECTION OF VENTURA BOULEVARD AND LONG RIDGE AVENUE, A SPIKE IN THE EAST CONCRETE CURB OF THE AVENUE, 34.4 M (112.9 FT) SOUTH OF THE CENTERLINE OF THE EASTBOUND LANES OF THE BOULEVARD, 6.0 M (19.7 FT) EAST OF THE CENTERLINE OF THE AVENUE, 3.6 M (11.8 FT) NORTH OF THE NORTHWEST CORNER OF A CATCH BASIN, AND 0.2 M (0.7 FT) ABOVE THE LEVEL OF THE BOULEVARD.
March 1996 Caltrans Inspection: Monument destroyed. New catch basin at this location.

PID: EW2256 Residual = -9.1 cm Type N
NAME: 08 15240
AT LOS ANGELES.
STANDARD SURVEY MONUMENT ON THE CENTER LINE INTERSECTION OF VENTURA BOULEVARD AND COLFAX AVENUE. IN LOS ANGELES, AT THE INTERSECTION OF VENTURA BOULEVARD AND COLFAX AVENUE, IN THE CENTER OF THE BOULEVARD, 12.9 M (42.3 FT) WEST OF THE CENTERLINE OF THE AVENUE, AND 0.7 M (2.3 FT) BELOW THE LEVEL OF THE BOULEVARD. NOTE--ACCESS TO THE DATUM POINT IS THROUGH AN 8-INCH METAL COVER CAST CITY OF LA ENGINEERING MONUMENT.
March 1996 Caltrans Inspection: Well monument, possible water saturation.

PID: EW4427 Residual = -3.9 Type N
NAME: 06 03760
CALIFORNIA DIVISION OF HIGHWAYS MONUMENT AT THE SURFACE IN MEDIAN ISLAND, ON THE CENTER LINE BEGINNING OF CURVE IN TOPANGA CANYON BOULEVARD, 960 FEET NORTH OF PLUMMER STREET. 0.8 MILE SOUTH ALONG TOPANGA CANYON BOULEVARD FROM THE JUNCTION OF DEVONSHIRE STREET AT CHATSWORTH, 960 FEET NORTH OF THE JUNCTION OF PLUMMER STREET, IN THE MEDIAN ISLAND OF THE BOULEVARD, 24 FEET SOUTH OF THE SOUTHEAST CORNER OF A STORM DRAIN. 0.3 KM (0.20 MI) WESTERLY ALONG SHERMAN WAY FROM THE POST OFFICE IN CANOGA PARK, THENCE 5.1 KM (3.15 MI) NORTHERLY ALONG STATE HIGHWAY 27 (TOPANGA CANYON BOULEVARD) , NEAR THE CENTER OF THE MEDIAN OF THE HIGHWAY, 299.0 M (981.0 FT) NORTH OF THE CENTERLINE OF PLUMMER STREET, 15.5 M (50.9 FT) SOUTHWEST OF UTILITY POLE NUMBER 353757M 88-12-5.13, 7.6 M (24.9 FT) WEST OF THE CENTER OF THE NORTHBOUND LANES OF THE HIGHWAY, 7.4 M (24.3 FT) EAST OF THE CENTER OF THE SOUTHBOUND LANES OF THE HIGHWAY, 6.9 M (22.6 FT) SOUTHEAST OF THE SOUTHEAST CORNER OF A STORM DRAIN, 0.3 M (1.0 FT) ABOVE THE LEVEL OF THE HIGHWAY, AND THE MONUMENT IS FLUSH WITH THE LEVEL OF THE MEDIAN. NOTE--THE DISK IS NOT STAMPED.
March 1996 Caltrans Inspection: No visible damage

PID: DY2495 Residual = -4.8 cm Type N
NAME: W 1313
EL SEGUNDO.
AT EL SEGUNDO, 0.1 MILES NORTHWEST OF THE INTERSECTION VISTA DEL MAR AND GRAND AVENUE, IN FRONT OF A LARGE WATER AND POWER BUILDING, IN TOP THE SOUTH CORNER OF A 4 BY 15-FT. CATCH BASIN, 21 FT. NORTHEAST THE CENTER LINE VISTA DEL MAR, 1 FT. NORTHEAST THE NORTHEAST CURB. RECOVERED IN GOOD CONDITION WITH THE FOLLOWING EXCEPTION. CHANGE--IN TOP OF THE SOUTH CORNER, TO IN TOP OF THE WEST CORNER.
IN EL SEGUNDO, AT THE INTERSECTION OF VISTA DEL MAR AND GRAND AVENUE, NEAR THE WEST CORNER OF A CONCRETE CATCH BASIN, 198.0 M (649.6 FT) NORTHWEST OF THE CENTER OF GRAND AVENUE, 11.6 M (38.1 FT) NORTHWEST OF THE WEST CORNER OF A WATER DEPARTMENT ACCESS BOX IN FRONT OF THE DEPARTMENT OF WATER AND POWER PLANT, 7.4 M (24.3 FT) SOUTHWEST OF A CHAIN-LINK FENCE, 7.2 M (23.6 FT) NORTHEAST OF THE CENTERLINE OF VISTA DEL MAR, AND 0.2 M (0.7 FT) ABOVE THE LEVEL OF VISTA DEL MAR.
March 1996 Caltrans Inspection: No visible damage. Mark is set in sandy soil near the ocean. Small cracks in the curb.

PID: DY2538 Residual = -4.6 cm Type N
NAME: U 1329
IN LONG BEACH, AT THE INTERSECTION OF SPRING STREET AND PALO VERDE AVENUE, IN THE SOUTHEAST CORNER OF A CONCRETE CATCH BASIN, 23.3 M (76.4 FT) WEST OF THE CENTERLINE OF THE SOUTHBOUND LANES OF THE AVENUE, 7.0 M (23.0 FT) NORTH OF THE CENTERLINE OF THE WESTBOUND LANES OF THE STREET, AND 0.7 M (2.3 FT) SOUTHEAST OF THE CENTER OF A MANHOLE COVER PRECAST LACFCD.
IN LONG BEACH, AT THE INTERSECTION OF SPRING STREET AND PALO VERDE AVENUE, NEAR THE SOUTHEAST CORNER OF A CONCRETE CATCH BASIN, 23.3 M (76.4 FT) WEST OF THE CENTER OF THE SOUTHBOUND LANES OF THE AVENUE, 6.0 M (19.7 FT) NORTH OF THE CENTER OF THE WESTBOUND LANES OF THE STREET, AND 0.2 M (0.7 FT) ABOVE THE LEVEL OF THE STREET.
March 1996 Caltrans Inspection: No visible damage. Small cracks in curb.

PID: EW4960 Residual = -8.1 cm Type T
NAME: NL+F
1.5 MI NW SAGUS (LOS ANGELES SHERIFF STATION), ALONG HENRY MAYO DRIVE TO SCE POWER LINE CROSSING. 55 FT E OF EASTERLY POWERLINE CROSSING, 112 FT N OF CORNER OF CHAIN LINK FENCE ABOUT SCE SUBSTA., 173 FT W OF POWER POLE 2124160E, 205 FT W OF FENCE AROUND GAS METERING STATION.
0.2 KM (0.10 MI) SOUTHWESTERLY ALONG PARKER ROAD FROM THE JUNCTION OF INTERSTATE HIGHWAY 5 IN CASTAIC, THENCE 9.1 KM (5.65 MI) SOUTHERLY ALONG THE OLD ROAD, THENCE 1.2 KM (0.75 MI) EASTERLY ALONG MAGIC MOUNTAIN PARKWAY, 62.6 M (205.4 FT) WEST OF THE NORTHWEST CORNER OF A CHAIN-LINK FENCE ENCLOSING A GAS PIPELINE METERING STATION, 28.5 M (93.5 FT) NORTHEAST OF THE NORTHEAST LEG OF A HIGH LINE TOWER, 8.8 M (28.9 FT) SOUTH OF AND LEVEL WITH THE CENTERLINE OF THE ROAD, 0.3 M (1.0 FT) NORTHWEST OF A WITNESS POST, AND THE MONUMENT PROJECTS 0.1 M (0.3 FT) ABOVE THE LEVEL OF THE ROAD. NOTE--THE BOLT IS ENCASED IN A 3 1/2-INCH PIPE FILLED AND SURROUNDED BY CONCRETE.
March 1996 Caltrans Inspection: Mark disturbed, appears to have been hit.

PID: EW6895 Residual = 3.0 cm Type N
NAME: L 1296
0.9 MI SOUTH FROM NEWHALL.
0.9 MI SOUTH ALONG SOUTHERN PACIFIC RAILROAD FROM THE STATION AT SAUGUS, 0.1 MILE EAST OF AND ACROSS ROAD AND TRACKS FROM THE NEWHALL COUNTY WATER DISTRICT PUMPING STATION NUMBER 11, 38.7 FT. EAST OF THE EAST RAIL OF THE MAIN TRACK, 2.4 FT. EAST OF THE CENTER OF A TELEPHONE POLE WITH A GUY WIRE, ACCESS HAD THROUGH A PLASTIC FLUSH WITH THE GROUND RECOVERED IN GOOD CONDITION. NOTE--THE DISK IS STAMPED L 1296 1977.
1.9 KM (1.20 MI) NORTHWESTERLY ALONG SAN FERNANDO ROAD FROM THE JUNCTION OF SIERRA HIGHWAY IN NEWHALL, THENCE 3.0 KM (1.85 MI) NORTHWESTERLY ALONG THE SOUTHERN PACIFIC RAILROAD, 200.0 M (656.2 FT) NORTHEAST OF THE NEWHALL WATER DISTRICT PUMPING STATION NUMBER 11, 14.9 M (48.9 FT) SOUTHWEST OF THE CENTER OF A MANHOLE, 11.7 M (38.4 FT) EAST OF THE NEAR RAIL, 1.0 M (3.3 FT) BELOW THE LEVEL OF THE TRACK, AND ACROSS THE TRACK FROM THE MOST SOUTHERLY OF 3 SELF STORAGE BUILDINGS. THE DISK IS ENCASED IN A 4-INCH PVC PIPE AND IS FLUSH WITH THE GROUND SURFACE.
March 1996 Caltrans Inspection: No visible damage

PID: EW4865 Residual = -11.6 cm Type S
NAME: C 1142
IN LOS ANGELES, 4.4 MILES SOUTHEAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD FROM THE CROSSING OF MARKET STREET AT NEWHALL, 4.7 MILES NORTHWEST OF THE STATION AT SAN FERNANDO, 6 1/4 POLES SOUTHEAST OF MILEPOST 457, IN THE TOP OF THE SOUTHEAST END OF CONCRETE BRIDGE 457.18, 7 1/2 FEET SOUTHWEST OF THE SOUTHWEST RAIL, 1.3 FEET NORTHEAST OF A GUARDRAIL, 1.1 FEET NORTHWEST OF THE SOUTHEAST END OF BRIDGE, AND ABOUT 3 FEET LOWER THAN THE TRACK.
LOS ANGELES, SYLMAR AREA, SAN FERNANDO ROAD, 0.5 MILE NORTHWESTERLY OF BALBOA BOULEVARD, 76.5 FEET NORTHEAST OF STREET CURB, AT A CURVE IN THE STREET TO THE RIGHT AND A ROAD TO LEFT LEADING TO NORTH VALLEY REFUSE CENTER, ON SOUTHERN PACIFIC COMPANY RAILROAD BRIDGE NO. 53-391, 7.5 FEET SOUTHWESTERLY OF THE SOUTHWESTERLY RAIL. SET IN TOP OF CONCRETE

HEADWALL OF BRIDGE 1.3 FEET FROM THE SOUTHEAST END. 0.6 KM (0.35 MI) NORTHWESTERLY ALONG THE SOUTHERN PACIFIC RAILROAD FROM THE JUNCTION OF THE BALBOA BOULEVARD IN GRANADA HILLS, IN TOP OF AND 0.4 M (1.3 FT) NORTHWEST OF THE SOUTHEAST END OF THE SOUTHWEST HEADWALL OF A CULVERT UNDER THE RAILROAD, 30.3 M (99.4 FT) NORTHEAST OF THE CENTER OF THE HIGHWAY, 3.9 M (12.8 FT) SOUTHWEST OF THE NEAR RAIL, AND 0.3 M (1.0 FT) BELOW THE LEVEL OF THE TRACK.
March 1996 Caltrans Inspection: Large cracks are visible in the bridge

PID: EW2473 Residual = -4.3 Type N
NAME: 03 01685
IN LOS ANGELES. WIRE SPIKE IN THE SOUTHWEST CURB OF SAN FERNANDO ROAD, 1 FOOT NORTHWEST OF THE BEGINNING OF CURB RETURN NORTHWEST OF BROMWICH STREET.
IN LOS ANGELES, AT THE INTERSECTION OF SAN FERNANDO ROAD AND BROMWICH STREET, A SPIKE IN THE SOUTHWEST CONCRETE CURB OF THE ROAD, 15.0 M (49.2 FT) NORTHWEST OF THE CENTER OF THE STREET, 9.2 M (30.2 FT) SOUTHWEST OF AND LEVEL WITH THE CENTERLINE OF THE ROAD, 0.4 M (1.3 FT) NORTHEAST OF A UTILITY POLE, AND 0.3 M (1.0 FT) NORTHWEST OF THE SOUTHEAST END OF THE BEGINNING OF THE CURB RETURN NORTHWEST.
March 1996 Caltrans Inspection: No visible damage

PID: EW4670 Residual = -9.6 cm Type S
NAME: B 1219
RECOVERED IN GOOD CONDITION, A NEW DESCRIPTION FOLLOWS. 1.4 KM (0.85 MI) SOUTHEASTERLY ALONG CENTER STREET FROM ITS JUNCTION WITH VIA FUSTERO IN PIRU, THENCE 8.2 KM (5.10 MI) EASTERLY ALONG STATE HIGHWAY 126, IN TOP AND 0.2 M (0.7 FT) EAST OF THE WEST END OF THE NORTH CONCRETE HEADWALL OF A CONCRETE BOX CULVERT UNDER THE HIGHWAY, 0.4 KM (0.25 MI) WEST OF THE VENTURA AND LOS ANGELES COUNTY LINE. 9.1 M (29.9 FT) NORTH OF THE CENTERLINE OF THE HIGHWAY AND ABOUT LEVEL WITH THE HIGHWAY SURFACE.
1.1 KM (0.70 MI) SOUTHERLY ALONG MAIN STREET FROM THE POST OFFICE IN PIRU, THENCE 9.7 KM (6.00 MI) EASTERLY ALONG STATE HIGHWAY 126, NEAR THE WEST END OF THE NORTH CONCRETE HEADWALL OF A BOX CULVERT UNDER THE HIGHWAY, 9.0 M (29.5 FT) NORTH OF THE HIGHWAY CENTERLINE, AND 0.3 M (1.0 FT) BELOW THE LEVEL OF THE HIGHWAY.
March 1996 Caltrans Inspection: No visible damage

PID: EW4667 Residual = 4.3 cm Type N
NAME: C 41
1.4 KM (0.85 MI) SOUTHEASTERLY ALONG CENTER STREET FROM ITS JUNCTION WITH VIA FUSTERO IN PIRU, THENCE 8.6 KM (5.35 MI) EASTERLY ALONG STATE HIGHWAY 126, AT THE VENTURA AND LOS ANGELES COUNTY LINE. 10.8 M (35.4 FT) SOUTH OF THE CENTERLINE OF THE HIGHWAY, 3.9 M (12.8 FT) NORTHWEST OF A THREE INCH IRON PIPE PROJECTING 6.0 FT, 2.7 M (8.9 FT) WEST OF A TWO INCH IRON PIPE PROJECTING 5.0 FT SUPPORTING A SIGN (L.A. COUNTY BOUNDARY LINE), 0.2 M (0.7 FT) NORTHEAST OF A WITNESS POST, 0.06 M (0.2 FT) ABOVE THE GROUND SURFACE AND ABOUT LEVEL WITH THE HIGHWAY SURFACE. NOTE-THE M IN BM HAS BEEN SCRAPED OFF BENCHMARK. 1.1 KM (0.70 MI) SOUTHERLY ALONG MAIN STREET FROM THE POST OFFICE IN PIRU, THENCE 10.1 KM (6.25 MI) EASTERLY ALONG STATE HIGHWAY 126, AT THE VENTURA-LOS ANGELES COUNTY LINE, 14.2 M (46.6 FT) NORTH OF BENCH MARK U 1451, 10.7 M (35.1 FT) NORTHWEST OF A PIPELINE VENT

PROJECTING 7-FEET, 2.4 M (7.9 FT) WEST OF THE SOUTH LEG OF A SIGN (LOS ANGELES COUNTY LINE) , 0.2 M (0.7 FT) ABOVE THE LEVEL OF THE HIGHWAY, 0.2 M (0.7 FT) NORTH OF A WITNESS POST, AND FLUSH WITH THE GROUND SURFACE.
March 1996 Caltrans Inspection: No visible damage

PID: EW9478 Residual = 4.0 cm Type N
NAME: 961 LA RM 1
IN SANTA SUSANA, AT THE INTERSECTION OF LOS ANGELES AVENUE AND TAPO STREET, I TOP OF A CONCRETE CURB. 15.9 M (52.2 FT) NORTH OF THE CENTERLINE OF THE WEST BOUND LANES OF THE AVENUE, 7.8 M (25.6 FT) SOUTH OF THE NEAR RAIL OF THE SOUTHERN PACIFIC RAILROAD, 4.4 M (14.4 FT) WEST OF THE CENTERLINE OF THE SOUTH BOUND LANES OF THE STREET, 2.2 M (7.2 FT) NORTH-NORTHEAST OF A UTILITY SIGNAL LIGHT POLE, 0.2 M (0.7 FT) ABOVE THE STREET SURFACE AND 0.1 M (0.3 FT) WEST OF A CURB. IN SANTA SUSANA, AT THE INTERSECTION OF LOS ANGELES AVENUE AND TAPO STREET, IN THE WEST CONCRETE CURB OF THE STREET, 15.9 M (52.2 FT) NORTH OF THE CENTERLINE OF THE WESTBOUND LANES OF THE AVENUE, 7.8 M (25.6 FT) SOUTH OF THE NEAR RAIL OF THE SOUTHERN PACIFIC RAILROAD, 4.4 M (14.4 FT) WEST OF AND LEVEL WITH THE CENTERLINE OF THE SOUTHBOUND LANES OF THE STREET, AND 2.2 M (7.2 FT) NORTH-NORTHEAST OF A SIGNAL LIGHT POLE.
March 1996 Caltrans Inspection: No visible damage

PID: EW6942 Residual = 5.8 cm Type S
NAME: 72 X 11
1.3 MI EAST FROM SANTA SUSANA.
1.3 MILES EAST ALONG THE SOUTHERN PACIFIC RAILROAD FROM THE POST OFFICE AT SANTA SUSANA, AT RAILROAD BRIDGE NUMBER 438.40. IN TOP OF THE NORTHWEST END OF THE NORTHEAST CONCRETE HEAD WALL OF A DOUBLE FLOOD CONTROL CULVERT UNDER THE TRACKS, 10 FEET EAST OF THE EAST WINGWALL OF THE BRIDGE, 20 FEET NORTHEAST OF THE NORTHEAST RAIL, 2.0 FEET NORTH OF THE CORNER POST OF A CHAIN LINK FENCE. 21.3 KM (13.25 MI) EASTERLY ALONG THE SOUTHERN PACIFIC RAILROAD FROM THE JUNCTION OF SPRING ROAD IN MOORPARK, NEAR THE NORTHWEST END OF THE NORTHEAST CONCRETE HEADWALL OF A DOUBLE BOX CULVERT UNDER THE RAILROAD, 5.5 M (18.0 FT) NORTHEAST OF THE NEAR RAIL, 2.1 M (6.9 FT) BELOW THE LEVEL OF THE TRACK, AND ON THE EXTENDED CENTERLINE OF STERLING STREET.
March 1996 Caltrans Inspection: No visible damage

PID: EW5003 Residual = 6.2 cm Type S
NAME: X 898
0.6 MI N FROM SAUGUS.
0.6 MILE NORTH ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD FROM THE STATION AT SAUGUS, 4 1/2 RAILS NORTH OF MILEPOLE 450, AT A 24-INCH CORRUGATED METAL PIPE CULVERT, IN THE TOP OF THE WEST CONCRETE HEAD WALL, 1.1 FEET NORTH OF THE SOUTH END, 35.7 FEET EAST OF THE CENTER LINE OF A PAVED ROAD, 20.3 FEET WEST OF THE WEST RAIL, AND ABOUT 6 FEET LOWER THAN THE TRACK. BOUQUET CANYON ROAD, 0.6 MILE NORTH FROM THE SOUTHERN PACIFIC COMPANY RAILROAD STATION IN SAUGUS, 72.0 FEET SOUTHEASTERLY OF POWER POLE NO. 558013E, 35.0 FEET EAST OF THE CENTER LINE OF BOUQUET CANYON ROAD, 22.0 FEET SOUTHEASTERLY OF TELEPHONE POLE NO. 558911H, 20.5 FEET WEST OF THE WEST RAIL OF RAILROAD. SET IN THE TOP OF THE WEST CONCRETE

HEADWALL OF CULVERT, 1.1 FEET NORTH OF THE SOUTH END, ABOUT 6.0 FEET LOWER THAN THE TRACK.
IN SAUGUS, AT THE INTERSECTION OF SAN FERNANDO ROAD AND CINEMA DRIVE, IN TOP OF AND 0.3 M (1.0 FT) NORTH OF THE SOUTH END OF THE WEST CONCRETE HEADWALL OF A CULVERT UNDER THE SOUTHERN PACIFIC RAILROAD, 21.7 M (71.2 FT) SOUTH OF THE EXTENDED CENTERLINE OF THE DRIVE, 10.8 M (35.4 FT) SOUTH-SOUTHEAST OF THE MOST SOUTHERLY OF 2 SIGNAL LIGHT POLES, 9.6 M (31.5 FT) EAST OF THE CENTERLINE OF THE NORTHBOUND LANES OF THE ROAD, 5.5 M (18.0 FT) WEST OF THE NEAR RAIL, AND 0.6 M (2.0 FT) ABOVE THE LEVEL OF THE ROAD.
March 1996 Caltrans Inspection: No visible damage

PID: EW5006 Residual = 6.2 cm Type S
NAME: Y 898
1.5 MI NW FROM SAUGUS.
1.5 MILES NORTHEAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD FROM THE STATION AT SAUGUS, 2 1/4 TELEPHONE POLES NORTHWEST OF MILEPOLE 449, AT THE BONELLI RANCH, AT 24-INCH CONCRETE PIPE CULVERT 449.10, IN THE TOP OF THE SOUTHEAST END OF THE SOUTHWEST CONCRETE HEAD WALL, 12.2 FEET SOUTHWEST OF THE SOUTHWEST RAIL, AND ABOUT 3 FEET LOWER THAN THE TRACK.
1.7 KM (1.05 MI) EASTERLY ALONG THE SOUTHERN PACIFIC RAILROAD FROM THE JUNCTION OF CINEMA AVENUE IN SAUGUS, NEAR THE SOUTHEAST END OF THE SOUTHWEST CONCRETE HEADWALL OF CULVERT NUMBER 449.10 UNDER THE TRACK, 3.8 M (12.5 FT) SOUTHWEST OF THE NEAR RAIL, 1.1 M (3.6 FT) BELOW THE LEVEL OF THE TRACK, AND ACROSS THE TRACK FROM A LARGE METAL BUILDING ENCLOSED BY A CHAIN-LINK FENCE.
March 1996 Caltrans Inspection: No visible damage

PID: EW4610 Residual = 5.0 cm Type N
NAME: 37 8
IN MOORPARK, AT THE INTERSECTION OF HIGH STREET AND WALNUT STREET, IN TOP OF A CONCRETE CURB. 13.7 M (44.9 FT) WEST OF THE CENTER OF WALNUT STREET, 7.4 M (24.3 FT) NORTH OF THE CENTERLINE OF HIGH STREET AND 0.2 M (0.7 FT) ABOVE THE HIGH STREET SURFACE. IN MOORPARK, AT THE INTERSECTION OF WALNUT AND HIGH STREETS, IN THE NORTH CURB OF HIGH STREET, 14.3 M (46.9 FT) WEST OF THE CENTER OF WALNUT STREET, 7.2 M (23.6 FT) NORTH OF THE CENTERLINE OF HIGH STREET, AND 0.1 M (0.3 FT) ABOVE THE LEVEL OF THE STREETS.
March 1996 Caltrans Inspection: No visible damage

PID: EW6937 Residual = 5.0 cm Type S
NAME: K 1295
0.6 KM (0.35 MI) WEST ALONG THE SOUTHERN PACIFIC RAILROAD FROM ITS JUNCTION WITH STATE HIGHWAY 23 IN MOORPARK. 24.0 M (78.7 FT) WEST OF A DERAILING RAILROAD SWITCH, 8.6 M (28.2 FT) NORTH OF THE NEAR RAIL, 4.4 M (14.4FT) SOUTH OF THE SOUTH HEADWALL FOR A CONCRETE BOX CANAL, 1.2 M (3.9FT) BELOW RAILROAD TRACKS AND 0.15 M (0.5 FT) BELOW GROUND SURFACE.
0.6 KM (0.35 MI) WESTERLY ALONG THE SOUTHERN PACIFIC RAILROAD FROM THE JUNCTION OF STATE HIGHWAY 23 IN MOORPARK, 32.1 M (105.3 FT) NORTH OF THE CENTERLINE OF POINDEXTER AVENUE, 23.2 M (76.1 FT) WEST OF THE WEST END OF A

RAILROAD SIGNAL CONTROL BOX, 8.6 M (28.2 FT) NORTH OF THE NEAR RAIL, 4.3 M (14.1 FT) SOUTH OF THE SOUTH WALL OF A DITCH, AND 1.0 M (3.3 FT) BELOW THE LEVEL OF THE TRACK. NOTE–THE DISK IS ENCASED IN A 4-INCH PVC PIPE WITH A SCREW CAP AND IS RECESSED 0.1 M (0.3 FT) BELOW THE GROUND SURFACE.
March 1996 Caltrans Inspection: No visible damage

PID: EW5012 Residual = -4.4 cm Type B
NAME: Y 984
2.9 MI E FROM SAUGUS.
2.9 MILES EAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD FROM THE STATION AT SAUGUS, 0.3 MILE EAST OF MILEPOLE 448, AT AQUEDUCT UNDERPASS 447.70, IN THE TOP OF THE CENTER OF THE NORTHWEST CONCRETE HEAD WALL, 18.4 FEET NORTHWEST OF THE NORTHWEST RAIL, AND ABOUT 1.5 FEET LOWER THAN THE TRACKS.
2.05 MILES WEST ALONG SOLEDAD CANYON ROAD FROM THE BRIDGE OVER THE SANTA CLARA RIVER, 2.9 MILES EAST OF THE STATION AT SAUGUS,IN TOP OF THE CENTER OF A CONCRETE HEAD WALL FOR THE LOS ANGELES COUNTY AQUEDUCT, UNDER THE RAILROAD, DIRECTLY IN LINE WITH THE CENTER LINE OF THE AQUEDUCT. NOTE- HEADWALL IS COMPLETELY BURIED, DISK IS 4 INCHES UNDERGROUND, 36.8 FT. SOUTHEAST OF SOUTHEAST CURB, SOLEDAD CANYON ROAD, 20.6 FT. EAST OF TELEPHONE POLE, 18.7 FT NORTHWEST OF NORTHWEST RAIL.
3.9 KM (2.40 MI) EASTERLY ALONG THE SOUTHERN PACIFIC RAILROAD FROM THE JUNCTION OF CINEMA AVENUE IN SAUGUS, NEAR THE CENTER OF THE NORTH HEADWALL OF A CULVERT SPANNING THE LOS ANGELES AQUEDUCT, 39.2 M (128.6 FT) WEST OF THE SOUTH LEG OF A SIGN (CANYON COUNTRY CHAMBER OF COMMERCE) , 11.3 M (37.1 FT) SOUTH OF THE SOUTH CURB OF SOLEDAD CANYON ROAD, 5.7 M (18.7 FT) NORTH OF THE NEAR RAIL, 0.5 M (1.6 FT) BELOW THE LEVEL OF THE TRACK, 0.3 M (1.0 FT) EAST OF A WITNESS POST, AND 0.1 M (0.3 FT) BELOW THE GROUND SURFACE.
March 1996 Caltrans Inspection: No visible damage

PID: EW6899 Residual = -11.6 cm Type S
NAME: M 1296
SAN FERNANDO.
1.6 MILE SOUTHEAST ALONG SAN FERNANDO ROAD FROM ITS JUNCTION WITH I 240 AND I 5, THENCE, 210 FT. NORTHEAST AND ACROSS TRACKS FROM THE JUNCTION OF SAN FERNANDO ROAD AND BLEDSOE STREET, AT THE SOUTH-EAST CORNER OF THE JUNCTION OF BLEDSOE STREET AND A PAVED ROAD RUNNING PARALLEL WITH TRACKS. 51.5 FT. SOUTHEAST OF CENTER LINE OF BELDSOE STREET, 54.5 FT. NORTHEAST OF THE CENTER LINE OF THE PAVED ROAD, 12.9 FT. SOUTHWEST OF THE NORTHEAST CORNER OF THE FENCE LINE AROUND MERLE NORMAN COSMETICS GROUNDS, 3.5 FT. WEST OF A HALF ARCH BRICK RETAINING WALL SUPPORTING THE FENCE, ACCESS HAD THROUGH A PLASTIC CAP FLUSH WITH THE GROUND.
RECOVERED IN GOOD CONDITION. NOTE–THE DISK IS STAMPED M 1296 1977, NOT M 1296 1978.
IN SLYMAR, AT THE INTERSECTION OF SAN FERNANDO ROAD AND BLEDSOE STREET, 64.0 M (210.0 FT) NORTHEAST OF THE CENTER OF THE ROAD, 16.6 M (54.5 FT) NORTHEAST OF THE CENTER OF A PAVED ROAD, 13.8 M (45.3 FT) SOUTHEAST OF AND LEVEL WITH THE STREET, 1.0 M (3.3 FT) WEST OF A FENCE CORNER WITH A SIGN (MERLE NORMAN COSMETICS) ATTACHED. NOTE–THE DISK IS ENCASED IN A 4-INCH PVC PIPE AND IS FLUSH WITH THE GROUND SURFACE.
March 1996 Caltrans Inspection: No visible damage

PID: EW7051 Residual = 7.5 cm Type S
NAME: P 1374
0.5 KM (0.3 MI) SOUTH FROM SAUGUS ALONG THE SOUTHERN PACIFIC RAILROAD FROM ITS STATION AT SAUGUS, IN TOP OF AND 0.5 METER (1.5 FT) SOUTH OF THE NORTH END OF A HEADWALL FOR A 60-INCH INDUSTRIAL CULVERT UNDER THE RAILROAD AND SAN FERNANDO ROAD, ON THE EAST EDGE OF THE CLARA RIVER, 48.3 METERS (158.5 FT) WEST ACROSS THE ROAD FROM THE WEST RAIL, 26.8 METERS (88 FT) WEST OF THE CENTER OF THE ROAD. MARK IS ABOVE LEVEL WITH THE ROAD.
1.9 KM (1.20 MI) NORTHWESTERLY ALONG SAN FERNANDO ROAD FROM THE JUNCTION OF SIERRA HIGHWAY IN NEWHALL, THENCE 3.8 KM (2.35 MI) NORTHWESTERLY ALONG THE SOUTHERN PACIFIC RAILROAD, IN TOP OF AND 0.5 M (1.6 FT) SOUTH OF THE NORTH END OF THE WEST CONCRETE HEADWALL OF A CULVERT UNDER THE RAILROAD AND THE SAN FERNANDO ROAD, 48.3 M (158.5 FT) WEST OF THE NEAR RAIL, 14.0 M (45.9 FT) WEST OF THE CENTERLINE OF THE SOUTHBOUND LANES OF THE ROAD, 4.9 M (16.1 FT) WEST OF A CHAIN-LINK FENCE, 0.3 M (1.0 FT) BELOW THE LEVEL OF THE ROAD, AND 0.1 M (0.3 FT) SOUTH OF A CHAIN-LINK GATE POST.
March 1996 Caltrans Inspection: No visible damage

PID: DY2535 Residual = -11.6
PID: DY2535 Type N
NAME: 93 A
IN LONG BEACH, AT THE INTERSECTION OF CHERRY AVENUE AND WARDLOW ROAD, 14.0 M (45.9 FT) WEST OF THE CENTERLINE OF THE SOUTHBOUND LANES OF THE AVENUE, 8.9 M (29.2 FT) SOUTH OF THE CENTER OF THE ROAD, 1.3 M (4.3 FT) EAST OF THE NORTHEAST CORNER OF A CATCH BASIN, LEVEL WITH THE ROAD, AND IN A CONCRETE MONUMENT THAT IS FLUSH WITH AND SURROUNDED BY A SIDEWALK.
IN LONG BEACH, AT THE INTERSECTION OF WARDLOW ROAD AND CHERRY AVENUE, 13.9 M (45.6 FT) WEST OF THE CENTERLINE OF THE SOUTHBOUND LANES OF THE AVENUE, 4.0 M (13.1 FT) SOUTH OF THE CENTERLINE OF THE EASTBOUND LANES OF THE ROAD, 3.6 M (11.8 FT) NORTHWEST OF A SIGNAL LIGHT POLE, 1.2 M (3.9 FT) EAST OF THE NORTHEAST CORNER OF A CATCH BASIN, 0.2 M (0.7 FT) ABOVE THE LEVEL OF THE ROAD, AND THE MONUMENT IS FLUSH WITH A SIDEWALK.
March 1996 Caltrans Inspection: No visible damage

PID: AA3228 Residual = -9.2 cm Type N
NAME: 5 43
3.0 KM (1.85 MI) SOUTHERLY ALONG INTERSTATE HIGHWAY 5 FROM THE JUNCTION OF STATE HIGHWAY 14 IN SAN FERNANDO, NEAR THE NORTH CORNER OF A CONCRETE CATCH BASIN, 7.6 M (24.9 FT) NORTH OF STREET LIGHT POLE NUMBER 43761, 5.4 M (17.7 FT) SOUTHWEST OF THE FOG LINE OF THE SOUTHBOUND HIGHWAY, 3.4 M (11.2 FT) NORTHEAST OF CALL BOX NUMBER 439, AND 0.2 M (0.7 FT) BELOW THE LEVEL OF THE HIGHWAY.
March 1996 Caltrans Inspection: No visible damage.

PID: AA3231 Residual = -11.9 cm Type C
NAME: 5 42.1
5.8 KM (3.60 MI) SOUTHERLY ALONG INTERSTATE HIGHWAY 5 FROM THE JUNCTION OF STATE HIGHWAY 14 IN SAN FERNANDO, NEAR THE SOUTH CORNER OF THE MOST NORTHWESTERLY OF 3 CONCRETE CATCH BASINS, 12.7 M (41.7 FT) SOUTH OF CALL BOX NUMBER 419 T, 11.0 M (36.1 FT) SOUTHWEST OF THE FOG LINE OF THE

SOUTHBOUND AUTOMOBILE LANES OF THE HIGHWAY, 3.0 M (9.8 FT) SOUTHWEST OF THE FOG LINE OF THE SOUTHBOUND TRUCK LANES OF THE HIGHWAY, 1.6 M (5.2 FT) NORTHEAST OF A WITNESS POST, AND 0.2 M (0.7 FT) SOUTHWEST OF A CURB.
March 1996 Caltrans Inspection: Small cracks in pavement.

PID: AA3234 Residual = -11.9 cm Type N
NAME: 405 47.2
IN MISSION HILLS, AT THE INTERSECTION OF FREEWAY 405 AND SAN FERNANDO MISSION BOULEVARD, NEAR THE SOUTHEAST CORNER OF THE CONCRETE FOUNDATION OF 2 UNDERGROUND CABLE JUNCTION BOXES, 68.0 M (223.1 FT) NORTH OF CALL BOX NUMBER 473, 28.5 M (93.5 FT) SOUTH OF THE CENTER OF THE BOULEVARD, 4.8 M (15.7 FT) WEST OF THE FOG LINE OF THE SOUTHBOUND FREEWAY, 0.4 M (1.3 FT) SOUTHWEST OF THE WEST END OF THE SOUTH ABUTMENT OF THE FREEWAY OVERPASS OF THE BOULEVARD, AND 0.2 M (0.7 FT) ABOVE THE LEVEL OF THE FREEWAY.
March 1996 Caltrans Inspection: No visible damage.

PID: AA3236 Residual = -10.4 cm Type N
NAME: 405 46.1
IN MISSION HILLS, AT THE INTERSECTION OF FREEWAY 405 AND DEVONSHIRE STREET, NEAR THE NORTHWEST CORNER OF A CONCRETE CATCH BASIN, 230.0 M (754.6 FT) SOUTH OF THE CENTER OF THE STREET, 49.0 M (160.8 FT) NORTH OF THE SOUTH END OF THE MEDIAN BETWEEN THE SOUTHBOUND FREEWAY AND FREEWAY ON-RAMP FROM THE STREET, 2.4 M (7.9 FT) WEST OF THE FREEWAY FOG LINE, 1.4 M (4.6 FT) EAST OF A WITNESS POST, AND 0.2 M (0.7 FT) BELOW THE LEVEL OF THE FREEWAY.
March 1996 Caltrans Inspection: No visible damage.

PID: EW4844 Residual = -13.9 Type N
NAME: 04 05510
AT LOS ANGELES. WIRE SPIKE IN THE WEST CURB OF BALBOA BOULEVARD, 3 FEET NORTH OF THE BEGINNING OF CURB RETURN NORTH OF INDEX STREET. IN GRANADA HILLS, AT THE INTERSECTION OF BALBOA BOULEVARD AND INDEX STREET, A SPIKE IN THE WEST CONCRETE CURB OF THE BOULEVARD, 14.8 M (48.6 FT) NORTH OF THE CENTER OF THE STREET, 7.1 M (23.3 FT) WEST OF AND LEVEL WITH THE CENTERLINE OF THE SOUTHBOUND LANES OF THE BOULEVARD, 3.1 M (10.2 FT) EAST OF A ROCK COLUMN, AND 1.0 M (3.3 FT) NORTH OF THE SOUTH END OF THE BEGINNING OF THE CURB RETURN NORTH.

PID: AA3256 Residual = 4.1 cm Type C
NAME: 405 40.2
IN SHERMAN OAKS, AT THE INTERSECTION OF FREEWAY 405 AND BURBANK BOULEVARD, 138.5 M (454.4 FT) SOUTH OF THE CENTER OF THE BOULEVARD, 15.3 M (50.2 FT) NORTH-NORTHWEST OF A SIGN (EXIT ARROW) , 15.3 M (50.2 FT) NORTH OF THE NORTH END OF THE SHOULDER BETWEEN THE SOUTHBOUND FREEWAY AND THE OFF-RAMP LEADING TO THE BOULEVARD, 12.3 M (40.4 FT) NORTH-NORTHWEST OF A SIGN (EXIT ARROW) , 11.8 M (38.7 FT) WEST OF THE CENTER OF THE RAMP, 3.1 M (10.2 FT) EAST OF THE FREEWAY FOG LINE, 0.8 M (2.6 FT) WEST OF A WITNESS POST, 0.3 M (1.0 FT) WEST OF THE EAST EDGE OF SHOULDER, DISK ON TOP OF A 0.9 METER LONG PIPE SURROUNDED BY AND RECESSED 0.01 M (0.03 FT) BELOW LEVEL OF SHOULDER.
March 1996 Caltrans Inspection: No visible damage.

APPENDIX II

Appendix II. GPS stations measured by the California Department of Transportation (Caltrans) as part of the post-Northridge survey.

GPS STATION	Height (m)	Latitude °N	Longitude °W
AA3173	244.516	34.2760	-118.778
AA3178	312.291	34.2776	-118.500
AA3179	435.870	34.2636	-118.644
AA3182	332.872	34.2616	-118.666
AA3183	401.689	34.4214	-118.488
AA3186	493.895	34.4404	-118.431
AA3193	228.642	34.3488	-118.917
AA3196	305.213	34.3233	-118.902
AA3201	194.639	34.2636	-118.864
AA3202	212.370	34.2145	-118.886
AA3204	210.679	34.1830	-118.892
AA3208	299.829	34.2572	-118.524
AA3211	239.924	34.0948	-118.602
AA3234	298.579	34.2716	-118.472
AA3239	263.793	34.2353	-118.473
AA3251	231.103	34.1940	-118.475
AA3276	154.287	34.0726	-118.467
AA3300	247.700	34.1732	-118.544
AA3309	207.874	34.1618	-118.472
AA3348	290.676	34.1571	-118.825
AA4282	64.4420	34.0373	-118.309
AA4298	35.075	34.0341	-118.362
AA4323	41.445	34.0233	-118.474
AA7402	106.300	33.7433	-118.404
AA9326	245.600	34.1482	-118.698
AA9327	56.500	34.0318	-118.419
AA9328	56.700	34.0319	-118.417
AA9329	345.500	34.2886	-118.468
AA9330	393.200	33.7445	-118.332
DY0088	18.444	33.8713	-118.029
DY0238	36.142	33.9167	-118.055
DY0468	17.480	33.8682	-118.216
DY0492	11.730	33.7951	-118.240
DY0555	31.852	33.9194	-118.097
DY0777	8.454	33.8102	-118.118
DY0785	12.172	33.8104	-118.075
DY0797	12.123	33.8390	-118.051
DY1083	4.131	33.7198	-118.273
DY1217	15.350	33.8190	-118.390
DY1251	3.316	33.9881	-118.471
DY1310	16.406	33.9377	-118.438
DY1327	9.052	33.9003	-118.420
DY1606	36.213	33.9202	-118.265
DY1708	18.192	33.8862	-118.265
DY1716	53.161	33.9967	-118.265
DY1768	21.030	33.7814	-118.296

GPS STATION	Height (m)	Latitude °N	Longitude °W
DY2032	7.487	33.8403	-118.263
DY2444	4.599	33.9734	-118.446
DY2498	96.826	33.7897	-118.408
DY2499	50.275	33.7415	-118.402
DY2915	72.880	33.8773	-118.395
DY9148	106.370	33.7438	-118.404
DY9264	21.794	33.7975	-118.298
DY9267	41.745	33.9652	-118.265
DY9291	128.288	33.7299	-118.338
DY9296	20.551	33.8129	-118.167
DY9308	11.100	33.9965	-118.403
DY9342	26.903	33.9282	-118.433
DY9343	33.741	33.9513	-118.180
DZ1220	923.56	34.5121	-117.922
EW1127	79.748	34.0458	-118.243
EW1270	119.874	34.1034	-118.339
EW1454	60.916	34.0620	-118.337
EW2045	143.544	34.1612	-118.283
EW2127	253.077	34.2223	-118.373
EW2202	192.779	34.1466	-118.423
EW2249	183.303	34.1404	-118.376
EW2709	552.793	34.4654	-118.407
EW2774	657.575	34.5445	-118.652
EW3969	31.482	34.0179	-118.503
EW4014	9.473	34.0391	-118.583
EW4348	452.174	34.1379	-118.600
EW4384	263.525	34.1750	-118.606
EW4418	271.863	34.2327	-118.603
EW4571	269.558	34.2719	-118.752
EW4579	196.929	34.2891	-118.829
EW4602	131.778	34.2776	-118.923
EW4649	288.248	34.4238	-118.643
EW4680	229.283	34.4069	-118.740
EW4726	146.384	34.3999	-118.903
EW4865	409.195	34.3234	-118.502
EW4991	361.811	34.4895	-118.620
EW6897	465.557	34.3566	-118.508
EW6899	368.933	34.3049	-118.466
EW6905	108.136	34.0978	-118.233
EW6937	151.695	34.2850	-118.888
EW6985	166.861	34.3962	-118.847
EW6986	213.294	34.4085	-118.770
EW6989	307.365	34.4382	-118.610
EW7332	396.029	34.2917	-118.488
EW7403	381.162	34.2788	-118.670
EW7538	220.278	34.3879	-118.999
EW9201	658.029	34.6147	-118.738
EW9214	779.495	34.5721	-118.694
EW9447	261.897	34.4059	-118.693
EW9488	139.351	34.1375	-118.267
EW9511	313.765	34.2699	-118.426

GPS STATION	Height (m)	Latitude °N	Longitude °W
EW9522	367.502	34.2754	-118.599
EW9548	357.175	34.4071	-118.540
EW9549	125.963	34.3937	-118.940
EW9587	56.710	34.0203	-118.285
EW9588	272.173	34.1464	-118.761
EW9595	365.013	34.1259	-118.477
EW9596	6.620	34.0343	-118.534
EW9597	251.559	34.2328	-118.555
EW9598	243.481	34.1955	-118.886
EW9604	806.600	34.6877	-118.790

APPENDIX III.

Appendix III. Leveling BM coordinates and heights. Site classes: B, bridges, bridge piers and abutments; S, culverts and retaining walls; T, electrical towers; F, building foundations; C, catchment basins; N, all others.

PID	Site	Latitude °N	Longitude °W	Height (m)
AA3152	B	33.7692	-118.2800	5.386
AA3154	B	33.8394	-118.2622	6.716
AA3155	B	34.0297	-118.2550	71.729
AA3158	B	34.4194	-118.5475	350.157
AA3160	B	34.3914	-118.5353	371.162
AA3164	B	34.3394	-118.5069	476.312
AA3165	B	34.2056	-118.3475	220.585
AA3166	B	34.1803	-118.3136	176.159
AA3169	B	34.4564	-118.6153	326.668
AA3171	B	34.5694	-118.6875	773.846
AA3172	B	34.4281	-118.6278	298.134
AA3174	B	34.2772	-118.4972	303.193
AA3175	B	34.2669	-118.4397	309.476
AA3176	B	34.2658	-118.4586	298.055
AA3177	B	34.2678	-118.4839	296.987
AA3187	B	34.4550	-118.4194	525.335
AA3204	B	34.1831	-118.8906	210.680
AA3205	B	34.1772	-118.8756	227.856
AA3211	B	34.0947	-118.6019	239.924
AA3217	B	34.1786	-118.3100	176.412
AA3218	B	34.1861	-118.3169	181.858
AA3219	B	34.1917	-118.3261	196.266
AA3220	B	34.1942	-118.3297	198.094
AA3225	B	34.2217	-118.3597	246.339
AA3227	B	34.3169	-118.4914	407.670
AA3233	B	34.2794	-118.4694	313.662
AA3239	B	34.2353	-118.4725	263.793
AA3241	B	34.2286	-118.4725	257.013
AA3243	B	34.2214	-118.4725	253.100
AA3245	B	34.2167	-118.4725	251.054
AA3247	B	34.2086	-118.4725	241.357
AA3253	B	34.1853	-118.4731	230.939
AA3258	B	34.1539	-118.4675	224.413
AA3263	B	34.1261	-118.4736	363.879
AA3266	B	34.1108	-118.4808	284.037
AA3268	B	34.0969	-118.4764	233.967
AA3275	B	34.0756	-118.4678	161.307
AA3278	B	34.0600	-118.4544	113.972
AA3281	B	34.0494	-118.4475	87.111
AA3282	B	34.0472	-118.4458	81.985
AA3283	B	34.0392	-118.4389	66.987
AA3284	B	34.0358	-118.4369	62.582
AA3285	B	34.0353	-118.4369	54.092
AA3289	B	34.1692	-118.5967	277.125
AA3291	B	34.1678	-118.5869	281.283
AA3293	B	34.1683	-118.5811	285.073
AA3295	B	34.1719	-118.5700	258.052

AA3295	B	34.1719	-118.5700	258.052
AA3296	B	34.1731	-118.5611	258.182
AA3298	B	34.1733	-118.5522	246.338
AA3299	B	34.1733	-118.5447	247.684
AA3301	B	34.1731	-118.5347	242.593
AA3305	B	34.1708	-118.5089	227.175
AA3310	B	34.1592	-118.4650	210.591
AA3311	B	34.1583	-118.4567	209.354
AA3312	B	34.1567	-118.4481	207.364
AA3314	B	34.1556	-118.4386	204.098
AA3316	B	34.1564	-118.4217	202.018
AA3318	B	34.1567	-118.4044	197.960
AA3320	B	34.1542	-118.3958	198.867
AA3322	B	34.1539	-118.3783	185.764
AA3323	B	34.1506	-118.3783	182.358
AA3324	B	34.1525	-118.3694	187.525
AA3325	B	34.1525	-118.3692	187.393
AA3328	B	34.1531	-118.3517	180.462
AA3330	B	34.1533	-118.3389	160.321
AA3331	B	34.1525	-118.3294	163.430
AA3332	B	34.1525	-118.3292	163.379
AA3336	B	34.1544	-118.3150	155.432
AA3343	B	34.1761	-118.8606	250.456
AA3344	B	34.1756	-118.8589	250.219
AA3345	B	34.1719	-118.8467	273.284
AA3346	B	34.1667	-118.8378	281.147
AA3348	B	34.1578	-118.8247	290.676
AA3349	B	34.1531	-118.8164	294.711
AA3350	B	34.1492	-118.8028	295.834
AA3352	B	34.1464	-118.7811	286.238
AA3354	B	34.1453	-118.7564	262.646
AA3356	B	34.1428	-118.7411	275.600
AA3358	B	34.1378	-118.7236	256.616
AA3360	B	34.1478	-118.6972	238.588
AA3365	B	34.1494	-118.6636	346.867
AA3366	B	34.1531	-118.6506	309.268
AA3367	B	34.1589	-118.6358	283.098
AA3369	B	34.1642	-118.6222	283.012
AA3371	B	34.1675	-118.6131	279.629
AA3372	B	34.0111	-118.4939	18.388
AA3374	B	34.0119	-118.4919	21.263
AA3381	B	34.1539	-118.4675	219.579
AA3386	B	34.0344	-118.3386	43.825
AA3387	B	34.0350	-118.3314	43.720
DY0476	B	33.8250	-118.2278	9.012
DY0484	B	33.8150	-118.2314	6.683
DY0492	B	33.7953	-118.2392	11.730
DY0541	B	33.9483	-118.1583	36.331
DY0553	B	33.9264	-118.1089	36.131
DY0687	B	33.8436	-118.1917	14.094
DY0754	B	33.8006	-118.2458	11.247
DY0756	B	33.8386	-118.2064	17.112
DY0757	B	33.8400	-118.2039	18.096
DY0759	B	33.8406	-118.2003	18.133
DY0775	B	33.8097	-118.1244	7.747
DY0777	B	33.8100	-118.1169	8.454
DY0784	B	33.8103	-118.0817	15.860
DY1037	B	33.7494	-118.2797	4.909
DY1225	B	33.7622	-118.4136	82.656

DY1289	B	33.9633	-118.4528	5.898
DY1768	B	33.7814	-118.2956	21.030
DY2002	B	33.7975	-118.2903	11.704
DY2004	B	33.7983	-118.2819	11.501
DY2006	B	33.7983	-118.2744	13.079
DY2032	B	33.8403	-118.2622	7.487
DY2507	B	33.7081	-118.2764	4.106
DY2539	B	33.8100	-118.0900	12.675
DY9002	B	33.8389	-118.3892	6.135
DY9271	B	33.8736	-118.0097	21.813
DY9272	B	33.8769	-118.0164	20.983
DY9273	B	33.8839	-118.0286	20.959
DY9274	B	33.8878	-118.0358	22.075
DY9275	B	33.8933	-118.0456	26.007
DY9276	B	33.9025	-118.0611	27.920
DY9278	B	33.9247	-118.1033	34.825
DY9283	B	33.9489	-118.1614	36.252
DY9284	B	33.9542	-118.1706	39.396
DY9285	B	33.9544	-118.1722	39.246
DY9290	B	33.8436	-118.3908	5.986
DY9296	B	33.8131	-118.1667	20.551
EW1153	B	34.0706	-118.2242	96.238
EW1164	B	34.0797	-118.2253	99.583
EW1194	B	34.1039	-118.2381	113.162
EW1274	B	34.1153	-118.3358	169.239
EW1277	B	34.1231	-118.3408	219.229
EW1279	B	34.1244	-118.3417	224.353
EW1586	B	34.0103	-118.4956	7.721
EW1591	B	34.0108	-118.4950	8.529
EW2031	B	34.1533	-118.2750	142.302
EW2039	B	34.1564	-118.2944	145.289
EW2040	B	34.1614	-118.2928	146.485
EW2045	B	34.1611	-118.2817	143.544
EW2050	B	34.1678	-118.2925	153.662
EW2080	B	34.1867	-118.3222	183.264
EW2088	B	34.1944	-118.3317	195.718
EW2092	B	34.1986	-118.3378	206.155
EW2351	B	34.2275	-118.3797	261.505
EW2368	B	34.2436	-118.3972	281.053
EW2487	B	34.2761	-118.4317	320.331
EW2543	B	34.3147	-118.4861	389.262
EW2684	B	34.4206	-118.4997	389.483
EW2698	B	34.4156	-118.4633	427.693
EW3970	B	34.0200	-118.5053	6.407
EW3984	B	34.0356	-118.5339	6.789
EW4014	B	34.0389	-118.5819	9.472
EW4061	B	34.0886	-118.6017	226.324
EW4062	B	34.0914	-118.6011	235.578
EW4074	B	34.1133	-118.5894	286.558
EW4556	B	34.2656	-118.6831	310.994
EW4569	B	34.2719	-118.7389	280.020
EW4571	B	34.2717	-118.7508	269.558
EW4575	B	34.2806	-118.7919	230.252
EW4576	B	34.2853	-118.8050	217.338
EW4586	B	34.2853	-118.8606	173.346
EW4587	B	34.2847	-118.8686	166.998
EW4591	B	34.2772	-118.8736	160.184
EW4623	B	34.3275	-118.9019	326.258
EW4644	B	34.3717	-118.9194	148.886

EW4654	B	34.4197	-118.6564	288.930
EW4657	B	34.4133	-118.6636	273.872
EW4658	B	34.4133	-118.6633	273.835
EW4671	B	34.4033	-118.7031	255.233
EW4678	B	34.4075	-118.7358	232.641
EW4697	B	34.4094	-118.7767	210.213
EW4699	B	34.4133	-118.7833	210.697
EW4710	B	34.4014	-118.8256	183.870
EW4711	B	34.4008	-118.8258	184.302
EW4714	B	34.3981	-118.8331	178.471
EW4721	B	34.3925	-118.8706	152.794
EW4731	B	34.3928	-118.9161	132.139
EW4758	B	34.3778	-118.9861	130.913
EW4761	B	34.3914	-118.9639	141.945
EW4763	B	34.3858	-118.9150	129.884
EW4872	B	34.3331	-118.5050	433.621
EW4903	B	34.3450	-118.5092	516.962
EW4963	B	34.4261	-118.5783	330.335
EW4965	B	34.4286	-118.5850	328.560
EW4966	B	34.4289	-118.5861	326.188
EW4981	B	34.4511	-118.6142	317.140
EW4991	B	34.4894	-118.6192	361.811
EW5012	B	34.4175	-118.5086	378.456
EW6834	B	34.0400	-118.5592	7.188
EW6901	B	34.2269	-118.3792	259.271
EW6940	B	34.2869	-118.8131	210.005
EW6943	B	34.2608	-118.6606	342.190
EW6947	B	34.2408	-118.5933	280.454
EW6948	B	34.2383	-118.5831	272.425
EW7049	B	34.3147	-118.4883	390.822
EW7050	B	34.3200	-118.4967	396.004
EW7052	B	34.6328	-118.7489	656.889
EW9032	B	34.0944	-118.6014	239.741
EW9079	B	34.1406	-118.7083	251.316
EW9190	B	34.6428	-118.7589	771.688
EW9191	B	34.6411	-118.7583	749.283
EW9193	B	34.6403	-118.7600	692.624
EW9199	B	34.6219	-118.7433	637.462
EW9215	B	34.5700	-118.6864	773.261
EW9473	B	34.2806	-118.7956	229.128
EW9482	B	34.2717	-118.7156	291.470
EW9486	B	34.0825	-118.2253	103.103
EW9500	B	34.2739	-118.5822	350.489
EW9501	B	34.2739	-118.5708	347.647
EW9502	B	34.2750	-118.5536	337.382
EW9503	B	34.2756	-118.5353	343.103
EW9504	B	34.2783	-118.5225	347.055
EW9505	B	34.2783	-118.5100	320.586
EW9506	B	34.2781	-118.5014	308.531
EW9508	B	34.2656	-118.4714	285.721
EW9509	B	34.2664	-118.4428	308.029
EW9514	B	34.1714	-118.6053	270.431
EW9521	B	34.2781	-118.6039	380.366
EW9529	B	34.4433	-118.6056	314.510
EW9549	B	34.3936	-118.9386	125.963
EW9578	B	34.3450	-118.9050	295.435
EW9588	B	34.1461	-118.7600	272.173
EW9595	B	34.1258	-118.4758	365.013
EW4960	T	34.4225	-118.5711	335.955

EW2046	T	34.1625	-118.2861	144.582
DY9265	T	33.9475	-118.2644	37.202
DY2547	T	33.9325	-118.2622	32.869
DY1590	T	33.8781	-118.2642	15.371
DY2548	T	33.8667	-118.2653	14.281
DY1975	T	33.8539	-118.2647	5.313
DY1974	T	33.8467	-118.2639	4.630
EW2771	T	34.5317	-118.6417	571.754
EW2762	T	34.5133	-118.6253	467.792
EW7007	T	34.4969	-118.6150	355.027
AA3209	T	34.3075	-118.4867	376.172
AA2688	S	33.9164	-118.0550	35.907
AA3124	S	34.2944	-118.4872	364.819
AA3156	S	34.4194	-118.5614	343.605
AA3163	S	34.3706	-118.5136	404.316
AA3170	S	34.4714	-118.6156	331.832
AA3180	S	34.2719	-118.6686	317.065
AA3192	S	34.3544	-118.9183	208.205
AA3193	S	34.3486	-118.9158	228.642
AA3199	S	34.3033	-118.8778	232.586
AA3200	S	34.2983	-118.8772	212.690
AA3201	S	34.2636	-118.8633	194.639
AA3259	S	34.1481	-118.4689	236.155
AA3340	S	34.1553	-118.2947	143.345
AA3361	S	34.1489	-118.6961	239.946
AA3364	S	34.1489	-118.6722	324.981
DY0548	S	33.9383	-118.1331	35.538
DY0555	S	33.9194	-118.0964	31.852
DY0562	S	33.8972	-118.0550	23.875
DY1066	S	33.7314	-118.2792	3.665
DY1117	S	33.7192	-118.3186	53.875
DY1296	S	33.9525	-118.4458	17.353
DY1306	S	33.9442	-118.4414	15.861
DY1336	S	33.8839	-118.4106	7.951
DY1705	C	33.9578	-118.2644	40.215
DY1706	C	33.9617	-118.2639	41.134
DY1707	C	33.9656	-118.2636	41.804
DY2003	S	33.7978	-118.2869	7.498
DY2500	C	33.7375	-118.3556	68.748
DY2502	S	33.7081	-118.2936	44.634
EW1176	S	34.0925	-118.2281	105.200
EW1200	S	34.1133	-118.2478	118.457
EW1252	S	34.0739	-118.3364	70.936
EW1453	S	34.0625	-118.3358	61.351
EW1454	S	34.0625	-118.3367	60.917
EW1593	S	34.0117	-118.4908	20.270
EW1595	S	34.0025	-118.4828	7.718
EW2015	S	34.1303	-118.2622	135.308
EW2030	S	34.1483	-118.2717	141.295
EW2117	S	34.2222	-118.3725	252.633
EW2127	S	34.2222	-118.3722	253.077
EW2235	S	34.1556	-118.4783	219.703
EW2359	S	34.2308	-118.3839	265.522
EW2362	S	34.2367	-118.3894	271.855
EW2468	S	34.2600	-118.4147	302.552
EW2480	S	34.2653	-118.4197	308.714
EW2700	S	34.4225	-118.4514	450.339
EW2707	S	34.4603	-118.4144	536.903
EW2709	S	34.4653	-118.4061	552.793

EW2761	S	34.5103	-118.6261	441.601
EW2763	S	34.5164	-118.6322	487.721
EW2774	S	34.5444	-118.6506	657.575
EW2777	S	34.5503	-118.6536	703.121
EW2784	S	34.5708	-118.6594	854.380
EW4042	S	34.0572	-118.5819	68.226
EW4053	S	34.0739	-118.5875	164.469
EW4073	S	34.1111	-118.5911	278.227
EW4078	S	34.1233	-118.5903	329.892
EW4080	C	34.1225	-118.5942	359.225
EW4285	S	34.1636	-118.5217	244.548
EW4314	S	34.1667	-118.5847	280.202
EW4319	S	34.1669	-118.5900	275.373
EW4321	S	34.1669	-118.5917	275.120
EW4327	S	34.1686	-118.5997	271.939
EW4346	S	34.1289	-118.5997	407.852
EW4353	S	34.1417	-118.6031	440.343
EW4361	S	34.1439	-118.6094	359.397
EW4492	S	34.2497	-118.8583	191.950
EW4548	S	34.2181	-118.8767	236.981
EW4553	S	34.2608	-118.6511	375.844
EW4555	S	34.2622	-118.6664	326.616
EW4559	S	34.2717	-118.7008	296.536
EW4568	S	34.2717	-118.7219	289.183
EW4573	S	34.2722	-118.7644	256.988
EW4582	S	34.2928	-118.8392	184.776
EW4585	S	34.2872	-118.8564	176.587
EW4590	S	34.2853	-118.8733	163.027
EW4613	S	34.3053	-118.8786	236.236
EW4614	S	34.3119	-118.8789	261.435
EW4616	S	34.3150	-118.8858	265.414
EW4618	S	34.3150	-118.8931	260.058
EW4622	S	34.3242	-118.9014	309.728
EW4624	S	34.3314	-118.9022	356.052
EW4625	S	34.3367	-118.9000	379.044
EW4627	S	34.3400	-118.9000	402.503
EW4630	S	34.3419	-118.9039	345.338
EW4631	S	34.3417	-118.9042	335.350
EW4649	S	34.4239	-118.6422	288.248
EW4650	S	34.4239	-118.6422	288.296
EW4651	S	34.4222	-118.6494	288.892
EW4652	S	34.4222	-118.6494	288.914
EW4663	S	34.4075	-118.6822	264.631
EW4670	S	34.4058	-118.6964	259.651
EW4674	S	34.4044	-118.7144	246.475
EW4677	S	34.4108	-118.7294	238.723
EW4680	S	34.4069	-118.7383	229.283
EW4693	S	34.4069	-118.7603	219.243
EW4698	S	34.4094	-118.7756	209.218
EW4705	S	34.4081	-118.8008	202.923
EW4706	S	34.4083	-118.8006	203.149
EW4708	S	34.4053	-118.8153	187.625
EW4717	S	34.3956	-118.8489	165.074
EW4725	S	34.3983	-118.8942	139.894
EW4757	S	34.3761	-118.9981	120.572
EW4764	S	34.3800	-118.9147	131.028
EW4801	C	34.2569	-118.5750	291.668
EW4813	C	34.2569	-118.5492	286.253
EW4816	S	34.2575	-118.5400	295.030

EW4841	C	34.2678	-118.5011	296.984
EW4865	S	34.3236	-118.5014	409.195
EW4970	S	34.4342	-118.5931	318.139
EW4971	S	34.4364	-118.5953	314.537
EW4979	S	34.4464	-118.6106	311.515
EW5003	S	34.4192	-118.5408	352.899
EW5006	S	34.4169	-118.5297	371.055
EW5009	S	34.4142	-118.5181	372.429
EW5017	S	34.2644	-118.8542	186.941
EW5018	S	34.2600	-118.8531	185.572
EW6623	S	34.4622	-118.4111	544.876
EW6840	S	34.0111	-118.4947	14.257
EW6896	S	34.3653	-118.5050	421.154
EW6897	S	34.3564	-118.5067	465.557
EW6899	S	34.3050	-118.4644	368.933
EW6937	S	34.2850	-118.8875	151.695
EW6942	S	34.2681	-118.6911	301.632
EW6949	S	34.2344	-118.5642	255.883
EW6986	S	34.4086	-118.7714	213.294
EW6987	S	34.4067	-118.7567	223.477
EW6999	S	34.5878	-118.7164	898.102
EW7002	S	34.5564	-118.6581	752.934
EW7003	S	34.5081	-118.6214	407.641
EW7051	S	34.4064	-118.5389	358.626
EW9040	S	34.1258	-118.5992	389.398
EW9192	S	34.6419	-118.7594	731.169
EW9200	S	34.6172	-118.7428	626.912
EW9201	S	34.6144	-118.7364	658.029
EW9202	S	34.6133	-118.7272	706.215
EW9203	S	34.6106	-118.7228	739.804
EW9204	S	34.6061	-118.7228	764.368
EW9205	S	34.6022	-118.7197	792.264
EW9206	S	34.5969	-118.7178	831.821
EW9208	S	34.5892	-118.7167	884.488
EW9209	S	34.5861	-118.7133	893.322
EW9210	S	34.5825	-118.7081	860.199
EW9212	S	34.5758	-118.7014	806.201
EW9214	S	34.5714	-118.6919	779.495
EW9216	S	34.5697	-118.6819	802.150
EW9217	S	34.5708	-118.6758	846.706
EW9274	S	34.4894	-118.6186	360.902
EW9476	S	34.2722	-118.7297	287.304
EW9479	S	34.2722	-118.7003	298.437
EW9480	S	34.2633	-118.6694	324.813
EW9482	S	34.2717	-118.7156	291.470
EW9548	S	34.4069	-118.5392	357.175
EW9597	S	34.2328	-118.5542	251.559
AA3234	F	34.2714	-118.4722	298.579
DY0512	F	33.9581	-118.2300	39.162
DY0525	F	33.9572	-118.2275	39.121
DY0527	F	33.9536	-118.2117	34.951
DY0529	F	33.9556	-118.2100	35.679
DY0531	F	33.9531	-118.1956	36.546
DY0559	F	33.9078	-118.0736	30.640
DY1085	F	33.7253	-118.2761	4.649
DY1113	F	33.7108	-118.2975	43.063
DY1187	F	33.8628	-118.3994	5.301
DY1254	F	33.9878	-118.4706	4.626
DY1283	F	33.9697	-118.4453	5.223

DY1294	F	33.9586	-118.4472	6.504
DY2534	F	33.8189	-118.1883	27.516
DY9023	F	33.7411	-118.4014	48.550
EW1134	F	34.0658	-118.2322	90.512
EW1142	F	34.0581	-118.2356	87.405
EW1197	F	34.1136	-118.2467	120.785
EW4372	F	34.1567	-118.6050	291.826
EW4381	F	34.1667	-118.6053	276.316
EW4719	F	34.3925	-118.8592	163.560
EW4733	F	34.4000	-118.9186	140.934
EW4975	F	34.4392	-118.6100	308.552
EW4989	F	34.4814	-118.6136	343.173
EW6835	F	34.0392	-118.5450	6.909
EW9188	F	34.6453	-118.7597	801.342
EW9445	F	34.4181	-118.7942	240.964
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AA3153	N	33.7783	-118.2864	10.684
AA3157	N	34.4158	-118.5489	351.181
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AA3181	N	34.2789	-118.6725	325.865
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AA3224	N	34.2164	-118.3531	238.335
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AA3280	N	34.0556	-118.4511	103.341
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DY0690	N	33.8364	-118.1894	30.445
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DY0765	N	33.8192	-118.1756	21.903
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DY1116	N	33.7142	-118.3103	38.254
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DY1285	N	33.9711	-118.4447	5.200
DY1293	N	33.9586	-118.4475	4.032
DY1295	N	33.9586	-118.4472	5.467
DY1304	N	33.9525	-118.4447	15.991
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DY1603	N	33.9136	-118.2647	37.524
DY1606	N	33.9200	-118.2644	36.213
DY1611	N	33.9253	-118.2642	36.566
DY1615	N	33.9336	-118.2644	33.587
DY1619	N	33.9400	-118.2656	35.061
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DY1643	N	33.9822	-118.2644	48.382
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DY1716	N	33.9967	-118.2644	53.162
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DY1862	N	33.7575	-118.2883	6.512
DY1900	N	33.7897	-118.2967	15.300
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DY1968	N	33.8150	-118.2633	11.736
DY1969	N	33.8192	-118.2633	11.745
DY1970	N	33.8236	-118.2625	9.522

DY1971	N	33.8314	-118.2633	7.022
DY1979	N	33.8669	-118.2650	14.679
DY2005	N	33.7986	-118.2778	8.323
DY2008	N	33.7994	-118.2625	14.012
DY2010	N	33.7992	-118.2572	13.537
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DY2495	N	33.9181	-118.4275	10.891
DY2496	N	33.9108	-118.4225	28.526
DY2498	N	33.7897	-118.4075	96.826
DY2499	N	33.7414	-118.4003	50.275
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DY2505	N	33.7092	-118.2794	4.293
DY2508	N	33.7078	-118.2750	4.132
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DY2511	N	33.7153	-118.2869	20.040
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DY2514	N	33.7225	-118.2725	4.085
DY2515	N	33.7200	-118.2714	3.104
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DY2519	N	33.7789	-118.2792	12.842
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DY2535	N	33.8192	-118.1669	17.126
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DY9026	N	33.7411	-118.3725	51.139
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DY9280	N	33.9353	-118.1233	34.551
DY9281	N	33.9447	-118.1414	36.142
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DY9286	N	33.9517	-118.1819	33.388
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DY9343	N	33.9511	-118.1789	33.741
EW1115	N	34.0375	-118.2494	74.327
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EW1127	N	34.0458	-118.2417	79.748
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EW1249	N	34.0653	-118.3361	64.254
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EW1256	N	34.0819	-118.3361	79.792
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EW1265	N	34.0981	-118.3364	105.559
EW1266	N	34.1003	-118.3375	112.654
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EW1273	N	34.1044	-118.3372	127.197
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EW1541	N	34.1111	-118.3356	146.704
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EW2017	N	34.1336	-118.2647	135.765
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EW2052	N	34.1694	-118.2967	156.698
EW2054	N	34.1742	-118.3042	164.087
EW2095	N	34.1992	-118.3378	204.884
EW2116	N	34.2097	-118.3550	230.918
EW2119	N	34.2158	-118.3636	242.246
EW2124	N	34.2200	-118.3700	249.345
EW2128	N	34.1261	-118.3439	227.919
EW2129	N	34.1264	-118.3442	225.594
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EW2141	N	34.1347	-118.3597	185.723
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EW2189	N	34.1433	-118.3969	188.887
EW2191	N	34.1431	-118.4000	188.361
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EW2195	N	34.1425	-118.4064	189.705
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EW2206	N	34.1472	-118.4267	194.396
EW2207	N	34.1467	-118.4306	197.271
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EW2211	N	34.1483	-118.4364	201.068
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EW2213	N	34.1492	-118.4400	204.738
EW2215	N	34.1494	-118.4411	203.335
EW2222	N	34.1517	-118.4542	207.024
EW2223	N	34.1522	-118.4564	210.310
EW2224	N	34.1522	-118.4567	210.734
EW2225	N	34.1531	-118.4631	214.763
EW2226	N	34.1522	-118.4586	211.091
EW2230	N	34.1544	-118.4681	218.697
EW2231	N	34.1542	-118.4689	218.575
EW2232	N	34.1542	-118.4692	218.619
EW2234	N	34.1553	-118.4761	218.706
EW2242	N	34.1572	-118.4892	228.393
EW2244	N	34.1575	-118.4911	229.421
EW2245	N	34.1575	-118.4936	228.066
EW2246	N	34.1581	-118.4950	228.333
EW2249	N	34.1397	-118.3750	183.303
EW2252	N	34.1397	-118.3764	182.090
EW2253	N	34.1397	-118.3781	181.171
EW2255	N	34.1397	-118.3839	183.345
EW2256	N	34.1406	-118.3869	183.542
EW2259	N	34.1436	-118.3919	189.257
EW2473	N	34.2519	-118.4064	287.523
EW2482	N	34.2661	-118.4217	309.350
EW2502	N	34.2831	-118.4408	324.837
EW2506	N	34.2814	-118.4394	324.009
EW2515	N	34.2869	-118.4450	329.573
EW2523	N	34.2964	-118.4544	351.304
EW2535	N	34.3128	-118.4767	389.480
EW2699	N	34.4167	-118.4553	439.675
EW2705	N	34.4500	-118.4228	517.377
EW2716	N	34.5050	-118.6150	375.787
EW2764	N	34.5192	-118.6356	499.307
EW2766	N	34.5231	-118.6392	503.176
EW2772	N	34.5356	-118.6433	583.676
EW2773	N	34.5400	-118.6469	619.213
EW2779	N	34.5531	-118.6569	727.689
EW2782	N	34.5631	-118.6581	809.047
EW2783	N	34.5656	-118.6589	829.740
EW2786	N	34.5758	-118.6681	889.925
EW2789	N	34.5767	-118.6700	865.301
EW3921	N	34.3117	-118.4997	407.943
EW3922	N	34.3142	-118.4992	421.231
EW3923	N	34.3156	-118.4992	422.319
EW3969	N	34.0178	-118.5019	31.482
EW3974	N	34.0264	-118.5150	5.773
EW4035	N	34.0461	-118.5767	28.221
EW4060	N	34.0842	-118.5989	224.685
EW4273	N	34.1592	-118.5003	235.373
EW4274	N	34.1594	-118.5022	238.666
EW4276	N	34.1606	-118.5086	248.966

EW4278	N	34.1611	-118.5128	250.454
EW4286	N	34.1642	-118.5236	246.311
EW4289	N	34.1658	-118.5278	248.509
EW4290	N	34.1667	-118.5297	246.592
EW4291	N	34.1669	-118.5303	246.318
EW4292	N	34.1675	-118.5322	242.688
EW4295	N	34.1708	-118.5394	242.611
EW4296	N	34.1714	-118.5419	243.423
EW4297	N	34.1719	-118.5436	243.171
EW4299	N	34.1725	-118.5494	242.639
EW4300	N	34.1731	-118.5514	240.772
EW4302	N	34.1731	-118.5550	241.978
EW4305	N	34.1722	-118.5614	254.469
EW4308	N	34.1719	-118.5678	253.442
EW4310	N	34.1700	-118.5742	271.714
EW4313	N	34.1681	-118.5800	289.383
EW4322	N	34.1675	-118.5944	274.619
EW4325	N	34.1678	-118.5964	273.815
EW4326	N	34.1681	-118.5989	273.324
EW4329	N	34.1683	-118.6014	271.651
EW4330	N	34.1686	-118.6028	272.331
EW4331	N	34.1686	-118.6050	272.612
EW4347	N	34.1353	-118.5981	433.869
EW4348	N	34.1378	-118.5997	452.174
EW4356	N	34.1425	-118.6044	395.086
EW4366	N	34.1472	-118.6044	330.544
EW4368	N	34.1522	-118.6044	302.732
EW4378	N	34.1619	-118.6047	281.273
EW4384	N	34.1753	-118.6047	263.525
EW4386	N	34.1775	-118.6042	260.799
EW4390	N	34.1828	-118.6050	250.476
EW4393	N	34.1906	-118.6050	244.946
EW4400	N	34.1972	-118.6053	242.506
EW4401	N	34.2011	-118.6053	244.112
EW4404	N	34.2047	-118.6053	245.595
EW4406	N	34.2083	-118.6053	248.591
EW4407	N	34.2156	-118.6053	253.099
EW4418	N	34.2322	-118.6025	271.863
EW4420	N	34.2356	-118.6042	272.793
EW4422	N	34.2383	-118.6053	274.731
EW4423	N	34.2408	-118.6053	276.918
EW4426	N	34.2431	-118.6061	276.832
EW4427	N	34.2450	-118.6064	290.397
EW4428	N	34.2475	-118.6053	285.877
EW4431	N	34.2500	-118.6056	285.474
EW4481	N	34.2225	-118.8750	238.009
EW4482	N	34.2256	-118.8750	239.295
EW4483	N	34.2272	-118.8683	251.134
EW4484	N	34.2303	-118.8694	263.915
EW4485	N	34.2336	-118.8642	282.167
EW4488	N	34.2406	-118.8614	202.295
EW4490	N	34.2456	-118.8675	166.690
EW4491	N	34.2494	-118.8653	196.162
EW4543	N	34.1928	-118.8928	218.374
EW4544	N	34.1989	-118.8892	233.809
EW4545	N	34.2056	-118.8850	224.156
EW4552	N	34.2636	-118.6428	436.537
EW4579	N	34.2897	-118.8294	196.929
EW4592	N	34.2711	-118.8719	189.459

EW4610	N	34.2856	-118.8803	156.748
EW4611	N	34.2903	-118.8819	178.595
EW4615	N	34.3153	-118.8789	278.929
EW4621	N	34.3194	-118.9017	286.391
EW4659	N	34.4103	-118.6714	274.247
EW4660	N	34.4086	-118.6753	268.786
EW4667	N	34.4061	-118.6917	262.752
EW4691	N	34.4067	-118.7547	226.456
EW4701	N	34.4169	-118.7889	214.476
EW4704	N	34.4119	-118.7936	207.368
EW4707	N	34.4061	-118.8094	191.059
EW4716	N	34.3964	-118.8400	172.074
EW4722	N	34.3936	-118.8789	148.371
EW4723	N	34.3936	-118.8842	143.378
EW4726	N	34.4000	-118.9008	146.384
EW4730	N	34.3986	-118.9122	143.757
EW4732	N	34.3994	-118.9178	139.728
EW4773	N	34.2678	-118.6053	302.705
EW4777	N	34.2608	-118.6053	297.080
EW4783	N	34.2556	-118.6053	292.174
EW4785	N	34.2575	-118.6056	294.795
EW4792	N	34.2569	-118.5961	298.778
EW4793	N	34.2572	-118.5939	298.163
EW4794	N	34.2569	-118.5917	297.418
EW4795	N	34.2572	-118.5894	294.319
EW4798	N	34.2569	-118.5831	290.272
EW4799	N	34.2569	-118.5831	290.105
EW4803	N	34.2569	-118.5717	291.769
EW4807	N	34.2567	-118.5639	293.377
EW4809	N	34.2572	-118.5586	297.673
EW4811	N	34.2569	-118.5544	293.429
EW4814	N	34.2572	-118.5436	294.859
EW4822	N	34.2572	-118.5303	299.887
EW4827	N	34.2569	-118.5144	295.577
EW4828	N	34.2572	-118.5119	293.509
EW4830	N	34.2572	-118.5100	292.004
EW4831	N	34.2572	-118.5058	290.129
EW4832	N	34.2572	-118.5036	289.075
EW4833	N	34.2572	-118.5019	286.206
EW4834	N	34.2583	-118.5014	285.779
EW4835	N	34.2606	-118.5014	288.661
EW4836	N	34.2608	-118.5014	288.842
EW4837	N	34.2617	-118.5014	289.902
EW4839	N	34.2647	-118.5011	292.434
EW4842	N	34.2717	-118.5014	301.915
EW4843	N	34.2722	-118.5014	302.289
EW4844	N	34.2756	-118.5014	310.740
EW4848	N	34.2806	-118.5008	324.930
EW4850	N	34.2867	-118.5008	333.592
EW4852	N	34.2869	-118.5008	343.753
EW4854	N	34.2967	-118.5014	377.957
EW4855	N	34.2992	-118.5017	389.208
EW4858	N	34.3061	-118.5006	387.412
EW4862	N	34.3092	-118.5014	393.509
EW4891	N	34.1225	-118.5911	342.626
EW4974	N	34.4403	-118.6050	309.785
EW4977	N	34.4339	-118.6178	303.970
EW5019	N	34.2514	-118.8514	191.075
EW6460	N	34.1242	-118.5978	389.328

EW6531	N	34.2925	-118.5011	364.394
EW6657	N	34.0711	-118.3361	70.186
EW6833	N	34.0419	-118.5700	6.853
EW6841	N	34.0064	-118.4869	12.055
EW6895	N	34.3989	-118.5369	364.112
EW6900	N	34.2722	-118.4275	316.237
EW6904	N	34.1194	-118.2525	127.769
EW6905	N	34.0978	-118.2319	108.136
EW6906	N	34.0533	-118.2431	90.037
EW6907	N	34.0247	-118.2578	67.066
EW6908	N	34.0181	-118.2625	63.973
EW6909	N	34.0114	-118.2642	60.054
EW6939	N	34.2875	-118.8172	205.735
EW6941	N	34.2719	-118.7431	276.233
EW6946	N	34.2431	-118.5964	284.140
EW6950	N	34.1714	-118.6053	268.325
EW6952	N	34.1256	-118.2519	137.220
EW6983	N	34.3758	-118.9989	119.993
EW6984	N	34.4058	-118.9272	132.554
EW6985	N	34.3953	-118.8453	166.861
EW6989	N	34.4381	-118.6094	307.365
EW7001	N	34.5742	-118.6675	881.555
EW7012	N	34.1869	-118.6050	246.753
EW7332	N	34.2917	-118.4872	396.029
EW7403	N	34.2786	-118.6692	381.162
EW7537	N	34.3878	-118.9975	216.039
EW7538	N	34.3878	-118.9978	220.278
EW7539	N	34.3875	-118.9978	217.267
EW7540	N	34.3878	-118.9978	221.866
EW9009	N	34.5272	-118.6414	545.554
EW9031	N	34.0869	-118.5997	225.975
EW9036	N	34.1014	-118.5917	264.499
EW9049	N	34.1625	-118.6056	281.519
EW9196	N	34.6347	-118.7575	673.756
EW9207	N	34.5936	-118.7194	852.799
EW9273	N	34.2075	-118.3514	224.961
EW9444	N	34.3850	-118.9750	139.461
EW9446	N	34.4047	-118.7008	255.496
EW9447	N	34.4058	-118.6919	261.897
EW9475	N	34.2714	-118.7317	284.473
EW9477	N	34.2714	-118.7269	287.696
EW9478	N	34.2717	-118.7083	295.072
EW9481	N	34.2603	-118.6622	330.163
EW9483	N	34.2653	-118.6353	470.035
EW9485	N	34.0042	-118.2639	55.718
EW9487	N	34.1300	-118.2628	135.654
EW9488	N	34.1375	-118.2664	139.351
EW9497	N	34.2692	-118.6331	478.305
EW9498	N	34.2747	-118.6253	453.721
EW9499	N	34.2764	-118.6169	425.593
EW9510	N	34.2767	-118.4322	319.802
EW9511	N	34.2700	-118.4250	313.765
EW9512	N	34.2242	-118.6058	258.782
EW9513	N	34.1939	-118.6053	243.395
EW9515	N	34.1219	-118.5942	362.124
EW9516	N	34.1181	-118.5911	309.853
EW9517	N	34.1069	-118.5908	274.010
EW9518	N	34.1017	-118.5914	264.658
EW9520	N	34.0506	-118.5800	39.609

EW9522	N	34.2767	-118.5975	367.502
EW9523	N	34.2750	-118.6036	360.656
EW9524	N	34.0444	-118.5786	22.624
EW9525	N	34.0400	-118.5750	8.236
EW9528	N	34.4400	-118.6028	309.904
EW9596	N	34.0342	-118.5328	6.620
EW9598	N	34.1953	-118.8847	243.481

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Co-Seismic Displacements of the 1994 Northridge, California, Earthquake

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Abstract The 17 January 1994 Northridge, California, earthquake significantly deformed the Earth's crust in the epicentral region. Displacements of 66 survey stations determined from Global Positioning System (GPS) observations collected before and after the earthquake show that individual stations were uplifted by up to 417 ± 5 mm and displaced horizontally by up to 216 ± 3 mm. Using these displacements, we estimate parameters of a uniform-slip model. Fault geometry and slip are estimated independent of seismological information, using Monte Carlo optimization techniques that minimize the model residuals. The plane that best fits the geodetic data lies 1 to 2 km above the plane indicated by aftershock seismicity. Modeling for distributed slip on a coplanar, yet larger model fault indicates that a high-slip patch occurred up-dip and northwest of the mainshock hypocenter and that less than 1 m of slip occurred in the uppermost 5 km of the crust. This finding is consistent with the lack of clear surface rupture and with the notion that the intersection with the fault that ruptured in 1971 formed the up-dip terminus of slip in the Northridge earthquake. Displacements predicted by either of these simple models explain most of the variance in the data within 50 km of the epicenter. On average, however, the scatter of the residuals is twice the data uncertainties, and in some areas, there is significant systematic misfit to either model. The co-seismic contributions of aftershocks are insufficient to explain this mismatch, indicating that the source geometry is more complicated than a single rectangular plane.

Introduction

The M_w = 6.7 17 January 1994 Northridge earthquake (USGS and SCEC, 1994) produced measurable co-seismic displacements over a large area (approximately 4000 km²) including much of the San Fernando Valley and adjacent mountainous areas. Over the region of largest slip on the fault plane, the Earth's surface was pressed into an asymmetric dome-shaped uplift, skewed toward the NNE. Over the uplifted region, the largest horizontal displacements also occurred, with displacement outward from the apex of the dome. The significant NNE-oriented shortening at the NNE and SSW margins of the domed area indicate the net compression that occurred between the hanging wall and footwall of the thrust fault that ruptured.

We have used Global Positioning System (GPS) geodetic data to quantify the static displacement field associated with the earthquake and its aftershocks. In this study, we sampled the displacement field at 66 stations (documented in Tables 1 and A1) with GPS-derived vectors measured with 1-sigma errors ranging 3 to 42 mm (east–west), 3 to 25 mm (north–south), and 3 to 90 mm (vertical). Our estimates are based on station positions measured within 15 months prior to and 1 month following the earthquake. In our analysis, we corrected for secular velocities at all of the stations by spatially interpolating between velocities estimated previously for 15 stations, using measurements spanning 5 or more years.

From the set of co-seismic displacement vectors we determined, we modeled the earthquake source using previously established methods based on the elastic dislocation theory. First, we estimated the dislocation source that could best explain the geodetic data with a single uniform-slip dislocation following the nonlinear optimization approach of Murray *et al.* (1994) and using a single rectangular dislocation in a homogeneous half-space. We then estimated the spatial distribution of slip on a larger (yet coplanar) fault surface following the singular value decomposition inversion approach implemented by Larsen (1991). This modeling is secondary to the data portions of this article and should be viewed in the context of other studies of the earthquake's source (Wald and Heaton, 1994b; Dreger, 1994; Shen *et al.*, this issue; Wald *et al.*, this issue). The models presented here interpret these GPS data independent of other information. Wald *et al.* (this issue) combine these GPS results with other data to estimate a more comprehensive source model.

Table 1

GPS Displacements and Model Residuals (displacements and residuals are in millimeters; errors are 1-sigma; component and vector "nres" values are normalized residuals)

Station ID	East	E_err	Uniform		Variable		North	N_err	Uniform		Variable		Correl. NE	Up	U_err	Uniform		Variable		Uniform NRES	Variable NRES
			E_res	E_nres	E_res	E_nres			N_res	N_nres	N_res	N_nres				U_res	U_nres	U_res	U_nres		
0094	39.8	4.9	10.7	2.18	11.1	2.27	56.2	5.6	19.1	3.41	16.4	2.93	−0.124	−32.8	32.0	−19.8	0.62	−23.7	0.74	2.37	2.18
0141	−14.8	19.8	10.1	0.51	12.6	0.64	−39.0	8.9	5.8	0.65	9.5	1.07	0.457	−51.0	48.7	−40.3	0.83	−38.5	0.79	0.68	0.85
0618	−5.7	3.9	−7.2	1.85	−6.6	1.69	−0.2	4.2	6.2	1.48	8.2	1.95	−0.121	7.1	19.4	8.0	0.41	8.0	0.41	1.39	1.51
0701	−1.9	3.5	0.7	0.20	2.7	0.77	25.8	3.7	1.6	0.43	0.7	0.19	−0.014	3.3	13.8	9.4	0.68	9.0	0.65	0.48	0.59
0702	−0.1	3.5	−2.5	0.71	−2.3	0.66	2.0	3.8	1.2	0.32	2.3	0.61	0.064	−23.4	14.6	−20.6	1.41	−20.5	1.40	0.93	0.96
0703	21.7	4.2	7.7	1.83	8.4	2.00	25.6	4.0	10.7	2.67	10.7	2.67	0.118	−11.1	16.0	−7.9	0.49	−8.7	0.54	1.89	1.95
0704	−31.5	3.1	−19.9	6.42	−9.4	3.03	−58.0	3.1	−18.2	5.87	2.2	0.71	−0.090	14.0	6.1	23.1	3.79	24.4	4.00	5.48	2.93
0705	13.5	4.5	15.3	3.40	16.5	3.67	0.6	4.2	2.2	0.52	3.7	0.88	0.098	−46.8	19.4	−45.8	2.36	−45.7	2.36	2.41	2.57
07CG	−0.8	4.9	0.6	0.12	2.7	0.55	28.2	5.8	2.8	0.48	0.3	0.05	−0.050	−8.7	34.1	−4.3	0.13	−3.7	0.11	0.30	0.33
07CI	2.4	20.1	2.1	0.10	2.5	0.12	9.5	9.5	3.7	0.39	4.7	0.49	0.423	−62.1	54.2	−59.2	1.09	−59.3	1.09	0.67	0.70
07DI	7.4	19.3	4.2	0.22	3.5	0.18	5.5	8.1	3.2	0.40	4.8	0.59	0.523	5.7	46.9	9.4	0.20	9.0	0.19	0.28	0.37
07EH	−5.7	27.8	−15.4	0.55	−17.6	0.63	3.1	19.2	5.2	0.27	6.5	0.34	0.630	−91.8	67.7	−87.9	1.30	−88.9	1.31	0.83	0.86
07FI	−4.4	5.0	−0.1	0.02	1.7	0.34	−7.6	5.1	−2.3	0.45	−0.1	0.02	−0.281	5.2	24.2	8.7	0.36	9.2	0.38	0.33	0.29
1201	3.4	3.6	3.5	0.97	4.4	1.22	2.9	3.6	−2.3	0.64	−1.8	0.50	0.042	−22.0	13.1	−20.8	1.59	−20.7	1.58	1.14	1.19
2131	6.1	3.7	4.1	1.11	4.7	1.27	−20.1	3.5	−1.5	0.43	3.1	0.89	−0.279	−20.0	11.9	−16.0	1.34	−15.7	1.32	1.04	1.17
56_Z	−5.5	29.6	−4.8	0.16	−3.9	0.13	2.2	8.2	−6.1	0.74	−5.7	0.70	0.370	80.6	73.5	82.8	1.13	82.9	1.13	0.79	0.77
ALPN	−14.0	32.7	−5.7	0.17	−3.8	0.12	−3.7	19.6	5.7	0.29	8.5	0.43	0.539	−21.8	72.6	−20.2	0.28	−20.0	0.28	0.25	0.30
BREN	−5.2	3.5	−3.5	1.00	0.3	0.09	42.3	3.4	1.1	0.32	−3.5	1.03	−0.047	−35.9	10.5	−25.0	2.38	−24.2	2.30	1.50	1.46
BURB	9.7	4.0	−4.3	1.07	−10.4	2.60	3.7	4.3	4.2	0.98	8.2	1.91	−0.105	−72.4	20.0	−70.3	3.52	−77.8	3.89	2.20	2.92
CAHA	8.2	3.7	−3.3	0.89	−8.7	2.35	9.4	4.0	8.6	2.15	12.5	3.12	0.009	6.2	17.2	9.1	0.53	2.7	0.16	1.38	2.26
CALA	41.2	3.1	11.0	3.55	9.6	3.10	78.8	3.1	8.7	2.81	0.0	0.00	−0.047	−2.6	5.7	19.4	3.40	28.5	5.00	3.27	3.40
CATO	30.8	3.2	3.2	1.00	1.4	0.44	45.7	3.2	8.1	2.53	5.1	1.59	0.043	−10.0	7.5	−0.4	0.05	−0.1	0.01	2.72	1.65
CHAT	−110.0	3.3	−22.3	6.76	−8.9	2.70	35.7	3.2	27.1	8.47	6.9	2.16	−0.035	154.0	8.2	−33.1	4.04	−39.7	4.84	6.68	3.43
CHRN	−96.0	5.0	13.5	2.70	−6.6	1.32	47.6	5.3	21.7	4.09	−21.3	4.02	−0.215	134.7	26.4	−4.2	0.16	1.1	0.04	2.83	2.44
DUMP	46.6	11.4	25.9	2.27	24.1	2.11	46.7	6.3	16.3	2.59	13.4	2.13	0.467	−22.7	36.9	−17.1	0.46	−16.7	0.45	2.01	1.75
GLEN	9.1	3.5	−3.8	1.09	−8.8	2.51	−8.6	3.4	−6.9	2.03	−4.3	1.26	−0.226	−5.6	12.8	−2.5	0.20	−6.5	0.51	1.33	1.65
HAP2	−20.7	3.1	−9.2	2.97	−5.0	1.61	13.4	3.1	7.1	2.29	4.5	1.45	0.005	12.7	6.3	15.3	2.43	11.7	1.86	2.58	1.65
HAPY	−42.6	3.2	−26.8	8.38	−23.6	7.37	22.3	3.2	14.8	4.62	12.2	3.81	0.101	12.7	7.9	14.4	1.82	11.7	1.48	5.62	4.87
HOPP	−17.5	3.2	−13.0	4.06	−11.7	3.66	6.3	3.2	6.1	1.91	7.1	2.22	0.148	15.1	7.3	19.0	2.60	19.5	2.67	3.00	2.91
JPLM	6.6	3.0	−0.3	0.10	−1.5	0.50	−7.3	3.0	−5.9	1.97	−4.6	1.53	−0.027	−1.8	3.1	2.2	0.71	1.9	0.61	1.21	1.00
LOVE	−84.6	3.1	−85.2	27.48	−84.3	27.19	−44.7	3.1	−19.8	6.39	−10.2	3.29	−0.022	−68.8	5.5	−61.6	11.20	−60.3	10.96	17.53	17.03
MALI	31.4	4.5	7.9	1.76	4.8	1.07	59.2	5.2	6.8	1.31	−1.8	0.35	−0.074	−18.5	30.9	−6.6	0.21	−2.8	0.09	1.27	0.65
MAND	2.9	3.5	2.3	0.66	7.2	2.06	57.5	3.7	9.4	2.54	2.3	0.62	−0.006	−17.7	13.9	−3.9	0.28	−2.5	0.18	1.52	1.25
MAYO	12.6	3.7	−1.7	0.46	−1.0	0.27	5.9	4.0	13.9	3.47	0.6	0.15	−0.050	5.3	17.0	−2.9	0.17	−6.1	0.36	2.03	0.27
MLND	6.8	4.7	1.5	0.32	6.9	1.47	33.6	5.5	2.1	0.38	−2.6	0.47	−0.021	3.6	31.0	9.4	0.30	4.5	0.15	0.34	0.89
MULH	6.1	3.4	−6.0	1.76	−3.5	1.03	64.1	3.3	−1.4	0.42	−14.3	4.33	−0.054	−18.8	9.8	−1.9	0.19	9.5	0.97	1.05	2.63
NEWH	−98.6	13.7	−91.2	6.66	−65.6	4.79	47.3	6.5	−6.9	1.06	−18.3	2.82	0.479	249.8	32.5	179.9	5.54	153.5	4.72	5.04	4.21
NIKE	1.7	3.5	−4.5	1.29	1.4	0.40	59.9	3.5	13.6	3.89	3.4	0.97	−0.017	−39.0	11.8	−29.6	2.51	−26.7	2.26	2.77	1.44
NORT	34.8	3.3	4.8	1.45	5.0	1.52	−58.8	3.3	−19.4	5.88	1.1	0.33	−0.338	213.2	8.1	−40.2	4.96	−38.0	4.69	4.52	2.85
N_49	9.3	34.4	6.1	0.18	9.1	0.26	55.0	24.5	1.2	0.05	−8.0	0.33	0.710	−29.2	87.5	−15.9	0.18	−11.8	0.13	0.15	0.25
OJAI	−0.8	5.0	−0.1	0.02	1.3	0.26	−1.1	7.2	−2.7	0.38	−1.9	0.26	−0.260	−34.2	35.9	−31.8	0.89	−31.7	0.88	0.56	0.55
PACO	86.5	3.2	0.5	0.16	−3.9	1.22	−13.4	3.1	−1.5	0.48	−2.7	0.87	−0.032	64.2	6.5	16.1	2.48	−8.4	1.29	1.46	1.14
PARK	−5.2	3.4	7.1	2.09	9.5	2.79	−18.9	3.4	−5.0	1.47	−1.6	0.47	0.074	−32.9	10.2	−29.1	2.85	−28.4	2.78	2.21	2.29

Table 1
Continued

Station ID	East	E_err	Uniform		Variable		North	N_err	Uniform		Variable		Correl. NE	Up	U_err	Uniform		Variable		Uniform NRES	Variable NRES
			E_res	E_nres	E_res	E_nres			N_res	N_nres	N_res	N_nres				U_res	U_nres	U_res	U_nres		
PEAR	12.5	3.2	16.2	5.06	17.7	5.53	4.4	3.2	8.0	2.50	9.8	3.06	0.095	−13.7	7.2	−12.5	1.74	−12.3	1.71	3.41	3.78
PELN	−14.9	27.3	0.7	0.03	3.2	0.12	−35.0	19.2	−4.8	0.25	0.0	0.00	0.619	37.2	69.4	40.9	0.59	41.4	0.60	0.37	0.35
PICO	−116.2	3.2	15.0	4.69	12.8	4.00	162.2	3.1	−4.4	1.42	0.0	0.00	0.029	388.5	6.7	−21.3	3.18	−16.6	2.48	3.37	2.72
PVEP	−1.8	3.0	−1.9	0.63	−0.6	0.20	14.1	3.0	−0.2	0.07	−1.3	0.43	−0.002	0.9	3.1	2.0	0.65	2.2	0.71	0.52	0.49
PVER	5.3	3.4	5.2	1.53	6.5	1.91	19.6	3.5	5.3	1.51	4.2	1.20	0.030	34.7	12.2	35.8	2.93	36.0	2.95	2.10	2.14
RESE	196.8	3.2	−11.6	3.62	0.1	0.03	−5.7	3.2	−19.7	6.16	0.5	0.16	−0.323	333.0	7.2	−21.7	3.01	−7.0	0.97	4.48	0.57
SAFE	−141.4	3.1	−9.6	3.10	−11.9	3.84	163.0	3.1	−3.2	1.03	1.0	0.32	0.004	416.6	5.0	5.6	1.12	10.2	2.04	1.99	2.52
SAFR	−130.1	3.4	1.7	0.50	−0.8	0.24	161.5	3.4	−4.7	1.38	−0.8	0.24	−0.032	393.7	10.5	−16.8	1.60	−11.3	1.08	1.25	0.65
SATI	76.2	3.2	13.6	4.25	12.7	3.97	−27.2	3.3	−7.0	2.12	−11.0	3.33	0.033	47.0	8.5	6.3	0.74	−24.4	2.87	2.78	3.42
SNPA	−13.1	3.2	−9.1	2.84	−6.7	2.09	4.9	3.3	2.0	0.61	2.0	0.61	0.112	−8.9	8.5	−5.3	0.62	−5.7	0.67	1.72	1.32
SPHI	−3.8	3.7	−3.1	0.84	−1.7	0.46	16.1	3.9	2.2	0.56	1.4	0.36	−0.100	−9.2	16.5	−7.6	0.46	−7.4	0.45	0.64	0.42
TUNA	36.0	3.2	21.7	6.78	21.9	6.84	83.4	3.1	15.0	4.84	2.0	0.65	−0.010	−27.3	7.0	−8.4	1.20	−0.4	0.06	4.86	3.97
U145	−53.4	5.0	−28.2	5.64	−18.3	3.66	10.8	4.9	−4.5	0.92	−9.9	2.02	−0.135	39.8	23.0	31.7	1.38	30.4	1.32	3.39	2.53
UCLA	−4.3	3.4	−2.6	0.76	0.3	0.09	50.7	3.4	20.0	5.88	19.0	5.59	−0.009	−29.0	11.0	−19.8	1.80	−22.3	2.03	3.58	3.43
USC2	4.4	4.8	4.1	0.85	3.9	0.81	17.7	5.7	8.7	1.53	10.3	1.81	−0.083	−27.5	32.5	−23.2	0.71	−24.2	0.74	1.09	1.22
VDGO	16.8	3.8	−0.6	0.16	−5.7	1.50	−5.0	4.0	−1.2	0.30	0.2	0.05	0.037	−23.9	18.1	−21.8	1.20	−25.3	1.40	0.72	1.18
VENI	6.4	3.8	8.7	2.29	11.0	2.89	27.1	4.0	1.1	0.27	−0.7	0.18	0.024	−22.3	17.9	−16.7	0.93	−16.4	0.92	1.44	1.76
W304	−0.6	4.9	−0.9	0.18	1.5	0.31	16.7	6.9	13.9	2.01	14.3	2.07	−0.196	−13.9	30.2	−11.0	0.36	−11.4	0.38	1.19	1.23
WARN	32.4	41.2	30.5	0.74	31.1	0.75	−4.5	18.4	6.3	0.34	9.1	0.49	0.342	0.1	88.3	2.1	0.02	2.2	0.02	0.47	0.52
WBCH	4.5	3.8	5.7	1.50	7.4	1.95	17.5	4.1	−1.7	0.41	−3.2	0.78	−0.010	−38.5	19.1	−35.6	1.86	−35.3	1.85	1.40	1.61
WHIT	−18.4	3.3	−20.2	6.12	−19.7	5.97	−21.9	3.3	−6.8	2.06	−2.7	0.82	0.054	−8.5	9.1	−4.4	0.48	−3.8	0.42	3.74	3.49
Z370	2.1	27.2	1.0	0.04	2.1	0.08	−37.5	19.2	−8.2	0.43	−0.3	0.02	0.589	0.1	71.0	6.2	0.09	6.6	0.09	0.25	0.07
Z786	50.1	17.2	3.7	0.22	−7.1	0.41	−3.6	5.7	7.7	1.35	8.9	1.56	0.160	20.9	26.0	6.0	0.23	−12.7	0.49	0.80	0.97

All Data:

	East	North	Up
Mean of ERR:	7.9	5.8	23.4
Std. Dev. of ERR:	9.2	4.8	21.6

All Data:

	Uniform	Variable	Uniform	Variable	Uniform	Variable	Uniform	Variable
Mean of NRES:	2.32	2.15	1.85	1.25	1.50	1.48	2.18	1.92
Standard deviation of NRES:	3.77	3.57	1.88	1.24	1.75	1.75	2.44	2.21
Excluding Station LOVE:								
Mean of NRES:	1.93	1.76	1.78	1.21	1.35	1.34	1.94	1.69
Standard deviation of NRES:	2.10	1.73	1.81	1.23	1.27	1.30	1.52	1.16

Note: For this analysis, the global stations ALGO, FAIR, KOKB, MADR, HART, YELL, YAR1, KOSG, TROM, WETT, SANT, TIDB, and DS1B were constrained to their ITRF'93 positions.

Data and Analysis

The GPS data used for our analysis were obtained in field surveys between October 1992 and February 1994 and from continuous observations at stations of the southern California permanent GPS geodetic array (PGGA) (Bock, 1993b) and the global tracking network overseen by the International GPS Service for Geodynamics (IGS) (Beutler and Brockmann, 1993). The accuracy with which a station's position can be estimated from each field survey is generally 5 to 15 mm for the horizontal coordinates and 10 to 30 mm for height (see Table 1, error columns), depending primarily on the number of days that station was observed and the length of each observation session. Most of the pre-earthquake and postearthquake data are from four distinct field projects, each of which has a different history of observations that is documented in Table A2 and Figure A1. A total of 534 occupations of 66 survey stations were made during 92 field sessions. These data were combined with global and regional continuously recorded GPS data covering 24 hours on the day of each field session.

We analyzed the data in two steps. In the first step, we used the GPS phase and pseudorange measurements to estimate station coordinates, satellite orbital parameters, and atmospheric delay corrections for each day of observation. For this step, we loosely constrained the coordinates and velocities of regional and global stations. In the second step, we combined the estimates and their covariance matrices from all of the days, applying position and velocity constraints to 13 globally distributed stations (listed in Table 1) to obtain a consistent solution for displacements at the epoch of the earthquake. For all of the experiments, we resolved integer-cycle ambiguities in the phase observations using the iterative technique described by Feigl *et al.* (1993). The two-step approach allowed us to distribute both the processing of the raw GPS observations and the combination of solutions among several groups, encouraging redundant and progressively improved analyses (see Table A2).

Figures 1 and 2 and Table 1 show our estimates of displacements for 66 GPS monuments within about 75 km of the Northridge epicenter. The uncertainties given in Table 1 and plotted in Figures 1 and 2 represent our best estimate of the 1-sigma error for each value or vector. These cannot be rigorously computed from the uncertainty in the GPS phase measurements because the error spectrum of these measurements is poorly understood. Rather, they are based on studies of short- and long-term repeatabilities for a subset of station position estimates from this analysis and the set for southern California between 1986 and 1992 (Feigl *et al.*, 1993). These studies suggest that for short observation sessions (<5 hr), the formal uncertainties are roughly consistent with long-term repeatability; for longer single-day sessions (5 to 8 hr), the formal uncertainties should be increased by a factor of 2 to 3; and for sessions of 24 hr or more, the appropriate scale factor is 3 to 4. Since the present analysis includes data from observation sessions ranging from 2 to 24 hr, a simple scaling of the formal uncertainties to achieve a chi-square of unity for the long-term scatter of estimates is inappropriate. The simplest approach, which we have adopted, is to add a constant value ([3 mm]^2) to the variance estimated for each coordinate in the solution.

We are able to check the validity of our weighting by examining the estimated displacements of stations sufficiently far from the epicenter that we expect small errors in their modeled displacements. If we adopt the arbitrary criteria that these stations should have model-predicted displacements less than 10 mm in all components, and estimated uncertainties less than 10 mm in the horizontal and 40 mm in the vertical components, then 12 stations are available for analysis. One of these stations, HOPP, has a 4-sigma residual in its east component (-13 ± 3 mm), a result that may be related to unmodeled motion on a second fault plane (discussed below). A second station, PEAR, has a 5-sigma residual in the east (16 ± 3 mm) that is not yet understood. For the remaining 10 stations (whose names are italicized in Table 1), the values of the square root of the reduced chi-square (nrms) for the east, north, and vertical residuals are 1.5, 1.0, and 1.2, respectively. From this we conclude that the uncertainties given in Table 1 are reasonable estimates of the 1-sigma errors for most stations.

Another concern arises from the small number of independent measurements for many stations (Fig. A1). For monuments with only one or two measurements in either the period before or after the earthquake, there is significant chance of undetected error. Such an error could arise in either the observations (e.g., by receiver malfunction, by improperly positioning the antenna over the survey monument, or by mis-measuring the antenna height) or the analysis (e.g., improperly repairing cycle slips).

All pre-earthquake data we used were collected within 15 months of the earthquake. Since the relative interseismic motions of most of the stations are small or well known, there is little error introduced by mismodeling these motions. The assumed velocities for the stations involved in this study (Table A1) were interpolated using 15 well-determined secular velocities and a simple model for slip on the San Andreas fault system (Feigl *et al.*, 1993). We believe that the velocity errors for the stations we used are less than 3 mm/yr.

Modeling

We used two methods to model the measured displacements. First, we applied an extension of the Monte Carlo technique following Murray *et al.* (1994), an approach that is well suited to finding the single-dislocation model that best fits the geodetic data and that is independent of seismological and geological information. To the extent that the inherent simplifying assumptions are valid, the result of this method points out that the geodetic data are best fit by slip on a plane that lies 1 to 2 km above the aftershock plane, northwest and up-dip of the mainshock hypocenter. Second, by inversion of the displacement data, we estimated variable

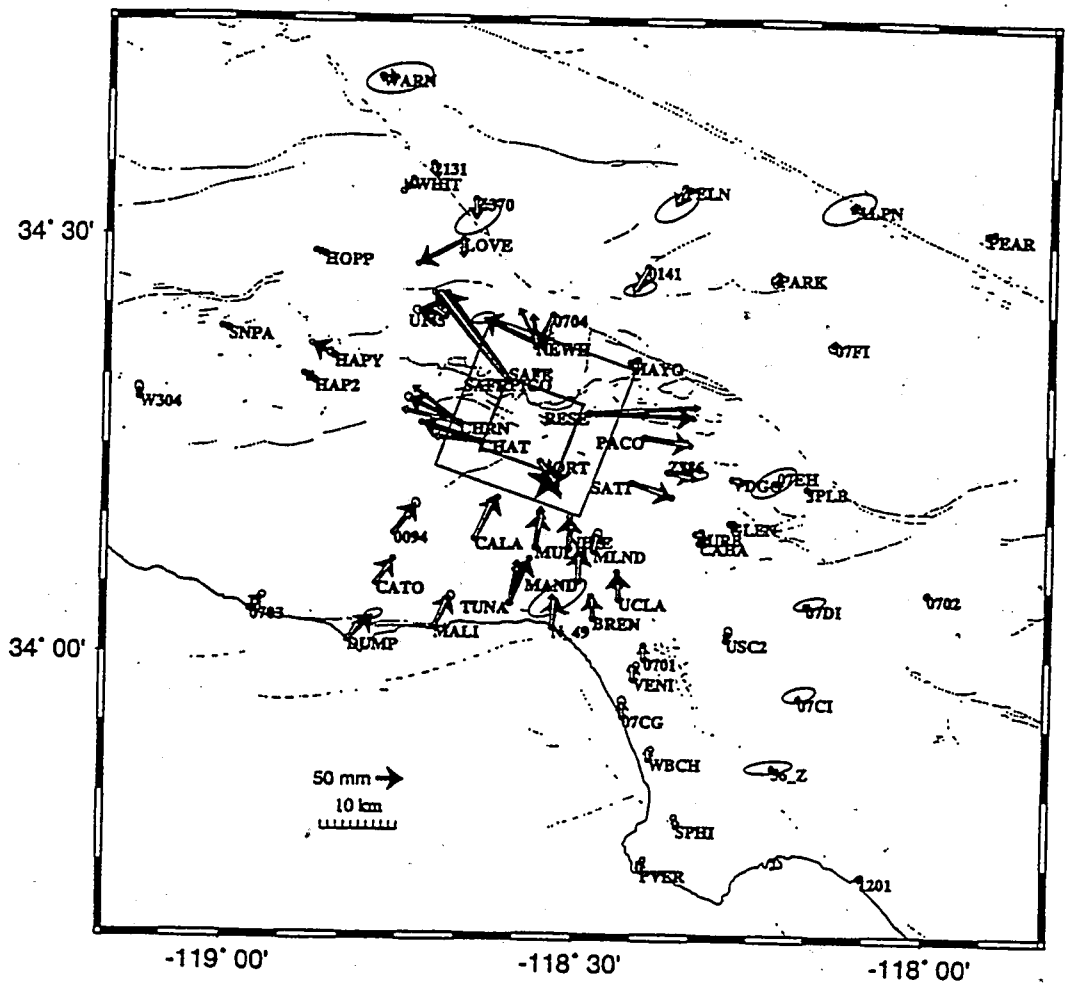


Figure 1. Measured displacements associated with the Northridge earthquake. Station locations are indicated by gray circles (and identified by a 4-character I.D. for reference to the tables). Horizontal displacement is shown by a heavy black vector and corresponding 1-sigma ellipse. Uniform-slip model vectors are shown in white; variable slip model is shown in gray.

slip on an enlarged and coplanar model fault plane. Neither approach led to statistically adequate fits to the GPS data, yet we limited ourselves to this class of models for the sake of simplicity. Also, because we had no unambiguous, objective basis to discard outliers, all of the GPS measurements were included in both modeling approaches, despite our recognition that certain stations clearly could not be fit well with these simple source models.

Both approaches are based on the elastic dislocation theory, which can be used to compute the displacements at a given point on the ground surface from a slip distribution model (e.g., Steketee, 1958; Chinnery, 1961; Savage and Hastie, 1966; Mansinha and Smylie, 1971; Okada, 1985). Both our forward and inverse modeling approaches incorporated a combination of algorithms from these references. The model geometry is displayed in Figures 1, 2 and 3, where we indicate the map view and cross-section geometry of the model fault surfaces. Modeled displacements are shown in Figures 1 and 2, and the residuals between the observations and each of the two models are given in Table 1 and Figure 7.

Nonlinear Optimization Method

We first estimated the best model with uniform slip on a single rectangular fault. This simple model is described by nine parameters that give the location, orientation, and dimensions of the dislocation plane, as well as the slip vector on that plane (see Table 2). We used nonlinear optimization methods, based on extensions of the Monte Carlo technique, to randomly vary the fault geometry and estimate the slip vector until the model with the smallest sum-squared residuals (χ^2) was found. This method provides a fault model that, on average, shows where the slip is concentrated at depth, but the assumption of uniform slip on a simple rectangle is clearly an oversimplification of the actual slip distribution.

We used the following procedures and assumptions,

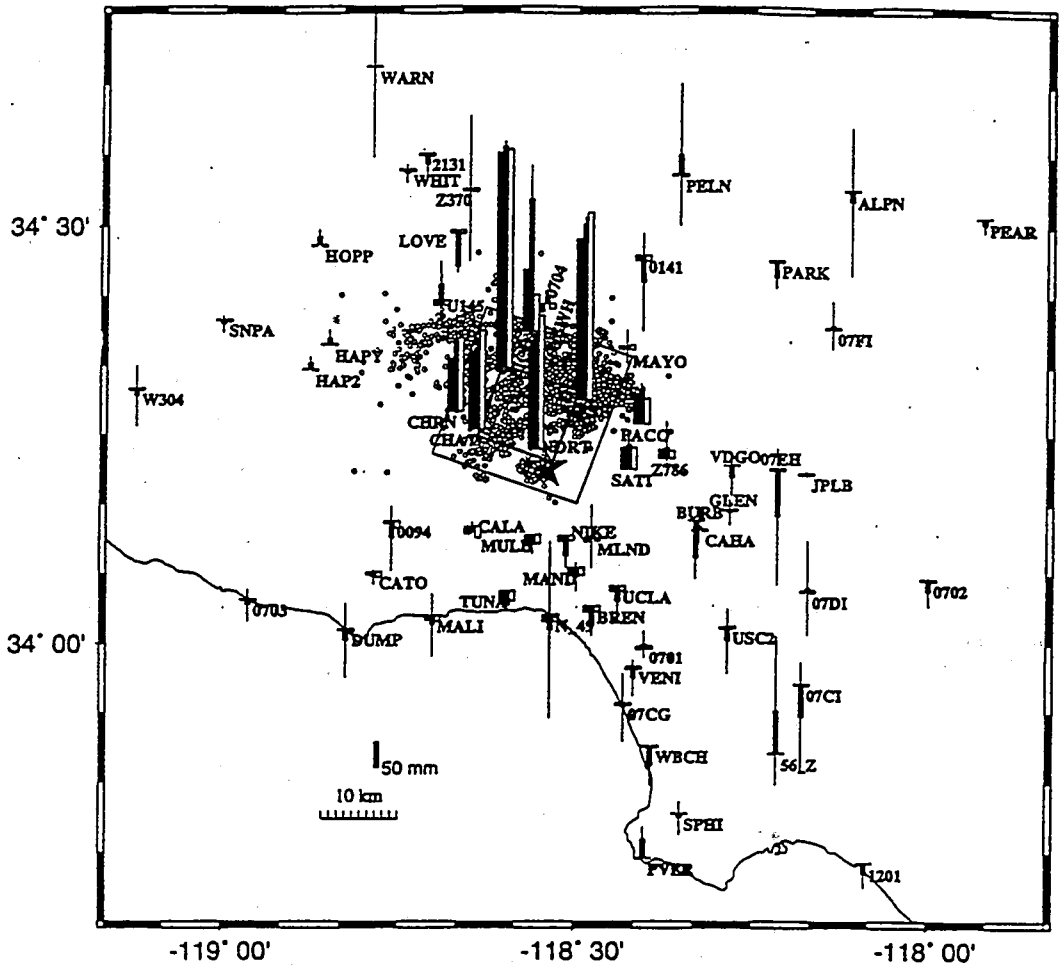


Figure 2. Measured and modeled vertical displacements at the GPS stations. Measured vertical displacements are shown by the central black column at each station, and the 1-sigma error is indicated by a vertical line. Uniform-slip model columns are shown in white; variable slip model is shown in gray.

Table 2
Model Parameters for Optimal Single-Dislocation Source Model and Its 95% Confidence Limits

Parameter	Optimal Model	95% Range	
		Low	High
Strike (deg)	109.56	100.53	118.77
Dip (deg)	40.96	38.17	43.65
Width (km)	13.28	9.35	17.12
Length (km)	10.51	6.28	13.11
Centroid depth (km)	10.07	9.00	11.34
Centroid latitude (deg)	34.2753	34.2647	34.2834
Centroid longitude (deg)	−118.5674	−118.5605	−118.5762
Slip magnitude (m)	2.50	1.91	4.40
Slip rake (deg)	91.3	84.1	97.2
Moment (N-m)	1.05×10^{19}	0.93×10^{19}	1.19×10^{19}

based on Murray *et al.* (1994). Slip was assumed to be uniform on a single rectangular fault, with its top edge parallel to the Earth's surface and embedded in a homogeneous isotropic elastic half-space with rigidity = 30 GPa. The projection was polyconic, with east-north correlations neglected. While the modeling procedure could be improved mathematically by including the correlations, which are available from the GPS data analysis (Table 1), such a change would be unlikely to cause substantive changes in our results.

For the optimal model, $\chi^2 = 2082$ (with 198 data and estimating nine parameters), yielding an nrms residual of 3.32. To assess uncertainties in the model, we compared trial models to the optimal model using an F-ratio test (Draper and Smith, 1981). Table 2 gives the parameters for the optimal model (and its 95% confidence limits), and Table 1 and Figure 6 show the distribution of normalized residual values. We believe that the large nrms residual results primarily from using too simple a model and not necessarily from an underestimate of uncertainties in the displacements,

as discussed below. Nevertheless, this model explains 95% of the variance in the GPS data (for the null model, i.e., no deformation, $\chi^2 = 41{,}600$).

The plane estimated by this approach dips toward the SSW and indicates that the main slip concentration occurred up-dip and toward the northwest of the mainshock hypocenter. This plane is evidently not coplanar with the aftershocks. Figure 3 shows the model plane plotted in cross section with respect to relocated aftershocks from Mori *et al.* (1995). The model plane is nearly parallel to the seismicity plane, lying 1 to 2 km above it. At the hypocenter, the vertical distance from the hypocenter to the (projected) model plane is about 2 km, considerably greater than the stated error in hypocentral depth of 0.4 km. One possible explanation that has not yet been evaluated is that the hypocenter determination and GPS-based modeling approaches have different datums, causing a shift in apparent depth that is due mainly to differences in methods. However, it seems highly unlikely that so large a shift could occur from that alone. More importantly, our assumption of a uniform Poisson solid for the physical model may introduce inaccuracy. A similar discrepancy has been observed and discussed elsewhere (e.g., Ekstrom *et al.*, 1992; Stein and Ekstrom, 1992), in which case it was attributed to assuming a half-space in the presence of variable crustal rigidity surrounding the modeled fault. This possibility is also noted by Shen *et al.* (this issue) and treated in more detail there.

Singular Value Decomposition Inversion Method

To solve for the slip distribution on an assumed fault plane, we applied singular value decomposition (SVD) (e.g., Jackson, 1972; Menke, 1989). SVD is a matrix decomposition technique used to estimate parameters when the model space is poorly constrained by the data. This approach is often used in geodetic inversions for fault slip, since the data must be obtained at the surface and, therefore, poorly resolve slip at depth (Harris and Segall, 1987; Segall and Harris, 1987; Freymueller *et al.*, 1994; Hudnut and Larsen, 1993). The technique is equivalent to least squares when the number of singular values equals the number of unknown parameters. Using a lower number of singular values means that only those parts of the model that are well mapped by the data will be estimated.

This modeling approach assumes a fault geometry. We assumed the model fault to be coplanar with that estimated by our nonlinear optimization approach (Fig. 3). We roughly doubled the length and width dimensions and extended the model plane up-dip; we used the strike, dip, and location of the optimal plane (Table 2). We assumed the fault plane to be 20 by 26 km and specified it to be composed of 130 subfaults, each 2 by 2 km. The model fault plane extends to within 1 km of the ground surface, and the center point of this plane is located at a depth of 9.86 km. We inverted the GPS estimates of displacement vector components and their associated errors (from Table 1) to estimate the thrust and strike-slip components of slip on each subfault, as described by Larsen (1991) and Hudnut and Larsen (1993). The number of parameters estimated was 260, and the number of data was 198 (each displacement vector contains three components).

We employed no positivity or slip constraints, nor smoothing apart from that which occurs inherently in the SVD method of inversion. In SVD, when the eigenvalue matrix is truncated, a form of smoothing is implemented. In this case, the number of singular values chosen was 23, because this solution was within the range of most reasonable solu-

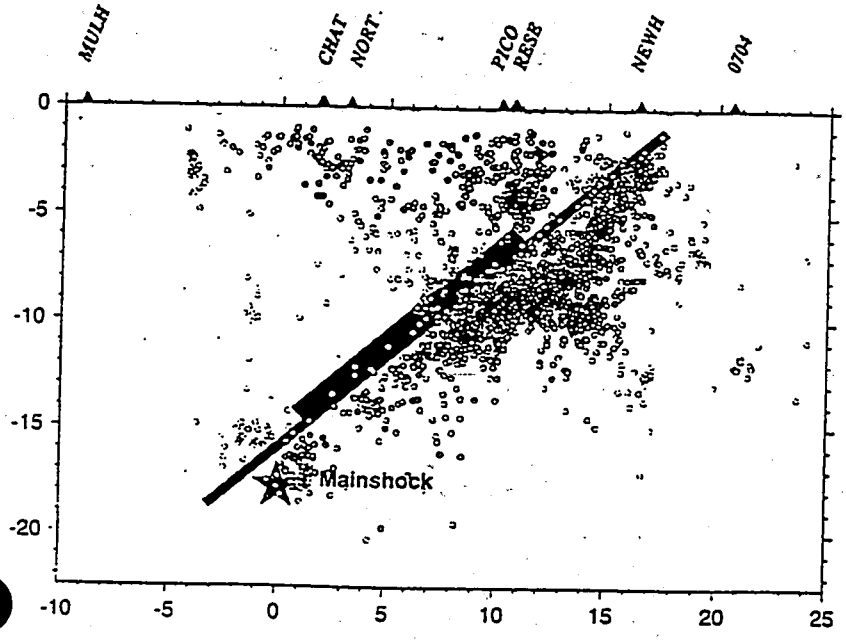


Figure 3. Cross section showing the model fault planes overlain on the aftershocks relocated by Mori *et al.* (1995). We find that one cannot model the geodetic data as well when assuming the fault plane is coplanar with the aftershocks. The uniform slip model plane is shown as a thick gray line, and the larger coplanar fault assumed for the variable slip model is shown as a thinner black line.

tions, obtaining a total moment of 1.63×10^{19} N-m and fitting the GPS data relatively well ($\chi^2 = 1681$). Other solutions at higher and lower singular values yielded qualitatively similar slip distributions in the range $18 < k < 25$, where k is the number of singular values. Within this "stable" range, the total moment increased from 1.55 to 1.71×10^{19} N-m, and the data nrms decreased slightly. Although a more rigorous selection of the optimal result from this approach is possible using an F-test (Jacobsen and Shaw, 1991), we made our selection by inspection. It is valid, yet somewhat subjective, to select the number of singular values retained in this manner (e.g., Parker, 1977). Figure 4 shows the changes in key parameters with increasing number of singular values, allowing our selection to be evaluated. The additional parameter shown (subfault nrms) indicates dispersion in the amount of slip on each subfault.

As expected, the variable slip model does fit the data better than the uniform slip model, with a 40% reduction in variance. For this variable slip model (Fig. 5), we effectively estimated 23 parameters, whereas the uniform slip model has only 9. Taking this into account, we still find that the variable slip model (nrms = 3.10) fits the data better than does the uniform slip model (nrms = 3.32). Both models explain 95% or more of the variance, but neither provides a statistically satisfactory fit to the data. Using a less stringent norm, say by doubling all of the stated errors, one could claim that either model fits the data adequately, but we do not feel this would do justice to the problem. In one test, we doubled the stated vertical errors (but kept the horizontal errors the same) and reran the variable slip model. The result of this test, however, was a barely reduced total nrms within the "stable" range of singular values, at the expense of a considerably higher total moment and subfault nrms. That is, loosening the error constraints made the model less physically reasonable. For these reasons, we feel this issue requires discussion, as there are many possible sources of the misfit, and simply doubling the stated errors would not explain the recognized and suspected problems.

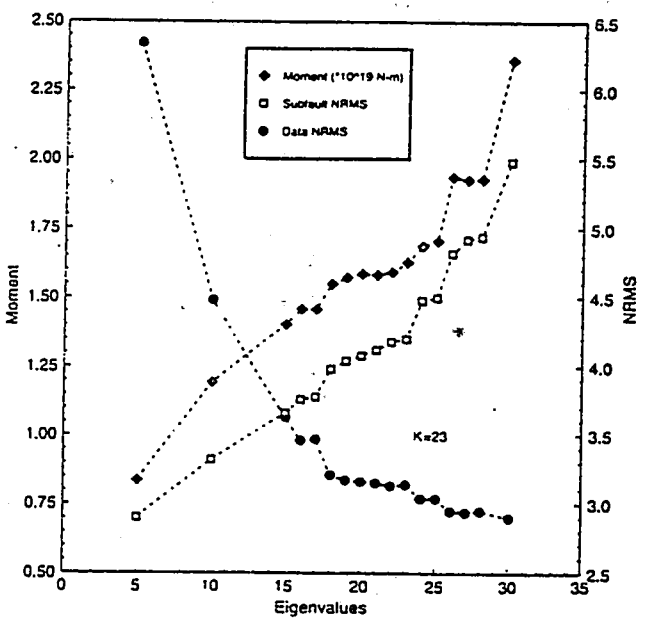


Figure 4. Total moment, subfault nrms, and data nrms (both based on reduced chi-squared values) as a function of the number of retained consecutive eigenvalues for the variable slip modeling. The total moment uses the length of each subfault's slip vector, summed over all subfaults. The subfault nrms is an index of dispersion for the length of all subfaults' slip vectors. The data nrms is a similar index for the model residuals.

Discussion

The normalized residuals between the data and either proposed model (Table 1 and Fig. 6) are greater than ex-

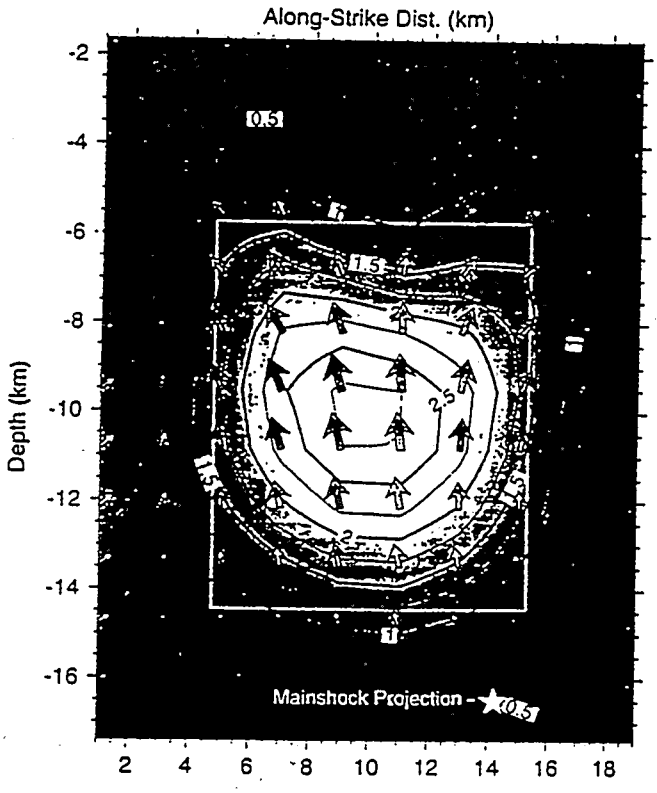


Figure 5. Distribution of slip on the Northridge fault plane. Contours and shading indicate the slip amplitude (in meters), and arrows indicate the slip vector for each subfault of the model. The model has 10 subfaults along-strike and 13 down-dip, each 2 by 2 km. Slip evidently occurred mainly up-dip and northwest of the hypocenter. Less than 1 m of slip occurred above a depth of 5 km. This model, based solely on the GPS data, differs substantially from those based solely on seismological data (Wald and Heaton, 1994b; Dreger, 1994). It differs, but less dramatically, with the "geodetic only" and "combined" models of Wald *et al.* (this issue).

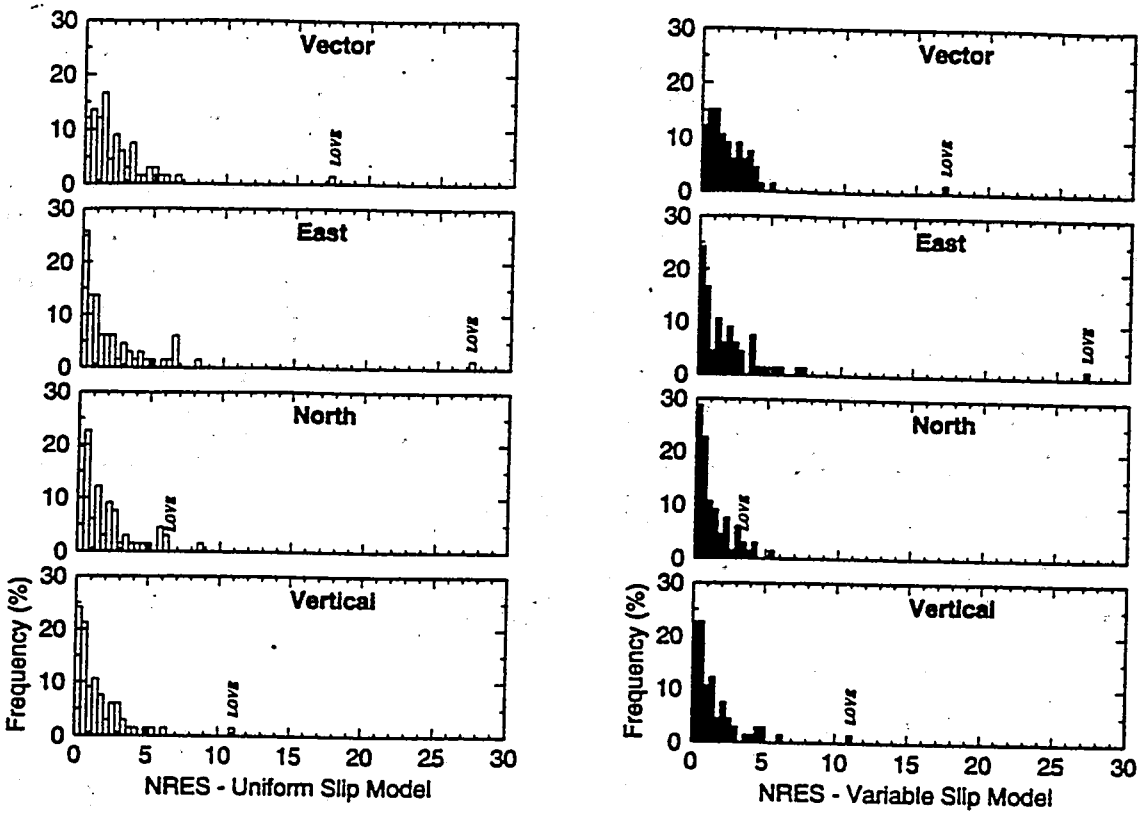


Figure 6. Distribution of normalized residual (NRES) values for the uniform and variable slip models. The outlier (especially in the east and vertical components) is station LOVE, whose displacement is anomalous (as discussed in the text).

pected (as is the summary nrms statistic for each model). This could be due in part to underestimating the measurement uncertainties, lack of an error model component representing monument instability, a poor physical model (i.e., neglecting the complexities of crustal structure and irregularities of the surfaces that ruptured, and the contributions of aftershocks), or data outliers (i.e., measurement blunders). Both modeling approaches have most difficulty fitting the same few stations, which are located within the same general area, so an inadequate physical model seems a likely explanation. However, the affects of aftershocks and monument instability may also be important for some stations.

Aftershocks. The displacement field contributions of aftershocks that occurred soon after the mainshock are, by necessity, included in our GPS data. Relatively shallow aftershocks, especially with $M > 5$, may have contributed to the displacement field we measured. For example, about 1 min after the mainshock, a shallow $M = 5.9$ aftershock occurred, and within 10 min, another shallow $M = 5.2$ occurred (according to the Caltech/USGS catalog based on Southern California Seismic Network data). Because these two events occurred so early after the mainshock, their locations and especially their depths are not well known. Hence, it is not possible to confidently model their contributions to the displacement field based solely on seismological information. In the preceding modeling section, we made no attempt to remove the effects of these two aftershocks, so what we call "co-seismic" actually includes these two early aftershocks. In that sense, our data differ from the seismological data used by Wald and Heaton (1994b) or Dreger (1994) to arrive at slip distribution models. Wald *et al.* (this issue) evaluate and discuss this issue.

Subsequent to these two early aftershocks, all other $M > 5$ aftershocks occurred between depths of 9 and 20 km, except for the shallow $M = 5.1$ event on 29 January. Displacement estimates given for the three GPS stations on Oat Mountain, PICO, SAFE, and SAFR are from data collected prior to the 29 January aftershock, and other GPS stations were unlikely to have been perturbed by that event. Over 40 aftershocks with $M > 4$ occurred within the first two weeks, many of which were shallow.

Monument Instability. Some errors may arise from infidelity of our survey monuments in representing tectonic signals. Although long-term monument stability is a serious issue for studies of interseismic motion, over the 16-month period of our observations, its effects are likely at the level of only a few millimeters (Langbein *et al.*, 1993a, 1993b; Wyatt, 1982; Johnson and Wyatt, 1994). More serious is the pos-

sibility that the strong shaking some of these monuments experienced during the Northridge earthquake may have created local displacements that are not representative of the upper crust.

Practices of surveying monument construction vary, as does the type of material in which monuments are emplaced. The simplest type of monument, several of which are used in this study, consists of a metal disk set with concrete into a drill hole in bedrock. Another common type consists of a concrete mass poured into a shallow hole that has been excavated in the soft rock or soil, with a metal disk at the top. Each of the older monuments used is one of these two types. More recently, for example, when Caltrans and NGS established the high precision geodetic network (HPGN) and HPGN-densification (HPGN-D) networks in the early 1990s, monuments called 3D rod marks were set in soft rock or soil. These marks are now preferred over the concrete mass type since they are not coupled to the uppermost soil and provide a deeper point of attachment to the ground. Still other monuments, of which there are few, are installed by attaching a metal disk to existing masonry such as retaining walls.

Because we typically have measured only one geodetic station at each location in our network, the contribution of monument instability to our errors is difficult to quantify. We have only one site (Oat Mountain) where coincidentally we had three separate monuments for which we obtained both pre- and postseismic GPS data of good quality. Also coincidentally, this site is the location of the largest displacements measured with GPS and presumably where ground shaking was very strong. The three Oat Mountain monuments (PICO, SAFE, and SAFR) are all set in soft, highly fractured rock capped with a thin (<0.5 m) veneer of soil. During the earthquake, these monuments likely experienced 0.5 to 1.0 g accelerations and 0.5 to 1.0 m/sec velocities. Monuments SAFE and SAFR are concrete masses with metal disks. From visual inspection before and after the earthquake, we concluded that SAFE was the better of the two because soil around the base of the concrete mass for SAFR had eroded away. PICO is a metal disk attached to a metal rod that was driven into the ground "to refusal" with a sledge hammer, and hence, it is probably less susceptible to surficial movements than either SAFE or SAFR. In Table 1, the results for motion of PICO, SAFE, and SAFR are given. The displacements estimated for these three sites disagree by up to 25 mm in the east component, up to 2 mm in the north component, and up to 28 mm in the vertical component. The differences in east and vertical displacements are outside our estimated 1-sigma measurement errors. These discrepancies occur between PICO and SAFE, the stations with better data. PICO was observed twice before and nine times after the earthquake, while SAFE was observed 10 times before and three times after (Fig. A1). SAFR has just one measurement each before and after the earthquake and is therefore suspect on geodetic grounds. We do not understand the discrepancy between our measurements at Oat Mountain, but we tentatively attribute them to localized monument instability induced by ground shaking in the earthquake. For this article, we have included the displacement estimates for PICO, SAFE, and SAFR in our modeling.

For another station, NORT, we had different concerns. The station is located about 3 km NNW of the mainshock epicenter; hence, its observed southeastward displacement is counterintuitive. The displacement was primarily vertical, with uplift of 213 ± 8 mm and horizontal motion of 68 ± 3 mm. This monument, an HPGN-D station, is a metal disk set in a poured concrete wall along a train track and flood control channel. The earthquake caused a train to derail adjacent to this station, and during the first occupations of this station after the event, we observed heavy equipment moving past the monument, within 1 m of the base of the wall. The equipment, which was being used to clear the train wreck from the tracks, compacted the asphalt road bed on the south side of the wall. When we arrived at the station, we observed a new crack in the wall (<10-mm movement), about 5 m southeast of the monument. The situation of the monument in such a wall, the crack that indicated damage to the structure, and the compaction of soil on the south side of the wall gave rise to concerns about monument instability. This monument was geodetically leveled before and after the earthquake relative to other benchmarks in the NGS/Caltrans vertical control network, and from this leveling, it appears that NORT went up by an amount similar to nearby benchmarks. We have no way to independently ascertain the horizontal integrity of the monument, except to say that by visual inspection, the wall appears to still be in line with the extension of the wall to the NW, and not to be tilted. In one test of the uniform slip model, the displacement of station NORT was left out without substantively changing the model results.

The station we have most difficulty fitting within errors is LOVE (Figs. 6 and 7). This station's displacement is very well determined, but the monument is a mass of concrete set in soft rock and soil. One possibility is that the motion of this monument included nontectonic motion induced by shaking since it also is located where strong ground motions occurred. There was a landslide and considerable ground cracking downhill from the site, but no cracks were observed north (uphill) of the site. A minor crack was observed to run in the soil through the monument. Although the assessment of those who visited the site was that the monument was probably not disturbed by more than 10 to 20 mm, the potential for significant nontectonic motion should not be overlooked.

The horizontal residual for NEWH is similar to that of LOVE, yet NEWH's residual is up (150 to 180 mm), whereas LOVE's residual is down (60 mm). Of course, since NEWH's displacement is less accurately determined, the modeling approaches we used would tend to allow its residual to be large. That is why we focus more on LOVE as the outlier station, even though the absolute residuals at NEWH are larger. The monument at NEWH is a concrete mass set in soil. Both NEWH and 0704 are very close to the up-dip displacement

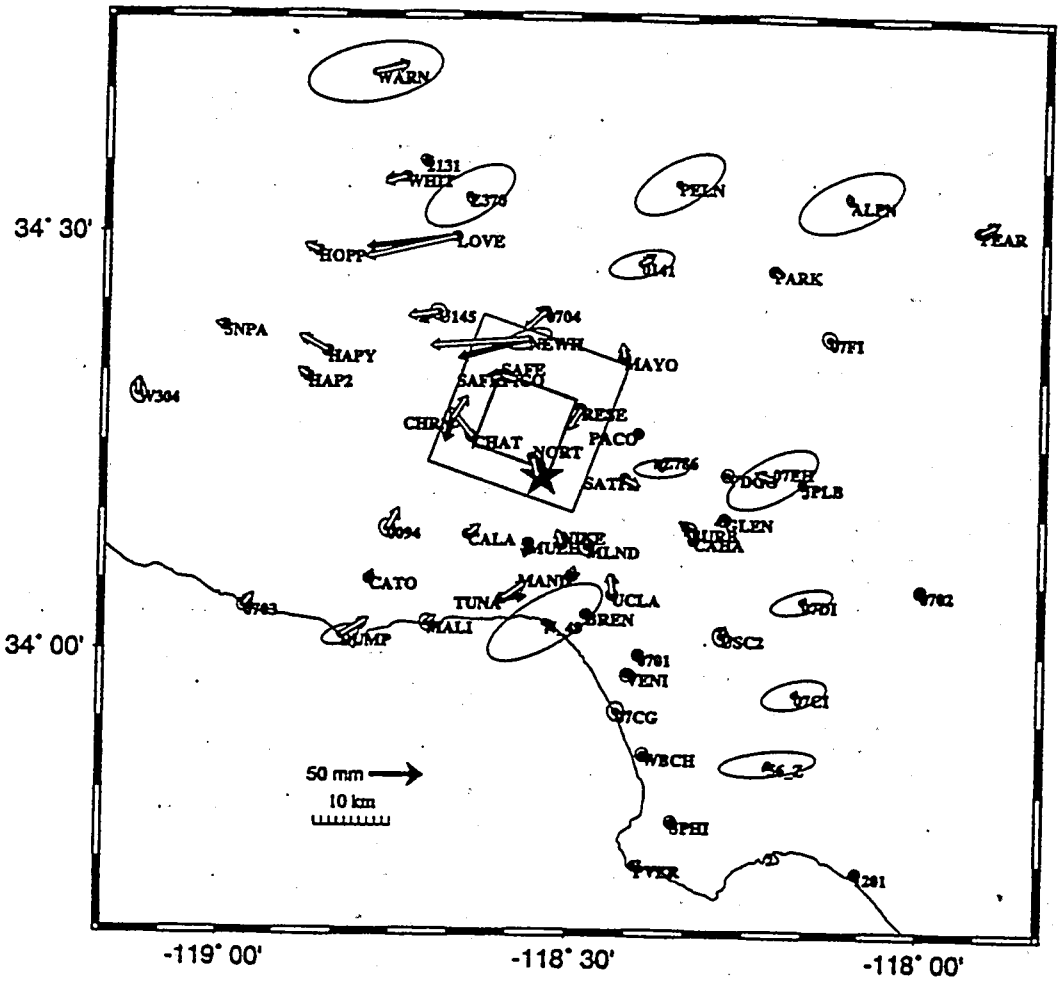


Figure 7. Residual vectors at the GPS stations. Some spatial systematics appear to remain in these unmodeled data, particularly in the vicinity of the eastern Ventura Basin, as discussed in the text. Also, residuals are significant but diversely oriented in the Santa Monica Mountains (near the down-dip edge of the rupture). Note the vector scale is several times larger than in Figure 1.

node, and we suspect that the misfits at these two stations may indicate some unmodeled slip on shallow structures (perhaps in combination with other potential problems we have mentioned). Aftershock seismicity indicates a steeper-dipping up-dip extension of the main rupture plane that would project to a line between these two stations, for example. Alternatively, the misfits could be explained by some sympathetic slip on hanging-wall structures.

Other stations in the vicinity of LOVE and NEWH (0704, CHAT, HAPY, HOPP, U145, and WHIT) are misfit less drastically, yet with a somewhat consistent westward component in the residual vectors (Fig. 7). Furthermore, preliminary results from leveling along highway 126 show unmodeled uplift of 10 to 20 mm in the vicinity of LOVE. We have considered the possibility that the misfits to data here may be due to seismic deformation associated with aftershocks, but we find it is not possible to account for the anomalies with the small displacement contributions of the aftershocks. An $M = 5.1$ aftershock that occurred on 19 January 1994 and located at a depth of 11 km was located close to these geodetic anomalies. This event had a pure reverse mechanism and is associated with seismicity on a north-dipping plane. The $M = 4.9$ aftershock on 26 June 1995 also occurred in this vicinity. If one postulates that some aseismic slip may have occurred on this north-dipping plane, it may be possible to improve fits to the geodetic data in the vicinity of stations LOVE and NEWH and along the highway 126 level line.

This apparently anomalous crustal deformation surrounds the intersection of the eastern Ventura Basin with the San Gabriel fault. It occurs in the area where the aftershocks most notably do not fall within the area of our model fault planes (Fig. 2). Furthermore, this area produced four preshocks $1.3 \leqq M \leqq 1.9$ at a depth of about 15 km within the 16 hr before the mainshock, called the Holser cluster (Hauksson *et al.*, 1995). It is not yet clear whether the prox-

imity of these preshocks and some larger aftershocks to the anomalous geodetic measurements is purely coincidental or may have a physical connection.

Fault Geometry and Material Properties

We are convinced from recent work on relocating the aftershocks by Mori *et al.* (1995) and Hauksson *et al.* (1995) that the fault geometry is more complicated than either a single uniform-slip dislocation or distributed slip on a single plane. Those studies indicate that the rupture almost surely occurred on a more complicated structure, so the geometry of our model is too simple. For example, the dip is shallower in the eastern portion of the aftershock zone than in the western portion. It is also possible that some shallow sympathetic slip may have occurred on a plane nearly parallel or perpendicular to the plane the mainshock occurred on, as suggested by south- and north-dipping features in the hanging-wall seismicity (Hauksson *et al.*, 1995). In addition, the seismicity indicates a somewhat deeper north-dipping structure near the northwestern up-dip corner of the rupture (closest to the anomalously displaced GPS stations U145, NEWH, and LOVE). The possibility of slip on other faults, particularly in the hanging wall, is investigated in Shen *et al.* (this issue). The geodetic data would be sensitive to even relatively small amounts of sympathetic slip on shallow structures, but future refinements of the modeling will be required to isolate any such affects. Geologists' formulations of the processes by which folds form (e.g., Suppe, 1985) include specific processes of localized deformation within the hanging wall; we do not attempt to take these into account here. Furthermore, we do not account for variable material properties within the earth's crust, and again, this may be a source of misfit. The challenge of adequately fitting our GPS results, perhaps with a more realistic fault geometry and/or more reasonable model of the crustal structure, remains to be met.

Preliminary Comparisons with Other Data

The pattern of uplift determined by extensive releveling (performed by the City of Los Angeles, National Geodetic Survey, and Caltrans) is roughly compatible with the models presented here. However, initial work with the leveling data has indicated that the total moment of our variable slip model is probably too high by about 20%. We also recognize that details of slip on the shallowest subfaults in the variable slip model presented here are not well resolved by the GPS data alone and that the leveling data will allow better imaging of the shallow slip. Furthermore, Murakami *et al.* (in press) have provided the first SAR interferometry results for the Northridge earthquake, and our variable slip model generally matches these independent data (although a lower total moment would also help us to match the SAR results better). We recognize at this stage that our uniform slip model is less consistent with either the leveling data or the SAR interferogram than is our variable slip model.

General Observations and Implications

The Northridge earthquake caused uplift of the Santa Susana Range, which seems intuitively sensible in terms of long-term displacement patterns. That is, the mountains, unsurprisingly, were pushed up by at least 400 mm (from our measurements at Oat Mountain), and perhaps as much as 520 mm (based on the maxima from our variable slip model). The largest amounts of uplift caused by the Northridge event fall along the crest of the Santa Susana range. More perplexing is our observation that the northern edge of the San Fernando Valley was also pushed up. It is difficult to reconcile this observation with the geomorphology of the area. The valley was pushed up less than the mountains, but nevertheless uplift of more than 200 mm occurred in Northridge, well south of the mountain front. Though we have only a few GPS stations within the San Fernando Valley that indicate uplift, preliminary releveling results show as much as 200 to 400 mm of uplift throughout the northern portion of the valley. Observed uplift of the northern San Fernando Valley qualitatively appears to conflict with the topography that has presumably been built, in large part, by prehistoric earthquakes.

The southward dip of the rupture plane in this event indicates that the fault is a backthrust, dipping contrary to the Sierra Madre fault system's orientation. The Oak Ridge fault system to the west also dips southward, implying that the Northridge earthquake occurred on an eastern extension of that fault system (e.g, Yeats, 1994). The Northridge fault plane, in turn, seems (from the aftershock seismicity) to be truncated at the upper edge by the fault that ruptured in the 1971 San Fernando (also known as Sylmar) earthquake (USGS and SCEC, 1994; Mori *et al.*, 1995). We appear to have imaged the up-dip truncation of slip at a depth of 4 to 6 km with our variable slip model (Figs. 3 and 5). This is slightly shallower than the intersection depth indicated by the seismicity. In places, the aftershocks extend spatially beyond the edges of the slip distribution model that we find best explains the geodetic data, especially near the northwest up-dip corner of the model fault (Figs. 2 and 3).

Slip in the Northridge earthquake was concentrated between depths of 5 and 20 km. Geologists have found no compelling evidence for a primary surface rupture (USGS and SCEC, 1994). Modeling indicates that in parts of the Santa Susana Range where we had no geodetic stations, uplift of as much as 520 mm may have occurred. In contrast, the 1971 earthquake, which was similar in magnitude, had large amounts of shallow slip and produced clear surface faulting (e.g., Heaton, 1982). As a result, the 1971 earthquake also produced much larger maximum displacements and commensurately larger strains and tilts at the ground surface (e.g., Savage *et al.*, 1975; Cline *et al.*, 1984). In that case, up to 2.5 m of vertical motion occurred over distances of 5 to 10 km, whereas the wavelength of vertical displacement associated with the Northridge event was several times longer as a result of the deeper concentration of large slip.

Conclusions

The displacement field of the earthquake was sampled by determining displacement vectors at 66 sites with respect to a time-dependent, well-established reference frame for global GPS tracking stations outside of southern California. The mean 1-sigma errors in these data are 8 mm (east–west), 6 mm (north–south), and 23 mm (vertical). From these precise measurements, we have quantified the displacement field associated with the Northridge earthquake (and its early aftershocks). The resulting data set, presented in Table 1, is of high quality and potentially high utility in understanding the earthquake. The data quality may, we hope, take others beyond the simple modeling efforts we have advanced in this article.

As a result of performing extensive analyses of the GPS data set, we feel that we understand the errors in the GPS data well enough to expect our models to fit these data appropriately within the stated errors, except for undetected problems at the less frequently measured stations. The exact reasons why our relatively simple models do not satisfactorily explain these GPS data remain unresolved, though we discuss the relevant issues and speculate that, perhaps most importantly, the source was too complex to be represented adequately with any single-plane model. The fact that we are not able to match the observations in a fairly well localized region to the north of the near-surface part of the fault plane suggests that the primary cause of the mismatch is using too simple a model, rather than monument instability.

From our GPS measurements, we produced a single-dislocation model independent of seismological and other information. Furthermore, the data were sufficient to allow an inversion in order to estimate the distribution of slip on the main fault plane. The observed displacement field was evidently produced mainly by slip on a SSW-dipping reverse fault in the mid-crust, under the northern edge of the San Fernando Valley. The Santa Susana Range was uplifted by the earthquake by as much as 400 mm (measured) to 520 mm (modeled), and the northern part of the San Fernando Valley was uplifted by more than 200 mm. The pattern of uplift caused by the Northridge earthquake appears discordant with the topography. Both of our modeling approaches indicate that in order to explain most of the variance in the GPS data, the largest amount of slip must have occurred up-dip and northwest of the event's hypocenter. We find that less than 1 m of slip occurred above a depth of about 5 km. We appear to have confirmed the suggestion by Mori *et al.* (1995) that the subsurface intersection with the 1971 earthquake fault plane formed the up-dip terminus of slip in the Northridge earthquake.

Our modeling indicates a simpler slip distribution than has been inferred on the basis of seismological data alone (Wald and Heaton, 1994b; Dreger, 1994). Clearly, the geodetic data and seismological data do not invoke identical images of the slip distribution. We present our variable slip model here partly to emphasize this point. Seismological data indicate slip concentrations near the down-dip edge of the rupture plane, whereas the geodetic data do not (see also; Wald *et al.*, this issue). This may be because there are too few GPS stations in the southern San Fernando Valley to resolve such features, or because contributions of these slip patches to the surface displacement field are too small to resolve with the available GPS data.

Geodetic data are well suited to mapping the final slip distribution of an earthquake and can therefore enhance imaging of rupture propagation beyond the capabilities of imaging based on seismological data alone, as was the case for the Landers earthquake (Hudnut *et al.*, 1994; Wald and Heaton, 1994a). By combining seismological and geodetic data, Wald *et al.* (this issue) attempt to resolve the differences noted above by using the combined seismological and geodetic data sets. It is also possible that the discrepancies seen result from aseismic slip; the geodetic measurements would include such phenomena, whereas the seismological data might not. Seismological and geodetic data are complementary, and combining the seismological data with geodetic data can provide the best available methods for imaging details of the earthquake source.

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Table A1
GPS Station Information

Station ID	Approximate Location			*A Priori* Velocities (ITRF 93)			Monument Information Station Designation and Stamping	Station Aliases	NGS ID
	Latitude (north)	Longitude (west)	Elevation (m)	East (mm/yr)	North (mm/yr)	Up (mm/yr)			
0094	34.1464	118.7610	271	−48.4	13.1	0.3	CADT GPS 0094 1992		
0141	34.4654	118.4073	553	−40.7	8.7	4.1	LACFCD 145-02390 1964		EW2709
0618	34.8252	118.8681	1111	−31.1	2.8	5.1	HPGN CA 06 18		EW9546
0701	33.9965	118.4033	10	−47.2	13.3	−0.3	HPGN CA 07 01		DY9308
0702	34.0776	117.9995	99	−41.9	8.5	1.3	HPGN CA 07 02		EV9239
0703	34.0528	118.9627	11	−49.8	13.5	0.3	HPGN CA 07 03		EW9547
0704	34.4071	118.5401	357	−43.5	9.4	4.4	HPGN CA 07 04		EW9548
0705	34.4927	118.7651	1062	−30.4	0.6	1.7	HPGN CA 07 05		EV9240
07CG	33.9282	118.4329	24	−47.5	13.4	−0.3	HPGN-D 07-CG VEN 1-9G	0158	
07CI	33.9513	118.1798	34	−44.2	9.2	1.6	07-CI HPGN-D 1992 (3-D-ROD)	0155	
07DI	34.0632	118.1711	136	−43.2	8.8	1.6	HPGN-D 07-DI 1992 (3-D ROD)	0153	
07EH	34.2107	118.2158	444	−42.1	8.1	1.6	07-EH HPGN CALIF-D 1992	0147	
07FI	34.3794	118.1362	1775	−38.6	6.4	1.3	07-FI (BOLT)	0142	
1201	33.7375	118.0883	8	−46.3	14.0	−0.8	HPGN CA 12 01		DY9309
2131	34.5859	118.7141	860	−41.1	5.6	−3.0	213-128 1974 RE 7078	213-128	
56_Z	33.8682	118.2160	17	−46.4	13.7	−0.5	MWDSC 56 Z 1933	0159	
ALPN	34.5436	118.1092	864	−33.6	3.1	1.7	ALPINE 1938	0024	EW0229
BREN	34.0447	118.4765	90	−47.0	13.7	−0.3	BRENTWOOD ECC. 6	SAW D-7, BREN, 0190	
BURB	34.1479	118.3309	157	−43.9	8.4	1.9	BURBANK 1953 1-7	0148	
CAHA	34.1370	118.3258	524	−43.9	8.5	1.9	CAHUENGA #2 1933	BUR J-8, 0280	
CALA	34.1401	118.6457	497	−47.7	13.2	0.2	CALABASAS 1933 RE 62	DC G-8, 0087, 0240	EW7450
CATO	34.0858	118.7858	826	−48.6	13.4	0.2	SOLSTICE CYN B.2 AUX 1 1966	CASTRO PEAK	
CHAT	34.2571	118.6406	674	−46.6	10.4	4.3	CHATSWORTH 1924	CHA H-6, 0330	
CHRN	34.2788	118.6702	381	−46.8	10.4	4.4	COCHRAN 1975	0115	EW7403
DUMP	34.0176	118.8248	7	−48.9	13.6	0.2	DUME PT. J-10 1950 RE 329	6024	EW4188
GLEN	34.1612	118.2826	107	−43.2	8.4	1.8	BE 102 USE	0102, BE10	
HAP2	34.3280	118.8771	332	−45.3	13.2	−2.8	HAPPY 2 1992	0113	
HAPY	34.3580	118.8501	704	−45.0	13.0	−2.7	HAPPY 1959		
HOPP	34.4777	118.8655	1345	−42.2	7.6	4.8	HOPPER 1941		
JPLM	34.2048	118.1732	450	−41.8	8.2	1.5	JPL MV-3 1983 CDP 7272 (PERMANENT)	IERS 40400 M006/M007, JPL1	
LOVE	34.4963	118.6687	727	−42.7	6.2	−3.1	LOMA VERDE RESET 1961		
MALI	34.0332	118.7019	59	−48.3	13.6	0.1	CADT MALIBU 1992	6022	
MAND	34.0905	118.4982	448	−46.9	13.5	−0.2	MANDEVILLE 1933	SAW A-2, 0255	
MAYO	34.3522	118.4296	1173	−43.0	9.8	3.9	MAY 1932	SYL I-6, 0370	
MLND	34.1259	118.4769	364	−46.1	11.2	3.6	CADT MULHOLLAND 1992 (3-D ROD)	6004	
MULH	34.1301	118.5599	475	−47.2	13.3	0.0	13-F-21 1940	13F2	
NEWH	34.3742	118.5638	365	−44.2	9.7	4.5	NEWHALL SURVEYS 1993	0353	
NIKE	34.1288	118.5129	569	−46.3	11.1	3.7	NIKE RESET 1978	RES K-9A, 0260	
NORT	34.2328	118.5552	262	−46.0	10.6	4.0	NORTHRIDGE LS 6172 1992	6003	
N_49	34.0343	118.5340	6	−47.3	13.7	−0.2	LAC N 49	6012	
OJAI	34.4399	119.2022	335	−47.9	9.2	−4.7	CADT OJAI 1992	0106	
PACO	34.2636	118.4083	393	−43.9	10.6	3.6	PACOIMA #2 LAC C 1933	PAC L-5, 0144, 0350	EW7328
PARK	34.4598	118.2188	1259	−37.7	5.5	1.7	PARKER J-5 1989 RE 11915	0022	EW7208
PEAR	34.5121	117.9224	924	−31.8	1.9	1.7	PEARBLOSSOM NCMN 7254 1983	6073, 5001, 0061	DZ1220
PELN	34.5610	118.3561	1479	−36.7	4.4	−3.8	PELONA 1932	0019, PELO	EW7132
PICO	34.3306	118.6013	1102	−45.4	10.0	4.4	PICO NCER 1977 USGS		
PVEP	33.7433	118.4042	70	−47.6	13.9	−0.4	PVEP (UNSTAMPED) (PERMANENT)	IERS 40403 M002	
PVER	33.7438	118.4036	106	−47.6	13.9	−0.4	PALOS VERDES ARIES 7268 1976 1980	PALO, 1000, 6002	DY9148
RESE	34.2917	118.4882	395	−44.5	10.3	4.0	RESERVOIR 1932	0015	EW7332
SAFE	34.3304	118.6013	1103	−45.4	10.0	4.4	PICO L9C	SAN FERNANDO	
SAFR	34.3305	118.6014	1103	−45.4	10.0	4.4	AUX.2 ECC.1 RM.2 1967 RE 5869	AUX2	
SATI	34.2092	118.4264	218	−44.8	10.9	3.6	SATICOY (UNSTAMPED)	5004, 0+00 SATICOY B.L.	
SNPA	34.3879	118.9988	200	−46.8	10.4	2.0	SANTA PAULA NCMN 7255 1981	SANT	
SPHI	33.7968	118.3525	140	−47.3	13.8	−0.4	SAN PEDRO HILLS J-1	0040, 6007	DY2861

Table A1
Continued

Station ID	Approximate Location: Latitude (north)	Longitude (west)	Elevation (m)	*A Priori* Velocities (ITRF 93): East (mm/yr)	North (mm/yr)	Up (mm/yr)	Monument Information: Station Designation and Stamping	Station Aliases	NGS ID
TUNA	34.0630	118.5955	538	−47.6	13.6	−0.1	TUNA 1933	TC A-5, 0210	
U145	34.4059	118.6929	262	−44.9	6.9	−3.2	U 1451 1989 (3-D ROD)	0109	EW9447
UCLA	34.0687	118.4410	200	−45.6	8.6	2.1	UCLA, YOUNG HALL ROOF		
USC2	34.0203	118.2853	21	−44.6	8.9	1.8	USC (UNSTAMPED)		
VDGO	34.2151	118.2801	931	−42.6	8.1	1.8	VERDUGO ECC. 1	LCR C-11A, 0310	
VENI	33.9722	118.4186	14	−47.4	13.3	−0.3	VENICE K-4C	5006	
W304	34.3058	119.1233	24	−48.3	11.0	1.8	W 304 1934	0110	
WARN	34.6877	118.7903	806	−38.7	4.8	−3.2	WARNE 1992	6028	
WBCH	33.8773	118.3945	72	−47.5	13.6	−0.4	TORRANCE E-3 ECC 7	0090, 6006	DY2915
WHIT	34.5674	118.7428	700	−41.9	6.0	−3.0	WHITAKER PK AUX NO 1 NO 3 1964 A-7A		
Z370	34.5445	118.6517	658	−41.4	5.8	−3.0	Z 370 1953 RESET 1967	6026	EW2774
Z786	34.2223	118.3734	252	−43.4	8.0	2.1	Z-786 1946	0146	EW2127

Table A2
GPS Data Sets (Experiments) Used in This Study

Survey Name	Identity	Time	Type	Length	Lead Agencies
Pre-earthquake:					
HPGN-Densification	HPGN-D2	Oct. 1992	TR-C[1]/P[2]	2–6 hr.	Caltrans/NGS
Inter-County	IC'93	July 1993	TR/AS[3]	6 hr.	USGS/SCEC
Partial HPGN-D net	HPGN-D3	Oct. 1993	TR-C[1]/P[2]	2–6 hr.	Caltrans
Ventura Basin	VB'93	Nov. 1993	OS-TR[4]	24+ hr.	JPL/MIT
Post-earthquake:					
Earthquake response	EQ'94	Jan. 1994	TR/AS[3]	6–24+ hr.	USGS/SCEC
HPGN and HPGN-D	COOP'94	Feb. 1994	TR-C/P[6]	2–6 hr.	Caltrans/NGS
Continuous:	PGGA	all above	TR-P[2], AS[5],	OS-TR[4]	UCSD/JPL

*TR-C refers to Trimble 4000 SST model receivers: dual-frequency L2-codeless. Geodetic control purposes to NGS first-order "group B" specifications.

†TR-P refers to Trimble 4000 SSE model receivers: dual-frequency P-code. Geodetic control purposes to NGS first-order "group C" specifications.

‡The Inter-County 1993 survey used a mix of TR-C/P and Ashtech (AS) C/P receivers.

§OS-TR refers to Osborne TurboRogue model receivers: dual-frequency P-code.

The earthquake response surveys within the first few weeks used a mix of TR-C/P, OS-TR, and AS-C/P receivers. Stations of the HPGN, HPGN-D, IC, and VB nets were occupied. This was a cooperative effort of scientists represented in this article, many of whom are listed in the acknowledgments.

¶The HPGN and HPGN-D network stations within a radius of about 75 km of the mainshock were surveyed in mid-February 1994, cooperatively with local government agencies and SCEC.

References:

October/November 1992—Caltrans HPGN-D. Supervised by Jay Satalich, Caltrans District 7. Processed by UCLA and USGS.

July, 1993—USGS/SCEC Inter-County Survey. Organized by Ken Hudnut, USGS. Processed by UCLA, MIT, USGS.

October 1993—Caltrans HPGN-D partial survey. Supervised by Jay Satalich, Caltrans District 7. Processed by UCLA and USGS.

November 1993—JPL/MIT Ventura Basin Survey (Donnellan *et al.*, 1993a, 1993b). Organized by Andrea Donnellan, JPL. Processed by MIT and JPL.

January/February 1994—USGS/UCLA/JPL/MIT/UCSD postearthquake response surveys (Hudnut *et al.*, 1994). Organized by Ken Hudnut, USGS (IC and HPGN/HPGN-D stations) and Andrea Donnellan, JPL (VB stations). Processed by JPL (VB stations), UCLA (all stations), USGS (all), and MIT (all).

February 1994—Caltrans/NGS cooperative post-earthquake survey. Organized by Don D'Onofrio, NGS and Jay Satalich, Caltrans District 7. Processed by UCLA and MIT.

All of the global and regional GAMIT tracking solutions were produced by UCSD (Fang *et al.*, 1992) and all of those for GIPSY were produced by JPL (Zumberge *et al.*, 1992).

Software used in these data analyses included FONDA (Dong, 1993), GAMIT (King and Bock, 1994), GIPSY/OASIS-II (Blewitt *et al.*, 1993b, Webb and Zumberge, 1993), and GLOBK (Herring, 1993).

Acronym Key:

California Division of Transportation (Caltrans), National Geodetic Survey (NGS), Jet Propulsion Lab (JPL), Massachusetts Institute of Technology (MIT), University of California, Los Angeles (UCLA), Scripps Institute at University of California, San Diego (Scripps/UCSD), and Southern California Earthquake Center (SCEC)—in some places representing contributions of all collaborating universities (MIT, UCLA, UCSD) as well as JPL.

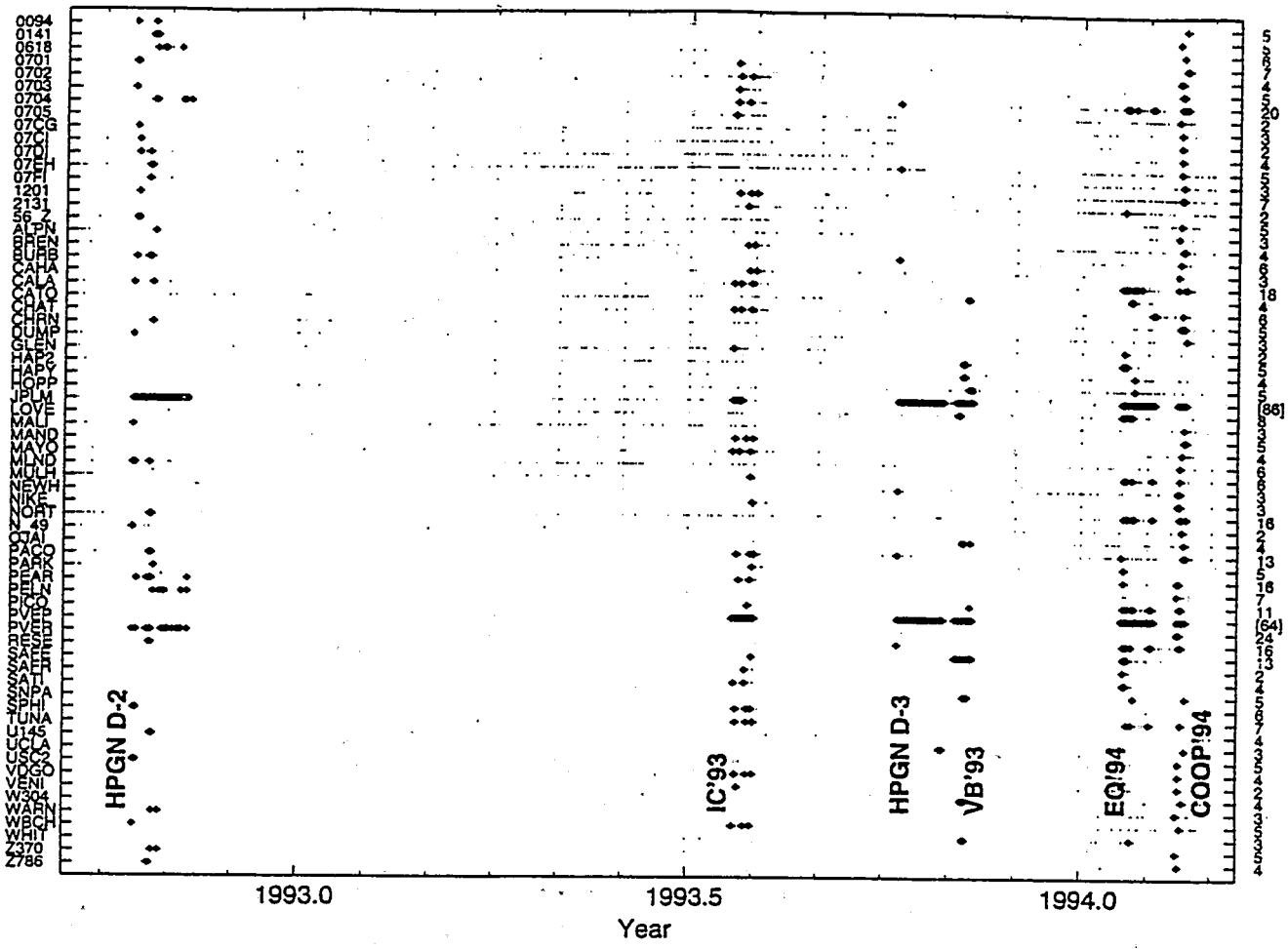


Figure A1. GPS station history of occupations. Station names are given on the left, and the total number of occupations for each station is given on the right. Each occupation is shown as a diamond symbol (except that in the Caltrans/NGS surveys: multiple sessions on the same day are represented by one symbol). Stations with a total of only two or three occupations are most susceptible to coarse errors.

Letter 3.8-18

Elizabeth Folb
11850 Susan Drive
Granada Hills, CA. 91344

Re:Sunshine Canyon Landfill Project
City of Los Angeles
Department of city Planning- Hearing Examiner
221 S. Figueroa St. 3rd. Floor
Los Angeles, CA. 90012

November 19,1997

Dear Sir/Madam

I do not feel it is prudent to expand the Sunshine Canyon land fill for the following reasons:

- ◇ Proximity to a critical water supply. Both airborne and underground contaminates are dangers. **522**
- ◇ The air quality in the area needs improvement. The landfill will contribute a significant adverse affect on air quality because of the waste itself and the increased traffic. **523**
- ◇ I do not want mature oaks removed and wildlife habitat disturbed. Disturbance of the environmental balance in this area has already been significant. The deer, bobcat, coyotes, and mountain lions in this area will certainly be affected and subsequently the neighboring communities will be affected by these animals **524**

I feel these reasons are very important. I feel that there could be a narrow-minded focus on scientific and economic evidence that can be skewed in either direction depending what side of the issue you are on. I think those entrusted with the decision should consider **common sense.** **525**
Is it probable that the dump won't affect our water,air, and animal habitat? **526**

BFI has submitted a business proposal. It is just one way to solve a waste disposal problem. **527**
BFI's proposal would create both economic hardship and health risk to the community. There are viable alternatives. As an example: I was able to reduce my own non recyclable waste by a whopping two-thirds after receiving my "Blue Bin". Please work harder at finding a solution to our waste disposal problem. Find a way other than expanding this or any other dump. **528**

Sincerely,
Elizabeth Folb

RECEIVED
CITY OF LOS ANGELES
NOV 26 1997
CITY PLANNING DEPT.
ZONING ADMINISTRATION

November 30 ,1997

RECEIVED
CITY OF LOS ANGELES
DEC 0 5 1997
ENVIRONMENTAL
UNIT

Los Angeles City Planning Department
Environmental review Section
221 N. Figueroa Street Room 1500
Los Angeles , CA 90012

To The Los Angeles City Planning Department;

I have reviewed the SEIR for Sunshine Canyon landfill expansion back onto the CLOSED CITY landfill and I have many comments and questions that need to be answered and addressed.

I would like to start by saying that I can not believe that this is even coming back to the City for expansion. I state this because we have **already had 30 plus years** of DUMP on the City side of Sunshine Canyon and the COUNTY side is currently operating and there will be no foreseeable end to the COUNTY operation. 529

The CLOSED CITY DUMP is NOT LINED now and has NO LEACHATE COLLECTION SYSTEM now BFI is proposing to put a liner over unstable trash and add more trash this is a ACCIDENT WAITING TO HAPPEN. 530

In 1988 as part of developing and promulgating Subtitle D regulations governing landfilling of municipal solid waste, the US EPA stated , " First , even the best liner and leachate collection system will ultimately fail due to the natural deterioration , and recent improvements in MSWLF (municipal solid waste landfill) containment technologies suggest that releases may be delayed for many decades at some landfills. " and "Once the unit is closed , the bottom layer of the landfill will deteriorate over time, and consequently , will not prevent leachate transport out of the unit." 531

In reviewing the water section 4.3 of this SEIR:
I wondered if the monitoring data and comments from 1989 are relevant 8 years later? Unfortunately , changes occur and therefore results from any tests on drainage , sedimentation , leachate collection, erosion control and precipitation should be recalculated. 532

How will and how has the existing water uses, residential , commercial and industrial water be affected by this project ? 533

Is the ground water in the San Fernando / San Gabriel Valley area being distributed to households and businesses for consumption now ? 534

When the storm water runoff originating in Sunshine Canyon flows south does it combine with Los Angeles river and go untreated to the ocean ? 535

What year was the rainfall data collected ? 536

What is the annual high rainfall data for the eastern Santa Clara River Valley ? 537
What is the annual low for Mount Islip ? 538
Where is Ducommum street rain gauge ? 539
Was the anticipated El Nino condition considered in this SEIR ? 540
What does Zone C on the flood insurance map mean? 541
What does Zone A mean ? 542

Because the drainage for the landfill converges at the mouth of the landfill , what are the safety mechanisms in place besides the trench now to catch the polluted water from exiting the site? 543

Where is the wash that the water collected in the county travels through located? Is this water tested and then treated ? How is this water treated? What will happen to this wash if the proposed expansion is approved ? 544
What does off site surface water mean ? 545

Has water from the culvert maintained by the City BOE underneath San Fernando Road ever been tested ?
If it has been tested , what for ? What are the results ?
If not then , why not ? 546

If the surface water (water that travels over trash) eventually reaches Sepulveda Dam , does this mean that the water is available for residential, commercial and industrial use ? 547

Are these areas that the water travels through to reach Sepulveda Dam, covered areas to prevent people and animals from coming into contact with it ? 548

What is included with the Industrial storm water permit ? 549
What was revised on the April 17 , 1997 permit ? 550

Which of the NPDES permit program is more stringent, the US EPA or the States ? 551
What are the differences between the programs ? 552
Why did BFI choose the State program ? 553

What are the requirements that need to be met by the SWRCB General Construction Activities Storm water Permit ? 554

On page 4-104 states that the General Industrial Storm Water permit revisions to the NPDES monitoring and reporting program may include ....
what does the General Industrial Storm Water permit include for Sunshine Canyon ? 555

Does the SWPPP have to be specific and how specific for how they will identify sources of pollution , practices they will use to reduce pollutants , assessment of potential pollution sources, etc.? 556

Did BFI file a notice of Intent to develop and implement the SWPPP ? If so when was it filed ? 557

How safe is it to allow the proponent to self inspect the sites storm water discharge? 558
Are they currently in compliance ? 559

Why was the wet season changed to exclude June through September? Is the data then averaged for 8 months ? 560

Figure 4.3-2 shows the proposed drainage plan and clearly shows that the drainage will go over existing trash even if it is through a channel the channel will still be on top of trash, how could this possibly be correct ? 561
The Sediment basin in the County is to be removed and then there will be NO existing collection area in the County . How can the proposed sediment basins B and C possibly contain all the water ? Doesn't this open the door to a major disaster? 562
Figure 4.3-2 shows that the water will flow from the County to the City basins B and C and then the water will **travel over channels, built on trash** which stability is questionable all to converge on basin A. 563
Is this a common engineered design , to build channels on top of trash , how could this possibly be safe ?
Basin A is so far away from the county area of operation , what will happen if there is a blockage in the channel , won't this cause a lake or flood of trash ? 564
What happens if the channel leaks even a small amount couldn't this cause a sink hole type situation ? 565
What emergency plan will be in place ? 566
Doesn't this leave all the stress for water drainage in the city ? 567
If basin A is designed to capture only 41-acre feet of runoff , how can this one basin accommodate all this water ? 568
How specifically will these channels for drainage, inceptor ditches, pipelines and sediment basins be designed to minimize ponding , infiltration , inundation , erosion , slope failure , washout and overtopping. 569

What are the standards of a certified laboratory ? 570
How are these laboratories chosen? By whom are they chosen ? 571
How often are the labs checked for accuracy ? 572

Why is the debris production curve based on the assumption of a "burned " watershed ? 573

In debris production area 6 (DPA-6) an assigned area specifically for Sunshine Canyon ? or are there other ares that have DPA-6 assignment ? 574

What County or City agency makes this assignment ? 575
Why are the Sediment basins being constructed in phases ? 576

After all the dispute about the County being a separate site now they will combine operations and is a clear case that they always sought incremental approval for this project against CEQA. 577

Who will be the lead agencies now ? 578
How will the tipping fees be split between the County and City ? 579

What surface improvements will be made in the existing landfill ? 580
Where will the storm water be dissipated ? 581
What is the proposed testing and monitoring program for the diverted storm water? 582
How does the energy dissipator slow surface water exit velocity ? 583
What is the pre-development maximum value of peak discharge ? 584

The surface water exits the dump site at San Fernando Road , then follows a cracked channel to the Jensen Filtration Plant , where it goes directly to ground. This canyon has received as much as 52 inches of rain a year and has a maximum 100 year , 24 hour projection of 9.80 inches. The base of the canyon is in a 100 year flood plain. Slides , washouts and flooding has occurred at this site before 585

What if the surface water is not able to be treated before entering Bull Creek Channel and Sepulveda Dam ?
How much potential does exist for non-storm water discharge into the storm water conveyance system ? 586
What various measures will be used to separate storm water from wastes being disposed of in the proposed landfill ? 587
What methods will be used to control sedimentation load during construction caused by storm water runoff ? 588
What methods will be used to control debris caused by storm water runoff ? 589
What methods will be used to control erosion caused by storm water runoff ? 590

What are the requirements of the NPDES permit for point source and non-point source discharges ? 591
Where will the water be monitored until the sediment basins are built ? 592
Is the flood control channel the same one that is referred to that is located directly east of the project entrance ? 593
Won't the temporary unlined drainage facilities, consisting of diversion ditches to intercept natural runoff, cause too much erosion if it rains excessively? 594
Isn't vegetation the best way to prevent erosion ?

What is meant by areas of disturbance shall be kept at a minimum during active filling operations? 595
What is minimum disturbance ?
How will this be done ?

What is the best % gradient for final landfill cover to preclude percolation of water ? 596
What is BFI's erosion control plan for Sunshine Canyon ?
When will this be completed ? Who will approve this plan ?

How can any clear thinking person believe that the potential impacts can be mitigated to less than a significant level . 600

This project will put a liner on top of existing trash, 30 plus years of trash that will continue to settle and then they will put over 11,000 tons of trash a day 6 days a week on top. 601
Vinyl Chloride which has a Maximum Contaminant Level of 0.5 ppb has already been detected on the City Side at 5.0 ppb . Vinyl Chloride can rapidly pass through intact without holes FML's (Flexible Membrane Liners). 602

When was the data pertaining to the ground water collected ? 603
Who conducted the exploration borings ? Who decided to where the borings should be taken ? 604
What ground water studies were done ? By whom ? Was this company a BFI subsidiary or a company chosen by BFI or the City / County ? 605

Why is the average horizontal ground water velocity in the fractured bedrock such a wide range (3 to 10 feet per year) ? 606
Don't earthquakes effect the water flow and change the permeability of water ? 607
Were the velocity tests done prior to the 1994 earthquake ? 608

How will the alluvium be removed ? Does this mean trash will be dug up and moved ? 609

How were the estimates of Hydraulic conductivity done ? 610
How were the estimates for ground water discharge velocity made? 611

At this time the ground water flows slowly toward the mouth of Sunshine Canyon and nothing is in place to contain the water which as data shows is high in Chlorides in MW-1. 612

In a letter to Mr. Frank Meneses dated January of 1991 Mr Blevins , Watermaster for the upper Los Angeles River states that the potential for contamination can be mitigated by installing a low permeability cutoff wall to the bedrock in the area of thin alluvium near the outlet area this would collect the water high in Chlorides. And as a fail-safe procedure a monitoring well should be placed in the alluvium a short distance downstream from the cutoff wall. 613
Has this cutoff wall been installed yet ?
Was the extraction trench built instead of the cut off wall ?

I thought that BFI told the County Board of Supervisors ,before they approved the County Project that the cut-off wall was installed through the alluvium and keyed to bedrock across the mouth of the canyon in May 1990. 614
This trench was installed over a weekend without staff from any agency present. 615

Also in the same letter Mr. Blevins that **there was a mistake made in the County Final EIR** document. He states that **THERE IS A HYDROLOGIC CONNECTION BETWEEN SUNSHINE CANYON AND THE GROUND WATERS OF THE SAN FERNANDO BASIN.** 616

In another letter to Mr. Meneses received January 10 ,1991 , the **MWD confirms this HYDROLOGIC CONNECTION. MWD doesn't agree that the ground water movement leaving the landfill would be slow.** 617
Even though the water in the general vicinity has relatively high mineral content . Similar quality ground water reserves are being developed elsewhere in Southern California to deal with the regional water shortage. 618

When were the Hydrogeologic field studies done ?
Who conducted these studies ? 619
How were the Hydrogeologic field studies done ?

I have included copies of two letters one from Mr Blevins and the other from MWD. to verify my comments made above. 620

Where is the Hydrology report by Robert Bean dated July ,1978 available to review? 621
Is this the most recent Hydrology report done on Sunshine Canyon, it is almost 10 years old ? 622

The SEIR states that the alluvium will be removed , how will this be done? 623
Will the trash be removed ?

The SEIR states that seeps and springs that were found in the County , does this mean that there were more wetland areas destroyed than the County final EIR predicted and mitigated for ? 624

How will the seeps and springs even though seasonal be kept from pooling once there is trash on top? 625
How can the public be assured that the stated non-active faults will become active again ? 626
As stated ground water is used for emergency and all surface and ground waters of the State are considered to be suitable or potentially suitable for municipal or domestic water supply. 627
The existing closed City side of the landfill has no liner and will continue to pollute the ground water unlike the County operation area there is no existing leachate collection system and all the leachate can combine directly with the ground water.

This is why it is so important to protect the ground water under the landfill from further degradation.

The Report dated August has indicated that problems do still exist? 628

Will the new monitoring wells be drilled for the proposed expansion ? 629
Will they be sited under the new guidelines of the LAWRWQCB Article 5 of chapter 15? 630
How many Lysimeters are being used now ? Are they in good working order ? 631
Who decided where to place the Lysimeters ?

It is stated that the land in close proximity to the landfill is underlain by Holocene alluvial soils that are liquefiable to shallow ground water. 632
Have any investigations been conducted to assure the public that the same Holocene alluvial soils do not exist in Sunshine Canyon ?
If so when and how and by whom was this done ? 633
The landfill is in an area of active faults. The neighbors of the landfill who lived through the 1971 Sylmar Quake and the 1994 Northridge quake know that this area is seismically active. Homes were severely damaged , or condemned. In 1971 Van Gogh Elementary School , which is just South of the landfill, had to be closed for a long time just to repair the damages. Because of the 1994 quake the school had to be demolished. North of the landfill , adjacent to the County site , freeway bridges collapsed completely in both the 1971 and 1994 quakes experiencing what Cal Trans said to be the highest G forces recorded in the Northridge Quake. 634
To the East , the Van Norman Dam cracked, the community beneath it was evacuated in 1971 , and the Dam was later reconstructed as the Los Angeles Reservoir.
Fortunately, the Dump was very small at the time (before BFI purchased it).
The California Department of Mines and Geology recorded a huge landslide on Dump property, that was the largest slide produced by the quake of 1971.
Researchers from the U.S. Geological Service consider this area of the Santa Susanas to be one of the most active landslide areas in the entire world.
In 1994, the Balboa Inlet Tunnel which brings California Aqueduct water to Los Angeles for treatment, was severely damaged. The records at Cal State Northridge show 3 small quakes , whose epicenters are in Sunshine Canyon.
The Alquist maps show active faulting extending into the site. BFI discounts this , based on an extrapolation form a letter written by Mr. Saul , of Mines and Geology. 635
However , when Mr. Saul was asked about this letter he said that he just did not see the fault where they had trenched, not that it wasn't there. He also said that the Santa Susanas were among the most faulted and folded ranges in California.

The Santa Susan Fault, that runs through the current berm , was declared to be inactive in the County EIR. Now , the County has declared it to be active , based on its seismic studies of Brown's Canyon. State Law prohibits , in Subchapter 15 , the siting of new landfills on Holocene faults. This landfill sits on the upper plate of the thrust fault. 636
Can earthquake faults act as conduits for water ? 637

The water in the Los Angeles Reservoir is 2 miles away and holds Post treated and filtered water . The only disinfectant treatment is done before being released to the public it is not filtered again. Any particulate matter (PM10's) including dust and bird droppings that fall into the water remain in the water.
The Reservoir is so large that it can not be covered to prevent this airborne contamination. 638

To state that there will be no impact is far from a true statement.

One of MWD's concerns was about the Balboa Inlet tunnel , which carries imported water from the State water project to MWD ' s Jensen Filtration plant and to the DWP's Aqueduct Filtration plant which together supply approximately 3 1/2 million people , the inlet tunnel is located immediately east of the landfill.
MWD states that because this tunnel runs directly underneath the drainage path leaving the landfill site, if the landfill leakage saturates the geologic formation surrounding this tunnel, hazardous landfill leachate could seep into the tunnel.

The following excerpt was taken from the findings of the State Water Resources Board (September 17,1992) 639
"The Metropolitan Water District of Southern California owns the Balboa Inlet Tunnel, which conveys untreated drinking water to the Jensen Filtration Plant. The 14 -foot tunnel comes within 500 feet of the eastern boundary of the existing landfill (closed City side) situated at the mouth of Sunshine Canyon. The top of the tunnel , at its shallowest point, lies 25 feet below the surface. Depth to ground water , at the same location is about 10 feet or less. Dependent upon flow rates , the hydraulic pressure head in the tunnel is approximately 3 to 19 feet lower than the ground water level. Under these conditions water may seep into the tunnel."

MWD and DWP are not capable of treating landfill leachate so they requested that BFI construct and operate a monitoring system between the landfill and the tunnel. 640
Is this monitoring system in place now ?

It is stated that the water beneath Sunshine canyon is of poor quality and is not potable, however, you do not state that the water is still treatable if not contaminated by leachate, is it not ? 641
Water is useful for more than drinking. 642
As MWD previously stated in a letter to Mr. Meneses of the County, the water in the general vicinity of the landfill has relatively high mineral content . However , similar quality ground water reserves are being developed elsewhere in Southern California to deal with the regional water shortage situation. Although brackish water desalination technology has become technically and financially attractive in recent years allowing improved basin management strategies for brackish ground water, such technology would not probably treat all landfill contaminants. 643

MWD also mentions that they are concerned about the High Chlorides found in MW-1 and felt that BFI's assertion that these high levels were attributable to nearby oil drilling activities and natural geologic conditions unsupported . 644

MWD goes further to state that because the explanation of high chlorides values is not provided , they recommend that a comprehensive analysis be conducted and submitted to the LARWQCB for its independent assessment of the leakage. 645

Is this the same report that has not yet been approved by the LARWQCB ? 646

How long has this been since the request from MWD to conduct this analysis of the high chlorides ? 647

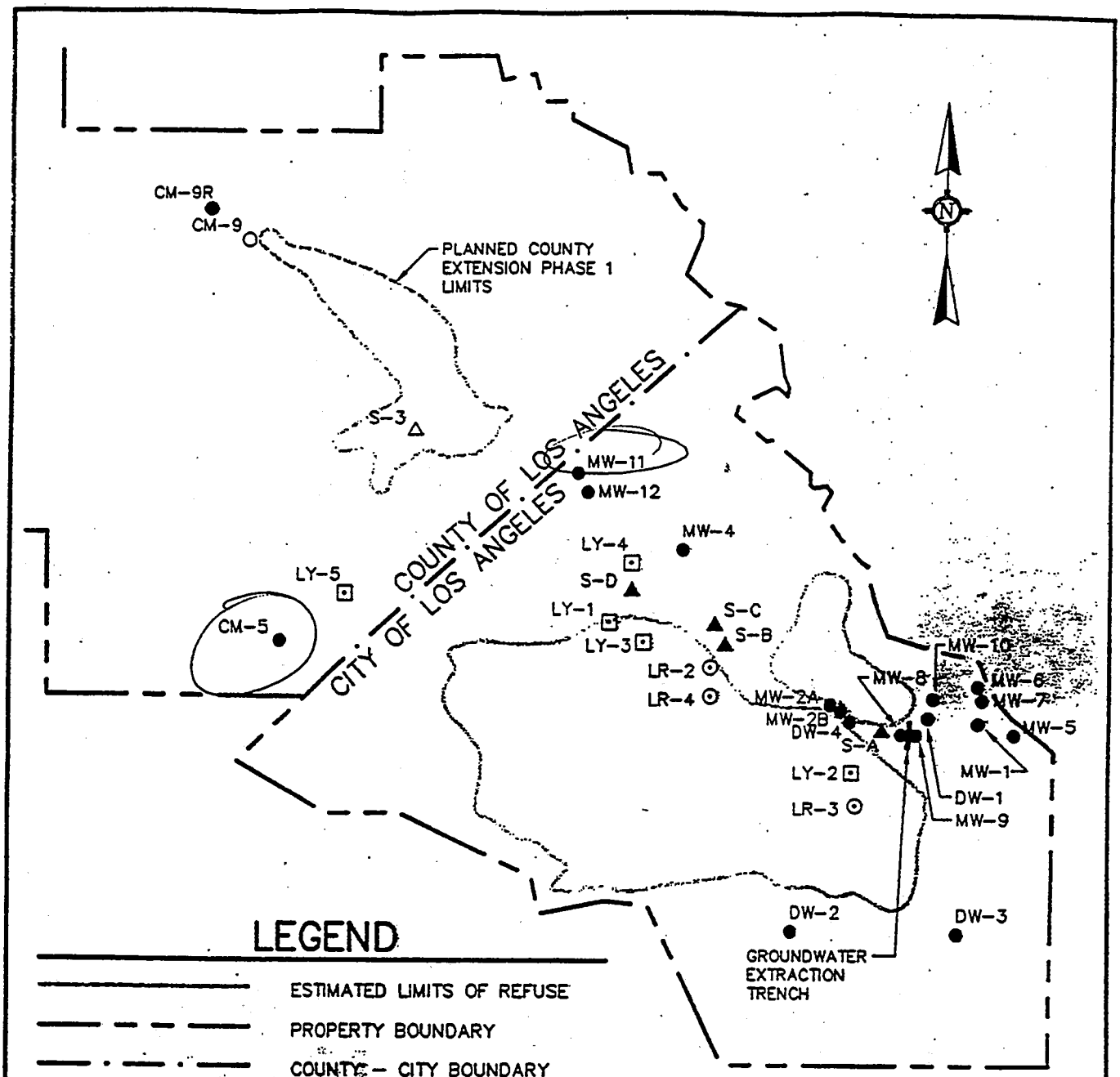
The MWD thought that the project should not go forward until the high chloride problem was resolved and it has been a long time now and the chloride issue is still not resolved . 648

Even if the high Chlorides are found to be from oil drilling as BFI states , are they still responsible for cleaning this up , after all they lease out the property that the oil wells are drilling upon ? 649

I reviewed the second quarter ground water and waste disposal report for Sunshine Canyon , inactive City landfill.
I wondered why they are allowed to monitor themselves and chose the laboratories to conduct their own testing without any check and balance system ? 650

In their August 1997 ground water monitoring and waste disposal report BFI has reported that there was detection of VOLATILE ORGANIC COMPOUNDS, 1,1-Dichloroethane , Chloroethane , Trichloroethane in Monitoring Well 10 (MW-10). MW-10 is located near MW-1 which is near the mouth of Sunshine Canyon.

In the same report Chloromethane was detected in two Monitoring Wells CM-5 and MW-11 . According to the map included with the August 1997 report these Monitoring Wells are located very near the IMAGINARY COUNTY SIDE / CLOSED CITY SIDE BOUNDARY. CM-5 is on the County Side and MW-11 is on the City side and are at opposite ends from one another.. The ground water in these Monitoring Wells is found at 18-19 feet. 651
I have included a copy of the map that shows the distance between these Monitoring Wells.
BFI claims that this Chloromethane is believed not to originate at the landfill because they are up gradient form the CITY side . This explanation seems to have no foundation.
They say that they will continue to monitor this in the future.



LEGEND

	ESTIMATED LIMITS OF REFUSE
	PROPERTY BOUNDARY
	COUNTY – CITY BOUNDARY
CM-9 ○	ABANDONED GROUNDWATER MONITORING WELL (2 MAY 96)
MW-1 ●	GROUNDWATER MONITORING WELL
LY-3 ⊡	LYSIMETER (LY-2 IS DAMAGED)
LR-3 ⊙	LEACHATE MONITORING WELL
S-D ▲	SURFACE WATER STATION
S-3 △	FORMER SPRING MONITORING LOCATION

1200 600 0 1200 2400

SCALE IN FEET

GeoSyntec Consultants

APPROXIMATE LOCATIONS OF MONITORING POINTS
SUNSHINE CANYON CITY SIDE LANDFILL
SYLMAR, CALIFORNIA

FIGURE NO.	2-1
PROJECT NO.	HR0133-02
DATE:	24 APRIL 1997

DWG: 0133F004 199704281329 LRS

9A

UPPER LOS ANGELES RIVER AREA WATERMASTER

CITY OF LOS ANGELES VS. CITY OF SAN FERNANDO, ET AL
CASE NO. 650079 — COUNTY OF LOS ANGELES

MELVIN L. BLEVINS — WATERMASTER
Office Location — Room 1455
111 North Hope Street
Los Angeles, CA 90012
Telephone (213) 481 6177

MAILING ADDRESS:
ULARA Watermaster
P.O. Box 111, Rm. 1455
Los Angeles, CA 90051

January 8, 1991

Mr. Frank Meneses
Impact Analysis Section
Room 1354, Hall of Records
Los Angeles County Department
of Regional Planning
320 West Temple Street
Los Angeles, California 90012

Dear Mr. Meneses:

Final Environmental Impact Report
Project No. SP86312, Case 2556
Sunshine Canyon Landfill Expansion

This letter is intended to clarify my opinion on the hydrologic connection between the Sunshine Canyon area and the groundwaters of the San Fernando Basin. Contrary to the statement in Topical Response 6 in the final EIR, it is my opinion that there is a hydrologic connection between the Sunshine Canyon area and the groundwaters of the San Fernando Basin. This connection occurs only through the thin alluvium beneath the outlet for surface drainage. In this regard, there is complete agreement with the statement in the second paragraph in the letter from Metropolitan Water District (MWD) to you dated January 8, 1991.

The potential for contamination can be fully mitigated by a low permeability cutoff wall to bedrock in the area of thin alluvium near the outlet area. The small volume of high chloride water collected behind this cutoff wall could be removed from a large diameter well and used for moisture control on the landfill. As a fail-safe procedure, a monitoring well should be placed in the alluvium a short distance downstream from the cutoff wall.

As ULARA Watermaster, I have met with Mr. Dean Wise, District Manager for BFI, Mr. Andrew Sienkiewich of MWD and the North Valley Coalition of the Granada Hills area (arranged by Ms. Sue Vila) on separate occasions to better understand the

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issues related to the Sunshine Canyon Landfill Expansion. I plan to attend the hearing of the County Board of Supervisors on January 17, 1991. If I can be of further assistance, please contact me at (213) 481-6177.

Sincerely,

ORIGINAL SIGNED
By M. L. BLEVINS

MELVIN L. BLEVINS
ULARA WATERMASTER

MLB:mm

c: Mr. Andrew Sienkiewich, Principal Engineer
Metropolitan Water District
Mr. Dean Wise, District Manager
BFI Waste Systems
Ms. Sue Vila, North Valley Coalition
Mr. Daniel Waters, General Manager
Department of Water and Power
Mr. James F. Wickser, Assistant General Manager - Water
Department of Water and Power

bc: Michael T. Moore
Frederick A. Findley
Norman L. Buehring
Frank Salas (2)
Bruce W. Kuebler
Melvin L. Blevins
Dr. John F. Mann, Jr.
Dennis C. Williams

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MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Office of the General Manager

JAN 10 1991
EXECUTIVE OFFICES
WATER SYSTEM

JAN 0 9 1991

Mr. Frank Meneses
Impact Analysis Section
Room 1354, Hall of Records
Los Angeles County Department of Regional Planning
320 West Temple Street
Los Angeles, California 90012

Dear Mr. Meneses:

Final Environmental Impact Report
Project Number SP 86312, Case 2556
Sunshine Canyon Landfill Expansion

We have reviewed the Final Environmental Impact Report (EIR) for the Sunshine Canyon Landfill Expansion. The comments herein represent Metropolitan's comments as a potentially affected public agency.

Request by the County Board of Supervisors

At its November 29, 1990 meeting, the Los Angeles County Board of Supervisors indicated that it would like to receive an official response from the Metropolitan Water District of Southern California regarding the Sunshine Canyon Landfill Expansion project's potential affect upon local water quality. Metropolitan believes the project would threaten local water quality if not properly designed and maintained.

The following factors, which are descriptive of modern municipal waste landfills, form the basis for Metropolitan's concerns:

* Waste deposited in landfills will contain household hazardous substances;

* Landfill wastes will not degrade into a benign state and will always have the potential for contamination until removed; and

* All lining systems are permeable and subject to leakage.

Metropolitan does not oppose the Sunshine Canyon Landfill Expansion. Metropolitan is concerned, however, that local water resources and conveyance systems be protected from contamination. The primary deterrents to contamination will be

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engineered protection systems for leachate control and responsible project management. It is also important that the project be regulated to ensure that these deterrents are effectively implemented.

Imported Water Tunnel

Metropolitan's Balboa Inlet Tunnel is located immediately east of the landfill, running directly underneath the drainage path leaving the site. This tunnel is a major drinking water conveyance facility serving approximately three and one-half million people, primarily in Los Angeles and Ventura Counties. If undetected landfill leakage saturates the geologic formation surrounding this tunnel, hazardous landfill leachate could seep into the tunnel.

Additionally, the Balboa Inlet Tunnel supplies State Water Project water to Metropolitan's Joseph Jensen Filtration Plant and to the Department of Water and Power's Los Angeles Aqueduct Filtration Plant. Neither of these filtration plants has the capability to treat landfill leachate. It is, therefore, essential that landfill leachate does not enter this tunnel.

Metropolitan requests that the project sponsor construct and operate a monitoring system located between the landfill and the tunnel. This system should also be maintained permanently, or until all landfill wastes have been removed from the site.

Metropolitan's Previous Comments on The Draft EIR

Based on our review of the document entitled "Responses To Comments, Volume A" and discussion with the applicant's consultants regarding our October 4, 1989 letter (enclosed), we have the following additional comments:

Hydrologic Connection to the San Fernando Basin

Sunshine Canyon is hydrologically connected to the San Fernando Basin. Upon consultation, Metropolitan and the Watermaster for the Upper Los Angeles River Area both disagree with the response statements (pages 17, 26, 27 and 91, Volume A) asserting the connection does not exist. However, Metropolitan does not disagree with the EIR finding that groundwater movement leaving the landfill area would be relatively slow.

Metropolitan concurs with the EIR findings that groundwater in the general vicinity of the landfill has relatively high mineral content. However, similar quality groundwater reserves are being developed elsewhere in Southern

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California to deal with the regional water shortage situation. Although brackish water desalination technology has become technically and financially attractive in recent years allowing improved basin management strategies for brackish groundwater, such technology would probably not treat all landfill contaminants.

Existing Landfill Leakage

Metropolitan previously commented that contaminants may be leaking from the existing landfill and that this problem should be corrected before the landfill is expanded. We noted high chloride values observed at the down-gradient monitoring Well No. MW-1. Topical Response No. 9 (page 25) and Response No. 25 (page 91) of Volume A assert that the high chlorides are attributable to other sources, such as nearby oil drilling activities and natural geologic conditions. Metropolitan finds that the supporting arguments for Response No. 9 lack a straightforward technical analysis of the monitoring well data.

Because an understandable explanation of the high chloride values at Well No. 1, MW-1 is not provided, Metropolitan recommends that a comprehensive analysis of the monitoring well data be conducted and submitted to the Los Angeles Regional Water Quality Control Board (RWQCB) for its independent assessment of the leakage. If leakage is detected, the problem should be corrected before the subject expansion is approved.

Metropolitan has contacted the project engineers, Purcell, Rhodes and Associates. They have advised Metropolitan of plans to construct a gravel drain and pumping system to intercept potential leakage as part of the closure plan for the existing landfill. While this concept seems reasonable, we recommend that any doubts about leakage be resolved by the RWQCB through review of a report as suggested above.

Water Agency Coordination

Metropolitan's comments provided above have been coordinated with the the Los Angeles Department of Water Power and the Watermaster for the Upper Los Angeles River Area.

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Points of Contact

We appreciate the opportunity to provide input to your planning process. Please direct questions regarding groundwater quality to Mr. Andrew Sienkiewich at (213) 250-6230. If we can be of further assistance, please contact Dr. Roberta L. Soltz, Manager of Environmental Affairs for Metropolitan, at (213) 250-6437.

Very truly yours,

Carl Boronkay
General Manager

AER-1/dgs

Attachment

cc: Mr. Melvin Blevins, Watermaster
Upper Los Angeles River Area

Mr. Bruce Kuelbler
Los Angeles Department Water & Power

Los Angeles Regional
Water Quality Control Board
Attention Mr. Robert P. Ghirelli

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Why is there no investigation to discover the reason that the Chloromethane was detected? 652

Could this be an indication that contamination is spreading? 653

What type of testing or investigation would be needed to discover the reason for this Chloromethane existence? 654

Chloroform was also detected in station S-D. They state that Chloroform is a trihalomethane and that it is commonly detected in municipal water supplies as a disinfection by-product. They also state that this did not originate at Sunshine Canyon, because S-D is up gradient from the landfill . 655
THEN WHERE DID IT COME FROM ?

WHAT IS NOT STATED IS THAT TRIHALOMETHANES ARE PRODUCED BY THE INTERACTION OF CHLORINE WITH ORGANIC MATERIAL. 656
COULD THIS BE SOMETHING THAT COULD OCCUR WHEN WATER COMES INTO CONTACT WITH ORGANIC MATERIALS THAT MAY BE FOUND AT A LANDFILL ?
AREN'T THM'S SUSPECTED CARCINOGENS? 657

In the same report, ground water levels in most of the Monitoring Wells had decreased but, three of them showed an increase. The amount they decreased is given but the levels of increase are not given. 658
How much of a ground water level increase was present for MW-8 , DW-3 and CM-9R?

What is meant by a general decrease ? 659

What is meant by the ground water was found to occur generally under confined conditions ? 660

When it is stated that the ground water velocity was estimated, Is this the same method used by MWD and DWP ? 661
How can the velocity be measured ?

What is the typical range of hydraulic conductivity for Sunshine Canyon ? 662
How was this range chosen ?

What is the work plan describing the investigation of the presence of VOC's in MW-10? 663

What company conducted the investigation ? 664

It has been a year since the investigation started . 665

What if any results have been found ?

In this report ,what is considered the maximum contaminant level for VOC's found in Leachate ? 666
In Leachate Monitoring Well 4 (LR-4) shows that 50 ppb of ethylbenzene and 5 ppb vinyl chloride was discovered.

According to the appendix (C19) the maximum contaminant level for vinyl chloride (Chloroethene) is 0.5 and the tests results for LR-4 was 5 ppb, Is anything being done to find out why this level exists ? 667

What explains these levels at this particular Well because the other Leachate Monitoring Wells did not show such levels ? 668

There are a few SYNTHETIC VOLATILE ORGANIC COMPOUNDS THAT WERE HIGHER THAN THE MAXIMUM CONTAMINANT LEVEL (MCL) 669
THE LAB TESTS DONE ON A SAMPLE FROM **LR-2** ON 6/2/97 SHOWS THAT **BENZENE WAS 3 ppb HIGHER** THAN THE MCL OF 1 ppb.

1,4-DICHLOROBENZENE WAS 3.4 ppb HIGHER THAN THE MCL OF 5 ppb. 670
THE LAB TESTS DONE ON A SAMPLE FROM **LR-4** ON 6/2/97 SHOWS THAT 671
BENZENE WAS 2.7 ppb HIGHER THAN THE MCL OF 1 ppb.

1,4-DICHLOROBENZENE WAS 10 ppb HIGHER THAN THE MCL OF 5 ppb. 672
THE LAB TESTS DONE ON A SAMPLE FROM **LR-3** ON 6/2/97 SHOWS THAT 673
1,4-DICHLOROBENZENE WAS 5 ppb HIGHER THAN THE MCL OF 5 ppb.

THE MCL FOR CHLORIDES IS 500ppb , **LR-2 AND LR-3 HAD EXCEEDED THE MCL , LR-2 WAS 411 ppb HIGHER AND LR-3 WAS 900 ppb HIGHER.** 674

LR-2 AND LR-3 ALSO EXCEEDED THE MCL FOR TURBIDITY WHICH IS 5 ppb FOR GROUND WATER. LR-2 WAS 3.4 ppb OVER THE MCL AND LR-3 WAS 37.1 ppb OVER THE MCL. 675 676

AND ALSO HIGHER FOR TOTAL DISSOLVED SOLIDS WHICH HAS A MCL OF 1000 ppb. LR-2 WAS 2560 ppb OVER THE MCL AND LR-3 WAS 1980 ppb OVER THE MCL. 677

THE **SURFACE WATER TESTING SHOWS THAT S-A ,S-B, S-C ALL EXCEEDED THE MCL FOR TOTAL DISSOLVED SOLIDS OF 1000 ppb BY AT LEAST 1500 ppb.** 678

S-A WAS 1670 ppb OVER THE MCL , S-B WAS 2140 ppb OVER THE MCL and S-C WAS 2120 OVER THE MCL. 679

Is the HELP model widely used in the waste industry? If so , where has it been used ? 680
Why was the HELP model chosen ?

Doesn't this method grossly underestimate the amount of leachate that will be produced over an extended period of time ? 681

Is there any other method that is used to predict leachate production , estimate surface runoff and drainage ? 682

Is HELP based on ideal situations ? Is there an error factor ? 683

How much moisture can be transmitted through the cap annually if the design specifications are achieved in the construction ? What is the anticipated increase in cap permeability with age ? How will the amount of moisture that penetrates the cap change as the permeability of the cap increases with age ? 684

How did the preliminary design of the project site indicate that infiltration would be lessened by reducing the area of percolation in the canyon? 685

How can the area of percolation in the canyon be reduced? 686

What materials were reviewed to make the conclusion about landfill leachate decreasing in pollution load over time? Where can these references be obtained for review ? 687

What observed studies were done that show leachate will decrease substantially in concentration upon landfill closure ?
Where can these studies be obtained ? 688

The HELP model estimates leachate production based on the County production rate of 120 gallons per minute. What will happen after the landfill is full , the County side has only been open for a short time ? 689

What will happen to this 120 gallons per minute of untreated leachate when the leachate collection system is closed in the County operating area ? 690

Is this untreated leachate to travel through the County area and into the City all the way to the proposed leachate collection system on the City side ?
How far will this untreated leachate travel total ? Will it travel in pipes over the old landfill? 691

This seems like it has great potential for disaster. If any earthquake occurs and cracks any pipe carrying leachate, what is your plan to handle the spill? 692

The proposed LCRS drainage network will be able to withstand how large a seismic event ? 693

What size seismic event will the HDPE pipe be able to withstand ? 694

What is meant by the drainage network will have the ability to deform without leakage ? 695

Why is rainfall data from 1969 relevant in 1997 ? Be realistic. Why are we preparing for El Nino conditions ? 696 Do you think that the same rain that falls less than a mile away from the landfill will not fall onto the landfill ? 697 Is there not more recent data on rainfall information than 1969 ? 698

What design and operational characteristics will ensure the integrity of the ground water resources and its quality within Sunshine Canyon ? 699

What environmental protection and control systems will ensure the integrity of the ground water resources and its quality within Sunshine Canyon ? 700

Who will do this continuous monitoring during landfilling operations , closure and post closure that will ensure the integrity of the ground water resources and its quality within Sunshine Canyon ? 701

The ground water is already impacted by the nonoperating City landfill how can anyone state with honesty that there is not expected to be an impact, what does not expected mean ? This is a non-committal statement. 702

When has there ever been any landfill company that was in total compliance , without any warnings or violations ? 703

When it states that the impacts would be less than significant if the operator stays in compliance , Can this really happen ? Be honest now. 704

Does the RCRA Subtitle D, 40 CFR part 258 , Subpart D ss 258.40 (design criteria) take into account that the liner will be placed on 30 plus years of landfill that will continue to sink ? 705

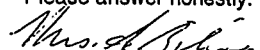
What will happen over time as the gap between the old trash and this proposed liner widens ? 706

Where will the holding tank for leachate be located ?
Will it be permanent or temporary?
Where will the pipes that carry this leachate run, on top of trash , underneath the trash?
Is the LCRS design based on the 120 gallons per minute of leachate ? 707

This idea to add a liner over a landfill that is 30 plus years old and unlined is puzzling and reminds me of the trash bag commercial where too much trash is put into a plastic bag and as it weakens , it bursts open causing a big mess. The only difference is that if it happens at this site the mess would be of extremely serious proportions. 708

I would like to close with one very important question , would you like this project if you lived near it and your children attended school less than a mile from it ? 709

Please answer honestly.



Mrs. Anne Zitlak

1. Is there a hydraulic connection between the landfill and aquifer potentially affected by the landfill and groundwaters beneath adjacent properties that could, at any time in the future, be used for domestic water supply purposes? 710

2. Will the landfill design (cap, liner, leachate collection-removal system, etc.) prevent leachate from being formed in the landfill, and prevent leachate's leaving the landfill through the liner system for as long as the wastes in the landfill represent a threat to groundwater quality? 711

3. How much leachate will be generated annually in the landfill over the period during which the wastes represent a threat to groundwater quality? 712

4. How will desiccation-cracks and differential-settling cracks in the cap of the landfill be detected and remediated? 713

5. What will be the costs, and how and by whom will the costs be paid, for cap maintenance for as long as the wastes represent a threat to groundwater quality? 714

6. What will be the rate of leachate transport (gallons/acre/year) through the landfill liner and out of the leachate collection and removal system through the liner at the time of construction? How will the leakage rates change over the time that the wastes in the landfill represent a threat to groundwater quality? What is the potential impact of such leakage on groundwater quality in the vicinity of the landfill? 715

7. For landfills incorporating composite liners, what will be the potential impact of desiccation-cracking of the soil-clay layer of the composite on the rate of leachate transport? What is the anticipate area of the liner in which intimate contact between the FML and the soil-clay layer will not be achieved? What will be the impact on the rate of leachate transport of not achieving intimate contact between the FML and the soil-clay layer over that area? 716

8. How will the problem of desiccation-cracking of the compacted soil layer of the composite liner be identified, and remedied? How will the desiccation-cracking that occurs affect leachate transport through the liner? 717

Permitting of Landfills (continued)
Questions

9. What is the expected composition of the leachate? What is the potential for each of the components to pollute groundwater in the vicinity of the landfill, rendering it unusable or impaired for use as a domestic water supply? 718

10. What is the potential for TCE and other chlorinated solvents in the proposed landfill to pollute groundwater with known human carcinogens? 719

11. What is the potential impact of any possible seismic activity that could occur in the vicinity of the landfill on the landfill structures? After a seismic event of any magnitude, how will the integrity of structures be examined and damage assessed before widespread groundwater pollution occurs. How will it be possible to make repairs on those structures when they are located beneath buried solid waste that may be hundreds of feet thick? 720 721

12. What is the ability of the groundwater monitoring system proposed to detect leakage from the landfill liner before widespread groundwater contamination occurs? 722

13. Can municipal solid waste leachate-contaminated aquifers be "cleaned up" to the point at which the groundwater and the aquifer can be used again for domestic water supply purposes? If so, how can this be done? 723

14. Did the consulting firm for landfill design and the EIR/EIS firm make a plausible worst-case scenario evaluation for the pollution of groundwaters by the proposed landfill? Have they estimated the total cost of groundwater and aquifer clean-up to the extent that clean-up can be accomplished? Who will pay those costs? 724

15. What are officials in the local political jurisdiction doing toward investigating and remediating current groundwater pollution from existing landfills, and toward preventing future groundwater pollution by landfills? 725

16. How will the moisture content of the waste in the closed landfill affect the rate of fermentation (gas production) and leaching of contaminants from the wastes? 726

KNOLLWOOD PROPERTY OWNERS ASSOCIATION
KNOLLWOOD
11962 SALBOA BOULEVARD, #168
GRANADA HILLS, CALIFORNIA 91344

December 1, 1997

RECEIVED
CITY OF LOS ANGELES
DEC 03 1997
ENVIRONMENTAL
UNIT

Hadar Plafkin, City Planner
Los Angeles City Planning Dept.
Environmental Review Section
221 N. Figuero Street, Room 1500
Los Angeles, CA 90012

Dear Mr. Plafkin:

We, the Members of the Board of Directors of the Knollwood Property Owners Association, who represent 550 homeowners, are concerned about the impact of the proposed expansion of the Sunshine Canyon landfill on the health of the families who live in this area. 727

We ask you to put yourself in our position and understand our concerns about the proposed expansion. For years we have been shocked by the way Browning Ferris Industries (BFI) has blatantly violated major restrictions placed on them by their operating permits. (BFI has opened areas for dumping when they didn't have the permits, has constantly operated without watering down the active areas as required, has built berms higher than allowed, has not covered raw dumping as required, has continued operations on even the windiest days, and has even delayed inspections.) We are sure you are aware of these infractions. 728

Even if they were to comply with all the precautions as they have promised, which is very unlikely considering their record, we, the residents of Granada Hills, would still be faced with having the world's largest dump in our backyard. 729 According to the Environmental Impact Report the expansion will significantly raise the level of air pollutants in the area. There will be a significant increase in nitrogen oxides, reactive organic gases, carbon monoxide, sulfur oxides, and suspended particulate matter which cannot be mitigated. 730

We understand that the City now has an economic interest in Sunshine Canyon because of the long term reduced price agreed upon by BFI if they are to accept half of the city's refuse. Please assure us that your major consideration will not be economic. 731

Those of us residing in Knollwood and Granada Hills do not feel that we should provide the necessary burial ground to meet the solid waste needs of the city of Los Angeles. We support Councilman Hal Bernson in his suggestion (July letter) that, instead of expanding to within the Los Angeles city limits, it be moved further north. 732

BFI says the landfill will have little effect on the adjacent land uses; however, we know, that they cannot get rid of 100% of the methane gas created by so large a landfill. We know that our very lives and those of our children are in danger if we continue to live here after expansion of the dump. 733

If the proposed expansion is approved by your office the landfill will be a mere 1700 feet from the nearest home. Again we ask you to imagine what our environment will be like if you approve the expansion of the Sunshine Canyon landfill. 734

Sincerely yours,

Iris S. Shah

Iris S. Shah, Ph.D.
Secretary, Knollwood Property Owners Association

LEONARD M. SALLE, P.E.
150 ERICA WAY
PORTOLA VALLEY, CALIFORNIA 94028-7440

RECEIVED
CITY OF LOS ANGELES
DEC 05 1997
ENVIRONMENTAL UNIT

December 1, 1997

Mr. Hadar Plafkin
City Planner
221 N. Figueroa St., 15th Floor
Los Angeles, CA 90012

RE: Sunshine Canyon Landfill Draft Subsequent Environmental Report (EIR)

Dear Mr. Plafkin:

I have reviewed the Environmental Impact Report at the request of my son, William F. Salle who is a member of the Affected Community.

My qualifications, briefly, are as follows:

* California Registered Civil Engineer (16597)
* Fellow of the American Society of Civil Engineers
* Charter Member of the Association of Environmental Professionals
* Life Member of the American Water Works Association

My Class III sanitary landfill experience is as follows:

* Design and permitting manager at Emcon Associates for numerous landfills including the Kirby Canyon Landfill in San Jose, California
* Design and EIR involvement at Emcon Associates with respect to numerous landfills, including, Ox Mountain in San Mateo County, California (a BFI Landfill)
* Landfill Group Manager at Emcon Associates

* Design, permitting, and Operations Consultant for the Redwood landfill, Marin County, the Altamount landfill in Alameda County, and Kirby Canyon in San Jose

Currently I am employed by Santa Clara County as a professional engineer and have no conflict of interest in doing this review.

Please respond, with specificity, to the following comments:

A. Refer to Section 4.13-transportation/circulation; Page 4-346, passenger car equivalents (PCE) under Traffic Generation Criteria. It is stated that "one transfer truck is assumed to have approximately the same impact on normal traffic operations as three passenger cars, and one curb side collection trash truck is equivalent to two passenger cars". These assumptions appear to be understatements generally, and do not relate to the fact that the impact of a truck will vary significantly depending on the conditions of the road, e.g., a sloped entrance ramp, the conditions of traffic and signalization. 735

Please provide the following clarifications in response to this comment:

1. The source and precise conditions and data from which the assumptions were derived; 736

2. Supporting data that shows that the assumptions apply to each of the analyzed intersections; 737

3. Quantify the common occurrence of having multiple trucks occupy a short stretch of road and how that may produce impacts which are different than the assumptions. Note, experience shows that trucks neither enter nor leave landfills at an even spacing. Multiple trucks at an intersection, or even a stretch of road (for example where one truck attempts to pass another) can create much greater impact than an equal number of trucks evenly spaced out in traffic. 738

4. If the assumptions cannot be fully supported by data, they should be revised and the impact should be recalculated. 739

B. Please refer to page 4-372, table 4.13-9 (project specific mitigation measures).

1. The second paragraph where the San Fernando Road at Balboa does not provide a specific mitigation, but rather refers to a recommended traffic surveillance and an indication that preliminary discussion with LADOT staff indicate a computer signal control system with a possible mitigation that could be implemented. 740

Since a mitigation is supposed to be an inherent part of a proposed proposal project, on what basis can this be considered a mitigation? 741

2. Is there an absolute commitment that this mitigation will be provided? 742

3. If there is no assurance that the mitigation will be provided as part of the proposed project, the mitigation should be removed from the impact analysis. 743

C. Refer to page 4-44. Under City Mitigation Measures it is stated that "final maximum refuse slope, gradients shall be no more steeper than 2H to 1V for the landfill". 744

It is difficult to see how a 2H:1V slope can be considered a mitigation. Most landfills in earthquake prone areas in California are designed at 3H:1V or flatter.

There are a number of critical factors relating to slope stability that the Environmental Impact Report has not addressed. For example: 745

1. The contents of a landfill vary considerably throughout a given landfill. 2. The strength of any section of a landfill can change with time as decomposition (see page 2-65 "Refuse Decomposition Processes") and settlement takes place. 3. The contents of municipal landfills can be expected to change significantly with changes in technology, e.g., a paperless work place and with greater emphasis on recycling. 746 747

Given the many variables in trying to assess landfill performance, it is prudent to make conservative assumptions. It should be noted that an engineered fill (which is not the case here) is normally constructed with a maximum slope of 2:H to 1:V. An engineered fill uses graded and defined earth materials, moisture condition and compacted within narrow limits. By contrast, a sanitary landfill has a content which is to a large degree undetermined, which is loosely compacted, which is subject to significant settlement and changes in strength characteristics over time. These calculations are absent. Please state in your response to this comment how the stability analyses that have been conducted have reasonably considered the above variables. Also provide the basis for claiming that a 2H to 1:V slope is mitigation given that many experts including myself, would consider this an overly steep slope. 748 749 750

D. Refer to page 5.1. In considering potential sites for major new landfills, it is customary to perform a site selection study. Such a study uses a rigorous methodology which looks at all significant variables and (those normally cover by an EIR) within a geographic area. Additionally, the study evaluates acquisition 751

variables. There is no indication that such a study was performed in developing alternative sites for evaluation. Please respond to this comment by describing the methodologies (not the public processes which are described) used in selecting and analyzing the alternative sites. 752

E. Refer to page 5.4. Under section 5.3, "Methodology Used for Analyzing Alternatives," it is stated that "these alternatives were evaluated based on their ability to satisfy the specific objectives of the proposed project." This approach puts a major emphasis on the project proponent's stated development objectives and therefore shades the analysis in favor of their proposal. This approach does not appear to satisfy any reasonable standard for objectivity. Even referring to the project proponent's development objectives is misleading. Please describe what was done to insure objectivity given the project proponent's active participation in the alternative selections and the fact that these alternatives are evaluated by a consultant paid directly by the project proponent. 753

F. Section 2.10 page 2-75 states that the "combined landfilling at one face would consist of landfilling operation occurring on approximately 10 acres." This is a huge working face. Bulldozers, trucks, and other landfilling equipment will be operating from 5:00 a.m. to 6:00 p.m. dumping and spreading garbage on an area equal in size to about 15 football fields. The Environmental Impact Report describes litter control devices that will be employed to control the blowing of garbage. In the past litter control was a problem at Sunshine Canyon even with a smaller operation. 754

1. Describe what modeling or methodologies have been used to ensure the effectiveness or litter control.

What are the potential impacts of wind on the 10 acres that will constitute the working face with respect to garbage, dirt and air quality? What methodology, models and documents were relied upon? 755 756

OBJECTIVITY

As an individual who has been involved in the EIR process since its inception, it is obvious that even the most objective EIR consultants cannot maintain complete objectivity when they are working directly for a project proponent. Their interaction with the project proponent, their client, and their desire to maintain an ongoing relationship with that client, creates a major conflict for the consultant who is trying to be objective and professional. Additionally, the consultants often get caught up in their client's view of trying to deal with an unreasonable public and they use 757

their knowledge to craft an EIR which has an appearance, but not the reality, of objectivity. This is self evident in reviewing the Sunshine Canyon Environmental Impact Report. The above comments provide examples of advocacy of drafting the Environmental Impact Report in a manner to support the project rather being clearly objective. An additional problem is that the public must depend on the lead agency to identify statements in the Environmental Impact Report which lack objectivity. First an EIR of this scope and complexity is frequently beyond the review expertise of the agency staff. Secondly, the EIR can be crafted to deceive the reviewers.

Given the above, please describe exactly what has been done to ensure the objectivity of this EIR.

I look forward to the project proponent's detailed response to the foregoing.

Very truly yours,

LEONARD M. SALLE

LMS/yh

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RECEIVED
CITY OF LOS ANGELES
DEC 05 1997
ENVIRONMENTAL UNIT

December 1, 1997

Mr. Hadar Plafkin
City Planner
221 N. Figueroa St., 15th Floor
Los Angeles, California 90012

RE: Sunshine Canyon Landfill

Dear Mr. Plafkin:

I along with my wife and two year old son, reside at 17457 Rushing Drive, Granada Hills, California 91344. My residence is situated in close proximity to the proposed expansion of Sunshine Canyon and I have the following questions with respect to the draft subsequent environmental impact report.

1. With respect to page 4-47, the Environmental Impact Report state that "on most spring and on early summer days, the daily air pollutants produced within the SCAB are moved out of the air basin through mountain passes or are lifted upwards by the warm vertical currents produced by the heating of mountain slopes. In those seasons, pollutants within the SCAB are disbursed and transported "often to a distance of sixty miles or more by ocean air currents during the afternoon." 758

a) What studies, methodologies, reports and/or documents are relied upon for this assertion?

b) What are the dispersion rates from carbon monoxide which is related to the proposed operation of Sunshine Canyon? 759

c) What are the dispersion rates from reactive organic gasses which is related to the proposed operation of Sunshine Canyon? 760

d) What are the dispersion rates from nitrogen oxide which is related to the proposed operation of Sunshine Canyon? 761

e) What are the dispersion rates from sulfur dioxide which is related to the proposed operation of Sunshine Canyon? 762

f) What are the dispersion rates from particulates which is related to the proposed operation of Sunshine Canyon? 763

g) What are the dispersion rates from fugitive dust which is related to the proposed operation of Sunshine Canyon? 764

h) What are the dispersion rates from ozone which is related to the proposed operation of Sunshine Canyon? 765

i) What are the dispersion rates from nitrogen dioxide which is related to the proposed operation of Sunshine Canyon? 766

2. With respect to the federal ozone standards discussed at page 4.53, the Environmental Impact Report states that these [ozone] concentrations increased during the summer, with daily concentrations increasing from the late morning to the afternoon. 767

a) How much ozone will be released during the summer months?

b) How much ozone will increase by each year? 768

c) What methods, studies and documents have you utilized to analyze this issue? 769

d) What will the affect of increased ozone have on the health of children in the affected area? 770

e) What will the affect of increased ozone have on elder people or people with respiratory problems in the affected area? 771

f) Have there been any studies done with respect to the increase of ozone over a localized area? 772

g) What, if any, attempts have there been made to mitigate the affects of increased ozone? 773

3. Have alternative sites been examined, as a possible mitigating factor? If so, please state the methodology used for analyzing alternative sites and all supporting documentation upon which the analysis was made. 774

4. What will be the affect of increased particulate matter on the population on the affected area? 775

5. What will be the specific health affect of increased particulate matter on the elderly? 776

a) Upon children aged 0-5? 777

b) On children aged 6-10?

c) On children aged 11-15?

d) On children aged 16-25?

6. What is the affect upon increased particulate matter on property values? 778

7. Has a modeling been done which examines levels of increased particulate matter as the usage of the landfill continues over time? 779

8. Have any studies been performed which examines the affect of increase particulate matter on the affected population? 780

a) If so what studies? If not, why not?

9. On page 4-55 the report states that "because the area is subject to frequent violations of both State and federal air quality standards for ozone and state standards for particulate matter the project area is very sensitive to additional ozone precursor and particulate pollutant emissions. 781

a) What, if anything, have been done to mitigate the affect of additional ozone and particulate matter in an area that is acknowledged to be an area "subject to frequent violations of both state and federal air quality standards for ozone and particulate matter"?

b) Exactly, what does it mean when Environmental Impact Report states that "the project area is very sensitive to additional ozone precursor and particulate pollutant emissions?" 782

c) What, if any, studies have been done in this area to ascertain the "sensitivity"? Are we talking about affects on people's health? This area must be addressed with specificity. 783

d) What studies if any, have been done to ascertain the effect of additional O3 and PM10 pollutants on the residential population which lives in the vicinity of the Sunshine Canyon? 784

e) If no studies have been performed, does BFI intend to perform any studies by a qualified health care professional prior to the expansion of Sunshine Canyon? 785

10. With respect to the table utilized on page 4-56 (table 4.2-2 "Air Quality Monitoring Summary for Santa Clarita Monitoring Station") the report notes that with the exception of inhalable particulates, all values are based on 365 days per year. 786

a) On what basis were the inhalable particulates measured?

b) Were the particulates analyzed by specific size? 787

c) If so, what methodology and documents were utilized? 788

d) Why is Sunshine Canyon being expanded when the report itself states that there will be an unavoidable adverse impact on air quality when Sunshine Canyon resides in an area that already has very poor air quality? 789

11. The Los Angeles Times in its November 20, 1997, edition reported a year long study by the Kaiser Foundation Research Institute which found a particularly strong correlation between hospital admissions and elevated levels of course particulates that typically come from road dust, tire wear and airborne erosion from construction sites. As indicated in the EIR, particulate matter along with other pollutants will rise significantly and the impact cannot be mitigated. Have the recent health studies (including Kaiser's) been reviewed, especially those concerning particulate matter, in relationship to the particulate matter that will be generated by Sunshine Canyon? 790

a) If yes, what studies have been reviewed? 791

b) If no studies have been reviewed that have specifically reviewed the relationship to the affects that particulate matter have on individuals, why is this project going forward? 792

12. The Environmental Impact Report fails to address the topic of potential diminution of property values. BFI has operated other municipal landfills in proximity to residential neighborhoods. 793

a) Have there been any studies which attempted to correlate the affect that the opening of a municipal landfill or the expansion of a municipal landfill has on residential property values?

b) If there have been any studies done, why were they not cited? 794

c) If there have been studies done, please specify the study, when it was performed and in relationship to which landfill? 795

d) If studies have not been performed, indicate why a study has not been performed which would demonstrate the impact, if any, the proposed expansion of Sunshine Canyon have on existing residential property values? 796

13. On Page 4.57 the Environmental Impact Report indicates that the Page Four SCAQMD is the first local agency in the country to adopt a market-based approach for controlling stationary source emissions of oxides of nitrogen and sulfur and, in accordance with the pending revisions, is proposing additional market-based control measures. 797

a) Does the Environmental Impact Report adopt a market based approach for evaluating air quality?

b) If a market-based approach is being adopted by BFI with respect to air quality, on what basis is it being implemented? 798

c) If a market based approach is being adopted by BFI with respect to air quality, how does the report relate to the health consequences of the residential population which resides adjacent to Sunshine Canyon? 799

14. The Environmental Impact Report, beginning Section 4.2.7 (site preparation/construction sequencing) provides a model for pollution. 800

a) Does the model show the variations from month to month and season to season?

b) If no, why not, especially since pollution levels are significantly higher in the summer months? 801

c) If yes, what model was used and what factual basis was used for the extrapolation? 802

15. Under 4.2.7, of the Environmental Impact Report further states that "based on the projected emission presented herein, a significant air quality impact is predicted for nitrogen oxide. 803

a) What levels will the nitrogen oxide increase to and how will those levels vary over months?

b) In addition, how will the increased levels of nitrogen oxide adversely affect the local residents? 804

c) Have health studies been performed to ascertain the health affects of the increased nitrogen oxide on the affected population? 805

d) If yes, what studies were done?

e) If no studies have been performed, is BFI going to perform any studies into the potential health affects on the subject population for increased nitrogen oxide prior to the opening of the expansion of Sunshine Canyon? 806

16. Why is the air quality monitoring a summary for Santa Clarita of monitoring station (table 4.2-2) only go through 1994? 807

17. In light of the fact that figures are available through 1996 wouldn't it not be more prudent for the Environmental Impact Report show the most current figures for the number of days standard for the exceeded maximum levels for monitoring such violations? 808

18. Based on the current Federal Clean Air Act requirements, how many days of the year will the PM10's exceed the federal standards for the proposed expansion? 809

19. Based on the current Federal Clean Air Act requirements, how many days of the year will the ozone exceed the federal standards for the proposed expansion? 810

20. Based on the current Federal Clean Air Act requirements, how many days of the year will the carbon monoxide exceed the federal standards for the proposed expansion? 811

21. Based on the current Federal Clean Air Act requirements, how many days of the year will the nitrogen dioxide exceed the federal standards for the proposed expansion? 812

22. Based on the current Federal Clean Air act requirements, how many days of the year will the sulfur dioxide exceed the federal standards for the proposed expansion? 813

23. Based on the current Federal Clean Air Act requirements, how many days of the year will the inhalable particulates exceed the federal standards for the proposed expansion? 814

24. What affect will the increase fugitive dust emissions have on the population adjacent to the Sunshine Canyon? 815

25. What studies have been done in relationship to the affect that fugitive dust emissions will have on the subject population? 816

26. Project construction is projected to produce nitrogen oxide (893.8 pounds per day) and PM10 (203.8 pounds per day) in excess of those levels deemed by the SCAQMD as significant. 817

a) What studies have been done to determine the health affects of the increased nitrogen oxide and PM10's?

b) What is the dispersion rate of the nitrogen oxides and PM10's? 818

c) What studies delineate the dispersion rates of the nitrogen oxides and PM10's? 819

d) If studies have not been done or reviewed which delineate the dispersion rates of the nitrogen oxides and PM10's why not? 820

27. At page 4-64 the Environmental Impact Report indicates an anticipated fuel consumption of 23.5 miles per gallon (which is comprised of transfer trucks, curb side collection trucks, and local delivery trucks). 821

a) Please identify the make and model of any transfer truck, curb side collection truck or local delivery truck that is able to obtain 23.5 miles per gallon.

b) please indicate the source of the calculations which were used to support the emissions estimated therein (it appears the calculations were based on an eight hour day as opposed to the ten hours of operational use which is indicated in the EIR). 822

28. On what basis was the conservative method utilized in the derivation of heavy equipment and vehicle emissions? 823

a) Would it be more appropriate to use a less conservative methodology? 824

29. Which respect to Fuel Storage and Dispensation, what are the calculations utilized to compute that daily diesel consumption for heavy equipment is estimated at 900 pounds per day. 825

30. Under Stock Pile Erosion (page 4-71) the report indicates that "At height of ten feet, a stockpile would require a land area of approximately thirty acres." 826

a) What is the height limitation on stockpiles?

b) What is the height limitation based upon? 827

c) How do the calculations of PM10's differ with respect to the height of the stockpile? 828

d) How many stockpiles could be utilized at any one time? 829

31. In the EIR's calculation on page 4-71, on what basis is .22 utilized for PM10 particulates? 830

a) What studies support the use of .22 for PM10 particulates? 831

32. With respect to the calculations shown on page 4-72 .36 is used for calculation of PM10 particulates. 832

a) On what basis is .36 utilized for PM10 particulates and what studies form the basis for utilizing .36 for said calculation?

33. In the carbon monoxide micro-scale analysis passenger car equivalents of 2 to 1 were used for curb side collection trucks and 3 to 1 were used for transfer trucks.

a) Is there any published documentation or studies on which justify or support such a conversion or ratio? 833

b) If such studies exist, please identify said studies.

34. With respect to page 4-76, which indicates that Screen Two model was utilized in the health risk analysis (4.2.9) which was not designed for a complex terrain such as Sunshine Canyon, why was such a model utilized? 834

a) How can you have accurate assessments of the health risks when the model utilized (Screen Model Two) is not designed for use in complex terrain such as Sunshine Canyon? 835

35. Has BFI studied the health risk associated with landfills in which a residential population is situated within a half mile of the landfill?

a) If yes, what have those studies revealed? 836

b) If no, why not consider the potential adverse consequences?

36. On page 4.77, the Environmental Impact Report indicates the chronic health impacts were predicated on conservative impact assumptions. Why are conservative impact assumptions utilized? 837

37. Under the Health Risk Analysis, was the health risk analyzed for the 9 carcinogenic material and the five noncarcinogenic constituents which were utilized in table 4.2-13. 838

a) If no, why were no such studies performed?

38. With respect to page 4-78 on the third indented paragraph the Environmental Impact Report that "the project environmental document should provide an analysis to demonstrate ... the project will not have significant negative impact on air quality in the long term (5 years or longer.) However, the next paragraphs states "the impact analysis demonstrates that significant levels of air pollutants will be generated over the long term." How does BFI square these two competing contentions? 839

39. The Environmental Impact Report further states that page 4-78 that "with resent finding by nationally recognized health experts, the new 1997 draft AQMP puts greater emphasis on PM10 particulate matter." Identify the recognized health experts identified in this statement as well as their reports. 840

40. If the air quality will be adversely impacted and cannot be mitigated, why are sites not thoroughly reviewed which are situated in an area which is not contiguous to a residential population? 841

41. With respect to the City of Los Angeles Air Quality Element, how is this project consistent with the goal of the obtainment of good air quality when the EIR admits that air quality will suffer and that the affects cannot be mitigated? 842

42. With respect to goal four listed on page 4-83 identify the "stand-alone health risk assessments". 843

a) What studies documents and/or research demonstrate that the "air pollutants admitted from the flare station, which is a pollution control device, was shown to induce no potential adverse health affects as indicated under goal four on page 4-83. 844

43. The Environmental Impact Report states that the "project is currently out of attainment for both ozone and PM10 suspends particulate pollutants." 845

a) Please identify how far out of attainment the project will be for O3 and PM10 for the life of the project and further indicate whether the project area will not be in attainment for other pollutants over the life of the project.

b) Further, specifically identify the methodology, assumptions, studies and documents, upon which the requested information is based. 846

44. As indicated on page 4-84 the project is considered significant on cumulative level with respect air pollutants. This being the case, on a year to year basis through the life of the project, identify how the amount of pollutants which will exceed the federal maximum standards. 847

a) Furthermore, identify the health risks associated with increased N02, S02, PM10, C0, ROG. 848

b) Furthermore, please identify the methodology, studies, experts and information utilized in arriving at said yet unstated conclusions. 849

45. What are the dispersion rates for N02, S02, PM10, C0, ROG, and at what distance do they meet the federal air quality standards? Please provide the documents, methodology, studies, which support the EIR, yet unstated conclusions, regarding these matters. 850

46. With reference to page 4-86, to what level will fugitive dust be mitigated? 851

47. On page 4-86, under the heading Exhaust Emissions, the report states that significant impacts are anticipated. Accordingly, what affect will the mitigation measures for heavy equipment and site construction have on the air quality? 852

a) What studies, if any, were performed to calculate the level of mitigation air quality? 853

b) To what degree will the air quality be mitigated by such mitigation measures set forth for heavy equipment operation and site construction? 854

48. With respect to page 4-87, how does the project proponent's commitment to reduce traffic congestion translate into the actual implementation of plan to reduce traffic congestion? Is the "commitment" legally binding on BIF? 855

49. With respect to table 4.2-15 (operational emissions, control measure reduction efficiency, and residual emissions), please describe how Ultrasystems Environmental Incorporated derived the numbers utilized in said table. 856

50. With respect to table 4.2-16, please describe the source of the numbers utilized by Ultrasystems Environmental Incorporated. 857

51. With respect to table 4.2-16, the EIR notes that control efficiency are conservative: On what basis are conservative control efficiencies utilized? 858

a) The EIR admits that in the past, the landfill was subject to prior dust control problems, how do the mitigation efforts used in the past differ from those that are planned to be used when Sunshine Canyon is expanded? 859

52. On page 4-91 the Environmental Impact Report states that "even with the implementation of mitigation measures, project-generated and project-related cumulative impacts are considered significant and unavoidable. The EIR appears to suggest that there will not be any health affects, this being the case, why are the impacts still considered "significant."? 860

53. With respect to odor impacts, what studies, if any, have been done to support the EIR's claim there are formidable barriers to odor migration? 861

54. On what basis is the EIR's claim that the 1,700 foot separation between the nearest residential unit to the timber ridge is sufficient to eliminate potential odor nuisance problems emanating from the working face of the landfill. 862

55. With respect to the wind under 4.2.2 (California's SCAB regional climate characteristics report indicates "with very light average wind speeds, the SCAB's atmosphere has a limited capability to disperse their contaminates horizontally. It is common knowledge that average wind speeds do not reflect the extreme in wind variations and high winds often common in the hills surrounding Granada Hills. Especially, it is common knowledge that the winds can reach very high speeds in the canyon passes including, Sunshine Canyon. 863

a) Is it appropriate for the EIR to use a model that reflects the average wind speed? What methodology, models and documents were relied upon?

b) What is the dispersion of air contaminants horizontally during periods of high winds? What methodology, models and documents were relied upon? 864

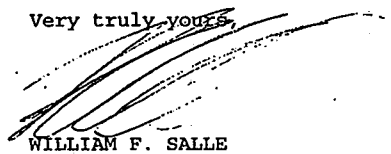
c) What is the dispersion rate of air contaminants when they are disbursed with reference to various wind speeds? What methodology, models and documents were relied upon? 865

56. What affect will the air contamination caused by the project have on the LA Water Treatment Plant located off Balboa? What methodology, models and documents were relied upon? 866

a) Please provide the exact methodology and documents used to support any information on this matter.

I look forward to a detailed response to the very real concerns my family and I have with respect to BFI's proposed expansion of Sunshine Canyon.

Very truly yours,



WILLIAM F. SALLE

WFS/yh

GEORGE KANE **Letter 3.8-23**

ATTN: Hadar Plafkin, City Planner
Los Angeles City Planning Dept.
Environmental Review Section
221 N. Figueroa St 15th Floor
Los Angeles, CA 90021-2601

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December 2, 1997

RE: SUNSHINE CANYON LANDFILL PROJECT

Dear Hadar Plafkin,

I write not as a resident of Granada Hills alone, but as one who is very concerned about the environment as well. It appears that the biggest waste dump in LA, perhaps the world, is nearing a reality. 867

Big business and money probably have more clout than one more concerned citizen, but how can this be on the cusp on happening when, from the information I have received, there should be great alarm over the Final Environment Impact Report. What about that today, tomorrow? There appears dangerous potential for harm not to just those nearby, but to those much further away. What about us, our children? 868

A landfill of this monstrosity should not be located so near people and a fresh water supply. Seems common sense, let alone a formal report, should make that clear. 869

You have "the clout" of the opinion of one more concerned LA resident. 870

Sincerely,

George Kane

cc: Mike Wallace, CBS

11916 Mallot Place Granada Hills, CA 91344 818-368-8338

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Letter 3.8-24

LASER

Landfill Alternatives Save Environmental Resources

A California Non-Profit Public-Benefit Corporation

Participating Organizations:

Citizens Against the Chiquita Canyon Landfill Expansion
Coalition of West Covina Homeowners Associations
Communities United for Safe Trash Management
Foundation for the Preservation of the Santa Susana Mountains
Friends of Caballero Canyon
Friends of Pico Canyon
Friends of Towsley Canyon
Hacienda Heights Improvement Association
Kagel Canyon Civic Association
Mothers and Others Against the Dump
North Valley Coalition
Ridge Trail Park Trust
Santa Clarita Citizens' Transportation Association
Santa Clarita Civic Association
Santa Clarita Oak Conservancy
Santa Clarita Organization for Planning the Environment
Santa Clarita Valley Canyons Preservation Committee
Santa Susana Mountain Park Association
Save Our Sylmar
Save the Angeles Foundation
Val Verde Civic Association

Founding Members:

Ed Ayres
Glenn Bailey
Rona Barger
Allen Cameron
Frank Cas
Mary Edwards
Jan Hinkston
Ann Irvine
Vera Johnson
Jill Kline
Marsha McLean
Arlene Mead
Chip Meyer
Mike Ormsby
Karen Pearsen
Lynne Plambeck
Sue Vis
Rob Zapple
Ann Zisa

12-2-97

Planning Department
City of Los Angeles

Re: Sunshine Canyon Landfill Expansion SEIR

Dear Sirs:

These comments are presented in addition to other comments submitted by our organization under separate cover.

We would like to begin by making some general remarks. We want to express concern that there is no material recovery facility planned in conjunction with this expansion. If we are really to re-direct our solid waste management policies, recovery facilities must be built. An existing landfill is an obvious and logical site as it would facilitate redirection of waste already arriving at the landfill and extend capacity. (We would not be supportive of an increase in daily tonnage to support a MRF as the daily tonnage approved for Sunshine is already substantial.) An industrial site away from residential areas would be even more suitable. This option should be explored. 871 872

The SEIR does not seem to adequately address air pollution problems that may impact the Santa Clarita Valley. Prevailing winds often produce "Newhall only" days of excessively high air pollution. The Santa Clarita Valley is designated as a non-attainment zone for compliance with ozone standards under the Clean Air Act. Landfills produce ozone precursors. These problems must be addressed and mitigated in the SEIR. 873

We object to "exempt waste" being calculated in such a fashion as to substantially increase the real amount of waste that is actually delivered to the landfill. It appears that the traffic and air pollution studies do not include this additional "exempt" waste delivery. This is a deficiency. 874

It seems that mitigations for impacts have changed between the County and City portions of the landfill. These changes sometimes appear in the text in locations that do not make them readily apparent. We request that the Planning Department prepare a table that identifies each County mitigation with a corresponding column for the comparable City required mitigation so that the decision makers may be informed as to the comprehensiveness and cohesiveness of the mitigation requirements for both areas. 875 876

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Landfill Alternatives Save Environmental Resources

Water

Surface Water

The reports required for monitoring under the state General NPDES Permit and the General Industrial Stormwater Permit should be included in the appendices so that the decision makers and the public can make informed decisions regarding problems with control or pollution of surface water run-off from the landfill. 877

It has been stated in public scoping sessions and in the SEIR that the closed section of the Landfill will be covered by a liner and surface run-off diverted around this area. With the well-established settling phenomenon experienced by all landfills, we question the reliability of any liner that will undergo that much movement. The liner at Chiquita Canyon Landfill suffered a substantial tear from movement caused by the Northridge earthquake. It seems probable that a similar failure would be experienced by any liner subject to the stress of landfill settling. Also it was indicated that seam weld tests where only made to 30 PSI. Again, this does not seem adequate for the amount of stress that this liner would potentially incur. 878 879 880

Were surface water and flood flow controls analyzed for capacity to handle "El Nino" events? 881

Page 4-112 states that "The potential exists for non-stormwater discharges into the stormwater conveyance systems. Various measures would be used to separate stormwater from wastes being disposed of in the proposed landfill....". These measures should be formulated into a table for easy review and conditioned to be followed by the CUP. 882

Groundwater

Although there is a chart in the SEIR entitled "Site Ground Water Monitoring Wells Map" provided by GeoSynthetic Consultants indicating the location of Groundwater Monitoring Wells, Exploratory Borings/monitoring wells and lysimeters, there is no indication of the location of water quality data collected from leachate recovery wells, springs, surface streams and subdrains. It is therefore impossible for the public or the decision makers to determine if these samples were taken from downstream or upstream of the landfill and any hydrological movement of pollutants that may have occurred. This makes the data deficient for purposes of analysis. 883

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Landfill Alternatives Save Environmental Resources

Groundwater Data included in Appendix C18 is not comprehensive. Why was data included on surface streams only from 1995 to 1996 1st and 2nd quarter. Are these the required NPDES reports? Did the requirement begin in 1995? Page 4-129 states that "a comprehensive network of 22 groundwater monitoring wells was installed within Sunshine Canyon. Since installation, groundwater is sampled and analyzed quarterly for possible contamination." Why is data not included for monitoring wells other than CM-11 3rd Quarter, 1996? This is a deficiency. 884

Appendix C19 is entitled "DWP and MWD Water Quality Background Data". The data in this appendix refers only to imported water. Water quality of imported water would not be an indication of background quality of surface or ground water. Imported water has in fact no relation at all to the surface or ground water sources that might be impacted by the landfill and in no way can provide "background data". Was there any water quality information generated from the area of Sunshine Canyon prior to the original installation of the landfill? If so, this information should be included in the SEIR. 885

It is important for decision makers to note that a discussion of high chloride levels on page 4-129 discloses that the operator has been asked to do additional investigation to determine the sources of these elevated levels occurring downgradient of the landfill. Page 4-130 states that VOCs have been detected in one ground water monitoring well. Elevated Chlorides and VOC detection have been an indication of leachate leakage at other sites. These elevated levels could be an indication of pollutant migration within the ground water, an occurrence which the operator has denied could happen. Close attention should be paid to these points and all questions should be answered thoroughly to ensure the safety of the public. 886

Among the measures defined on page 4-134 to reduce leachate production is a statement that "Additionally, the proposed City/County Landfill will not accept liquid wastes or wastes with high moisture content." "High Moisture Content" should be defined by a percentage number, and this statement should be made part of the conditions of approval so that it is enforceable. 887

Section 4.3-.3 Flood Hazard/Mudflow Hazard - These hazards do not seem to have been addressed for El Nino events or the proposed greater height of the landfill. This is a deficiency. 888

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andfill Alternatives Save Environmental Resources

Please find attached to this letter:

1) MWD Letter of January 1991 which remains relevant to the discussion of water quality. 889
2) Comments by our 2nd Vice President, Jeff Yann regarding alternatives to landfills.

Thank-you in advance for your time and attention to our concerns.

Sincerely,

Lynne A. Plambeck
Chair

23942 Lyons Avenue, Suite 103-353 • Newhall, CA 91321-2444 • (818) 845-7652

Pg 1 of 4

MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

JAN 10 1991
EXECUTIVE OFFICES

JAN 0 9 1991

Mr. Frank Meneses
Impact Analysis Section
Room 1354, Hall of Records
Los Angeles County Department of Regional Planning
320 West Temple Street
Los Angeles, California 90012

Dear Mr. Meneses:

Final Environmental Impact Report
Project Number SP 86312, Case 2556
Sunshine Canyon Landfill Expansion

We have reviewed the Final Environmental Impact Report (EIR) for the Sunshine Canyon Landfill Expansion. The comments herein represent Metropolitan's comments as a potentially affected public agency.

Request by the County Board of Supervisors

At its November 29, 1990 meeting, the Los Angeles County Board of Supervisors indicated that it would like to receive an official response from the Metropolitan Water District of Southern California regarding the Sunshine Canyon Landfill Expansion project's potential affect upon local water quality. Metropolitan believes the project would threaten local water quality if not properly designed and maintained.

The following factors, which are descriptive of modern municipal waste landfills, form the basis for Metropolitan's concerns:

* Waste deposited in landfills will contain household hazardous substances;
* Landfill wastes will not degrade into a benign state and will always have the potential for contamination until removed; and
* All lining systems are permeable and subject to leakage.

Metropolitan does not oppose the Sunshine Canyon Landfill Expansion. Metropolitan is concerned, however, that local water resources and conveyance systems be protected from contamination. The primary deterrents to contamination will be

Pg 3 of 4

The Metropolitan Water District of Southern California

California to deal with the regional water shortage situation. Although brackish water desalination technology has become technically and financially attractive in recent years allowing improved basin management strategies for brackish groundwater, such technology would probably not treat all landfill contaminants.

Existing Landfill Leakage

Metropolitan previously commented that contaminants may be leaking from the existing landfill and that this problem should be corrected before the landfill is expanded. We noted high chloride values observed at the down-gradient monitoring Well No. MW-1. Topical Response No. 9 (page 25) and Response No. 25 (page 91) of Volume A assert that the high chlorides are attributable to other sources, such as nearby oil drilling activities and natural geologic conditions. Metropolitan finds that the supporting arguments for Response No. 9 lack a straightforward technical analysis of the monitoring well data.

Because an understandable explanation of the high chloride values at Well No. 1, MW-1 is not provided, Metropolitan recommends that a comprehensive analysis of the monitoring well data be conducted and submitted to the Los Angeles Regional Water Quality Control Board (RWQCB) for its independent assessment of the leakage. If leakage is detected, the problem should be corrected before the subject expansion is approved.

Metropolitan has contacted the project engineers, Purcell, Rhodes and Associates. They have advised Metropolitan of plans to construct a gravel drain and pumping system to intercept potential leakage as part of the closure plan for the existing landfill. While this concept seems reasonable, we recommend that any doubts about leakage be resolved by the RWQCB through review of a report as suggested above.

Water Agency Coordination

Metropolitan's comments provided above have been coordinated with the the Los Angeles Department of Water Power and the Watermaster for the Upper Los Angeles River Area.

SUNSHINE CANYON LANDFILL EXPANSION
City of Los Angeles Jurisdiction
Environmental Impact Report Comments
December 4, 1997

ATTACHMENT
LASER (Landfill Alternatives Save Environmental Resources) COMMENTS

1. Why, with solid waste alternatives available that can produce jobs across the labor spectrum, is the City willing to settle for an alternative that only generates 35 jobs at the project site? 890

2. Why are the County projections of landfill shortfalls used as a basis for this project any more credible now than they have been over the last 15-20 years, over which time history has shown them to be highly inaccurate? 891

3. Why is it considered more acceptable to offer a landfill proposal with a "buyback center," which is not conveniently located or efficient, in lieu of a full recycling facility without the landfill that can effectively reduce environmental impacts of solid waste disposal? 892

4. Why is hauling 11,000 tons of waste per day from all over the basin by trash truck to Sunshine Canyon considered to be more beneficial to air quality than centrally located waste processing facilities and waste reduction programs, with residues, if any, rail shipped to more remote sites? 893

5. What analyses have been done of the overall environmental impacts of the total City/County proposed project to support the contention that the substantial environmental impacts it poses will be less than using alternative disposal sites (e.g., desert sites) or technologies? 894

6. Why is using Sunshine Canyon for landfilling considered to facilitate implementation of A.B. 939 than use of solid waste technologies that don't require landfilling (A.B. 939's true objective) or using other sites with less proximity to population centers with less potential to be harmful to nearby residents? 895 896

7. How can an analysis that assumes Puente Hills will be filled in 2003 (when the County approved its expansion on a footprint that will last to or beyond 2013) and that Chiquita Canyon can only take 5,000 tpd (when the County approved it at 10,000 tpd) be considered anything but ultra conservative and biased toward approval of Sunshine Canyon? How does this analysis actually square with the reality of virtually no in-County impacts when BKK, Lopez Canyon, and Azusa all closed within a few months despite drastic projections of adverse impacts? 897 898

SUNSHINE CANYON LANDFILL EXPANSION
City of Los Angeles Jurisdiction
Environmental Impact Report Comments(Continued)
December 4, 1997

8. How can County DPW figures be relied upon to support landfill expansions when they are largely generated by L. A. County Sanitation Districts, who, with limited exceptions, is largely a landfill operator (Calabasas, Spadra, Puente Hills, Scholl Canyon, Savage Canyon), and strongly biases these figures to support their landfill operations? 899

9. How can conformity with solid waste management plans be listed as a compelling EIR basis for expanding Sunshine Canyon when environmental analysis of landfill expansion listed in those plans was not performed and left to individual site-specific evaluations at the time of expansion? 900

10. How can projected impacts of expansion of other landfills elsewhere in the county and outside the county be used as a basis for assuming that full expansion of Sunshine Canyon lessens regional impacts, when specifics of those alternative solutions are not identified? 901

11. How can expansion of Sunshine Canyon be judged environmentally superior on a regional basis to using non-landfill alternatives, which are being successfully used to eliminate landfilling in other jurisdictions, without a detailed analysis of those alternatives and how they could be used? 902

12. What back-up is provided for the assumption that non-landfill alternatives cannot resolve the need for disposal capacity? How can this analysis be considered complete without citing examples of locations where techniques like landfill mining and recovery are actually being done to not only eliminate current landfilling but reduce the volume of environmentally hazardous landfills? 903

13. How can inconsistency with project objectives be used as a basis for eliminating non-landfill solutions when, in fact, those objectives were specifically established by landfill proponents, including the project proponent, to support landfill expansion? 904

14. Why is disturbance of desert sites, which represents a far greater habitat resource than native habitat in Los Angeles County canyons, considered to be a greater environmental impact than full development of Sunshine Canyon, particularly for a site like Eagle Mountain where existing terrain has been heavily disturbed by open pit mining? Does this statement also consider the number of residents adjacent to the Sunshine Canyon site and to the desert sites? 905 906

15. How can the proponent automatically assume that if the City of Los Angeles finds the environmental impacts of expansion of Sunshine Canyon to be unacceptable that the County expansion will still be allowed, so the environmental benefits of not allowing the City expansion will be minimal? 907

SUNSHINE CANYON LANDFILL EXPANSION
City of Los Angeles Jurisdiction
Environmental Impact Report Comments(Continued)
December 4, 1997

16. Why aren't the cumulative impacts of disposal at Chiquita Canyon, Elsmere Canyon, and Sunshine Canyon considered together, since these projects are not mutually exclusive? How can this inconsistency be justified in light of the reality of what might be projected to happen if the premise that all four near-term landfill closures cited in the document as one of the bases for this expansion actually occurred? 908

17. Why is there no in-depth analysis of use of non-polluting waste-to-energy technologies, volume-based disposal fee structures, in-vessel composting, and other technologies that both provide economic benefit through resource recovery and job creation, as well as eliminate of adverse landfill impacts. 909

18. How can cost be used as a major basis for eliminating consideration of the Reduced Volume Alternative when no economic analysis is provided and CEQA does not allow cost to be used as a basis to eliminate environmentally superior alternatives? 910

19. How can destruction of California Gnatcatcher habitat be considered consistent with guidelines which site the importance of habitat preservation as a key objective of preserving sensitive species? Are Gnatcatcher surveys to be conducted systematically. or simply by casual field observation on site visits, which does not conclusively demonstrate that rare species are not present? 911 912

20. What permit requirements will be imposed to assure that odor and associated harmful gas migration will be properly mitigated if such impacts prove to be more of an operational problem than the EIR anticipates? Experience at other landfills demonstrates that the proposed mitigation measures described here are not effective. 913

21. Will the permit include requirements for conformance to the level of significance used by the City as a basis for approval, if approved, with possible cessation of activities if proposed mitigation measures are not effective in bringing landfill operations into conformance with EIR commitments in areas like traffic impacts, odors or release of other harmful gases, seismic slope stability, ground water contaminant leakage, dust, and litter? 914

22. Since replacement habitat plans are not yet available for review, will opportunities be provided under a formal City process for interested residents to participate with public agencies in assuring that these replacement plans are truly effective? Will destruction of on-site sensitive natural areas, including trees, riparian habitats, and other significant resources, be prevented until such time as agreement is reached that replacement plans are truly equivalent? 915 916

SUNSHINE CANYON LANDFILL EXPANSION
City of Los Angeles Jurisdiction
Environmental Impact Report Comments(Continued)
December 4, 1997

23. Will landfill activities be reviewed during operations by a Citizens Advisory Committee composed of resident representatives including LASER member North Valley Coalition? Will members of this group be granted opportunity for actual on-site verification of conditions described to them at meetings? It is assumed that notification for such visits should require no more than 24 hours and should be subject to denial only if conditions exist that would compromise their safety. 917 918 919

Letter 3.8-25

December 2, 1997

Thomas K. Murphy
12820 Jolette Avenue
Granada Hills, CA. 91344
(818) 363-3434

RECEIVED
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ENVIRONMENTAL
UNIT

City Of Los Angeles
Department Of Regional Planning
Environmental Review Section
221 North Figueroa Street, 15th Floor
Los Angeles, CA. 90012-2601
Attention: Hadar Plafkin, City Planner

I am writing to comment on the B.F.I. "E.I.R." report prepared in regard to opening the City portion of the Sunshine Canyon Dump. First I have difficulty with the objectivity of an E.I.R. report bought and paid for by the company that wants to create something that is obviously an environmental disaster. I would also be interested in learning how such a self-serving and biased system of doing "your own" E.I.R. reports was ever allowed. 920

That said, I have some other problems with B.F.I's "E.I.R." report. There is no mention in the E.I.R. of how home owners will be compensated for the loss of value of our property if this huge dump is permitted to open. It does mention the revenue the City Of Los Angeles will receive, conveniently omits the revenue B.F.I. will receive and makes no mention of the revenue losses property owners will "receive." 921 922

Why is this dump even being considered? The City closed it once because it caused such problems in our neighborhood. Why, in B.F.I.'s E.I.R. report is every alternate sight including sights that are not that distant, can accept more garbage for many more years and are located away from residential areas always somehow found to be environmentaliy less acceptable, except when it comes to "humans" living next to this location? Is it because B.F.I. doesn't own these other locations? 923 924

I'm concerned with this E.I.R.'s apparent dismissal of any earthquake danger in the dump. To say the faults in the canyon are inactive is a rather careless assumption. The Northridge "Fault" was not only "inactive", it wasn't even known to exist. Also to say the dump can withstand a "direct-hit" equal to the Northridge quake is at best speculation and at worst careless. This carelessness not only endangers the people who live close to the dump but if the dump doesn't withstand the "direct-hit" and tons of garbage end up in the nearby City water facilities it will effect thousands of others, too. 925

In the very few instances that the B.F.I. E.I.R. report even admits there are "adverse" effects on our community, from this dump, there is no suggestion what might be done to alleviate these adverse effects. Is it just..."too bad, folks?' 926

With approximately 1000 trucks dumping garbage everyday what besides telling private haulers they can't dump their loads of garbage if their trucks are emitting excessive smoke what will be done? Will City owned trucks be told the same thing or will they receive a "pass?" Also, what besides "encouraging" small commercial and private users of the dump not to use Balboa Blvd., will prevent these operators from totally taking over Balboa Blvd., to get to the dump? 927 928

I would also like to express concern that another huge brush fire similar to the 1989 Granada Hills fire could start in the middle of the night in the Dump. Although B.F.I. denies the fire started in their dump, it was never said to have started anywhere else either. 929

In B.F.I.'s E.I.R. report it mentions at some point entire operation of the dump will be visible by motorists driving Northbound on the I-5 freeway. What, if any, thought has been given to the danger of distracting drivers and what about the possibility of the considerable wind that blows in the area blowing debris onto the I-5? 930

Finally, although I have other concerns I would like to emphatically state that there was horrible dust and debris from the old, now finally closed, city portion of the dump. In the B.F.I. E.I.R. report it is stated that during the often windy periods they will water down the garbage. A few years ago while preparing the hills at the end of Jolette Avenue to build houses during the grading work the contractor watered down the dirt. Believe me during 90 degree heat with the wind blowing the dust wasn't abated and this was just "dust/dirt" not dirt full of pollution, germs and other filth generated by garbage. 931

Even in B.F.I.'s own E.I.R. report they have to admit that there would be much less environmental damage if they confined their operation to only the Canyon portion. 932

They do point out they'll have cut down another 1300 Oak trees in addition to the 2700 they've already chopped down if they're not permitted to reopen the City portion of the dump. While I'm not in favor of the dump at all and not in favor of chopping down another 1300 Oak trees I would prefer the cutting down of trees as opposed to the cutting down of human beings especially children which this "Mega-Dump" could very well accomplish. At the recent B.F.I. "Key Group Meeting" I couldn't find one B.F.I. employee that lived in our neighborhood. Perhaps we could get an answer why. 933 934

Sincerely

Thomas K. Murphy

Pollution linked to hospital stays

Close connection of smog, illness alarms activists

By David R. Baker
Daily News Staff Writer

As smog and soot levels rise in the Los Angeles air, so do hospital admissions for asthma, pneumonia and other respiratory problems, a new study found.

The study, to be released today at an air-quality symposium, tied daily air pollution measurements to patient admissions during 1995 at Kaiser Permanente hospitals, including those in Woodland Hills and Panorama City.

Researchers found that the number of admissions rose in lock step with increases in either ozone levels or the amount of particulates — airborne pollutants far smaller than the diameter of a human hair.

"This is the first study of its kind conducted in the (Los Angeles) Basin and shows that the region's air pollution continues to be a leading public health concern," said Shankar Prasad, health effects officer for the South Coast Air Quality Management District, which paid for the $145,000 study.

Although researchers expected to see some correlation between pollution and hospital admissions, they didn't expect such a significant increase, said district spokesman Sam Atwood.

The study comes just after the AQMD announced the region experienced the least-smoggy season on record.

Local environmentalists called the findings alarming.

"These are people hospitalized simply because they were breathing the air, not because they were doing anything harmful," said Tim Carmichael of the Coalition for Clean Air. "It's a tragic situation, and we've got to do everything we can to change that."

Indeed, the study and the symposium — hosted by the air quality agency — could have far-reaching effects on how Southern California deals with air pollution. After listening to the results of this and other health studies today, participants in the two-day symposium will discuss efforts to cut emissions from what many consider a major source of air pollution — diesel engines.

Although only 4 percent of California vehicles use diesel, those vehicles account for more than 30 percent of nitrogen oxide emissions and even more of the particulate pollution, according to the AQMD.

Two bills that would encourage truck-fleet operators and others to switch from diesel-burning engines were discussed in the state Legislature during the past session. And next year, the state's Air Resources Board will consider listing diesel exhaust as a toxic air contaminant, a step that could lead to further regulation.

Beau Biller, spokesman for the California Trucking Association, said he opposes such a classification because it would leave diesel users vulnerable to lawsuits from people claiming the exhaust made them sick.

The Kaiser study did not look at specific sources of pollution. Instead, it matched ozone levels and particulate emissions throughout 1995 with Kaiser records covering 1.6 million patients.

For every 10 microgram increase in the concentration of particulates, hospital admissions rose an average of 7 percent for chronic respiratory illnesses, 3 percent for cardiovascular disease and 3.5 percent for acute respiratory illnesses.

Ozone had a similarly hazardous effect. During the study, when the ozone concentration in the air rose by 10 parts per billion, an average of 2.7 percent more people with chronic respiratory problems, 5.7 percent more cardiovascular disease sufferers and 1.5 percent more people with acute respiratory diseases checked themselves into the hospital.

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December 4, 1997

City of Los Angeles
Planning Department
221 North Figueroa Street
Los Angeles, California 90012

Re: Proposed Sunshine Canyon Landfill Expansion

I am writing in response to the Sunshine Canyon Landfill Expansion Environmental Impact Report. Following are the questions and/or comments about the EIR.

In addressing the Alternatives to the proposed project, Section 5.0 of the EIR, states that an EIR must "describe a range of reasonable alternatives to the project or to the location of the project, which would feasibly attain most of the basic objectives of the project but would **avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives.**" The difficulty is in evaluating the comparative merits of the alternatives, particularly when we have a County and City believing that we are facing an imminent "time to crisis". As we run around in circles, arms flailing in the air above our heads close to panic, we fail to see that the alternative to landfilling in one area is not to landfill in another. The EIR pits one potential landfill site against the other, all with similar significant impacts. The "viable" alternatives are all landfills with the same objectives as the proposed project therefore not fitting the strict definition of an "alternative." Of the eight (8) "alternatives" analyzed only the subsection Waste-to-Energy under Waste Management Technologies and Strategies is strictly an alternative. The others under that same section are waste diversions. The EIR fails to address and evaluate **non-landfill disposal** alternatives. Why were these alternatives not addressed? 935 936 937

The EIR also states that "feasible is defined in the CEQA statutes (21061.1) as 'capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social and technological factors.'" At this point in time, there have been 2 documents produced that address these factors directly. Both are included for the record. The first document, **Approaching an Integrated Solid Waste Management System for Los Angeles County, California,** defines how the County and thereby the City can implement certain scenarios with waste diversion and recycling that, I believe, will give us the period of time to address the economic, environmental, social and technological factors of feasible, viable alternatives. **(Figure E-1, Page E-4)** The **Solid Waste Task Force Report** gives us an introduction to those alternatives. 938 939

The fact that the proponent is requesting a permit for the proposed project, an Immediate 940

Combined City/County Landfill Operation, leads me to believe that the following discourse and and the submission to the record of these documents is relevant.

GBB Solid Waste Management Consultants, the producer of the report entitled "Approaching an Integrated Solid Waste Management System for Los Angeles County, California" states the objectives of the report on **page E2:** 941

1. To offer **alternatives** to the Board of Supervisors and the public for urban landfills.
2. To provide suggestions for **extending the life of existing landfills.**
3. To foster a policy consistent with AB 939 to **divert** solid waste away from landfills.

GBB depended on the 1996 Siting Element and the 1995 Draft Environmental Impact Report/Draft Environmental Impact Statement for Elsmere Canyon to arrive at their suggestions. The County also "relied on these two documents to sustain their current landfill policy." 942

According to GBB **"A review of the County's reports reveal that they exaggerated the projection of waste generation and the need for additional landfill capacity. When critically analyzed, there is a clear discrepancy between the two documents regarding the amount of waste generated per day. The Siting Element projects waste generation per day for 1997 to be some 4,200 tons more than the DEIR/DEIS document. The County has employed the higher estimate presented in the Siting Element document, thus accelerating their claim that additional new landfill capacity is required or the "time to crisis" is imminent." (Page E-3)** In November of 1993 when the proponent (BFI) asked and eventually received a permit to expand into the County portion, Dr. Gerald Simmons arrived at the same conclusions as GBB. The County gave an overriding consideration to the expansion because of the "time to crisis" phenomenon. All based on exaggerated figures.) 943 944

From the evaluation and analyzation of the Siting Element and the DEIR/DEIS , GBB presents a strategic approach to addressing the County's short term 15 year "time to crisis" by "selecting a series of **proven low risk alternatives**" which will enable the "County to develop waste disposal policy well beyond the AB 939 planning period." 945

In order for the County to accomplish its long term goal a set of Scenarios are proposed that can operate independent of one another or combined to have a cumulative impact. These same scenarios, I believe, can be applied to the City. 946

" Scenarios 1-6 is relatively **low cost** and politically risk-free compared to the cost of landfill expansion." **(Figure E-1, Page E-4).** If these scenarios were to be utilized, **24 years of capacity could be realized, thus giving the County and the City ample time to address and implement viable alternatives.** 947

The viable alternatives are presented to us in a report by the Solid Waste Task Force in conjunction with a Technical Advisory Group. They address recycling and diversion but they go one step further and address alternatives to landfills, not alternative landfills to landfills.. Although the information is not detailed nor do they in some instances look at costs, nonetheless they introduce alternatives some of which should have been addressed in the EIR. (Enclosed for 948

the record-11/7/97 Draft, Section 3.0, Page 9.)

Given that we have two documents that will enable the County and the City to make a beneficial change in the policies and procedures of solid waste management, that diversion and recycling will give us 20 odd years to explore alternatives without the need of further expansion or new landfills, I would like to request an evaluation of the Scenarios introduced and addressed in the GBB document and an evaluation of the alternatives presented in the Solid Waste Task Force Document before permitting the Combined City/County Operation for Browning Ferris Industries. 949

Questions:

Section 5.4-There were ten major Class III landfill facilities as of January 1996, since then 3 have closed. Figure 5.4-1 shows 8. Three from ten is 7...? 950

Section 5.4 page 5-9 When other in-County landfills exhaust their capacities and close, won't the increased reliance on the existing landfill (if permitted) Combined City/County Landfill at Sunshine Canyon experience the same increase of environmental impacts to a level of greater significance? 951

Section 5.4 page 5-9 How can there occur rapid depletion of the County's long-term landfill disposal capacity if the County's goal is toward recycling and diversion? 952

The Immediate Combined City/County landfill will be the new kid on the block. Won't the increased reliance be placed on the proposed project facility due to landfill closures, thereby increasing environmental impacts to significant levels at that facility? 953 Are we to assume that this landfill will not import trash, nor will the other landfills exhaust their capacity making it unlikely that that waste stream will be diverted to Sunshine Canyon? 954

The burden of providing disposal capacity at Sunshine Canyon will create local significant impacts. How do you justify placing that burden on local over remote locations when you factor in the population quotient in close proximity to the landfill? 955

The Immediate Combined City/County Landfill Operations will have greater significant impacts after the first 18-24 months. What will those impacts be? 956

In conclusion, the responsibility of permitting landfills falls squarely on the shoulders of the agencies making the decisions. It is to these agencies that the Council looks for guidance in making its decisions. This holds true for the County as well. By assuming that position of authority the agencies must look at and take into consideration all the factors at work in a project. When we speak of significant impacts, we are talking about children, the elderly, the ill and all others in between. 957

If economics is the driving force for the permitting of these necessary landfills, then the long term economic effect on the residents closest to the project must be evaluated. This would include property, health and livelyhood. 958 If the EIR addresses to "reduce the project proponent's long-term capital outlay for site infrastructure" then the EIR must also address the long-term capital outlay for the residents that will be significantly impacted by this landfill. 959 You cannot make an informed decision in a vacuum. All factors must be considered. The long-term capital outlay for the residents of the area will far exceed that of BFI for their infrastructure when there



are consistent impacts of a significant nature to the resident's that, by BFI's own admission, cannot be mitigated to a non-significant level. That admission can be found under the Section of Air Quality in the EIR.

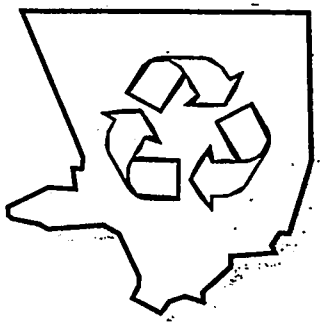
We are looking at increased health problems over the long-term caused by the existence of a landfill in close proximity to a residential area as opposed to health and safety problems caused by the lack of landfill capacity. 960 Which in your determination, in the long-term is easier and more cost effective for a County or City to resolve? 961 By first evaluating and implementing a strict diversion and recycling program the County and the City will increase the period of time needed to evaluate cost-effective alternatives that will not produce the significant impact that the proponent of this landfill admits cannot be mitigated. 962 Serious consideration must be given to the proposals stated in this letter before permitting the project site. 963

Thank you for your time.

Sincerely,

Encl.

Approaching an Integrated Solid Waste Management System for Los Angeles County, California



PREPARED BY:

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APPROACHING AN INTEGRATED SOLID WASTE MANAGEMENT SYSTEM
FOR LOS ANGELES COUNTY, CALIFORNIA

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APPROACHING AN INTEGRATED SOLID WASTE MANAGEMENT SYSTEM FOR LOS ANGELES COUNTY, CALIFORNIA

EXECUTIVE SUMMARY

Throughout the nation there is growing controversy regarding the best approach for managing the millions of tons of waste generated by residents, businesses, and industries in large urban areas.

Pressures from both the public and private sectors have been successful in focusing attention on recycling and other alternative methods for managing of solid waste. As a result, a number of new statutes throughout the nation have been enacted to minimize reliance on landfills. California adopted Assembly Bill 939 (AB 939), the California Integrated Waste Management Act, in 1989. This act mandated that by 1995, 25% of the waste stream in each of California's counties had to be diverted from landfills. Furthermore, the act required that this diversion rate be increased to 50% by the year 2000. Diversion is defined as the process of diverting solid waste away from landfills through source reduction, recycling, and composting.

One year prior to enactment of AB 939, Los Angeles County developed a Solid Waste Management Action Plan (1988) which explicitly called for 50 years of in-county landfill capacity and minimized diversion potential. Six new in-county landfills were proposed in this Action Plan. In spite of the new legislative mandate to increase diversion of waste from landfills, as well as rapidly advancing technology which enabled the capacity of existing landfills to be expanded, Los Angeles County persisted in emphasizing landfills as the primary means of solid waste disposal.

Clearly an independent analysis of Los Angeles County's public policy on solid waste disposal was needed. This report provides another perspective to a "landfills first" policy, based upon carefully studied data projected in alternative "scenarios" by the authors. The Board of Supervisors could consider this document in their decision making process to comply with AB 939, as well as to preserve urban land for alternative uses.

These scenarios describe how Los Angeles County can implement strategies to increase regional interest. The goal is to divert more than 50% of the County's trash away from urban land and add years to the final life of the existing landfills in the County.

WHAT ARE THE OBJECTIVES OF THIS REPORT?

1. To offer alternatives to the Board of Supervisors and the public for urban landfills.
2. To provide suggestions for extending the life of existing landfills.
3. To foster a policy consistent with AB 939 to divert solid waste away from landfills.

Thiis report paints a different picture of the future of solid waste disposal by making the following points:

- The document presents a strategic approach for addressing short and long term solid waste disposal requirements. The key to implementing the approach involves selecting the appropriate combination of alternative scenarios.
- By selecting a series of proven low risk alternatives (such as shown in Scenarios 1-5) for immediate implementation, the County's short term 15 year "time to crisis" is alleviated.
- Adoption and implementation of additional policy alternatives as recommended in the report enables the County to develop waste disposal policy well beyond the AB 939 planning period.

WHY DOES THE COUNTY DRAW DIFFERENT CONCLUSIONS FROM THE SAME DATA?

To illustrate the potential impact of creating a new diversion policy in Los Angeles County, the authors of this report developed a computer model which allocated the waste generated in the County among diversion and alternate disposal options. Prior to developing a model, the report presents a comprehensive review of two County sponsored documents; the 1996 Siting Element and the 1995 Draft Environmental Impact Report/Draft Environmental

Impact Statement (DEIR/DEIS) for Elsmere Canyon. The County has relied upon these two documents to sustain their current landfill policy.

A review of the County's reports reveal that they exaggerated the projection of waste generation and the need for additional landfill capacity. When critically analyzed, there is a clear discrepancy between the two documents regarding the amount of waste generated per day.

The Siting Element projects waste generation per day for 1997 to be some 4,200 tons more than the DEIR/DEIS document. The County has employed the higher estimate presented in the Siting Element document, thus accelerating their claim that additional new landfill capacity is required or the "time to crisis" is imminent. The computer model projects the quantity of waste disposed of in landfills located in Los Angeles County beginning in 1996 and running through 2044. The model evaluates waste disposal through the use of a series of waste management strategy scenarios. Each scenario develops a series of diversion alternatives aimed at increasing the life of in-county landfills.

SCENARIOS

The following summarizes the seven computer generated scenarios found in this report. Each scenario provides waste management strategies aimed at diversion such as recycling and composting, which will ultimately increase the life of existing in-county landfills. These scenarios can operate independent of one another, but in the analysis Scenarios 1-5 have been combined to have a cumulative impact. The impacts of the scenarios are shown graphically in Figure E-1.

SCENARIO 1--HISTORIC RATES

The County's solid waste strategy found in its Siting Element, the Base Case, calls for a minimum diversion of 50% as required by AB 939 and disposing the remaining waste in landfills.

Scenario	Waste Diversion and Disposal Policies	Projected Landfill Shortfall Date (Cumulative)	Years Added to Landfill Capacity
Base-Case	LA County Public Works' latest baseline for waste generation, rate of landfill use, and recycling (50% only from 2000), found in the Siting Element.	1999	N/A
1	The County's latest base-case with the historic use (daily disposal) rate of landfills, not the theoretical maximum rate.	2001	2
2	Include a net waste export of waste to Orange County landfills (which began January 1996) of 3,500 tons per day in 1997; rising to 6,000 in 2001 through 2026.	2007	6
3	Increase recycling of inert materials like construction and demolition debris (C&D), and divert remainder to the proper inert materials landfills, and away from Class III landfills from 1996.	2009	2
4	Incorporate the impact of LA City for 70% waste diversion (recycling, composting) by 2020 for the County Unincorporated areas as well as LA City.	2010	1
5	Use space-saving chemical/foam cover instead of dirt as the cover added daily to landfills, on all LA County landfills from 1997.	2014	4
In addition to Scenario 5, one or both of the following:			
6A	Intensive diversion and recycling: adopt and implement the 70% waste diversion rate by 2020 for all of LA County and its 88 cities (residential, commercial, industrial).	2016	2
6B	Intensive diversion and recycling: add a ban on recyclable materials -- wood, corrugated paper and yard waste -- from landfills starting in 1998.	2019	5

	Effect of Additional Policies:	Years Added to Scenario 5
7	Assume no increased waste diversion, but expand five of the existing landfills to around half the level proposed by the County; no new landfills.	6
--	Use the conservative waste generation growth projections based on accurate, LA County specific data.	3

Figure E-1. Summary of Policy Options to Increase Diversion and Provide Adequate Disposal Capacity for Los Angeles County

Contrary to the County Siting Element figures which overestimates by using Daily Permitted Capacity numbers, this scenario utilizes more realistic figures based on a landfill's historic usage. This recalculation delays the supposed Daily Disposal Capacity Shortfall or "time to crisis" until the year 2001, two years past the County's original estimate (2 years).

SCENARIO 2–EXPORT ADDITION

The County's Siting Element does not account for existing export of L.A. County waste to Orange County. This scenario accounts for this export at a rate of 2,000 Tons Per Day (TPD) based on existing contracts in 1996 and 3,500 TPD starting in 1997. Exports are raised to 6,000 TPD in the years 2001 through 2044. Thus, this scenario extends the time to crisis from 2001 to 2007 (6 years).

SCENARIO 3–INERT MATERIAL AND BIOSOLIDS BAN

This scenario would ban inert materials and biosolids (sludge) in Class III landfills. It is assumed that the inert ban would be 80% effective and the sludge ban 100% effective since the material is controlled by the County. If implemented, this scenario extends the time to crisis to the year 2009 (2 years).

SCENARIO 4–DIVERSION GOAL BY 70 PERCENT

This scenario calls for the County to join with the City of Los Angeles and adopt a goal of 70% diversion in all unincorporated County areas by the year 2020. The result would be an extension of Daily Disposal Shortfall (time to crisis) to 2010 (1 year).

SCENARIO 5–CHEMICAL/FOAM COVER

This scenario replaces the use of dirt to cover waste deposited daily in L.A. County landfills with a chemical or foam cover. The report assumes a daily foam or chemical cover is initiated in 1997. The saving capacity is 22%, allowing space for 22% more waste at each

landfill. Implementation of this technology will delay the Daily Disposal Shortfall until the year 2014 (4 years).

SCENARIO 6–INTENSIVE RECYCLING AND DIVERSION

Two different model scenarios were conducted, both of which are mutually exclusive to the other.

6a. Total County 70% Diversion. Assumes all cities and the unincorporated areas of Los Angeles County achieve 70% diversion by 2020. Starting in 2001, the impact would increase diversion by one percent per year, extending the shortfall to the year 2016 (2 years).

6b. Recyclable Material Ban. Assumes a ban of corrugated wood and yard waste in Class III landfills beginning in 1996. The ban would be 70% effective and postpones the Daily Disposal Shortfall until 2019 (5 years).

SCENARIO 7–LANDFILL EXPANSION

This scenario was added not to propose landfill expansion but to put in proper context for policy makers the comparative results achieved by focusing on a reduce/recycle/compost strategy. Implementing Scenarios 1-6 is relatively low cost and politically risk-free compared to the cost of landfill expansion. It also illustrates that 24 years of capacity can be realized by these methods. Further ample time is realized for emerging alternatives such as rail haul to take effect and further alleviate the pressure for landfilling of waste within the County. This strategy must be enacted in conjunction with Scenarios 1-5 to postpone the Daily Disposal Shortfall until 2023 (9 years).

HOW CAN LOS ANGELES COUNTY CREATE AN ALTERNATIVE WASTE DISPOSAL POLICY?

In this report a number of different alternatives to extend existing landfill capacity are examined. Clearly, if the County adopts these alternative strategies there is no need to develop

new landfills anytime in the near future. In order to implement these alternatives Los Angeles County will have to shift its waste management strategy and place more emphasis on recycling and diversion *as required by law.* Further, the County should realize that its self-imposed requirement of 50 years in-county disposal capacity may have a serious legal flaw. The courts have recently ruled in-county disposal unconstitutional.

The first step is for the County to develop a new policy which outlines the process of diverting solid waste away from landfills through source reduction, recycling and composting. Once the policy is adopted, the County will become responsible for implementing and ensuring the process of diversion. Specifically, the County should:

- Develop a diversion strategy;
- Adopt billing and accounting methods for solid waste that fully account for all cost items;
- Set new diversion goals for the County's unincorporated areas, and to monitor and report on the achievement of these goals;
- Coordinate and facilitate diversion programs with the County's 88 municipalities;
- Provide incentives between the public and private sectors to increase the participation in County-wide diversion programs; and,
- Function as a role model to the cities by developing a model recycling program for all County facilities, as well as implementing a County-wide "reduce-recycle" advertising campaign.
- Review legality of flow control ordinances or other restrictions on waste flow in the County.
- Develop detailed costs for implementation of the new policy.[1]

[1]Detailed cost analysis of diversion options was beyond the scope of this study.

CONCLUSION

It is the conclusion of this report that Los Angeles County can effectively meet and exceed its AB 939 requirements without opening new landfills. Indeed, by leading its 88 municipalities and the unincorporated areas into the 21st century, Los Angeles County can be the facilitator to implement an effective regional diversion-oriented solid waste disposal policy. However, the County must act now.

I. INTRODUCTION AND PURPOSE

The impetus for the development of this document arises from sincere concerns about the potential environmental, aesthetic, and social consequences of Los Angeles County's policy of developing in-county landfills for solid waste management. The County's promotion of the new Blind, Elsmere Mission/Rustic-Sullivan and Towsley Canyon landfills provides examples of this. The authors and many individuals and groups in the County feel strongly that there are better ways of managing the rubbish of our society than vast storage piles that must be engineered, managed, and monitored for 80 to 100 years, and, in the process, destroying pristine canyons with their wildlife, waterfalls, and opportunity for open space recreation in an increasingly urbanized area. The alternative vision is a diversion-based policy that applies the full array of modern solid waste management technologies that together can reduce, reuse, and recycle as much of the solid waste generated by the residents and businesses in the County and the 88 cities as possible, and transform or safely dispose of the remainder.

Approaching an Integrated Solid Waste Management Plan for Los Angeles County was prepared by Gershman, Brickner & Bratton, Inc. (GBB), a national consulting firm that specializes exclusively in solid waste management. GBB's professional staff consists of engineers, planners, economists, environmental scientists, market analysts, and recycling and community relations specialists. GBB was assisted in this effort by a distinguished team of individuals who provided unique perspectives on Los Angeles County issues. They are:

- Joan Edwards, of J. Edwards & Associates, former Director of the Integrated Solid Waste Management Office for the City of Los Angeles Board of Public Works.
- Eugene Tseng of E. Tseng & Associates, a nationally-recognized environmental engineer and member of the California bar who has provided technical services to the State of California as well as technical oversight for the City of Los Angeles' AB 939 Solid Waste Generation Study. Eugene Tseng is also an Adjunct Professor at the UCLA Anderson Graduate School of Management.
- J. Eugene Grigsby, III and Leobardo F. Estrada of UCLA. Eugene Grigsby is president of The Planning Group in Los Angeles. He is also a professor at UCLA's Graduate School of Public Policy and Social Research, where Leo Estrada is an associate professor. Dr. Grigsby and Dr. Estrada provided essential population and demographics data for Los Angeles County.

It is not intended that this document serve as a detailed Integrated Solid Waste Management Plan for the County of Los Angeles -- the County Plan (presently in preparation) that pulls together all the Source Reduction and Recycling Elements (SRREs) developed by the County and the incorporated municipalities is intended by California's AB 939 law to be a very specific, implementable Integrated Plan. The components needed for such an implementable plan that are not available in this document are:

- Verifiable quantification and characterization of waste actually generated in Los Angeles County (including materials presently diverted, both reported and estimates of unreported): As discussed in later chapters of this document, the County's projections of waste generation are inconsistent, and based on dubious assumptions.
- Determination of leadership and the roles of the public and private sectors: The County's present posture is that it has limited influence over future development of solid waste management. However, the County is responsible under AB 939 for developing the overall County Plan, and this requires commitment and leadership.
- Reorganization of the County's management structure to accommodate reduction and recycling as an integral part of the County's activities: This is not solely a responsibility of the incorporated municipalities and the private sector.
- The essential public input to the development of a Plan: While this document is an exhaustive review of current trends and techniques, it has not been through the extensive public review, public hearing, and comment process that is necessary for a community to claim a Plan as its own.
- Develop detailed costs for implementation: The changes in policy recommended will change the costs of solid waste management in the County. The cost increases and savings will need to be determined by the County and the Cities.

Instead, this document is meant to inspire a profound change in the County's *status quo* approach to solid waste management exemplified by the County's support for the proposed Elsmere Landfill. The County's historic policy emphasizing landfill capacity must adapt to present reality, which places pollution prevention and diversion first. In the following chapters, this document lays out the complex parameters defining solid waste management from now

through the turn of the Century, reviews alternative technologies and management structures, and recommends actions for implementation by the County and the 88 cities.

This report incorporates the dramatic changes experienced in the field of waste reduction/recycling in recent years. Since the SRREs were prepared in the early 1990s, technologies have improved, new markets have developed, existing markets have expanded, and the overall economics of waste diversion are increasingly positive. The County believes that addition of huge new landfill capacity in the County promises to maintain competition for disposal, and thus will keep disposal costs down. However, cheap disposal is only one factor to consider in developing an integrated solid waste management program, including source reduction, recycling, collection, transfer, and composting. Landfills have hidden potential costs if cleanup actions are necessary. On the other hand, diversion has no such future costs and provides the current benefits of local jobs and raw materials for new or existing industries.

Finally, this document is not a pie-in-the-sky fantasy of an ideal world. GBB is well aware of the limitations of current practices. Some waste will remain that must be managed by traditional disposal methods (i.e., landfilling). However, that is not a reason to rely on landfills as the primary approach to solid waste management. The alternative technologies and management structures outlined here are all practical, tested approaches presently in use by local governments across the nation, and real-life examples and a Case Study provided. Not one of the recommended approaches is new or revolutionary nor does any single component represent a "magic bullet" for solid waste management. Together, however, these recommendations represent a dramatic shift in vision, offering the County of Los Angeles, the 88 cities, and their inhabitants the opportunity to chart the future of integrated solid waste management and environmental preservation.

II. HISTORY OF SOLID WASTE PLANNING IN LOS ANGELES COUNTY

Los Angeles County is the most populous local jurisdiction in the United States. The population in 1995 was 9.3 million people of diverse cultural, social and economic backgrounds. This population has been growing rapidly in the last decade, with the growth rate doubling from the previous decade's annual growth rate of half of one percent to the current decade's growth rate of over one percent per year. The County covers an area of approximately 4,100 square miles and is comprised of 88 cities and a large unincorporated area. Economic activity is as diverse as the population and includes manufacturing (aerospace, electronics and automobiles), entertainment, oil and food processing industries. The Port of Los Angeles is one of the busiest ports in the country and serves as the major connection between the U. S. and Japan and the other Pacific Rim countries.

The size and diversity of Los Angeles make solid waste management planning a large and complex undertaking. Each of the 88 cities and the County play a role in the collection of the solid waste generated in the County. These roles range from permitting of private collectors to operating large collection operations. In addition, there are in excess of 250 private firms that collect solid waste in the County.

After World War II, solid waste management was mainly an individual and community problem. Many residents burned their waste in their backyards. The waste that was not burned was taken to community or private dumps, some of which practiced open burning as well. Beginning in the early 1950's, the Sanitation Districts of Los Angeles County (Sanitation Districts) initiated planning for solid waste. In the late 50's, the Sanitation Districts working jointly with the County, sited and developed five landfills and a transfer station to improve the quality of solid waste disposal and end open burning. These facilities were implemented under a series of joint powers agreements and funded by the County and the individual Sanitation Districts. Planning and policy formulation was done jointly. In the mid-1960's, the County and the Sanitation Districts established a joint trust fund and adopted the policy of setting rates at the landfill operations with the intent of both paying for operations and developing a surplus with which to expand existing facilities and acquire new facilities. In 1970, the various Sanitation

Districts pooled their resources and established a joint transfer and disposal system, operated by County Sanitation District No. 2. The County and the Sanitation Districts believed they had planned and implemented an excellent system; it was, however, one that would quickly prove to be insufficient for the waste generated in the County. In the early 1970's, materials and energy recovery as alternatives to landfilling were considered and rejected as unproven and expensive.

In 1972, the Legislature passed the California Solid Waste Management and Resource Recovery Act. This Act created the California Solid Waste Management Board to oversee solid waste management policies and programs in California. The 1972 Act assigned primary responsibility for solid waste management plans to the local governments. County solid waste management plans were the result. The state was responsible for statewide policy, approving county plans, providing technical and financial assistance, overseeing enforcement, inventorying disposal sites, and developing a state solid waste management plan. The California Solid Waste Management Board (CSWMB) developed five principles for solid waste management under the 1972 state policy:

1) Solid waste management must be planned and conducted in an economical and environmentally sound manner;

2) Solid waste management must be consistent and in compliance with state policy, county plans, and minimum state standards;

3) Solid wastes need to be reduced to conserve energy, natural resources, and land resources;

4) Material and energy recovery from wastes is to be encouraged; and

5) Adequate litter programs are needed to ensure environmental quality and public health, safety, and well-being.

The counties were required to adopt and maintain solid waste management plans which evaluated resource recovery options, and implement recovery programs which limited the dependency on landfill disposal. The CSWMB prepared planning guidelines and procedures for preparing these plans, including procedures for revising and amending plans. The CSWMB also

developed minimum standards for solid waste management. These standards still govern disposal in the state and were enforced by both the state and local governments. The CSWMB promoted waste-to-energy facilities as an alternative to landfilling in California. The CSWMB felt that a solid waste management "crisis" was real and that Southern California would run out of landfill space by 1982.

In 1976, the Solid Waste Control Act was enacted, requiring permits for landfills and transfer stations. The Act also required cities and counties to establish a local enforcement agency to enforce the permit requirements and the other provisions and regulations called for in the Act. The Department of Health Services was designated as the enforcement agency for solid waste facilities in the County.

As mentioned, the 1972 Act required local jurisdictions to develop a solid waste management plan in cooperation with cities and private industry. Los Angeles County developed its plan and the Board of Supervisors adopted it in 1976. It was approved by the CSWMB in 1977. Since that time, the County has reviewed and updated the plan, as required, several times. The current plan, the Los Angeles County Solid Waste Management Plan (the Action Plan), is dated March 1984. This, along with Revision A (August 1985), is the official document currently governing solid waste management planning in the County. The Action Plan set out the goal of developing a solid waste management system that minimized the quantity of waste produced and disposed in the County by source reduction, recycling, waste-to-energy, and/or new technologies.

Few of the goals enunciated in the Action Plan were ever realized. The waste-to-energy goals encountered strong public opposition and only two of the planned facilities were constructed. Source reduction and recycling also lagged in their implementation. The County concluded that additional solid waste facilities were required for the projected future waste flows. As a result, the County along with the County Sanitation Districts initiated the Solid Waste Management Siting Project. This effort established criteria and guidelines for siting solid waste facilities (transfer stations, waste-to-energy facilities and landfills). In addition, a search for landfill sites was initiated. The County and the County Sanitation Districts alternative site

study group reviewed an initial list of 101 potential sites. From this list, six sites were selected -- including Blind Canyon, Brown Canyon, Elsmere Canyon, Mission/Rustic-Sullivan Canyons, Towsley Canyon, and Toyon II.

In April 1988, in order to further the goals of the siting efforts, the Solid Waste Action Plan was developed. This document -- ironically containing source reduction, recycling and composting elements -- primarily focuses on landfills. The Action Plan calls for 50 years of landfill capacity held in public ownership. To achieve this goal, the Action Plan supports the expansion of existing landfill and the development of new landfills. The six sites selected in the alternative site study have been reviewed for feasibility and four have been determined to be feasible: Blind, Elsmere, Mission/Rustic, and Towsley Canyons.

In 1989, the California Integrated Waste Management Act was passed by the Legislature and signed into law. This Act (AB 939) revised the framework for solid waste management planning in the state. Most significantly, AB 939 established a hierarchy for the management of solid waste. It requires local jurisdictions to divert solid waste from landfills through source reduction, recycling, and composting. AB 939 also establishes clear mandates for diversion: 25 percent in 1995 and 50 percent in 2000. In addition to requiring cities and counties to prepare specific planning documents that demonstrate how the diversion mandates will be met, the Act revised the state level review and planning processes and established the California Integrated Waste Management Board (CIWMB).

In summary, the County of Los Angeles solid waste management planning, in the opinion of this report, is focused primarily on in-County landfill. The County's policies reflect this orientation of the Action Plan, which, until superseded, still has the force of law.

III. RATIONALE FOR A NEW APPROACH TO COUNTY SOLID WASTE MANAGEMENT PLANNING

This Chapter summarizes the complex history of solid waste management in the U.S. as it has evolved over the last twenty-five years and its relevance to practices. Striking changes in our attitudes toward, and handling of, municipal solid waste have occurred during this period. In this context, it is necessary for Los Angeles County and all of its 88 cities to catch up with the times. The public demand for change is clear, resulting in new laws, new technologies, and new economics of solid waste management. It is entirely reasonable to assume that this pace of change will continue in the next twenty-five years.

A. PUBLIC DEMAND

The development of recycling and improvements in disposal technology in the United States is largely the result of grassroots efforts. Beginning with Earth Day in 1970, the general public has become more and more aware of their environment. This awareness has been heightened by environmental and conservation organizations' efforts at public education. The battle cry of these efforts has been, "We are a throw-away society -- the most wasteful nation on earth." Out of this point of view came the question, "What can one individual citizen do to make a difference in such a complex society?" The answer came clear, "I can recycle, I can control my own trash and I can conserve resources."

This attitude fostered volunteer recycling drop-off centers, such as the one in Berkeley, California that started in the early 1970s. With the growth of such centers, volunteers realized the need for wider participation and statewide coordinated efforts. This realization produced demand for legislated local and state recycling goals, with the result that most states now have enacted recycling laws. This trend continues. A survey conducted for Waste Management Inc. in 1995[7] indicates that 63 percent of consumers favor stricter recycling laws and 85 percent feel recycling is here to stay.

[7]"Attitudes and Behavior Regarding Recycling," The Gallup Organization for Waste Management, Inc., March 1995.

B. POLICY SHIFTS

The first statewide recycling law was passed in Oregon in 1983. Today, a total of 41 states have passed recycling legislation. Initially, most of these state laws set a statewide goal to be achieved by the local jurisdictions responsible for solid waste management. These goals stated a percentage of the solid waste to be recycled or diverted by a specified year. Originally, legislation left determination of the methods to attain goals up to the local jurisdiction. However, policies have shifted toward a mandatory requirement in about half the states, and many individual communities in states with voluntary goals are also choosing mandatory practices.

The federal government, after largely ignoring solid waste for a decade, shifted to a recycling-oriented policy reflected in their integrated waste management hierarchy: source reduce, recycle (including composting), combustion (with energy recovery) and landfilling. This integrated approach was first enunciated in *The Solid Waste Dilemma: An Agenda For Action* published by the U.S. Environmental Protection Agency (U.S. EPA) in 1989. This report stated a national goal of 25 percent recycling by 1992. This policy shift at the federal level was paralleled by additional shifts at the state and local levels. Many jurisdictions shifted from recycling goals to the broader requirement of reduction and diversion, instituting bans against landfilling specific materials including yard waste, tires, batteries, white goods (i.e., large appliances), waste oil and other specific materials. Some communities passed legislation banning the sale of products made of hard-to-recycle materials (e.g., foam plastic fast food containers). However, many of these bans were rescinded as markets became available or because of court challenges by manufacturers.

As discussed in Chapter II, California passed AB 939 in 1989. This law changed the focus of solid waste management from disposal to diversion by establishing a hierarchy which places landfilling on the lowest tier and setting diversion statewide goals of 25 percent by 1995 and 50 percent by 2000.

More recently, increasing recycling goals is one policy trend that is apparent. For example, New Jersey raised the original 25 percent reduction/recycling requirement to 60 percent in 1992. The City of Los Angeles has set a 70% diversion goal and Alameda County has set a goal of 75%. Also, realization has set in that removing materials from the waste stream alone is not enough. This realization is resulting in efforts to develop or expand markets for materials, and to contribute to the development of markets through purchase of products with recycled content. Laws and ordinances are being passed designed to encourage market development, and "Buy Recycled" programs are increasing nationwide.

Policy shifts have occurred in the private sector in concert with the grassroots demand for change. New laws to protect the environment have been passed and new technologies have been developed in the environmentally aware industries. The paper industry, for example, initially adopted a goal of recycling 40 percent of the waste paper generated each year in the U.S., then raised the goal to 50 percent. Browning Ferris Industries (BFI), a leading national solid waste management company, committed its resources to recycling. As a result, BFI has become the world's largest recycling firm. Thousands of businesses throughout the U.S. have invested billions of dollars in infrastructure to separate, process and utilize recycled materials.

A policy shift being implemented in Europe is the producer responsibility or the "take it all back" system. This system shifts the responsibility for recycling and disposal of products, particularly packaging, to the manufacturer or producer. This approach is being discussed in the United States and the business sector is strongly opposed. Implementation on a nationwide, not state or local basis, seems to make the most sense as is illustrated by the experience in Europe. Producer responsibility is discussed in Appendix A.

In this climate of policy shifts toward recycling from the grassroots to all levels of government, business and industry, Los Angeles County needs a policy shift to a proactive integrated waste management policy approach that places a priority on diversion.

C. DIVERSION TECHNOLOGY

As recycling and diversion policies changed, approaches to collecting recyclables evolved beyond the Berkeley-style volunteer drop-off center. The solid waste stream, originally viewed as a heterogeneous mass, is now divided into generator sectors (residential, commercial, institutional and industrial), product categories (tires, white goods, yard trimmings, batteries, etc.) and materials (ferrous metals, glass, paper, etc.). This fractionating is due to the needs of the diversion industry as well as the unique manner in which certain waste stream components (such as tires, rechargeable batteries or household hazardous wastes) must be managed in order to reduce the impacts on landfills.

The industrial segment of the economy has discovered that, in many cases, pollution prevention (i.e., not producing a waste in the first place) not only saves money on waste management but lowers the cost of product manufacture. This trend in the manufacturing sector caused a severe economic decline in the hazardous waste management industry. As the environmental regulations tightened during the 1980's due to RCRA and other requirements, the industry developed disposal facilities including hazardous waste incinerators and "secure" Subtitle C landfills. The price charged for hazardous waste disposal rose to cover the cost of these investments and their operation. The increase in disposal fees caused the generating industries to take a hard look at the "generate and dispose" policy. The result, in many generating industries, was a change in policy to pollution prevention. This policy focuses on examining industrial processes or the way products are made, then making changes in these processes to reduce the waste discharge. Many industries found that this not only reduced the cost of waste disposal allocated to a product, but improved the product quality.

The recycling industry, both public and private sectors, has found that recycling costs can be reduced if some individual waste components are never mixed in with the waste stream. This means changing the behavior of the individual waste generator in the home, office, business, and industry, so that different materials are placed in specific containers. The custodial, waste collection and waste processing functions require changing as a result. This change in behavior can be motivated by ethical, economic or cultural factors. It can occur spontaneously or by

design. The process is accelerated when there is an overall vision or policy, such as that stated by AB 939.

This source-separation eliminates some sorting and contamination clean-up steps. Chapter VII and Appendix B discuss separation technologies that have evolved. At the same time, sortation and clean-up technology has developed to the point where, for example, plastic containers can be economically sorted mechanically into individual resins. The pace of these developments is accelerating, and solid waste management planning should take this trend into account.

Implementation of technology requires investment. In the past decade, there has been a very large investment in the infrastructure necessary to implement diversion and recycling. For example, communities have made a multi-billion dollar investment in recycling collection and processing infrastructure. The paper industry has invested billions in existing plants and building new ones to accept and process recovered paper. Other industries have decided to use recycled materials to make new products and have modified processes and plants to utilize new feedstocks. In addition, communities and states have made major investments in market development. These include tax breaks, grants, and financing to businesses that utilize recovered materials, as well as siting, permit expediting, and other facilitation services. As a result, both the supply and demand portion of the markets for recovered materials looks positive, as discussed in Chapter VII. Investment and market structures are projected to improve in the future and these trends also impact solid waste management planning.

D. LANDFILL PROBLEMS

New landfills, as well as other solid waste facilities, have become difficult to site in urbanized areas. People living in or near a potential site area, and the businesses located there, have legitimate concerns based on the inherent nature of these facilities and their impacts. These include: truck traffic, noise, dust, odors, litter, and air and water pollution. Large facilities compound these characteristics, increasing their impacts in a non-linear fashion. These reasons alone are sufficient for a community to object to the siting of a large MSW landfill facility in

or adjacent to the community. While recently adopted laws and new technologies are designed to control environmental impacts, the performance of old landfills and dumps that are releasing air and water emissions without mitigation, promoting rats and other vectors, and contain hazardous wastes serve as a basis for community protests against these facilities. As landfills compete in urban and suburban areas with other land uses, these concerns will make siting landfills more difficult and expensive.

Modern landfill technology, including multi-layer liners (using plastic membranes and clay), leachate collection and treatment, methane gas collection, monitoring wells and cover requirements, is designed to address the problems presented by old dumps. However, the technologies are new and long-term performance data is not yet available. This presents problems in predicting the long-term impacts of landfills. For example, data on large-scale liner failure in a landfill containing 50 million tons of waste (e.g., Elsmere after 10 years of operation at design capacity) does not exist. Such a failure, whether due to technical or seismic problems, could result in correspondingly catastrophic groundwater contamination and other impacts. This makes estimating the cost of long-term operations and post-closure care difficult and subject to unproven assumptions.

The technical cost is not the only consideration. Once failure occurs and environmental damage results, litigation is initiated to determine liability among the owners, operators, and users. Legal costs (based on Superfund experience) are likely to exceed remediation costs. In addition, as discussed in Chapter VI, the human health risk from air emissions from landfills is greater that of waste-to-energy facilities.

E. CHANGES IN LANDFILL MANAGEMENT

New landfill management techniques have been developing over the past decades. These approaches have arisen in part to avoid some of the landfill management problems discussed above, such as application of daily cover materials to control odors, litter and vectors and to prevent landfill fires. Another driving factor in management changes is the need to conserve landfill capacity as a result of the difficulties encountered in siting new landfills or expanding

existing fills. The experience and potential for conserving or using landfill capacity most efficiently is discussed in Chapter VI and Appendix C. The pressures to innovate landfill improvements are accelerating in all the urban/suburban areas in the country, and in many rural areas as well. Implementation of appropriate landfill conservation management techniques need to be factored into landfill planning in Los Angeles County.

F. ECONOMICS

These trends impact the economics of solid waste management. These impacts are quantum changes, rather than incremental. For example, when communities first implemented curbside collection of materials for recycling, the initial result was a 10 to 15 percent diversion of the residential waste stream. The collection of recyclable materials from each household was implemented with new trucks and staff increased costs. Refuse collection costs, however, remained the same, even though the collected quantity dropped slightly. Communities were paying for two parallel collection systems. However, increasing diversion to 50 percent requires an entirely new system. This new system includes new containers, levels of service, trucks, personnel requirements, management strategies and fee structures. Chapter VII discusses many examples. The south half of City of Seattle contracts weekly automated waste collection, once per month automated recycling collection, and separate weekly yard waste collection. This Seattle system reports 55 percent recycling. The north half of Seattle contracts with a second vendor that uses a different system, recovering slightly less of the waste stream. To provide incentive for diversion, the City Solid Waste Utility charges a variable rate fees to households, operates as an enterprise fund, and uses a full cost accounting methodology to set these fees. Seattle's variable rate is based on the size of the waste disposal container requested by a household, with a total monthly cost of less than $10.00 to a household using the smallest size container. No fee is charged for recycling and yard waste collection. (See Appendix D for a description of Seattle's program and Appendix E for a discussion of enterprise funds and full cost accounting.)

Variable rate fees (either by container size as in Seattle or by weight of the disposed material) have been shown to reduce the total quantity of waste generated. Many communities

are not benefiting from the economies available from rationalizing their collection systems in keeping with the integrated waste management philosophy. These potential savings coupled with the potential revenues from recovered materials should be included in solid waste planning.

Nationwide, the trend in the cost of landfill construction and operation is upward as a result of increasingly stringent federal and State requirements. The cost of constructing new cells and landfills includes liners; leachate collection, storage, treatment and detection; and gas collection and processing and monitoring required by recent federal and State regulations contribute to this trend. Also, the cost of closure and post-closure maintenance add additional disposal cost, as the projected costs for these expenditures must be raised during the active life of the landfill. New rules have closed smaller, inefficient landfills, and encouraged the development of very large landfills that can spread higher development and operation costs over a greater tonnage of waste.

This rising cost trend appears to be in conflict with the short-term trend of lower tipping fees at various landfills in the Los Angeles region. This local downward pressure is caused by excess capacity and increased competition for smaller quantities of solid waste. The result of this will be an industry shakeout and consolidation in southern California.

G. FLOW CONTROL

The County should recognize that the reliance on in-county disposal capacity may have a serious legal flaw. On May 16, 1994, the Supreme Court of the United States examined the constitutionality of local government exercise of preference for the use of a local transfer station for solid waste. In a majority opinion by Justice Kennedy, the Court pronounced a Clarkstown, New York ordinance requiring the use of a local transfer station unconstitutional, because it discriminated against out-of-town providers of disposal services. *C & A Carbone v. Town of Clarkstown*, 114 S.Ct. 1677, 128 L.Ed.2d 399 (1994).

Similar reasoning to the County's "in-county" capacity policy led the State of New Jersey and its Department of Environmental Protection to require each garbage district in the State to

provide for disposal capacity within the district or another district through agreements. The New Jersey plan, with its preference for in-state and in-district disposal capacity planning, was struck down by the United States Court of Appeals for the Third Circuit, in *Atlantic Coast Demolition*.

The Supreme Court decision in the *Clarkstown* case and the Third Circuit's decision in the *Atlantic Coast Demolition* case indicates that, to the extent that the County solid waste management plan relies on the Action Plan with its requirement for 50 years of in-county landfill capacity and ordinances which favor in-county disposal, it is subject to successful legal challenge.

H. CONCLUSION

The developments and trends touched on above make integrated waste management planning difficult and imperative. The current fluid situation provides Los Angeles County with an opportunity to provide the leadership and coordination needed to develop an integrated waste management system for the County and its 88 cities that will serve its citizens well into the Twenty-first Century.

IV. WASTE GENERATION PROJECTIONS

A. STATEWIDE AND NATIONAL TRENDS

The increase in waste generation rates projected in the Elsmere Canyon DEIR/DEIS and the Siting Element are inconsistent with California State Board of Equalization reports and EPA forecasts. "Time-to-crisis" estimates in the DEIR/DEIS assume a waste generation increase rate of 2.5 percent per year from years 1993 to 2000. The Siting Element uses the CIWMB Adjustment Methodology to project even higher waste generation for the Los Angeles County.

In *Characterization of Municipal Solid Waste in the United States: 1994 Update*, the U.S. EPA projects that the national per capita waste generation rate will decrease from 4.4 pounds per person per day in the year 1993 to 4.3 pounds per person per day by the year 2000. A May 1995 study prepared for the CIWMB[2] calculated that the amount of solid waste disposed in California each day was 5.9 pounds per person in 1993, compared to 7.9 pounds per person as of January 1, 1990, and 7.4 pounds per person per day as of June 1985. This shows a 20.3 percent reduction in the eight years between 1985 and 1993. The report speculates that, "(t)he reduction in disposal amount is generally believed to be the result of the start-up of many new recycling programs and the reduction in generation amounts because of a prolonged recession in California."

The most important data is local. California State Board of Equalization waste disposal records, when compared with California Department of Finance population figures, reveal a descending trend in per capita waste generation rates in Los Angeles County.[3] Also, this is consistent with the efforts toward source reduction on the part of the County and the 88 cities as enunciated in the SRRE's.

[2]*Toward Ensuring Adequate Landfill Capacity*, prepared by Environmental Science Associates for the California Integrated Waste Management Board (CIWMB), May 9, 1995.

[3]References for data sources and methodology are provided on Table V-1.

Table IV-1 presents waste generation projections for Los Angeles County based on California State Board of Equalization reports and California Department of Finance census documents. For years 1990 to 1994, actual Population figures and quantities of Waste Disposed were used in Table IV-1. Using the diversion rates projected by the County in the DEIR/DEIS, the annual tonnage of Waste Generated was calculated [Waste Generated = Waste Disposed / (1 - Diversion Rate)]. This daily Waste Generated was converted to pounds by multiplying by 2,000 and converted to a daily figure by dividing by 365 and divided by the Population to derive the Per Capita Generation rate for 1990 through 1994. Waste Generated was calculated by multiplying Per Capita Generation by Population and converted to a six day per week basis.

Beyond the year 1994, California Department of Finance Population estimates and Diversion Rates anticipated by the County were used. To project Waste Generated, the first step was completing a linear regression on the Per Capita Generation data for years 1990 to 1994. All Per Capita Generation figures below the single line on Table IV-1 represent data points on the linear regression line. Based on the regression, there is obviously a downward trend in Per Capita Generation, which is expected as public participation in source reduction and recycling continues to rise. This projection is reasonable for Los Angeles County given the demographic changes discussed below and it is consistent with EPA forecasts. The Waste Generated for all years beyond 1994 are calculated by multiplying the Per Capita Generation by the Population.

In the DEIR/DEIS, the County showed waste generation rates increasing by 2.5 percent per year from 1993 to 2000, and then by 1 percent per year for all years beyond 2000. One percent was the assumed annual population growth, and per capita generation was assumed to increase by 1.5 percent per year until the year 2000. However, Table IV-1, based on records from the California State Board of Equalization and the California State Department of Finance, reveals that these assumptions do not reflect the actual trends. The annual percent change in population is slightly more than 1 percent, but per capita generation rates are declining. The reasons for the lower waste generation trend are discussed in the next section.

In the Siting Element, the County projects waste generation using the CIWMB approved standard adjustment method. The Adjustment Methodology is built up from the 1990 (base year)

Table IV-1. County of Los Angeles Projections For Waste Generation and Disposal

Year	Population[1]	Percent Change In Population	Waste Disposed (Tons)[2]	Diversion Rate (%)[3]	Waste Generated (Tons)	Materials Recycled (Tons)	Per Capita Generation (Pounds/Day)	Waste Generated (Tons/Day)
1990	8,897,500		12,197,677	18.00	14,875,216	2,677,539	9.1608	47,677
1991	9,016,094	1.3	12,062,900	19.40	14,966,377	2,903,477	9.0957	47,969
1992	9,128,197	1.2	12,073,556	20.80	15,244,389	3,170,833	9.1509	48,860
1993	9,246,713	1.3	11,288,268	22.20	14,509,342	3,221,074	8.5980	46,504
1994	9,364,835	1.3	12,068,712	23.60	15,796,743	3,728,031	9.2428	50,631
1995	9,489,576	1.3	11,624,443	25.00	15,499,258	3,874,814	8.9496	49,677
1996	9,636,490	1.5	10,976,380	30.00	15,680,542	4,704,163	8.9162	50,258
1997	9,769,611	1.4	10,294,491	35.00	15,837,678	5,543,187	8.8828	50,762
1998	9,908,514	1.4	9,601,519	40.00	16,002,531	6,401,013	8.8495	51,290
1999	10,043,552	1.4	8,887,711	45.00	16,159,475	7,271,764	8.8161	51,793
2000	10,180,868	1.4	8,159,212	50.00	16,318,425	8,159,212	8.7828	52,303
2001	10,308,177	1.3	8,229,862	50.00	16,459,724	8,229,862	8.7494	52,756
2002	10,437,186	1.3	8,301,089	50.00	16,602,178	8,301,089	8.7160	53,212
2003	10,563,974	1.2	8,369,770	50.00	16,739,541	8,369,770	8.6827	53,652
2004	10,689,131	1.2	8,436,393	50.00	16,872,786	8,436,393	8.6493	54,079
2005	10,812,672	1.2	8,501,140	50.00	17,002,280	8,501,140	8.6160	54,494
2006	10,936,119	1.1	8,564,747	50.00	17,129,494	8,564,747	8.5826	54,902
2007	11,059,924	1.1	8,628,039	50.00	17,256,078	8,628,039	8.5492	55,308
2008	11,185,267	1.1	8,691,772	50.00	17,383,544	8,691,772	8.5159	55,716
2009	11,312,477	1.1	8,756,187	50.00	17,512,375	8,756,187	8.4825	56,129
2010	11,441,900	1.1	8,821,534	50.00	17,643,069	8,821,534	8.4492	56,548
2011	11,573,880	1.2	8,888,057	50.00	17,776,114	8,888,057	8.4158	56,975
2012	11,709,189	1.2	8,956,322	50.00	17,912,645	8,956,322	8.3824	57,412
2013	11,848,248	1.2	9,026,621	50.00	18,053,242	9,026,621	8.3491	57,863
2014	11,991,827	1.2	9,099,503	50.00	18,199,006	9,099,503	8.3157	58,330
2015	12,137,604	1.2	9,173,172	50.00	18,346,344	9,173,172	8.2824	58,802
2016	12,287,579	1.2	9,249,113	50.00	18,498,226	9,249,113	8.2490	59,289
2017	12,440,565	1.2	9,326,399	50.00	18,652,797	9,326,399	8.2156	59,785
2018	12,596,568	1.3	9,405,005	50.00	18,810,011	9,405,005	8.1823	60,288
2019	12,755,268	1.3	9,484,668	50.00	18,969,335	9,484,668	8.1489	60,799
2020	12,916,552	1.3	9,565,277	50.00	19,130,555	9,565,277	8.1156	61,316
2021	13,079,741	1.3	9,646,310	50.00	19,292,620	9,646,310	8.0822	61,835
2022	13,243,874	1.3	9,727,043	50.00	19,454,085	9,727,043	8.0488	62,353
2023	13,409,051	1.2	9,807,539	50.00	19,615,079	9,807,539	8.0155	62,869
2024	13,574,969	1.2	9,887,570	50.00	19,775,141	9,887,570	7.9821	63,382
2025	13,741,575	1.2	9,967,090	50.00	19,934,180	9,967,090	7.9488	63,892
2026	13,908,376	1.2	10,045,737	50.00	20,091,473	10,045,737	7.9154	64,396
2027	14,074,529	1.2	10,122,901	50.00	20,245,803	10,122,901	7.8820	64,890
2028	14,240,348	1.2	10,198,815	50.00	20,397,631	10,198,815	7.8487	65,377
2029	14,405,759	1.2	10,273,429	50.00	20,546,858	10,273,429	7.8153	65,855
2030	14,570,887	1.1	10,346,834	50.00	20,693,669	10,346,834	7.7820	66,326
2031	14,735,527	1.1	10,418,889	50.00	20,837,779	10,418,889	7.7486	66,788
2032	14,899,270	1.1	10,489,311	50.00	20,978,621	10,489,311	7.7152	67,239
2033	15,062,569	1.1	10,558,424	50.00	21,116,847	10,558,424	7.6819	67,682
2034	15,225,602	1.1	10,626,357	50.00	21,252,714	10,626,357	7.6485	68,118
2035	15,388,723	1.1	10,693,359	50.00	21,386,718	10,693,359	7.6152	68,547
2036	15,552,029	1.1	10,759,496	50.00	21,518,991	10,759,496	7.5818	68,971
2037	15,715,662	1.1	10,824,863	50.00	21,649,727	10,824,863	7.5484	69,390
2038	15,879,914	1.0	10,889,659	50.00	21,779,318	10,889,659	7.5151	69,806
2039	16,044,951	1.0	10,953,991	50.00	21,907,982	10,953,991	7.4817	70,218
2040	16,211,079	1.0	11,018,060	50.00	22,036,120	11,018,060	7.4484	70,629
2041	16,373,190	1.0	11,078,399	50.00	22,156,798	11,078,399	7.4150	71,015
2042	16,536,922	1.0	11,138,843	50.00	22,277,686	11,138,843	7.3816	71,403
2043	16,702,291	1.0	11,199,388	50.00	22,398,776	11,199,388	7.3483	71,791

[1]California Department of Finance, Demographic Research Unit, 1993 Population Projection Series; Because projections only completed until 2040, years 2041 – 2043 are based on 1% annual population growth estimate.
[2]California State Board of Equilization
[3]Los Angeles County Department of Public Works

waste generation figures in the residential and commercial sectors, and utilizes the projected residential and commercial sector ratios of population, employment, and taxable sales to compute adjustment factors, that are in turn used to project the waste generation in the year of interest.

EPA's report and the County's solid waste planning efforts both start with a projection of waste generation. In its past planning efforts, called "time to crisis" calculations in the DEIR/DEIS and the Siting Element, the County has developed a number of waste projections. Two of these are shown in Table IV-2: the first data column is from the 1996 Siting Element and the second data column is from the 1995 DEIR/DEIS[4]. Interestingly, the County's most recent projection shows an increase in the per capita waste generation rate. Table IV-2 provides a comparison between data from the waste projection discussed above, County historical data and a calculation based on the social and economic factors discussed in Section B of this chapter.

It is the conclusion of this report that the County's projections are high and exaggerate the need for landfill disposal capacity. Figure IV-1 shows graphically how the County's change in the projection method from the DEIR/DEIS in 1995 to the Siting Element in 1996 impacted the projected landfill need. The top curve is the current Siting Element projection; the middle curve is from the DEIR/DEIS; and the bottom curve illustrates the projection developed in this chapter. In the DEIR/DEIS, the projected quantities of waste generated per day are some 4,400 tons lower than the Siting Element, with the corresponding reduction in disposal need.

B. LOS ANGELES DEMOGRAPHIC TRENDS

Since the publication of the County Action Plan in 1988, Los Angeles County has seen its robust economy take a downturn and stagger with the loss of industries, jobs and wage growth. In the County, for example,

- There were 335,000 fewer non-agricultural jobs in 1994 than in 1988;

[4]*Draft Environmental Impact Report/Draft Environmental Impact Statement, Elsmere Canyon*, U.S. Department of Agriculture and Los Angeles County, January 1995.

Table IV-2. Los Angeles County Solid Waste Generation Estimate Comparison

Year	County 1996 Estimated Total Generation[1] (Tons)	County 1995 Estimated Total Generation[2] (Tons)	Alternative Projected Total Generation[3] (Tons)
1995	15,640,000	14,679,912	15,499,258
1996	16,327,544	15,046,824	15,680,542
1997	16,719,120	15,423,096	15,837,678
1998	16,758,884	15,808,728	16,002,531
1999	16,865,731	16,204,032	16,159,475
2000	17,129,863	16,609,008	16,318,425
2001	17,530,719	16,774,992	16,459,724
2002	17,867,335	16,942,848	16,602,178
2003	18,203,390	17,112,264	16,739,541
2004	18,502,275	17,283,552	16,872,786
2005	18,786,215	17,456,400	17,002,280
2006	19,048,179	17,630,808	17,129,494
2007	19,288,491	17,807,088	17,256,078
2008	19,507,528	17,985,240	17,383,544
2009	19,705,384	18,164,952	17,512,375
2010	19,882,280	18,346,848	17,643,069
2013		18,902,520	18,053,242
2033		23,064,912	21,116,847
2043		25,477,920	22,398,776

[1]Source: *Countywide Siting Element*, Los Angeles County Department of Public Works, January 1996.

[2]Source: "Draft Environmental Impact Report/Environmental Impact Statement -- Proposed Elsmere Solid Waste Management Facility," Los Angeles County Department of Regional Planning, January 1995.

[3]Source: GBB.

- Unemployment in 1988 was hovering around 5 percent, but has since doubled to about 10 percent in 1994; and
- Jobs in the aerospace/high technology industries have declined by 45 percent, which translates to the loss of 125,200 jobs since 1988.

While the national recession was declared over in 1991 by the Council of Economic Advisors as other regions of the United States rebounded, in 1995 Los Angeles County remains mired in the recession with hopeful signs of weak upward swing to the end of the decade.

1. Economic Restructuring

Although not unique in undergoing restructuring from a manufacturing to a service and information based economy, Los Angeles is experiencing a far more rapid, intense, and complex transformation of its urban economy (Soda, Morals, and Wolf, 1983). In addition to the loss of aerospace jobs, employment losses hit a broad range of the County's economy. For example:

- The retail sector lost nearly 62,000 jobs, construction lost 3,000 jobs, public employment lost nearly 15,000 jobs, and the services sector remained about 10,000 jobs below its prior levels (Wolf and Grigsby, 1995).
- The value of two-way trade in the Los Angels Customs District, which grew by 13 percent during the 1988-89 period, rose by only seven percent in the 1994-95 time period.
- The County received 50,200 housing unit permits in 1988, but only received 25,300 in 1994, a decline of 50 percent.

2. Changing Demographic Climate

Los Angeles County continues to grow, from 7,477,400 people in 1980 to 8,863,200 in 1990 to an estimated population of 9,194,400 in 1993. The annual rates of growth have declined from about 1.6 percent a year from 1980 to 1990, to 1.2 percent since 1990. More importantly, Los Angeles County has undergone a dramatic shift in its ethnic composition since 1988. White-Nonhispanic share will decline from 41 percent in 1990 to 33 percent in the

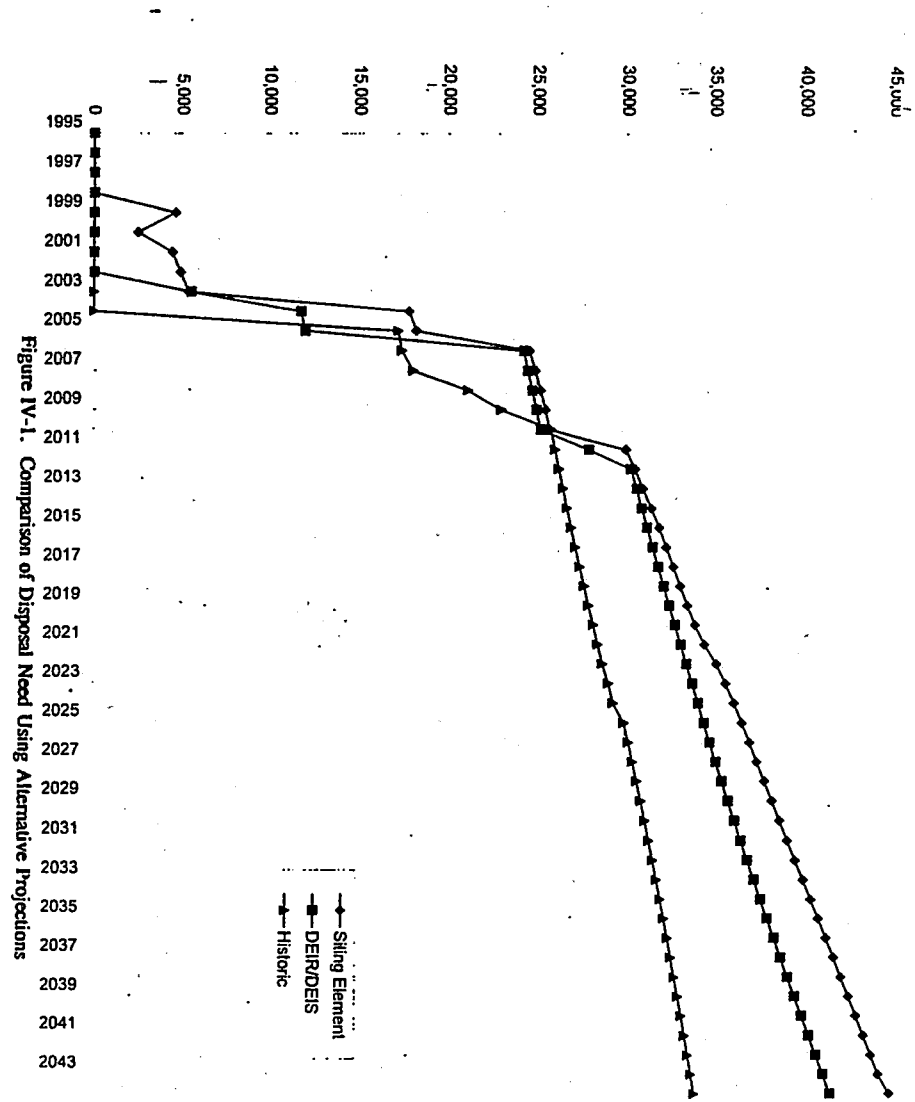


Figure IV-1. Comparison of Disposal Need Using Alternative Projections

year 2000. Moreover, the Hispanic share of the population (at 38 percent in 1990) is projected to rise to 46 percent by the year 2000. Hispanic population growth is fueled by larger family sizes and the continued influx of immigrants. White Non-hispanics are declining in share due to the outflows of population. For example:

- During the 1992-93 period, 112,800 persons moved out of Los Angeles County.
- Southern California Association of Governments has just recalibrated its projections for the five-county area downward by over half a million. They estimate that about 95,300 persons will leave the five-county SCAG region each year from 1995 to 1999. After the year 2000, the number of annual out-migrants from the SCAG region will rise to 135,000.
- The State Department of Finance estimates that almost all the growth Los Angeles County will experience over the next five years will result from immigration from abroad.

Los Angeles County has been transformed from a primarily white (Non-hispanic) population to one where Hispanic-, Asian-, and African-Americans account for 60 percent of the County's population.

3. Changing Income Structure

The vacuum created by the loss of a large number of high wage jobs associated with manufacturing and aerospace has been filled by service sector jobs paying lower wages with fewer benefits. About two-thirds of the County's Hispanic population are in non-manufacturing jobs. Hispanic-, Asian- and African-Americans are more likely to be located in the services sector, which is devoted to the generic consumption and maintenance activities required or expected in large urban areas. The kinds of retail and services provided -- markets, small to medium size retail stores, restaurants, car repair and medical care -- account for most of the low-wage job growth experienced by Los Angels County since the late 1980s.

Workers in lower occupation levels receive lower wages. With less discretionary income to spend, consumer patterns are less wasteful. Many anecdotal observations have been made

about the "conservation behaviors" of recent immigrants and lower income households who continually seek ways to extend the uses of material goods and products.

4. Implications of Waste Disposal Demand

The population forecast used in the DEIR/DEIS is too high. Any population projection estimated prior to 1990 will inflate future population growth. In 1993, the latest report available, the State Department of Finance lowered its population projections. In 1995, SCAG adjusted its 1990 population projects downward for the five-county region. The center for the Study of California's Economy has also lowered its population projections in its latest 1995 report.

The shift from a manufacturing to a service base economy will change waste disposal demand for Los Angels County. In general, service base economies are more likely to use recyclable materials, create less sludge, and produce refuse that can be converted to fuels. Many of these newer industries are more efficient and produce less waste.

The aggregate numbers hide significant compositional changes. The latest projections are lower but all assume some degree of growth. More importantly, the growth will be driven by immigration primarily from Mexico, Latin America and Asia. These changes in the components of growth and subsequent compositional changes challenge basic assumptions that waste disposal patterns of the past will be replicated in the near future.

Lower household incomes mean less waste per capita is generated. The association of higher incomes with greater consumption and waste has been well established. The current outlook of greater shares of lower income, non-white populations in Los Angeles County over the next decade projects to declining tonnage of waste disposal demand.

C. IMPORT/EXPORT OF WASTE

The Siting Element shows that 2,220 TPD of waste were imported into Los Angeles County from San Diego, Ventura, Orange and San Bernardino Counties. This totaled 692,640 tons of solid waste that were imported and disposed of in Los Angeles County landfills in 1995. The Siting Element also reports that 74,880 tons of solid waste were exported from the County in 1995. This results in a net import rate of 1,980 TPD on a six-day/week basis and 617,760 for the year. The DEIR/DEIS indicated that in 1993 the imports and exports were about equal and that the exports were approximately 485 TPD. Clearly, something has changed. The imports into the County in 1995 amounted to six percent of the waste landfilled. However, these data, in the opinion of this report, do not accurately reflect the true situation, as discussed below.

The past assumption that imports are approximately equal to exports is no longer a good assumption. The current situation is too dynamic. Several recent events exemplify the changes that affect waste import and export, including:

- The agreement between Orange County and WMI diverts the waste that was imported into Los Angeles County from San Diego County going to Riverside County instead. This agreement provides for 168,000 tons per year.
- The agreement between Orange County and Taormina Industries calls for 350 TPD in January 1996, increasing to 2,000 TPD by January 1997.
- The prospect of future importation from Ventura County has decreased due to a recent landfill expansion in Ventura.

The quantities that are included in the quarterly reporting required by CIWMB will not provide the data necessary to project future inter-county waste flows.

- The data is taken on a sampling basis for a period of one week every quarter. This is then projected over the other 11 weeks in the quarter. To be accurate, the data should be taken continually and summed for the quarterly report;

- Taking the origin data on a periodic sampling basis allows waste disposers to change their disposal location for the sampling period, thus distorting the data. This practice has been common in 1995 and it is well-known in the solid waste industry in the Los Angeles area; and
- The sampling does not reflect the fluid situation of landfills in and around Los Angeles. This is shown by the contract entered into by Orange County and others as discussed in Chapter V.

Poor information leads to poor policy and management decisions. It is recommended that the County and the 88 cities institute actual accounting of solid waste by weight and encourage the CIWMB to modify the reporting requirements for solid waste facilities so that the data reflects actual practice.

V. CURRENT AND FUTURE LANDFILL CAPACITY

The California Integrated Waste Management Act of 1989 requires Los Angeles County to continually have sufficient disposal capacity to accommodate the upcoming fifteen years of projected disposal need. The County of Los Angeles Department of Public Works has extended their planning period considerably further into the future, to 50 years as discussed in Chapter II. To demonstrate the need for the proposed Elsmere Canyon Landfill, it must be shown that the existing solid waste disposal facilities available to Los Angeles County are incapable of handling the waste generated over the 15-year period.

In the Elsmere Canyon DEIR/DEIS[11], the County predicted the "time-to-crisis" as shown in Table V-1. This is the point when there is no available landfill capacity in the County. According to the DEIR/DEIS, this occurs in 2004, when an Unsatisfied Need of 5,529 tons per day (TPD) capacity is projected.[12] The numbers and methodology used in Table V-1 and other DEIR/DEIS tables to project solid waste generation rates and disposal capacity were provided by the Los Angeles County Department of Public Works. This projection methodology covers the 50-year period preferred by the County.

Interestingly, in the Siting Element, the County provides a new and shorter "time to crisis". The County's projection from the Siting Element is shown in Table V-2 and indicates a Daily Disposal Capacity Shortfall in 1999. This loss of five years in the "time to crisis" is the result of the County's choice of data on which to base its waste generation projection as discussed in Chapter IV. In the Siting Element, the County has shortened the planning period to the 15 years required by AB 939. Summary data are presented in this Chapter, and year-by-year tables from which these summaries are prepared are included in Appendix F. The procedure used in Appendix F takes the same basic format utilized by the County "time-to-crisis

[11]Developed from Table 3.3.1, page 3-11, *Draft Environmental Impact Report/Draft Environmental Impact Statement*, Elsmere Canyon, USDA and LA County, January 1995. Format and data are the same.

[12]Actually, the table is abbreviated and does not show all of the data, including 2004. A year-by-year table is presented in Appendix F.

Table V-1. Existing Waste Management System Component Capacities and Projected Disposal Needs
County of Los Angeles Metropolitan Area
(Tons Per Day Assuming a 6–Day Disposal Week)

Year	Waste Generation Rate	Percent Diversion	Disposal Need	Landfill Capacities (lpd–6)									Unsatisfied Need
				Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez	Sunshine	Chiquita	Calabassas	
1993	44,784	22.2	34,842	12,000	3,000	12,000	2,022	7,000	3,333	0	1,443	2,426	0
7 yrs. – 2000	53,234	50.0	26,617	12,000	0	12,000	1,821	0	0	6,000	0	2,185	0
10 yrs. – 2003	54,847	50.0	27,424	12,000	0	12,000	1,876	0	0	6,000	0	2,251	0
15 yrs. – 2008	57,645	50.0	28,822	0	0	0	1,972	0	0	0	0	2,366	24,484
20 yrs. – 2013	60,585	50.0	30,293	0	0	0	0	0	0	0	0	0	30,293
40 yrs. – 2033	73,925	50.0	36,962	0	0	0	0	0	0	0	0	0	36,962
50 yrs. – 2043	81,660	50.0	40,830	0	0	0	0	0	0	0	0	0	40,830

Source: "Draft Environmental Impact Reprt / Environmental Impact Statement – Proposed Elsmere Solid Waste Management Facility," Los Angeles County Department of Regional Planning, January, 1995.

Table V-2. Scenario A – Time-To-Crisis Analysis

ASSUMING NO NEW OR EXPANDED LANDFILLS DURING THE PLANNING PERIOD

Based on October 1, 1994 through September 30, 1995 six day average tonnages and assuming AB 939 diversion is fully implemented
Los Angeles County Countywide Siting Element

Year	Waste Generation Rate	Percent Diversion	Total Disposal Need	Maximum Daily Transformation Capacity	Landfill Disposal Need	Daily Disposal Capacity Shortfall (Excess)
	(tpd-6)		(tpd-6)	(tpd-6)	(tpd-6)	(tpd-6)
1995	50,129	25.00%	37,596			
1996	52,332	30.00%	36,632	1,977	34,655	(22,425)
1997	53,587	35.00%	34,832	1,977	32,855	(8,784)
1998	53,714	40.00%	32,228	1,977	30,251	(2,543)
1999	54,057	45.00%	29,731	1,977	27,754	4,629
2000	54,903	50.00%	27,452	1,977	25,475	2,477
2001	56,188	50.00%	28,094	1,977	26,117	4,435
2002	57,267	50.00%	28,634	1,977	26,657	4,904
2003	58,344	50.00%	29,172	1,977	27,195	5,372
2004	59,302	50.00%	29,651	1,977	27,674	17,789
2005	60,212	50.00%	30,106	1,977	28,129	18,200
2006	61,052	50.00%	30,526	1,977	28,549	24,565
2007	61,822	50.00%	30,911	1,977	28,934	24,899
2008	62,524	50.00%	31,262	1,977	29,285	25,205
2009	63,158	50.00%	31,579	1,977	29,602	25,480
2010	63,725	50.00%	31,863	1,977	29,886	25,727

ASSUMPTIONS:

1. The waste Generation Rate was estimated using the CIWMB's adjustment methodology, utilizing population and economic projections available from the State Department of Finance and the Southern California Association of Governments.
2. 25% Diversion Rate in 1995 increases to 50% by 2000 and thereafter.
3. Sunshine Canyon Landfill becomes operational on July 1, 1996.

NOTES:

1. The 1995 diposal need quantity will be updated in the final CSE once complete 1995 Disposal Quantity Reporting Data are available.
2. "tpd-6": tons per day, 6 days per week.

Source: Los Angeles County Department of Public Works, January 1996.

tables, and modifies the calculations.

The presentations in the DEIR/DEIS and the Siting Element developed by the County shows a short "time to crisis" or time to Daily Disposal Shortfall, due to its flawed assumptions and the selection of improbable scenarios. Specifically, the County fails to:

- project landfill operation at historically based waste acceptance rates (The landfills listed in Table IV-1 are all assumed to be operating at their maximum permitted capacity, so that in a given year, the projected amount of disposed waste can exceed the generated waste by up to 2.6 million tons, or over 7,000 TPD.);
- project the export of County-generated waste to out-of-County landfills;
- project the utilization of inert landfills, which have capacity for the inert fraction of the MSW stream;
- consider banning inappropriate materials, i.e., inerts and sewage sludge, from Class III landfills in Los Angeles County;
- include the capacity of the two waste-to-energy facilities operating in Los Angeles County; and
- consider the impact of the high diversion goal adopted by the City of Los Angeles.

The following section of the report adjusts the "time-to-crisis" calculations to account for the above factors. This is done in an incremental, step-by-step approach using a computer model that starts with the County's waste generation projection as published in the Siting Element and discussed in Chapter IV. The computer model starts with 1995 and projects waste generation for the next 50 years. Year-by-year tables are presented in Appendix F, which show the individual landfill and other waste allocations used to identify the exact "time-to-crisis" years and the individual effect of each step-by-step adjustment discussed in the text. Using the County's high waste projection emphasizes that alternatives to landfilling can and should be the primary thrust of the County's solid waste planning.

The majority of the information used in the adjusted tables is taken directly from documents and tables generated by the Los Angeles County Department of Public Works. The

County's calculation, as shown in the Siting Element and presented in Table V-2, projects Los Angeles County to reach a "crisis" in disposal capacity in year 1999. However, as the landfill "crisis" based assumptions in Table V-2 are modified in subsequent tables, it is revealed that the Los Angeles County solid waste disposal capacity is not in a "crisis." In fact, the "crisis" year is extended to 2014 -- fifteen years later and beyond the AB 939 planning period -- using the cumulative modifications discussed below.

A. WASTE MATERIALS FLOW MODEL

A computer model was developed to estimate the flows of solid waste materials generated in Los Angeles County. The model allocates the waste among waste-to-energy, diversion, and other alternatives to landfilling; and then allocates the remaining waste among the County landfills. Any unallocated waste is Daily Disposal Shortfall.

The computer model projects the quantity of waste needing disposal in the landfills in Los Angeles County beginning in 1996 and running through 2044. As mentioned above, the model uses the quantity of waste generated in each year projected by the County in the Siting Element. This is expressed as a daily rate based on a six-day week, as is the case in the solid waste permits. A portion of the waste generated is allocated to diversion, based upon the diversion rates projected by the County in the Siting Element. Waste is also allocated to the two waste-to-energy facilities at their capacity. Whatever waste remains each year is then variously allocated to landfills and diversion alternatives under a number of solid waste management strategy scenarios; each of the scenarios are designed to evaluate the differential impact of the various solid waste management strategies available to the County.

There a number of assumptions and parameters that are constant throughout all scenarios. These are:

1. Seventeen (17) permitted Class III landfills in Los Angeles County are included in the model. All are operating as of January 1996, except Sunshine Canyon -- which begins operating January 1997. No new landfills are opened.

2. The landfill daily allocations are initially based upon actual historic usage (1994) and rise to the permitted daily capacity as required. Total permitted capacity is the limiting factor as to how much a landfill can accept in the initial scenarios. These capacity quantities are taken from the Siting Element and are reproduced in Table V-3.

3. The waste to energy facilities are operated at 85.7 percent of maximum continuous rating (MCR). This percentage is the availability factor that allows for facility outages for preventive maintenance and repair. It is a conservative figure, as these plants can operate between 90 and 95 percent of MCR. The 1,760 TPD MCR is a seven-days-per-week figure, which is converted to the six-days-per-week figure used by the County. Therefore, 1,760 TPD on a seven day basis becomes 2,053 TPD on a six day basis. When multiplied by the availability factor of 85.7 percent, the result is 1,760 TPD on a six day basis. Also, no landfill space is allotted to the ash. This is because the Sanitation Districts are mixing the ash with cement to make concrete, then crushing the concrete, and using it for road sub-base. The County, in their calculations, uses 1,977 TPD permitted capacity for these facilities, which is higher than the plants' physical capacity.

4. The Lopez Canyon and BKK landfills are closed at the end of 1996.

5. The composition of the waste generated in Los Angeles County is that documented in the Interim Database assembled by the CIWMB and dated 1993.

The model allocates the quantity of waste generated each year based upon the historic actual uses of each landfill. For example, historically Puente Hills landfill has accepted about 16 percent of the County's annual quantity of waste needing disposal. Therefore, in projecting future disposal, the model attempts to maintain this proportion, even though Puente Hill's Permitted Daily Capacity is higher. As landfills reach their Total Permitted Capacity, or Expanded Capacity in Scenario 7, and close, the model allocates more waste to the open landfills -- until Permitted Daily Capacities are reached. Each landfill's Daily Permitted Capacity is never exceeded. Waste that cannot be allocated is summed as Unsatisfied Disposal Need. Los Angeles County overestimates the utilization of the landfills in the Siting Element. This is done by always projecting that landfills will be used at their Daily Permitted Capacity. This approach accelerates the "time to crisis" in the Siting Element by 2 years compared to that discussed in Section C, Landfill Waste Acceptance Rates.

Table V-3. Los Angeles County Landfill Capacities in Tons

Landfill	Remaining Permitted Capacity Jan. 1, 1996	Expanded Capacity	Permitted Daily Capacity	1994 Actual Utilization
Puente Hills	29,774,000	64,400,000	12,000	10,945
Spadra	2,147,000	2,147,000	3,700	2,156
BKK	2,652,000	2,652,000	12,000	8,878
Scholl	10,900,000	10,900,000	3,400	1,587
Bradley	7,506,000	7,506,000	7,000	4,448
Lopez	520,000	520,000	4,000	2,351
Sunshine Canyon	16,900,000	100,000,000	6,600	--
Chiquita Canyon	1,848,568	31,100,000	10,000	1,692
Calabassas	15,000,208	15,000,208	3,500	2,975
Brand Park	593,000	593,000	102	18
Antelope Valley Dump	2,129,000	8,300,000	750	539
Azusa Land Reclamation	3,086,000	3,086,000	6,000	695
Burbank	6,358,000	6,358,000	240	162
WM of Lancaster	472,600	11,100,000	1,000	435
Pebbly Beach Disposal	40,345	40,345	33	4
U.S. Navy	48,100	48,100	1	1
Whittier-Savage Canyon	2,663,000	2,663,000	350	217

Countywide Siting Element, Los Angeles County Department of Public Works, January 1996.

The initial run of the computer model or scenario provides a baseline allocation of waste and follows the County's strategy, which is: do the minimum diversion required by AB 939 and landfill the rest of the waste. Six other solid waste management strategies or scenarios are offered. Each of these is discussed in the following paragraphs. The rational for each strategy is discussed and the impact of that strategy is provided. The "time to crisis" is identified by the year that the County has an unsatisfied landfill need. The unsatisfied landfill need is also shown graphically to allow visual comparison of the impacts. Detailed values for each scenario are provided in Appendix F. Changes in the parameters in the Scenarios are not mutually exclusive and therefore have a cumulative impact, unless otherwise specified. This reflects the fact that an integrated solid waste management system for Los Angeles County is recommended to contain a combination of programs or strategies in order to achieve its objectives.

B. LANDFILL CLOSURES

In November, 1995 BKK and Browning Ferris Industries (BFI) announced that they had concluded an agreement which would close the BKK landfill in West Covina. The agreement has several contingencies including the reopening of the Sunshine Canyon landfill. Under the agreement BFI will acquire some of the assets of BKK including the ---transfer station and the Elsmere landfill project. The closure of the BKK landfill appears to be immanent and should occur before the end of 1996. Also, the City of Los Angeles has announced that it would close the Lopez Canyon landfill as of July 1996. This closure of these two landfills have an impact on the capacity available for Los Angles County waste.

The closure of the BKK and Lopez Canyon Landfills before they reach capacity reduces the County's available landfill space by some two to three million tons and reduces the useful life of the Los Angeles disposal system. To provide the most accurate representation of the current and future solid waste system for Los Angeles County, all subsequent landfill capacity and requirement estimates will be based on the assumed closure of the BKK and Lopez Canyon Landfills in 1996.

C. LANDFILL WASTE ACCEPTANCE RATES (SCENARIO 1)

In the Elsmere Canyon DEIR/DEIS and the Siting Element, the County projects Los Angeles County landfills to be perennially operating at their maximum permitted daily capacity. Table V-3 shows that in 1994 no operating Class III landfill (except perhaps the U.S. Navy) accepted the solid waste at its permitted capacity. On average, the County landfills operated at 53 per cent of permitted capacity in 1994. However, these landfills have historically operated at less than their permitted capacity.

The result of using maximum daily permitted capacities to calculate the "time-to-crisis" is that the annual total of disposed waste exceeds the projected total generated amount. For example, Table V-1 shows that 34,842 TPD of waste required landfill disposal in 1993; however, using the Daily Permitted Capacity, 43,224 TPD are assumed to be disposed.

Therefore, 8,382 TPD of waste, or 2.6 million tons per year, is shown to be disposed of in Los Angeles County landfills that is not generated. For all years before the "crisis" in Table V-1 and Table V-2, the projected total waste disposed of exceeds the generated amount.

It is unreasonable to project landfill acceptance rates that are independent of the key parameters, such as the waste generation and the diversion rates. Assuming that all landfills operate at full daily capacity leads to projected useful lives for each facility that are consistently short. Thus, the "time-to-crisis," based on the maximum utilization of landfills at the maximum permitted disposal capacities, does not present a true picture of landfill needs.

The model calculates data similar to Table V-2, except landfills are not assumed to operate at their maximum daily capacity, and the physical capacity of each landfill is assumed to be fully utilized. The total amount of waste requiring landfill disposal, Daily Disposal Capacity Shortfall, is proportionally divided among all of the operational landfills. The portion of the total generated waste allocated to each facility is prorated based on the tonnage of waste each landfill received in 1994, as reported by the California State Board of Equalization. For example, for Puente Hills in 1995, the average 1994 daily acceptance rate (10,945 tons) is divided by the summation of the average daily acceptance rates for all of the active landfills (47,912 tons) to yield 22.8 percent. This percentage is multiplied by the tonnage of waste requiring disposal to project the quantity disposed of in Puente Hills. The 1994 average daily acceptance rate for each landfill is shown in Table V-3. The daily acceptance rates were derived by dividing the annual tonnage received in 1994 (reported by the Board of Equalization) by 312 (days/year), to reflect six days of operation per week (6 days/week x 52 weeks). After the Chiquita Canyon landfill is expanded, the permitted daily capacity will rise-to 10,000 TPD. For the purpose of the model, an average daily acceptance rate of 7,000 tons was assumed.

The first year the remaining physical capacity of a landfill is less than the permitted annual capacity, the landfill is assumed to accept enough waste to reach capacity and begin closure. For example, when the remaining capacity of Lopez Canyon is less than 4,000 TPD (the permitted acceptance rate), it is assumed that during that year, Lopez Canyon will accept enough waste to reach its total permitted capacity.

As landfills reach their total permitted capacity and begin closure, the calculations used to allocate the total amount of generated waste to the remaining operational landfills are adjusted. When landfills reach capacity, their daily acceptance rate is withdrawn from the summation of the daily acceptance rates used to prorate the allocation of waste to the various facilities, and the active landfills are responsible for a larger percentage of the annual generated waste. For example, when Lopez Canyon closes, the prorated percentage of waste allocated Puente Hills is 10,945 TPD divided by 45,561 TPD (the previous summation of the daily acceptance rates of 47,912 minus 2,351 tons, the daily acceptance rate of Lopez Canyon). However, this new percentage is not applied to the total amount of waste requiring disposal for that year because Lopez Canyon did accept some waste to reach closure. Therefore, the new percentage is applied to the total amount of waste requiring disposal minus the amount Lopez Canyon received to reach total capacity. The results of this calculation are shown in Figure V-1.

By comparing Table V-2 and Figure V-1, it is evident that projecting the landfills to operate at their maximum permitted capacity until closure has a negative effect on the "time-to-crisis. Table V-2 predicts that 1999 will be the first year Los Angeles County is without disposal capacity sufficient to accommodate the generated waste. However, Figure V-1, based on the rational assumption that the amount of waste landfilled will be approximately equivalent to the amount requiring disposal, projects 2001 to be the "crisis" year. Although there is potential for out-of-County waste to reach Los Angeles County disposal facilities, it can not be assumed that the landfills will continually operate at maximum capacity. Similarly, although there is potential for Los Angeles County waste to be hauled and disposed of outside of the County limits, it can not be assumed that the quantity of waste disposed of in Los Angeles County facilities will be less than the generated amount. From years 1995 to 2001, Table V-2 includes the disposal of over 12 million tons of waste in excess of the generated amount. This would mean that 24 percent of the waste shown to be disposed of in Los Angeles County Landfills over this period was not generated in Los Angeles County. For the year 1994, the Los Angeles County Department of Public Works reported that only 675 TPD, or 1.8 percent of the

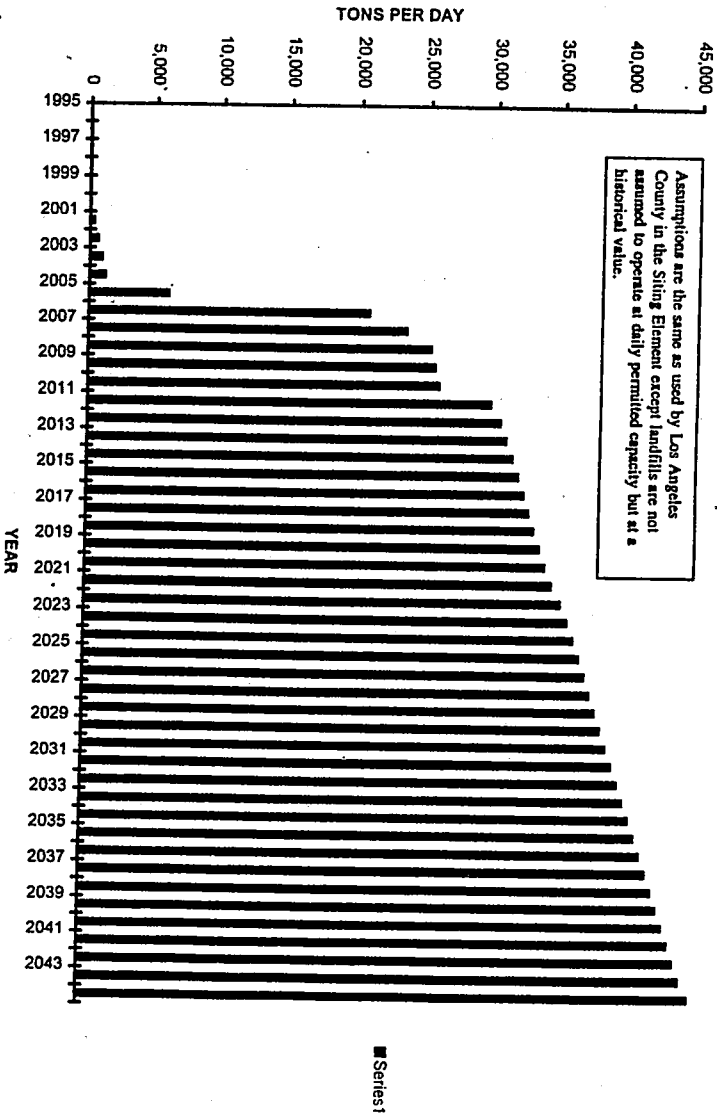


Figure V-1. Scenario 1 -- Using Historic Disposal Rates
Los Angeles County Disposal Need

disposed waste, is generated out-of-County.[13]

The first year that the County landfills experience a Daily Disposal Capacity Shortfall is 2001, when the Shortfall is projected to be 343 TPD. This is two years later than Shortfall is shown in the Siting Element. This difference is caused by the County approach of reducing the remaining capacity of each landfill by the Daily Permitted Capacity in its "time to crisis" calculation. The impact of this is mitigated slightly by the difference in the waste-to-energy facilities' capacity discussed above. The Shortfall in each year of the planning period is shown graphically in Figure V-1. As can be seen in the chart in Figure V-1, the Shortfall is small until 2006 -- when it is projected at 5,000 TPD. At the end of the AB 939 planning period, 2010, the Shortfall is 25,000 TPD.

D. OUT-OF-COUNTY ACCESSIBLE DISPOSAL FACILITIES (SCENARIO 2)

In addition to Class III landfills in Los Angeles County, landfill capacity accessible via rail or competitive truck transfer offers considerable potential in accommodating large amounts of County waste. Tables V-4 and V-5 list the out-of-County and out-of-State facilities that potentially could be utilized in a waste-by-rail system for Los Angeles County. These tables are adaptations of information developed by the City of Redlands[14] and the City of Los Angeles.[15]

Of the out-of-County facilities, Eagle Mountain, Rail Cycle/Bolo Station and Mesquite Regional Landfill projects all are planning for disposal capacities that exceed the proposed Elsmere Canyon Landfill. Western Waste, the operator of the El Sobrante Landfill, is proposing to expand the existing landfill and increase capacity from 4,000 to 10,000 TPD and a total capacity of 100 million tons. The final EIR for this is in preparation and it is expected that the

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[13]Draft table, "Remaining Permitted Combined Disposal Capacity of Existing Solid Waste Disposal Facilities in Los Angeles County as of January 1995," Los Angeles County Department of Public Works, March 1995.

[14]City of Redlands, *Solid Waste Landfill Disposal Options Available to the City of Redlands*, July 1995.

[15]City of Los Angeles, Bureau of Sanitation, Solid Resources Action Plan, November 1995.

Table V-4. Accessible Out-Of-County Landfills

Project Title	Rail-Cycle	Eagle Mountain Project	CA RailFill Systems	El Sobrante Landfill	Orange Co. Landfill
Facility	Bolo Station Landfill	Eagle Mountain Landfill	Mesquite Landfill	El Sobrante Landfill	Orange Co. Landfill
Operator	Waste Management	Mine Remediation Corporation	Western Waste	Western Waste	Orange County IWMD
Landfill Location	Amboy, San Bernardino County	Eagle Mountain, Riverside County	Glamis, Imperial County	Western Riverside County	Bowerman, Prima Deshecha, Olina Alpha, Santiago Canyon
Status	EIR and CUP in progress.	EIR released.	Final EIR and CUP approved.	Operational. EIR prepared for expansion.	Operational.
Tons per day capacity	21,000	20,000	20,000	4,000 Proposed expansion to 10,000.	5,000 - 6,000 may soon be available for import.
Years of capacity	70	100	100	10	47 with import
Online date	—	—	Mid 1997	On line	On line
Tipping fee at landfill	$26.00	$25.00	Unknown	$10.46 for cities who contract with WWI. Waste transport must be from transfer stations.	$19.00 for contracted quantities; $35 other
Approximate distance from Los Angles (miles)[4]	190	190	240	65	70 or less
Method of Transportation	Rail Haul	Rail Haul	Rail Haul	Long Truck Haul	Truck Haul

Notes: 1. Estimates do not include rail haul costs or intermodal facility costs.
2. Long truck haul costs will vary according to the selection of options and vendors.
3. Transfer costs could vary according to selection of options and vendors, ranging from approximately $10.00 - $16.00 per ton.
4. Distance measured from the intersection of I-10 and I-5, via road.

Source: City of Redlands, California, *Solid Waste Landfill Options Available to the City of Redlands*, July 1995, modified and updated by GBB.

Table V-5. Accessible Out-Of-State Landfills

Facility	Butterfield	East Carbon County	La Paz	Yuma
Operator	Waste Management	East Carbon Development Company	Browning-Ferris (owned by La Paz County; a public/private partnership with BFI)	Sanifill
Location	Phoenix, Arizona Area	Carbon County, Utah	Parker, Arizona Area	Yuma, Arizona
Status	Operational	Operational	Operational	Operational
Tons per day capacity	Unlimited	20,000	Unlimited	
Years of capacity	100	10 - 30	Variable	
Tipping fee at landfill	$16.00 (negotiable)	Proposed $48.00 - $55.00/ton for transfer, rail transport and disposal	$15.00 - $20.00	
Approximate distance from Los Angeles (miles)[1]	370	582	270	330
Method of Transportation	Rail Haul	Rail Haul	Rail Haul/Long Truck Haul	Rail Haul

Note: 1. Distance measured from the intersection of I-10 and I-5, via road.

Source: City of Redlands, California, *Solid Waste Landfill Disposal Options Available to the City of Redlands*, July 1995, modified and updated by GBB.

expansion permit will be granted to El Sobrante shortly. When that happens, sixty percent of the waste disposed of in El Sobrante must come from neighboring communities in Los Angeles, Orange, San Bernardino, and San Diego Counties. This expansion would allow for continued operations of the landfill from 1996 to 2026. Western Waste, the operator of El Sobrante, has submitted a proposal for 15 years of disposal services to the City of Los Angeles. Recently, Riverside County announced that it would be offering capacity at its El Sobrante landfill for $30.00 per ton. The Campo Solid Waste Management Project proposes a disposal rate of 3,000 TPD; rail haul would be required for this to be feasible.

Following its bankruptcy, Orange County began to explore the option of importing waste into the County landfills as a means of generating revenue. The Board of Supervisors approved this approach in November 1995 with the goal of importing 5,000 TPD by January 1, 1996. Contracts have been concluded with Waste Management and Taormina Industries for 2,000 TPD starting January 1, 1996. This waste is expected to be generated in Los Angeles County because Riverside, San Bernardino, and Imperial Counties all have landfills actively competing for waste.

As an example of the possible use of out-of-county facilities, effective November 1, 1995, San Bernardino County entered into a 15-year contract with Norcal Waste Systems, Inc. to provide a broad range of services relating to the administration, engineering and operation and maintenance of the County's network of landfills. San Bernardino County currently has 17 different landfills serving the 27 incorporated municipalities in the County in addition to the unincorporated area. The County receives approximately 1.3 million tons per year of solid waste for disposal.

As a result of various policy changes, the Los Angeles County landfills are in jeopardy of losing tonnage. As in other California counties, cities have the ability to contract with service providers for both collection and disposal services and sometimes do so for a combined service and do not designate where waste should be taken for disposal. Waste from several cities in Los Angeles County already have their waste disposed of outside of the county. It is possible that additional cities may follow suit.

If this situation were to occur and the County/Norcal had additional capacity that they could offer to other waste suppliers, e.g., cities in Los Angeles County or area haulers, San Bernardino County could be in a similar situation as Orange and Riverside Counties and market that capacity either directly or through their contractor. According to Gerry Newcombe, Deputy Director, San Bernardino County Solid Waste Management Department, the County's contract with Norcal allows for spot tonnage to be brought into the County system by either party.[10]

Of the out-of-State facilities, East Carbon, Roosevelt and Butterfield Station Landfills would accommodate daily disposal capacities that equal or exceed the proposed Elsmere Canyon Landfill. Franconia has a permitted capacity of 10 million tons and no daily disposal limits. The La Paz County Landfill has a capacity of 5 million tons. In addition, the CIWMB reports that both the Franconia and La Paz County landfills have the potential for expansion.

Waste from the County has been exported in the past and exportation has been expanded, beginning in January 1996. In the past, the County has assumed that the exports are approximately equal to imports. However, as mentioned above, Orange County has contracts with private waste haulers servicing Los Angeles County to provide disposal at their (i.e., Orange County) landfills for 4,000 TPD, beginning January 1, 1996. These contracts, and others that are planned, will result in significant net exports of waste from Los Angeles County. These exports, and others that could result from Orange County's decision to import waste, are not considered in the Siting Element.

Waste export depends on transfer stations to be efficient. Presently there are 19 transfer stations in Los Angeles County with a combined capacity of over 50 percent of the waste disposed in the County. These transfer stations depend on large trucks with a maximum payload of 22 tons. Table V-6 lists eleven transfer station facilities which are in the planning stages. These facilities all plan to provide access to rail transportation, some of these facilities are operating but not as solid waste rail transfer stations. Several of these are well along in the planning process and could be operational in 1997. The advantages of rail transportation are

[10]Personal conversation: G. Newcombe and H. Gershman, GBB, November 30, 1995.

lower operation costs, reduced truck traffic and lower environmental impact. A number of the projects include materials recovery processing in the planning of the rail transfer stations. One of these is the Puente Hills facility. The County Sanitation Districts have completed the final EIR[11] for a 4,000 TPD Materials Recovery Facility (MRF) located at Puente Hills with waste rail loading capability. The MRF is planned to divert 15 percent of the waste processed, resulting in 3,400 TPD requiring disposal. With rail facilities planned, it is logical that this waste would be rail hauled to one of the remote landfills discussed above.

While the Siting Element discusses rail haul, it does not take into account in computing disposal need. These exports have been, however, accounted for in this waste strategy. The exports, on a net basis, are at a rate of 2,000 TPD in 1996, and 3,500 TPD starting in 1997, which accounts for the Orange County contracts. Exports are raised to 6,000 TPD in 2001 to account for Puente Hills and other transfer station/MRF facilities on a conservative basis and continue through 2043.

The result is that the first year that Daily Disposal Shortfall occurs is 2007, extending the "time to crisis" by six years. The Shortfall in 2007 is 7,000 TPD and jumps to 16,000 TPD in 2008. This is shown on the chart in Figure V-2. At the end of the AB 939 planning period, 2010, the Shortfall is 20,000 TPD. This is 5,000 TPD less than Scenario 1, where export was not accounted for.

E. INERT MATERIALS AND BIOSOLIDS (SCENARIO 3)

Discussion of landfills in Los Angeles County usually focus on Class III sanitary landfills for non-hazardous materials. However, unclassified or inert landfills need to be included in solid waste management planning as well. Inert landfills can accept essentially non-decomposable materials, such as dirt and concrete. There are seven inert landfills in the County: Azusa, Calmat, Chandlers, NuWay, Peck Road, Reliance Pit #2, and Strathern, which were not

[11] *Puente Hills Waste Management Facility Environmental Impact Report*, County Sanitation Districts of Los Angeles County, May 1995.

Table V-6. Planned Rail Transfer Station Projects

Facility	Location	Capacity TPD	Landfill	Status
Central Los Angeles Solid Waste Station	City of Los Angeles	—	BFI - LaPaz, AZ	Existing transfer station would be expanded
East Los Angeles Intermodal Facility	City of Commerce	4,200	Unknown	Existing Rail Facility No Solid Waste Permit
Hobart Intermodal Facility	City of Vernon	—	Unknown	Existing Rail Facility No Solid Waste Permit
Industry Intermodal Facility	City of Industry	—	Unknown	Existing Rail Facility No Solid Waste Permit
Industry Solid Waste Station	City of Industry	5,700	Unknown	Draft EIR mid-May; Operate 1998
Pamona Materials Recovery Facility	City of Pamona	6,000	Unknown	Draft EIR in preparation
Puente Hills Materials Recovery Facility	near City of Whittier	4,000	Unknown	Final EIR released
Rail-Cycle LP Solid Waste Station	City of Commerce	4,200	Bolo Station Butterfield Station	Have permits; site work in progress
Southern Pacific Intermodal Facility	City of Long Beach	—	Unknown	Existing Rail Facility No Solid Waste Permit Operational 1998
Vernon Materials Recovery & Transfer Facility	City of Vernon	—	Unknown	Previous CUP expired
Western Waste Industries Transfer Station	City of Carson	—	Mesquite	Permits expected 1996 Operation 1997

considered in the Elsmere Canyon DEIR/DEIS and fully addressed for planning purposes in the Siting Element. These have a total permitted capacity of over 80 million tons.

In 1990, the Board of Equalization (BOE) shows 768,422 tons of inert materials delivered to County Class III landfills, which comprises 7.4 percent of the waste stream disposed of in these facilities.[12] Much of this material is recyclable, as discussed in Appendix B. However, assuming that it must be landfilled along with the current material accepted at these landfills, the permitted inert landfill capacity will accommodate the projected amount of inert material for the next 40 years with no additional recycling.

This waste management strategy assumes that inert material is prohibited from disposal in Class III landfills in the County. Also, it assumes that inert materials are banned from Class III landfills starting in 1996 and that these landfill bans will be enforced. However, even when bans are enforced, some amount of material slips by. Thus, for this Scenario, it is assumed that the effectiveness of the ban is 70 percent.

Additionally, approximately 500 TPD of biosolids (sewage sludge) are being landfilled currently by the Sanitation Districts. While this is not a lot of material and only totals some 156,000 tons per year, there are viable alternatives to this practice as discussed in Appendix B. In Chapter IX, it is recommended that biosolids be banned from disposal in County landfills. This material is totally under the control of the County and the Sanitation Districts and, therefore, the ban should be 100 percent effective. A landfill ban on biosolids does not impact the year in which Shortfall occurs, but it does make a positive impact.

These bans result in a net reduction of six percent in landfill disposal need. The implementation of this solid waste option extends the first year that Daily Disposal Shortfall occurs by two years, to 2009, as shown in Figure V-3. This Shortfall is 4,000 TPD in 2009, at the end of the AB 939 planning period, 2010, it increases to 13,000 TPD.

[12]CIWMB-Interim Database Project - County of Los Angeles, August 4, 1993.

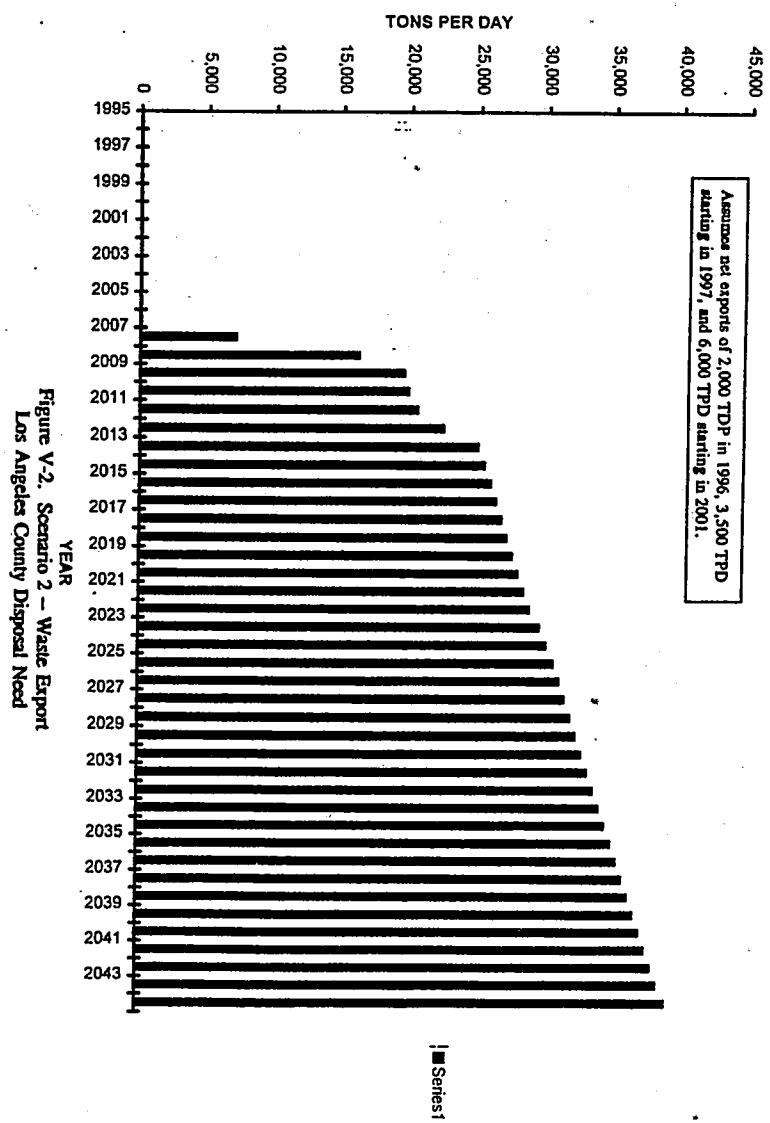


Figure V-2. Scenario 2 – Waste Export
Los Angeles County Disposal Need

F. CITY DIVERSION OF 70 PERCENT (SCENARIO 4)

The City of Los Angeles has adopted the goal of 70 percent diversion to be achieved in 2020. The planning in the Siting Element does not take the impact of achieving this goal into account in the calculation of landfill disposal need. In fact, the goal is not even acknowledged. The City generates 39 percent of the total waste generated in the County; diversion of 70 percent of this waste and diversion of 50 percent of the remaining waste generated in the County will result in an average of 59 percent diversion County-wide. Additionally, it is the position of this report that the County should be more proactive in the diversion of waste from landfills. One step the County could take is to adopt the 70 percent goal for the unincorporated areas to demonstrate the County's commitment to a diversion-based policy.

This strategy shows the results of the landfill disposal need calculation when the City and the County unincorporated area meet the 70 percent diversion goal. The waste for which the County is responsible has been included because the County has control of solid waste management policy and implementation of those policies. In Chapter 9, which outlines the recommendations for County policy, it recommended that the County adopt the 70 percent goal. Scenario 4 assumes that the City of Los Angeles and the County unincorporated areas achieve 70 percent diversion in 2020. The unincorporated area generates approximately nine percent of the total waste in the County. This added to the City's 39 percent results in 47 percent of the waste generated in the County subject to the 70 percent goal. The result is a total of 59 percent diversion in 2020.

This option does not have any impact until after the year 2000. Starting in 2001, the impact is to increase the diversion of the entire County by half a percent per year until 2020. The result is to extend the first occurrence of Daily Disposal Shortfall by one year compared to Scenario 3, to 2010. This can be seen in Figure V-4. The amount of the Shortfall is 5,700 TPD in 2010, compared to 11,700 TPD in 2011. Further reductions occur in subsequent years, as can be seen by comparing Figure V-3 and V-4.

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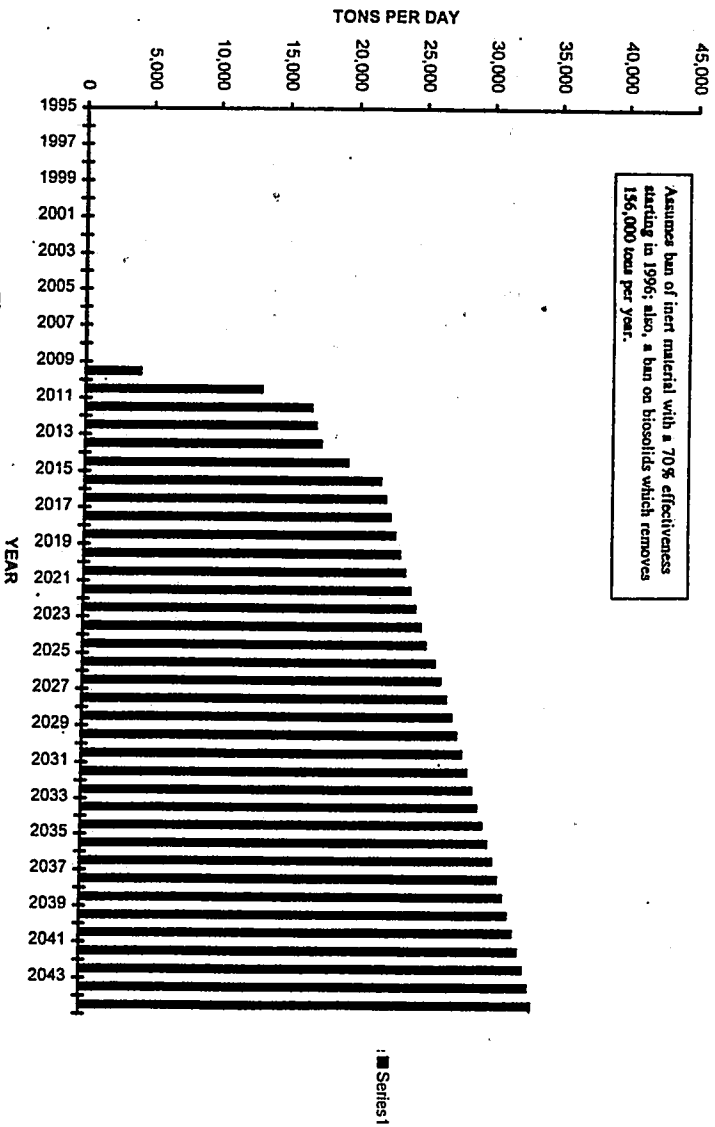


Figure V-3. Scenario 3 – Inert Material and Sewage Sludge Bans
Los Angeles County Disposal Need

V-22

The combination of the first four solid waste management strategies:

- Projecting landfill use based upon waste available and historic usage rather than permitted daily capacity;
- Export addition;
- Insert material and sewage sludge bans; and
- Diversion goal of 70 percent for the City and the unincorporated area.

result in essentially postponing the occurrence of Daily Disposal Shortfall beyond the AB 939 fifteen year planning period.

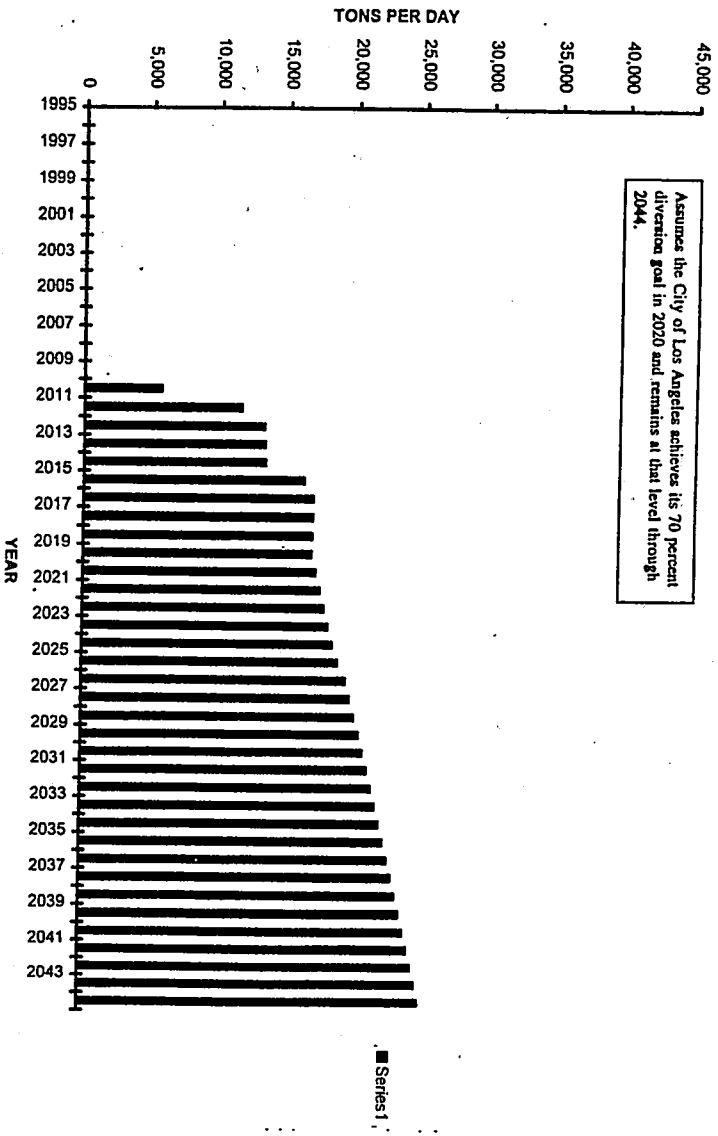


Figure V-4. Scenario 4 – Diversion Goal of 70 Percent Los Angeles County Disposal Need

VI. STRATEGIES FOR CONSERVING LANDFILL CAPACITY

Considerable experience has been gained in recent years by public and private landfill operators in utilization of technologies and management techniques for conserving landfill space. A detailed discussion of landfill conservation approaches, and examples of their applications, are provided in Appendix C. For the purposes of estimating the amount of current landfill capacity in Los Angeles County that could be saved for future use by the application of landfill conservation techniques, two have been selected: (1) chemical or foam cover and (2) biostabilization. The application of these two techniques as applied to the landfills in Los Angeles County is discussed below.

A. CHEMICAL OR FOAM COVER (SCENARIO 5)

Chemical or foam compounds have been specifically developed to be used as intermediate daily cover on landfills and are available from nationally-reputable manufacturers. Their use is widespread and performance documented at numerous operating landfills. This experience shows that foam conserves between 20 and 33 percent of landfill capacity when used in place of daily cover soil, by allowing the replacement of the dirt by solid waste.

To project a "time-to-crisis" estimate for Los Angeles County based on the use of foam cover beginning in 1997, the total remaining capacity for each landfill was multiplied by 1.22 in the year it is converted to foam. The space saved by not using dirt accounts for the 22 percent capacity increase provided by foam cover.

Figure VI-1 is the County's "time-to-crisis" table, as modified in Chapters IV and V of this document, and showing phased-in use of synthetic foam cover at County landfills. The use of foam cover begins in 1997 with all landfills in the County using foam cover in place of dirt or other materials that consume landfill capacity.

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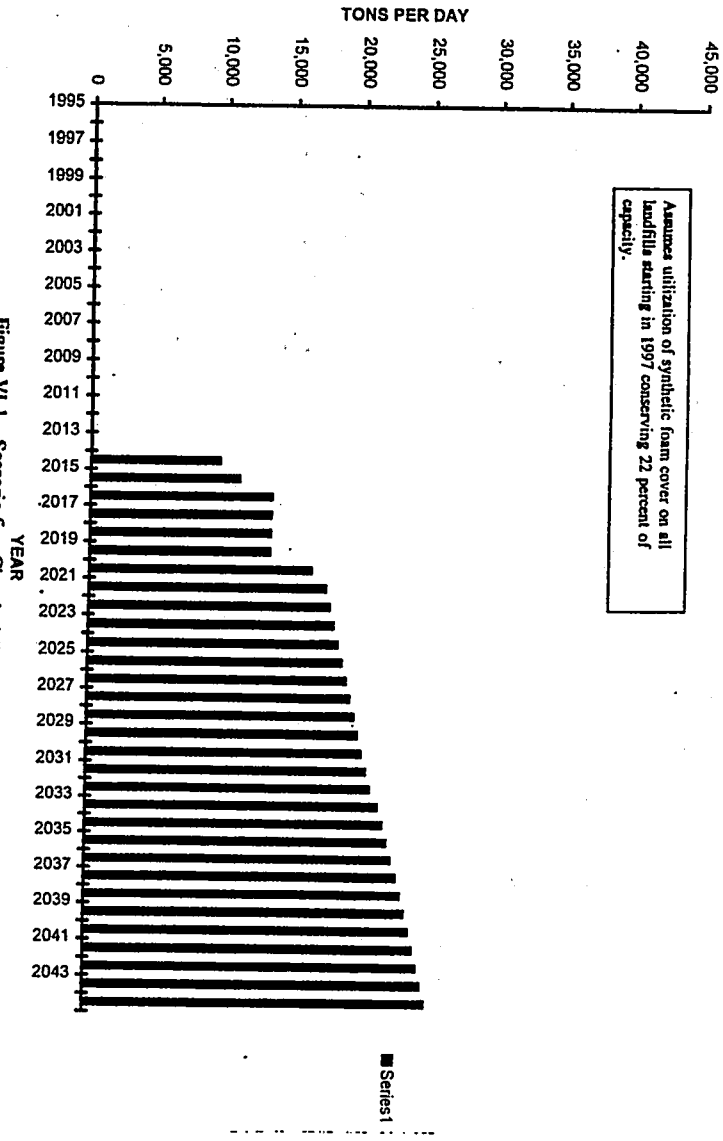


Figure VI-1. Scenario 5 – Chemical Foam Landfill Cover
Los Angeles County Disposal Need

The implementation of this technology extends the time until Daily Disposal Shortfall by four years, to 2014. In addition to moving the occurrence of Shortfall to 2014, foam cover significantly decreases the amount of the Shortfall in all subsequent years of the 50 year planning period. This can be seen on the chart in Figure VI-1.

B. BIOSTABILIZATION (SCENARIO 5A)

Current landfill management is based on a "high and dry" approach. Under this technique, both rain water and ground water are kept out of the landfill. Any water that does penetrate is collected and removed as "leachate. Leachate is treated in a waste water treatment plant and discharged. Opening and sorting old landfills has shown that very little breakdown of the organic materials takes place.[19] In many cases, old newspapers are still readable after 25 years.

Biostabilization incorporating shredding and leachate recirculation is a developing technology with excellent promise. This promotes the breakdown of the organic materials in the landfills, increases gas generation, and results in volume reduction. This allows additional waste to be deposited. Operating experience in Albany, New York indicates increases in landfill space utilization between 50 and 100 percent. At the higher levels, this could be thought of as "recycling" landfills. As mentioned previously, a discussion of operating techniques that allow additional waste to be disposed per unit of landfill volume are discussed in Appendix B.

Figure VI-2 shows the results achieved by application of this technology in the County landfills at the 50 percent level in conjunction with foam cover. Because the technology is developing and will take some time to implement, implementation is shown starting in 2000.

Figure VI-2 was developed using the same methodology as discussed in Section A except for each landfill, the amount of capacity consumed between years 2000 and 2043 is multiplied by 50 percent to estimate the capacity conserved due to biostabilization. This value is then

[19]Rathje, William. "Rubbish," *The Atlantic Monthly*, December 1989, pp. 99-109.

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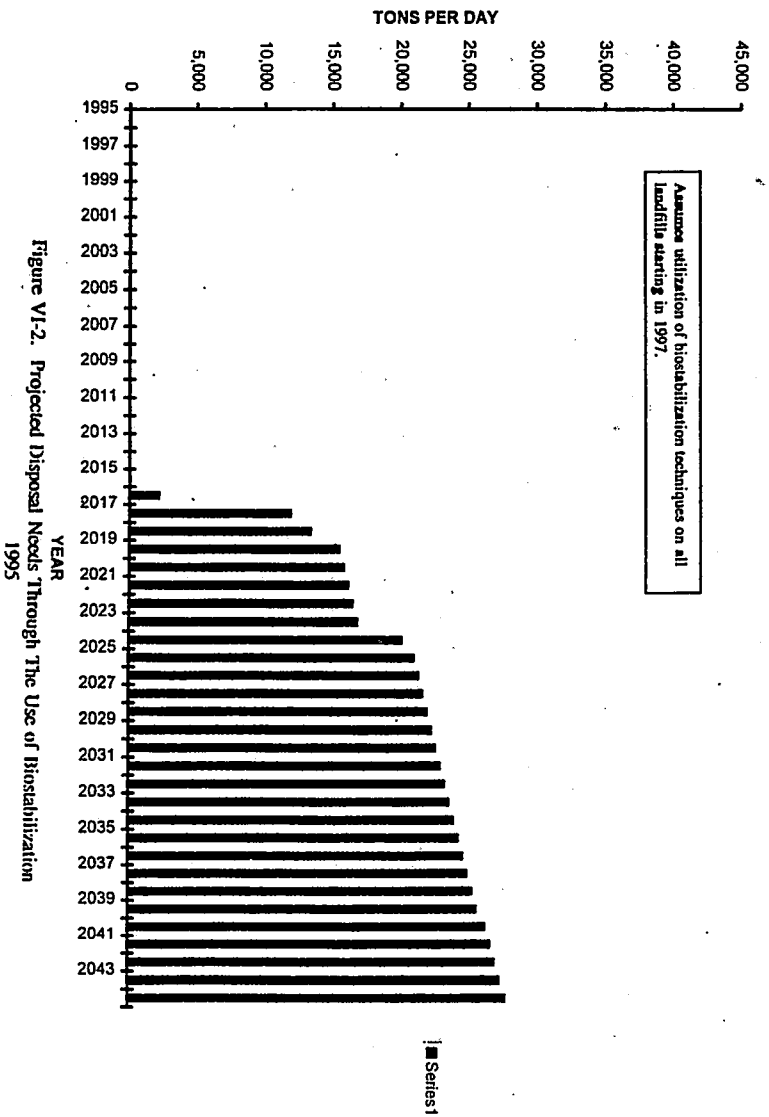


Figure VI-2. Projected Disposal Needs Through The Use of Biostabilization 1995

VII. DIVERSION OPPORTUNITIES

This Chapter focuses on the opportunities to increase diversion of solid waste from landfill disposal in Los Angeles County. The discussion provided below is a summary and evaluation of a more detailed analysis provided in Appendix B. Diversion Alternatives, supplemented by Appendix G. International Technology Applications. Appendix B looks at each of the available diversion alternatives presently in use by other communities in the U.S., assesses their appropriateness for implementation in Los Angeles County, and, where applicable, estimates the percentage of the County waste stream that could be addressed by each diversion alternative. The provision of information on alternative approaches applied in other countries in Appendix D further demonstrates that recovery of materials from the waste stream and avoidance of land disposal are not pioneering approaches to waste management, and are not unique to the U.S.

There is a correlation between a public policy that is committed to diversion and recycling and the achievement of diversion. The public policy is manifest in public documentation: statutes, regulations, planning reports and public information pieces (brochures, newsletters, press releases, instructional booklets, etc.). One familiar feature of a policy commitment to diversion is the diversion goal. Forty-one states have recycling goals and thirteen have goals of 50 percent or higher, including the state of California. The commitment is stronger and more effective when the goals are mandatory.

Many of the successful programs in the larger cities and counties have adopted and are actively working toward goals higher than state goals and on an accelerated schedule. These programs include: Seattle, WA with a goal of 60 percent and 1995 diversion of 53 percent for residential waste; King County, WA with a goal of 65 percent and a 1995 diversion of 49 percent; Ocean County, NJ with a goal of 60 percent and county-wide 1995 diversion of 59 percent where 11 of the 33 municipalities reported 50 percent or higher; and Minneapolis, MN that achieved the state goal of 50 percent in 1995.

The City of Los Angeles has adopted the goal of 70 percent recycling by the year 2020. San Jose achieved 43 percent diversion in 1995. This achievement shows what can be accomplished in only five years with a public policy decision followed up with a plan and implementation. However, in the "time to crisis" calculation the County has not accounted for the impact of the City's high diversion goal and its impact on the disposal needs.

The purpose of the exercise undertaken in Appendix B was not to identify a few selected technologies that could be calculated to bring Los Angeles County into compliance with the 50 percent diversion requirement by the year 2000. Instead, each technology or market was evaluated independently for its potential to address a specific portion of the County's waste stream. This allows comparison of what percentage could be diverted by each approach, assuming a reasonable capture rate for the type of material(s) addressed. The analysis was conducted by type of material, so as to avoid "double-counting." Diversion calculations for the materials were added to the computer model developed to calculate the landfill requirement as discussed earlier. The details of how these calculations are applied to the County Waste Stream are discussed in Appendix H.

This analysis shows that no single technical approach will meet diversion goals. However, by applying the full range of available technologies, summing together the fractions of the waste stream that could be diverted by each of the technologies deemed appropriate to Los Angeles County, the analysis shows that 74.5 percent of the waste stream could be diverted by recycling/reuse technologies by the year 2020. This is well beyond the legislatively-mandated 50 percent.

Also evaluated in this Chapter is the diversion potential of transformation (waste-to-energy) facilities. Transformation can be counted as 10 percent of the 50 percent diversion goal (i.e., a minimum of 40 percent must be diverted from disposal by other means) under California law. Review of the two existing waste-to-energy facilities and the potential of new facilities to reduce landfill capacity needs in Los Angeles County is discussed under Section VII.C below.

A. DIVERSION PROGRAMS

An analysis of current recycling programs and a diversion model to project future recycling rates was developed for this Chapter. Current program information is based on County-provided data, and diversion rates for individual materials, facilities, and programs are based on the discussion provided in Appendix B. In the discussion below, the year 1995 represents Level 1, Current Programs; year 2000 represents Level 2: Intensified Current Approaches; and year 2020 represents Level 3: Maximum Diversion.

1. Level 1: Current Programs

The current status of diversion programs can be summarized by saying that the County and the Cities have done the easy part. While not universal, residential diversion systems in the County include curbside collection, yard waste collection, and medium-level public information efforts directed to residents. Commercial and waste generators have developed, for the most part, only voluntary and economically-driven diversion programs. The County and most of the Cities have some public information programs directed toward the commercial and industrial sectors; however, these are not comprehensive efforts to maximize diversion. In summary, current programs are:

Residential
- Curbside Recycling Collection
- Yard Waste Collection
- Medium-level Public Information Campaign

Commercial/Industrial
- Voluntary Programs
- Economically-driven Programs
- Some Public Information Programs

In the DEIR/DEIS and the Siting Element, The County assumes that these programs will achieve 25 percent diversion in 1995. However, the Los Angeles County diversion analysis model, developed for this document and discussed in Appendix H, indicates a 20.33 percent

diversion rate in 1995. This rate reflects continued implementation of the above-mentioned programs. The fact that these programs have not been fully implemented, with uniform policy and administrative backup by the County and all 88 cities, is reflected in the recovery rates for the materials targeted in the programs. Recovery rates for individual recyclable materials are provided in Appendix H.

Table VII-1 shows the estimated overall diversion rate and the residential, commercial and industrial sector components from which this rate is derived on the first line of the Table (1995). Table VII-1 also shows that simply maintaining current programs will not achieve the 50 percent diversion goal required by AB 939 by 2000.

In order to attain 50 percent diversion in 2000, a new approach is required. As discussed in this document, the new approach is a County-wide policy shift to a diversion-oriented solid waste management strategy. Recommendations to the County for implementing this policy shift are presented in Chapter IX. These recommendations result in diversion programs that are executed by the public and private sectors in the County as well as by the County and the 88 cities.

2. Level 2: Intensify Current Approaches

The first step toward increasing diversion is to intensify the present approach to residential waste diversion, and increasing efforts in the commercial/industrial sectors. The commercial/industrial waste stream represents nearly half of the County waste stream. Increasing efforts in this area are essential to achieving the diversion goal. Level 2 efforts would include:

Residential
- Intensive Curbside Recycling Collection
- Yard Waste Collection
- Comprehensive Recycling Drop-off Facilities
- High-level Public Information Campaign covering source reduction, reuse, and recycling
- Mandatory Recycling Programs

Table VII-1. Projected Diversion By Sector for Intensive Programs

(TPD–6)

Year	Total Waste Generation Rate	Residential Waste Generation Rate	Commercial Waste Generation Rate	Industrial Waste Generation Rate	Residential		Commercial		Industrial		Total	
					Waste Recovery Rate	Percent Recovery Rate	Waste Recovery Rate	Percent Recovery Rate	Waste Recovery Rate	Percent Recovery Rate	Waste Recovery Rate	Percent Recovery Rate
1995	49,677	21,461	22,355	5,812	5,138	23.94	3,575	15.99	1,385	23.83	10,097	20.33
1996	50,258	21,712	22,616	5,880	6,398	29.47	4,926	21.78	1,731	29.44	13,054	25.97
1997	50,762	21,929	22,843	5,939	7,673	34.99	6,297	27.57	2,082	35.05	16,052	31.62
1998	51,290	22,157	23,081	6,001	8,978	40.52	7,699	33.36	2,440	40.66	19,117	37.27
1999	51,793	22,375	23,307	6,060	10,302	46.04	9,124	39.15	2,804	46.27	22,230	42.92
2000	52,303	22,595	23,536	6,119	11,652	51.57	10,576	44.94	3,175	51.88	25,403	48.57
2001	52,756	22,790	23,740	6,172	12,080	53.00	10,939	46.08	3,288	53.27	26,307	49.87
2002	53,212	22,988	23,945	6,226	12,514	54.44	11,308	47.22	3,403	54.66	27,225	51.16
2003	53,652	23,178	24,144	6,277	12,950	55.87	11,678	48.37	3,518	56.04	28,146	52.46
2004	54,079	23,362	24,336	6,327	13,388	57.31	12,049	49.51	3,634	57.43	29,071	53.76
2005	54,494	23,542	24,523	6,376	13,829	58.74	12,422	50.66	3,750	58.82	30,001	55.05
2006	54,902	23,718	24,706	6,424	14,272	60.18	12,798	51.80	3,867	60.21	30,938	56.35
2007	55,308	23,893	24,889	6,471	14,720	61.61	13,178	52.95	3,986	61.59	31,884	57.65
2008	55,716	24,070	25,072	6,519	15,174	63.04	13,562	54.09	4,106	62.98	32,842	58.94
2009	56,129	24,248	25,258	6,567	15,635	64.48	13,952	55.24	4,227	64.37	33,813	60.24
2010	56,548	24,429	25,447	6,616	16,102	65.91	14,347	56.38	4,351	65.76	34,799	61.54
2011	56,975	24,613	25,639	6,666	16,576	67.35	14,748	57.52	4,476	67.15	35,801	62.84
2012	57,412	24,802	25,836	6,717	17,059	68.78	15,157	58.67	4,604	68.53	36,820	64.13
2013	57,863	24,997	26,038	6,770	17,552	70.22	15,574	59.81	4,734	69.92	37,860	65.43
2014	58,330	25,199	26,249	6,825	18,055	71.65	16,001	60.96	4,867	71.31	38,922	66.73
2015	58,802	25,403	26,461	6,880	18,565	73.08	16,433	62.10	5,001	72.70	40,000	68.02
2016	59,289	25,613	26,680	6,937	19,086	74.52	16,874	63.25	5,139	74.08	41,100	69.32
2017	59,785	25,827	26,903	6,995	19,616	75.95	17,323	64.39	5,279	75.47	42,219	70.62
2018	60,288	26,045	27,130	7,054	20,155	77.39	17,780	65.54	5,421	76.86	43,356	71.91
2019	60,799	26,265	27,360	7,114	20,702	78.82	18,244	66.68	5,566	78.25	44,512	73.21
2020	61,316	26,488	27,592	7,174	21,258	80.26	18,714	67.83	5,713	79.64	45,686	74.51

Commercial/Industrial
Mandatory Recycling Programs
Food Waste Composting Facilities
Comprehensive Recycling Drop-off Facilities
Public Information, Training and Assistance

In the residential waste generation sector, three new programs are recommended to meet the goal: (1) expanded curbside recyclables collection, (2) a system of comprehensive drop-off recycling centers, and (3) a more comprehensive public information program covering source reduction, reuse, and recycling. These programs are discussed in Appendix B. For the commercial and industrial waste generation sectors, four new programs are recommended: (1) mandatory recycling and diversion, (2) food waste composting, (3) a system of comprehensive recycling drop-off centers, and (4) a public information, training and assistance program targeted to these generators. This latter program should include waste audits, waste reduction, utilization of waste materials as industrial feedstocks, and recycling. The separate handling of food waste in the composting program will substantially lower the contamination of corrugated and other paper in the commercial waste stream.

The projected results of the policy shift and implementation of the Level 2 recommended programs is shown as the year 2000 line on Table VII-1. This Table indicates that implementation starts in 1996, expands through 1999, and is completed in the year 2000. The diversion analysis model projects an overall diversion rate of 48.57 percent for this scenario in 2000. While this projected rate essentially achieves the AB 939 goal of 50 percent diversion, it does not represent the full potential of a diversion-oriented solid waste management policy.

3. Level 3: Maximum Diversion

Full implementation of the diversion-oriented waste management policy requires additional programs to be developed and executed by the County and the 88 cities. Level 3 efforts include:

Residential
Intensive Curbside Recycling Collection

Yard Waste Collection
Comprehensive Recyclables Drop-off Facilities
High-level Public Information Campaign
HHW Curbside Collection
Mixed Waste Composting
Weight or Volume-Based Fees

Commercial/Industrial
Mandatory Recycling Programs
Food Waste Composting
Comprehensive Recyclables Drop-off Facilities
High-level Public Information, Training, Assistance and Enforcement
Commercial/Industrial Materials Recovery Facilities (MRFs)
Special Waste Management

Under the maximum implementation approach, three additional programs are recommended for the residential sector: (1) curbside collection of household hazardous waste (HHW), (2) mixed waste composting, and (3) variable rates. The first two programs are linked. A key problem encountered in implementing mixed waste composting facilities in the U.S. has been the quality of the end product as discussed in Appendix B. A County-wide program of HHW collection at the curb has the potential to significantly reduce toxic contaminants prior to composting, resulting in a high-quality compost product. As discussed in Appendix I, Cost Issues, variable rate programs have been shown to increase diversion rates and decrease the amount of waste generated in the residential sector. A more intensive public information program will be necessary to make these programs work. Table VII-1 shows the projected results of implementing these additional programs. These programs would be implemented incrementally, culminating in 2020. The residential sector diversion increases to 80.3 percent.

In the commercial and industrial waste generation sectors, jurisdictions would begin enforcement of the mandatory commercial/industrial recycling program requirements, and two new programs are recommended: (1) special waste management, and (2) commercial/industrial mixed waste processing. The latter program would require that all permitted solid waste transfer and disposal facilities have processing capability to divert recyclable materials from all commercial/industrial waste received. In other words, every waste management site would have a commercial/industrial materials recovery facility (MRF) equipped to recover recyclables from the mixed commercial/industrial waste stream. The special waste management program

complements the MRF program by removing from the mixed waste many of the substances that can contaminate recyclable materials. The level of public information, training and assistance would need to be increased to implement these programs. Implementation of these additional programs, with their new facilities, will take some time. Therefore, Level 3 is projected to be fully implemented in 2020. Table VII-1 shows the projected diversion rate for the commercial sector would be 44.9 percent in 2000, and at full implementation in 2020, 67.8 percent. In 2000, the diversion rate is 51.9 percent for the industrial sector, increasing to 79.6 percent in 2020.

B. MARKET TRENDS

1. Introduction

The success of any recycling program depends on the security of the markets for recyclable products. A material can be recycled only if a market and/or an end use exist. This Section presents a general overview of the various types of markets for potentially recyclable materials, the types of recyclables in the waste stream, and the uses of recyclables as commodities. In addition, this Section addresses some of the trends that have influenced markets in the past and making some projections for the future. A more detailed discussion of the markets for individual materials can be found in Appendix J.

2. Recyclables as Commodities

For recycling to work, adequate markets must exist for all of the materials. Many communities have experienced setbacks in their recycling programs due to faltering of one or more markets. In these cases, separated materials may be stored, but most ultimately are landfilled. Successful recycling is therefore dictated by markets.

Recyclable materials separated from the waste stream become commodities, similar to the virgin materials used to make nearly every manufactured item. For example, aluminum beverage cans -- either flattened, baled, or shredded -- become a metal commodity similar to

aluminum produced from bauxite (ore). The recycled aluminum cans are essentially pure aluminum and can be used to manufacture all of the products manufactured using ore-derived aluminum.

The same type of relationship described above for aluminum generally exists between virgin materials sources and recyclable materials sources for the other recyclables, such as ferrous metals, paper, glass, and plastics. However, the relationship is not identical in all cases. For example, the equipment and processing requirements for making paper from virgin material (wood pulp) are different from those used for making paper from recycled paper. Consequently, a paper mill may have the processing equipment to handle only virgin material (i.e., wood pulp) and cannot use recycled paper as feedstock. For this type of mill, recycled paper is not interchangeable with virgin wood pulp. However, as noted earlier, a large number of paper mills in the United States have made or are making an investment in the capability to use either recycled or virgin feedstock. Thus, the total market for recycled paper exhibits the characteristics of a commodity market.

Commodities markets function worldwide and suppliers are indifferent about the destination of their commodities. The objective is to achieve the highest price (net of transportation costs). A corollary objective is that the market will be a repeat customer since the supplier needs continuing markets for commodities. Dropping one customer to supply another -- whether a domestic or foreign entity -- for a higher price, will not pay off in the long run if the new customer does not offer repeat business. The first supplier will be displaced by another supplier for the market that was dropped, and the first supplier may have difficulty reacquiring the original customer.

Many factors affect commodities markets, and thus the prices paid for recyclable materials. Domestic production and production capacity, imports, consumption, energy and transportation costs, changing technology, new product opportunities, and availability of substitute material are among the factors that affect markets for recyclable materials. International markets are affected by the same forces as well as by foreign trade tariffs, currency

exchange rates, trade policy and programs, and other political forces. All of these elements are expressed in the language of economists as the law of supply and demand.

Export markets for recyclable materials are large and active for the United States. Paper is a prime example. Greatly expanded recycling programs on the East Coast have generated more paper than regional mills can absorb. At the same time, the growing economies of the Pacific Rim countries demand fiber that cannot be produced locally, forcing importation of recovered paper from the United States and Europe. Paper is now the number one export (in annual tons) for the Port of New York. U.S. exports (all grades) of wastepaper for the period in 1994 was 7.7 million tons. This represents a 31 percent increase over 1993 and two years of declining exports.

The greater number of factors involved in export markets serve to increase the volatility of prices paid for recycled materials. It is important to understand that domestic marketers of recyclable materials must compete with export markets for the same materials. Domestic markets would rather not compete with export markets nor pay the higher prices bid by foreign competitors.

The factors that can increase prices can also drive them down, although the principles of economics will limit the lower end. Suppliers will no longer be willing to sell materials below a certain price. Once the price drops below the full cost of producing virgin material, recyclable material will begin to displace the raw material (where interchangeable). Furthermore, once domestic production requirements (demand) for recyclable materials are satisfied, suppliers will look for export markets. Many overseas markets have no domestic virgin material supplies to compete for the available demand.

All of the market forces discussed above combine to affect the value of recyclable materials. Prices offered for recyclables have shifted significantly in recent times -- some increasing, some decreasing. An important point to realize in secondary material markets is that future prices will be more or less than any current price. Accordingly, recycling programs should be designed to lessen dependency on day-to-day materials prices.

C. TRANSFORMATION FACILITIES

This Section focuses on existing transformation (waste-to-energy or WTE) facilities and opportunities for optimum operation. This Section provides recommendations regarding existing WTE capacity to the County of Los Angeles, and the rationale behind the recommendations.

A discussion of additional WTE capacity is also provided because waste combustion for energy (steam and/or electricity) generation presents a very real option for diverting non-recoverable waste from landfill disposal. However, given the potential for public opposition as well as difficulty in obtaining permits for additional emissions in the Southern California airshed, new WTE facilities located in the County or the expansion of capacity at existing facilities are not considered in calculating diversion from the waste stream for the purposes of this report.

1. Current Transformation Facility Capacity

Los Angeles County presently has two operating waste-to-energy facilities. Both facilities are of the mass-burn type, where the MSW is not processed into a fuel prior to combustion. These facilities are described below:

a. City of Commerce

This facility is owned by the Commerce Refuse to Energy Authority and operated by the L.A. Sanitation Districts. The Commerce facility began operations in 1986. Its design capacity is 380 tons per day (TPD), and it generates electricity. Air emissions control equipment includes a spray dry absorber to reduce acid gas emissions, a fabric filter to capture particulates and heavy metals, nitrogen oxide (NOx) controls, and continuous emissions monitoring. In addition, lime injection into the combustion unit is used to further reduce acid gases. The Commerce facility recovers 1,600 tons per year of ferrous metals from the facility ash. The present tipping fee at the City of Commerce facility is $30.00 per ton. The overall reported recycling rate for the City of Commerce in 1994 was 23 percent.

b. City of Long Beach

The Southeast Resource Recovery Facility (SERRF) is owned by a joint powers authority (L.A. Sanitation Districts and the City of Long Beach), and is operated by Montenay Corporation. Operations began in 1988. The Long Beach facility's design capacity is 1,380 TPD and the facility generates electricity. Air emissions control equipment includes a spray dry absorber as well as a dry scrubber for acid gas control, NOx control, a fabric filter to capture particulate and heavy metals, and continuous emissions monitoring. Long Beach recovers 13,000 tons per year of ferrous metals from the facility ash. The 1995 tipping fee at the Long Beach facility is $27.50 per ton. The facility operator notes that 800 tons per week accepted from a transfer station contains a lot of dirt, lowering the heat value of the waste, and thus reducing the energy output of the facility.

Together, these two facilities have a rated capacity of 1,760 TPD on a seven-day per week basis (expressed as 1,760 TPD_7); in 1994, these facilities processed 1,686 TPD on a six-day per week basis (1,686 TPD_6).[20] Currently, the facilities report that they are operating at near capacity, but are threatened by relatively cheap landfill disposal capacity available in the region. For example, waste presently flowing to the Long Beach SERRF may be lost to the Orange County Landfill, which is offering disposal for a tipping fee at the $20.00 per ton level. Unlike landfill capacity that can be "banked" for future use, WTE capacity not used each day is lost capacity. Additionally, any low-heat value waste (such as the dirt-laden transfer station waste sent to City of Commerce), reduces the energy output of the facility and increases operating costs because of the lost revenues. Therefore, it is recommended that the County:

- develop policies and plans to fully utilize capacity at the two existing waste-to-energy facilities in the future; and
- develop policies to ensure that the waste delivered to the WTE facilities is combustible (i.e., not dirt).

[20]Based on 1994 annual tonnage data reported by the California State Board of Equalization.

2. Future Expansion and/or Additional Transformation Capacity

The DEIR/DEIS indicates that WTE alternatives were not considered because they "take material away" from diversion and recycling. This is no more true of WTE facilities than it is of landfills. Integrated waste management calls for planning a mix of alternatives. If Los Angeles County achieves 70 percent diversion in the year 2020, there will still be 10,000 tons per day of waste needing disposal. Four 2,500 TPD WTE facilities[15] would reduce the need for landfilling to approximately 3,000 TPD, taking into account the seven-day per week operation and 25 percent (by weight) ash generation of WTE facilities and would generate 280 mega watts of electrical power.

There is a total of 121 municipal waste-to-energy facilities operating in the U.S.[16] These WTE facilities are constructed using two entirely different technologies, mass burn and refuse-derived fuel (RDF). Mass burn WTE facilities accept mixed MSW into a storage area and feed this material directly into the furnaces for combustion. The heat generated is used to produce steam and electricity. Refuse derived fuel facilities have additional processing beyond receiving and storage. This processing usually includes removal of non-combustible materials and shredding the combustible portion to a uniform particle size. The shredded material, RDF, is reading to be fired directly into dedicated boilers or in combination with other fuels in existing boilers. RDF can also be compressed into pellets for easier storage and handling.

One advantage of the RDF approach is that the fuel can be prepared in a different location from the combustion site. RDF processing could be incorporated as part of the transfer station/MRF facilities contemplated for rail haul. RDF technology would allow location of combustion power plants outside the Southern California airshed, eliminating concern about the impact of WTE emissions in Los Angeles County.

[15]Ten thousand tons per day (10,000 TPD) 6 days per week converts to 8,571 on a seven day basis; sizing the facilities to be 85 percent available results in four facilities with a total rated capacity of 10,084 TPD. This was rounded to four 2,500 TPD facilities. The 2,500 TPD of ash generated 7 days per week would result in 2,917 TPD going to landfill 6 days per week.

[16]Integrated Waste Services Association (IWSA), *Municipal Waste Combustion Directory of the United States*, 1995.

A major opportunity is for existing coal-fired power plants to substitute refuse-derived fuel (RDF) for a portion of their coal feedstock. The logical choice of power plants would be those which supply some of the region's electrical power, such as the Southern California Edison Mohave plant in Nevada or the City of Los Angeles Intermountain plant in Utah.[23] Each of these plants burns approximately 12,000 TPD of coal and is accessible by rail. If they obtained 10 percent of their energy from RDF, these two plants would utilize about 5,000 TPD of RDF. This has been done by Northern States Power in Wisconsin and Minnesota, resulting in both lower air emissions and increased waste management capacity, while maintaining power output.

Expansion of the two existing WTE facilities is a possible future option for Los Angeles County; however, there are several reasons for not entertaining this option at the current time. First, the facilities must compete with relatively cheap landfill prices in the region. Expansion should have the effect of lowering their per-ton operating costs on a per-ton basis (since adding a new line or two is lower-cost than building an entire new facility), but it is unlikely that they could reach the $20/ton tip fee and without endangering the financial stability of the facilities. There is enough challenge in maintaining waste flow for current capacity. Second, expansion could mean renegotiating their power agreements with Southern California Edison, and the new power purchase rates would be much lower than present rates. Both are presently receiving $0.13 to 0.14 per kilowatt hour (kWh) with a floor price of $0.09/kWh. New rates would be about $0.01 to 0.02/kWh, which would force tipping fees up to $85 to $100/ton.

Potential environmental and human health impacts of waste-to-energy have received considerable attention from the media and from the environmental activist community in recent years. What has not been made clear in this dialogue is that WTE is a cleaner power generator that the two primary sources of electricity in the U.S., e.g., coal and oil. Further, WTE air emissions only slightly exceed natural gas (the cleanest-burning fossil fuel) in the amount of pollutants emitted per unit of energy produced. A detailed side-by-side health risk analysis that compares a new landfill with a mass burn waste-to-energy plant "...shows that WTE plants may

[23]*Electric Power Monthly*, Energy Information Administration, U.S. Department of Energy, November 1995.

be a better choice than landfills for minimizing health risks and environmental effects."[24] Finally, WTE does not present the potentially grave environmental and health impacts associated with nuclear power plants.

A recent article in *Environmental Health Perspectives*[25] prepared by scientists and health professionals from the University of North Carolina at Chapel Hill, the U.S. EPA, and Mecklenburg County Health Department, reports on the first year of a three-year study of air quality and respiratory function and symptoms in six communities. Three of the communities have waste combustion facilities (one municipal solid waste-to-energy facility, one biomedical incinerator, and one liquid industrial hazardous waste incinerator). Each of these three communities were paired with comparable communities that do not have such facilities, for a total of six study sites. The article notes that results of the first year air monitoring showed, "(d)irect measurements of air quality and estimates based on a chemical mass balance receptor model showed that incinerator emissions did not have a major or even a modest impact on routinely monitored air pollutants." Similarly, the results of the epidemiological surveys showed that, "(a) one-time baseline descriptive survey (n = 6963) did not reveal consistent community differences in the prevalence of chronic or acute respiratory symptoms between incinerator and comparison communities, nor did we see a difference in baseline lung function tests or in the average peak expiratory flow rate measured over a period of 35 days." In conclusion, the article abstract notes, "(b)ased on this analysis of the first year of our study, we conclude that we have no evidence to reject the null hypothesis of no acute or chronic respiratory effects associated with residence in any of the three incinerator communities."

Southern California receives electrical power from a variety of primary as well as alternative energy sources. Major primary sources include coal-fired out-of-State power plants

[24]"Comparing Air emissions from Landfills and WTE Plants," Kay H. Jones, *Solid Waste Technologies*, March/April 1994.

[25]Carl M. Shy, et al., "Do Waste Incinerators Induce Adverse Respiratory Effects? An Air Quality and Epidemiological Study of Six Communities," *Environmental Health Perspectives*, Journal of the National Institute of Environmental Health Sciences, V. 103, No. 7-8, pages 714-724, July-August 1995.

as discussed above. Alternative sources include hydropower (from Hoover Dam), wind energy, and some experimental solar salt ponds at the Salton Sea. As L.A. County's population continues to grow, electrical service requirements will also continue to grow. New power capacity will be developed to meet this demand. Some or all of this demand could be met by conservation measures in the near term; however, sufficient conservation is unlikely under present legislative and regulatory structures. Because of the significant line losses experienced when transmitting power long distances, development of local power generation capacity is preferable to wheeling power in from outside the Los Angeles area.

New electrical power source options include new or expanded facilities based on fossil fuels (coal, oil, and natural gas). Coal and oil, in particular, would be difficult to justify given the air pollution concerns in the Southern California Air Quality Management District (SCAQMD). Siting a nuclear power plant is also problematic due to concern about possible earthquake damage to reactor containment (e.g., Diablo Canyon).

Expansion of existing alternative energy facilities or development of new ones is also limited. There are no rivers of sufficient year-round flow volume in Southern California that can provide additional hydropower from dams, not to mention the significant environmental impacts that result from damming up rivers to fill canyons. Both windpower and solar salt pond locations are relatively remote from populated areas, so long-distance line transmission would be required if these sources are expanded. Expansion of the wind farms in the desert near the Little San Bernardino Mountains is likely to encounter opposition from the growing desert cities (Palm Springs, Rancho Mirage, Desert Hot Springs, Palm Desert, etc.), as vast areas of (potentially subdividable) desert are already dedicated to wind farms. Solar technologies, including salt ponds, are still considered developing technologies, and have cost as well as technical limitations to their application.

Another developing technology that may become available for future power generation in Los Angeles County is pyrolysis (gasification) of municipal solid waste or selected feedstocks from the waste stream (e.g., tires). This technology breaks down the organic components of the waste into combustible gases, char, and oil by exposing the feedstock to high temperatures

in the absence of oxygen. Pyrolysis has been demonstrated under various private and federally-sponsored research projects; however, no successful commercial applications exist to date. However, in the 50-year planning period considered by the County, maturation and application of this technology is a reasonable possibility.

In conclusion, waste transformation technology is a viable option for future application to two problems that need to be addressed in Los Angeles County: diversion of municipal solid waste from landfill disposal, and generation of electricity to meet new population demands.

VIII. NEW PROJECTIONS FOR DISPOSAL DEMAND

Chapters IV through VII identify flaws in the design and calculations used by the County in the DEIR/DEIS and Siting Element "time-to-crisis" projections for the Los Angeles County solid waste disposal system. Each chapter highlights a portion of these projections, and provides an alternative projection, oftentimes supported by Los Angeles County government documentation. The strategy presented in this chapter includes all of the projection alterations, except landfill expansion, made in Chapters IV through VII. The alterations include the utilization of the following:

- closing of the BKK and Lopez Canyon landfills in 1996;
- increased waste exports;
- inert landfill capacity;
- waste-to-energy facilities in Los Angeles County;
- all operational Class III landfills in Los Angeles County;
- historically justified waste disposal rates;
- foam as an alternative daily landfill cover; and
- aggressive (but obtainable) recycling diversion rates.

Two different scenarios were run with the waste materials flow model to illustrate the impact of the intensive recycling and diversion strategy that is recommended for Los Angeles County. These are:

Scenario 6A: Achievement of a 70 percent diversion goal for all 88 cities and the County in the residential, commercial, and industrial sectors. This is targeted for achievement in 2020, the same schedule as the City of Los Angeles.

Scenario 6B; A strategy of diversion through landfill bans for corrugated board (cardboard), wood and yard waste. A landfill ban on all recyclable materials would accelerate this strategy; however, bans on these three illuminate this strategy's effectiveness.

Both of these Scenarios build on the strategies recommended and illustrated in the first five Scenarios as discussed in Chapter V. However, both are mutually exclusive -- that is, they are not combined into a single model run. In actuality, an intensive diversion and recycling strategy would employ the 70 percent goal and landfill bans for recyclable materials. In addition, this strategy must include a wide variety of diversion programs and facilities for processing materials banned from landfills. These facilities range from MRF's, such as the 4,400 TPD facility planned for Puente Hills with a 15 percent diversion, to the 1,000 TPD Bio Gro/Wheelabrator facility with diversion close to 100 percent. The full program recommended for the County is outlined in Chapter VIII and technologies discussed in Appendix B.

Scenario 6A: Total County 70 Percent Diversion

This Scenario assumes that all the cities, in addition to the City of Los Angeles and the County unincorporated area as discussed in Scenario 4, achieve 70 percent diversion in 2020. This would mean the cities, which represent 53 percent of the waste generated in the County, adopt and implement this 70 percent diversion goal.

This option does not have any impact until after the year 2000. Starting in 2001, the impact is to increase the diversion of the entire County by one percent per year and to extend the Shortfall by two years compared to Scenario 5, to 2016. This can be seen in Figure VIII-1. The amount of the Shortfall is 3,500 TPD in 2016, and increases to 10,000 in 2023. Further reductions, in excess of 5,000 tons per day (TPD), occur in subsequent years, as can be seen by comparing Figure VIII-1 and VIII-2.

Scenario 6B: Recyclable Material Bans

Most recycling and diversion programs target specific materials in the waste stream. The programs in Los Angeles County are no exception. Table VIII-1 lists these materials, along with the fraction of the County waste stream which they constitute. These materials total 57 percent of the waste disposed. Table VIII-1 also shows the estimated quantity of each of these materials disposed in landfills in 1995. It is recognized that the composition of the waste stream has

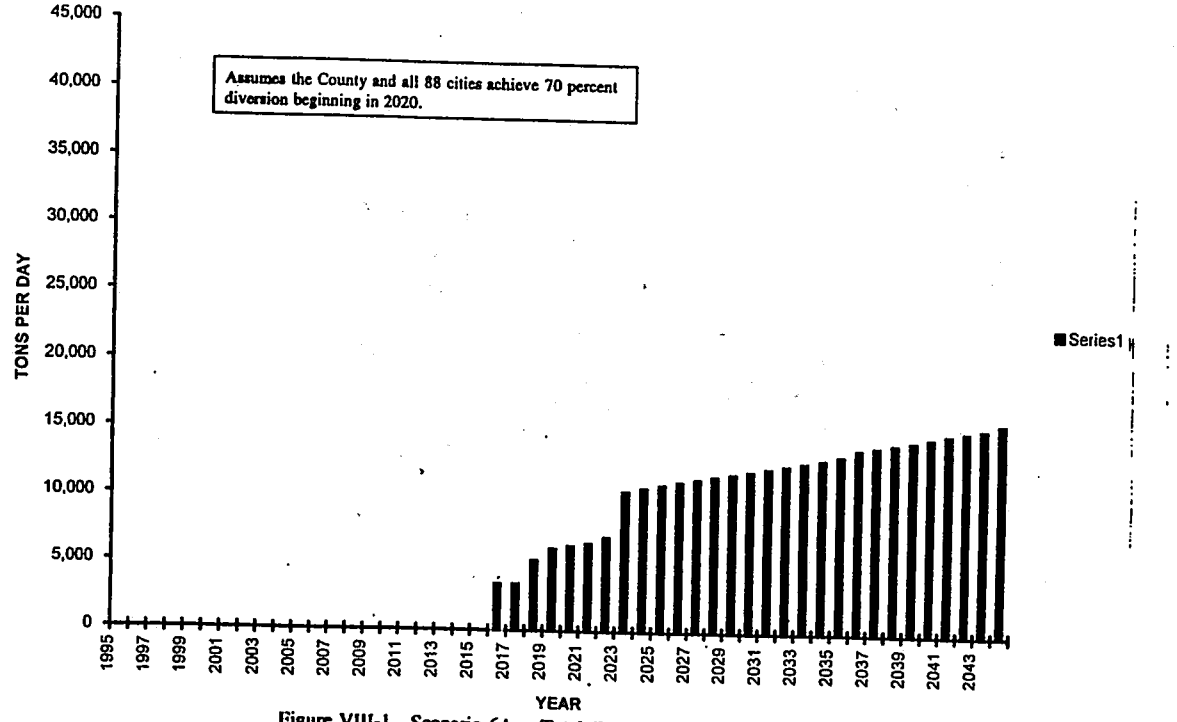


Figure VIII-1. Scenario 6A -- Total County 70 Percent Diversion
Los Angeles County Disposal Need

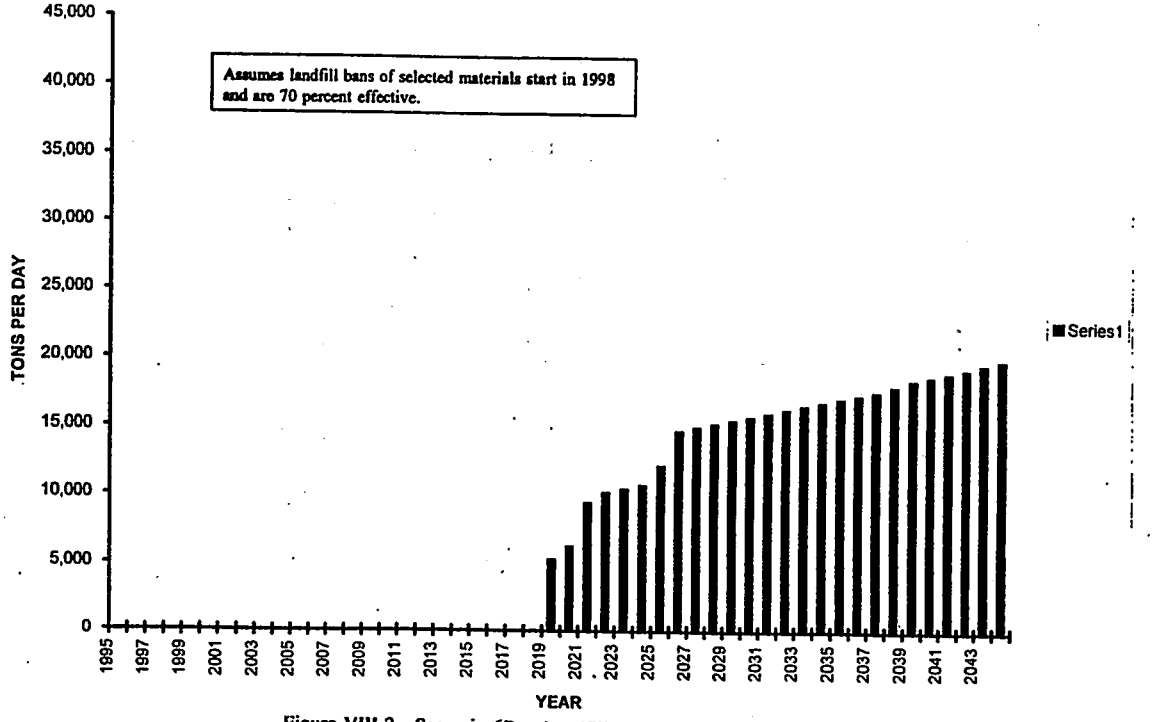


Figure VIII-2. Scenario 6B -- Landfill Bans of Selected Recyclables
Los Angeles County Disposal Need

changed since the 1990 SRRE's and the CIWMB Interim Database, the source of this data. These changes in subsequent waste composition are caused by changes in products in the marketplace. For example, the weight of individual glass and metal containers has decreased

Table VIII-1. Los Angeles County
Estimated Average Waste Composition of Selected Recyclable Materials

Waste Categories & Types	Composition As Disposed (%)	1995 Quantities Disposed (Tons)
Cardboard & Bags	8.3	868,241
Mixed Paper	11.7	1,223,906
Newspaper	5.1	533,498
Hi-Grade Ledger Paper	2.0	209,215
HDPE Containers	1.0	104,607
PET Containers	0.3	31,382
Recyclable Glass	3.0	313,822
Aluminum Cans	0.3	31,382
Ferrous & Tin Cans	3.9	407,969
White Goods	0.3	31,382
Yard Waste	12.7	1,328,513
Wood	8.8	920,545
TOTAL:	57.4	6,009,462

Source: CIWMB Interim Database Project, revised August 4, 1993.

in the last six years, and material substitutions in products, such as plastics for metals and glass, have changed the relative concentrations of these materials. In addition, the waste stream composition is altered by diversion. For example, diversion of all newspaper would result in an increase of the percentages of all other materials. Because of these changes -- and the fact that landfill bans, even when enforced, are never 100 percent effective -- not all of these banned materials will be diverted. To account for these factors, it is assumed in this Scenario that 70 percent of these materials will be diverted due to the landfill bans.

For this Scenario, the three materials (corrugated, wood and yard waste) shown in Table VIII-1 are banned from landfill disposal, beginning in 1998. These constitute 8.8, 8.3 and 12.7 percent, respectively, of the waste disposed (or approximately 30 percent total). The ban is

assumed to be 70 percent effective, allowing 30 percent of the banned material still to be landfilled. This strategy illustrates the effectiveness of immediate action on the part of the County. It postpones the Daily Disposal Shortfall until 2019, a gain of five years over Scenario 5 (Chapter VI). This is shown graphically in Figure VIII-2. Every year of delay in the implementation of this and other diversion strategies results in loss of landfill capacity. This capacity is difficult to replace.

As the model Scenarios illustrate, intensive recycling and diversion is an effective strategy for managing waste and conserving landfill space. Applying landfill bans to all the recyclable materials referred to in Table VIII-1 and developing recycling programs for these materials in the residential, commercial, and industrial sectors will further reduce the need for landfills in the County. The sooner this strategy is implemented, the greater its impact will be.

IX. LANDFILL EXPANSION POTENTIALS (SCENARIO 7)

The solid waste management strategies discussed in the previous chapters clearly will eliminate the need for additional in-county landfills in the short term (AB 939, 15 year planning period), if implemented. In the long term, The County and the 88 Cities will need to implement additional solid waste management strategies. After implementing all the strategies discussed the County and the Cities will have some 15,000 to 20,000 tons per day of waste to manage. A number of alternatives have been discussed but not included in the projections, including additional export (rail haul and remote landfilling), refuse derived fuel burned in existing coal fired powerplants, and composting. Expansion of existing in-county landfills is examined but not recommended in the following paragraphs.

Potential landfill expansions and closures play a large role in identifying the "time-to-crisis" for Los Angeles County. Depending on what is assumed with regard to expansions and closures, projections will indicate no crisis or a crisis in the next year. Projections in Table V-1, which were used in the Elsmere Canyon DEIR/DEIS, neglect the expansion potential of the landfills, which is an important factor in identifying a more realistic "time-to-crisis." In the Siting Element, six existing landfills were projected to expand and four new ones developed. It is true that there is no guarantee that permits will be renewed and extensions may be contested; however, the vast majority of landfill permits are extended, making this scenario the most probable outcome. Table IX-1 provides current and potential capacities for the landfills in Los Angeles County. All of the information in Table IX-1 is taken from reports generated by the Los Angeles County Department of Public Works.

In the Siting Element, the County suggests a scenario in which six landfills are expanded to their physical capacity. These are: Antelope Valley[20], Chiquita, Lancaster, Lopez, Puente Hills and Sunshine. In addition, the County shows the opening of four new landfills: Blind, Elsmere, Mystic/Rustic-Sullivan, and Towsley. This scenario results in a surplus of landfill capacity in the County through the planning period. The surplus is over 50,000 TPD at the end

[20]Antelope Valley has been issued a revised permit that increases daily disposal capacity to 1,400 TPD.

Table IX-1. Current and Potential Disposal Capacities for the Los Angeles County Landfills

Landfill	Permitted Disposal Capacity[1] (TPD)	Average Daily Disposal 1994	Total Permitted Capacity (million tons)[1]	Total Expanded Capacity (million tons)
Puente Hills	12,000	10,945	33.0	67.4[2,3]
Spadra	3,700	2,156	2.81	2.81
Scholl Canyon	3,400	1,587	11.5	11.5
Bradley	7,000	4,448	3.91	8.91
Sunshine Canyon	6,600	0	17.0	100.0[2]
Chiquita Canyon	5,000[4]	1,692	2.31	32.31[2]
Calabasas	3,500	2,975	12.6	12.6
Brand Park	102	18	0.6	0.6
Antelope Valley Dump	750	539	2.3	2.3
Azusa Land Reclamation	6,000	695	-- 3.5	3.5
Burbank	240	162	6.4	6.4
Lancaster	1,000	435	0.66	0.66
Pebbly Beach Disposal	33	4	0.044	0.044
Whittier-Savage Canyon	350	217	2.73	2.73

[1]Draft table, "Remaining Permitted Combined Disposal Capacity of Existing Solid Waste Disposal Facilities in Los Angles County as of January, 1995," Los Angeles County Department of Public Works, March, 1995.

[2]"Expansion of Existing In-County Waste Disposal Sites and Projected Disposal Needs," Los Angeles County Department of Public Works.

[3]Based on the calculation of 12,000 TPD x 312 days/year x 18 years (1995 to 2013) = 67.4 million tons.

[4]After expansion, the permitted daily capacity will increase to 10,000 TPD.

of the 15 year planning period, in 2010. In fact, the County's scenario of landfill expansion would result in excess landfill capacity in the County even without the new landfills.

This section (Scenario 7) examines a more modest landfill expansion strategy, where five landfills are expanded. Lopez and BKK have been dropped from the expansion list because they are scheduled to close in 1996. Also, this strategy reduces the size of the expansions of the five landfills. The values for expansion are as follows:

Antelope Valley	5.3 million tons
Chiquita	17.0 million tons
Lancaster	5.7 million tons
Puente Hills	50.0 million tons
Sunshine	60.0 million tons

These values for expansion were calculated by taking the difference between the total physical capacity and the present Total Permitted Capacity, dividing this potential increase in half, and adding this increase to the remaining Permitted Capacity. This value was then rounded.

This strategy is effective after the strategies described in Scenario 1 through Scenario 5 in Chapter V are implemented, as is the landfill conservation strategy discussed in Chapter VI. Intensive recycling and diversion described in Scenario 6 are not activated. The strategy in this Scenario postpones the "time to crises" to 2023, well beyond the AB 939 required planning period. Further, the Shortfall, when it does occur, is not severe, starting at 800 TPD and increasing to 10,000 and growing slowly thereafter. This is shown graphically in the chart in Figure IX-4.

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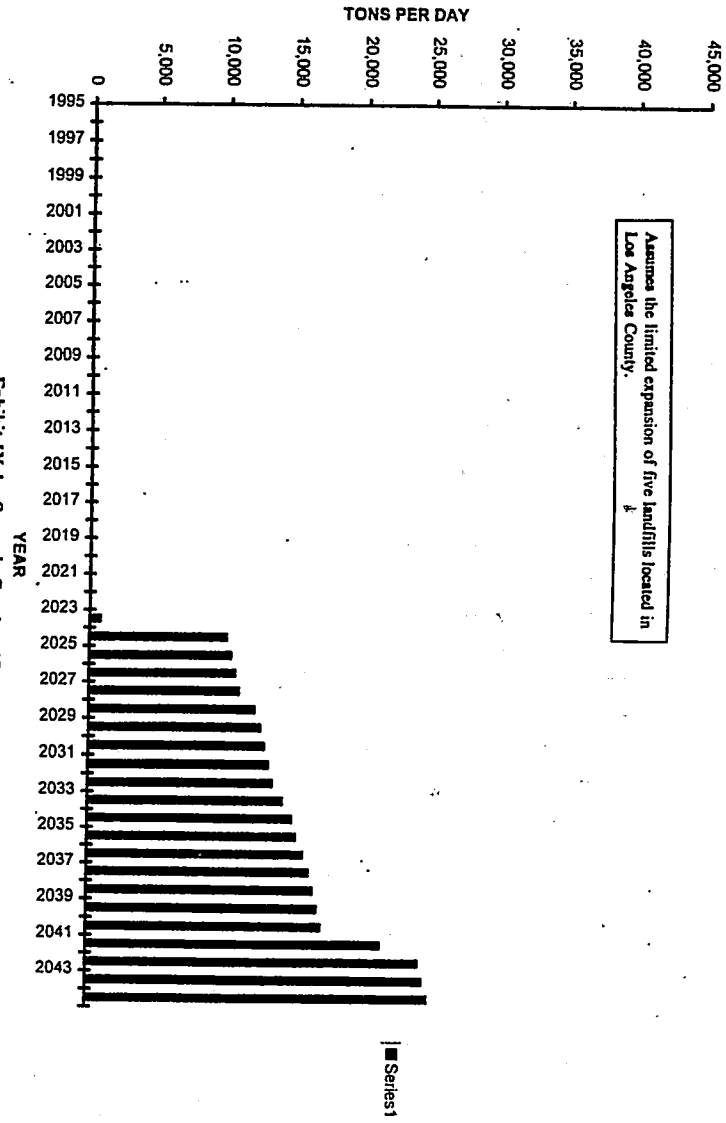


Exhibit IX-1. Scenario 7 -- Landfill Expansions
Los Angeles County Disposal Need

X. RECOMMENDED COUNTY ACTIONS

This Chapter draws upon preceding Chapters to establish the County's potential for a leadership role, as well as pointing out direct actions presently within the purview of the County government. Recommendations cover:

- Changes to the County structure that will foster a policy shift to diversion/transformation as the preferred methods for addressing solid waste, and
- Specific, practical applications.

Sections within the Chapter, where appropriate, estimate the amount of diversion that can be accomplished by implementing a particular recommendation.

The estimated cost of implementing a recommended plan is normally developed as part of the planning process. Because this report has been developed without County input, however, there are many unknown cost factors that make estimation of overall costs a misleading exercise. Some critical cost issues are discussed in Appendices E and I. It should also be noted that cost is not the deciding factor in determining the level of implementation for solid waste diversion programs; State law and federal EPA guidelines make it clear that source reduction/recycling are the preferred modes of managing solid waste, whether it is cheaper in the short run or not. Further, the guidelines for Environmental Impact Statements require consideration of alternatives without regard to cost.

A. USE OF COUNTY SOLID WASTE TASK FORCE

The Los Angeles County Solid Waste Management Committee (the Committee) has been in the forefront of solid waste planning for years. With the passage of AB 939, the Committee was given the task force responsibility as required under this legislation, by the County. The Committee has provided policy guidance for the Los Angeles County Board of Supervisors. Also, the Committee is responsible for coordination of solid waste management issues on a county-wide basis. The Committee has failed to develop a policy direction for the County that focuses on alternatives to in-county landfills.

Recommended County Action

The Board of Supervisors should reconstitute the Committee and give the reconstituted Committee the charge of developing diversion-oriented policies for the County.

B. WASTE DISPOSAL PRACTICES OF COUNTY DEPARTMENTS

Waste from government-owned and/or operated facilities can be a substantial portion of the municipal waste stream. This waste often goes unnoticed because it is considered "commercial waste" in traditional waste composition studies. However, where localities have conducted an analysis of that portion of the commercial waste stream attributable to government operations, the results can demonstrate significant opportunities for government diversion activity. For example, in the City of Los Angeles, an estimated 2.3 million tons of the total waste generated in 1995 was under City control and 29 percent of this was generated by government agencies.

Los Angeles County Public Works Department should seek assistance from other County Departments in achieving AB 939 goals and extending the life of in-County landfills. This is particularly important in light of the increased emphasis being placed in the County on commercial and institutional recycling rates and the expansion of residential curbside programs to include mixed paper and yard trimmings. All County agencies should be responsible for achieving 50% or greater recycling rates as well, including county offices, health facilities, prisons, parks and recreation facilities, maintenance facilities, etc.

Clearly, County Public Works does not have the authority to require such diversion activity from other County agencies. However, it can, and should, use its position to gather and analyze data, track recycling rates, and make recommendations to the County Board of Supervisors, which can then direct each individual agency to institute and report on diversion activities.

The ancillary benefits of such an approach are also substantial. Agencies are often unaware of their solid waste costs, focusing on diversion will result in significant source reduction as well as recycling. These efforts will produce cost savings to the generating agencies.

The County should recommend that the Board of Supervisors require the following of each County agency:

1. Commit to 50% recycling rate by 1998 and 65 percent by 2000.
2. Develop a plan to achieve these diversion rates, with year to year goals.
3. Prepare a report in 1996 that contains the following information:
   a. Describe how solid waste for the agency is picked up and disposed (agency employees, contracts with haulers, etc.)
   b. Provides a cost estimate for disposal (total and cost per ton)
   c. Describes service level utilized (number of containers, size of containers, frequency of pick-ups, etc.)
   d. Estimates the tons/year disposed of by the agency.
4. Prepare a report in 1996 that summarizes agency recycling activity, if any, and quantifies the cost, cost/benefit of those programs.
5. Submits quarterly narrative reports to the Department of Public Works, which are then summarized and included in DPW's Quarterly Report on the Action Plan to the Board of Supervisors.
6. Submits annual reports to the Board of Supervisors on status of recycling programs, including quantification of diversion rate.

The County Sanitation Districts of Los Angeles County (Sanitation Districts) operate two buy back/drop off centers for the general public: one at the Puente Hills Landfill and the other at the Palos Verdes Landfill in Rolling Hills Estates. The Palos Verdes Recycling Center opened in November 1977 and the Puente Hills Recycling Center opened in October 1982. Customers can receive money for their recyclables or "donate" them to a designated charity.

These are in addition to the four active landfills, a transfer station, three landfill gas-energy facilities, and the Commerce waste-to-energy plant operated by the Sanitation Districts.

Since their opening, both facilities have added materials to the list of recyclables accepted from the public and currently both accept glass in three colors, aluminum, steel, PET and "other plastic" containers, and newspaper. Over time, each facility gradually increased tonnage and customers and then began to experience a decrease in both tonnage and customers. For example, the Puente Hills Recycling Center started in 1982 with 424 customers bringing in 36 tons, grew to 7,499 customers bringing in 376 tons in 1991, and then dropped to 180 tons received from 4,535 customers in 1994. Similarly, the Palos Verdes facility accepted 449 tons from 4,627 customers in 1997, grew to 4,597 tons from 23,914 customers in 1991, and dropped to 689 tons from 16,688 customers in 1994. While some of this drop in the quantity of materials can be attributed to the initiation of curbside programs throughout the County, some of this drop is due to a lack of public information and promotion.

Both facilities could assist in the achievement of County-wide goals by filling gaps in curbside service and by encouraging residents and small businesses to drop off source separate materials for free as a means of avoiding disposal charges. The easily recycled materials, including corrugated cardboard, magazines, office paper and mixed paper, should certainly be added to the materials accepted by the centers. Harder-to-recycle materials, including white goods, tires, batteries, separated construction and demolition waste, and wood, should also be accepted. In addition, a drop-off site for clothing and small durables could be added in cooperation with a charitable organization. Information could be distributed at the site regarding other opportunities to divert materials in Los Angeles County. Through this and other types of activities, the Sanitation Districts could fill voids in County diversion services and increase overall tonnages diverted County-wide.

Recommended County Actions:

It is recommended the Sanitation Districts expand the drop-off system. This should include expanding the material accepted as discussed above and increasing the number of sites. The Sanitation Districts own and/or operate some 20 facilities throughout the County. An expanded citizens drop off center should be located at each of these facilities, if practical.

The Sanitation Districts should adopt and implement the 65 percent diversion goal for its facilities (offices and plant as applicable), as discussed above.

C. UNINCORPORATED AREA ACTIONS

Based on Los Angeles County's AB 939 disposal surveys, the unincorporated area of the County landfilled 211,057 tons of waste per quarter, compared to 2,923,059 tons landfilled from all localities in the County. This represents 7.22% of Los Angeles County landfilled waste, a substantial portion of County landfill usage. Overall, County quarterly disposal reports indicated that solid waste facilities in the County received a total of 289,010 tons of waste from the unincorporated area, compared with 3,756,290 tons from all Los Angeles County localities, or 7.7% of the total. The latter includes tons salvaged, transformed, landfilled and used as ADC in solid waste facilities in the County.

Los Angeles County Department of Public Works has a unique opportunity to both extend landfill life and to provide a leadership role in demonstrating diversion opportunities through its management of waste collection systems in the County unincorporated area. Therefore, it is recommended that Los Angeles County use the unincorporated area as a demonstration for intensive recycling and diversion. To do this the County would need to implement the Level 3 Maximum Diversion program described in Chapter VII.

Recommended County Actions:

Los Angeles County should implement the maximum diversion program. To initiate this program it is recommended that the County:

- Make a formal announcement to adopt the program;
- Adopt a 70 percent diversion goal for the unincorporated area;
- Establish a program team to develop a detailed plan and implement;
- Establish an enterprise fund administration and accounting system for solid waste in the unincorporated area solid waste system and fund it.

D. MANAGEMENT OF COUNTY BIOSOLIDS

The Sanitation Districts collect and treat wastewater for 78 cities and unincorporated areas in Los Angeles County. The Sanitation Districts operate 11 wastewater treatment facilities with a combined daily flow of more than 500 million gallons. Seven of the facilities are located in the metropolitan area of Los Angeles County, two in the Santa Clarita Valley, and two in the Antelope Valley.

The largest of the facilities is the Joint Water Pollution Control Plant located in the city of Carson. Approximately 1,250 wet tons of biosolids are generated at this facility daily. Total wet tons for 1994 were 473,200. Wastewater treatment for the Santa Clarita Valley is conducted at the Saugus and Valencia Water Reclamation Plants and solid generated during treatment are processed at the Valencia facility. A total of 20,000 wet tons of biosolids were disposed of in 1994 at the Chiquita Canyon Landfill. The Antelope Valley facilities include the Lancaster and Palmdale Water Reclamation Plants. Approximately 20 wet tons are produced daily from these facilities, where anaerobically digested, dried biosolids are intermittently released for soil amendment material. For example, the Antelope Valley biosolids have been used in agriculture, for landscaping at the Mira Loma Jail, and to revegetate perimeter slopes at local landfills.

Despite contracts for composting, land application, and Nox reduction in cement kilns, some 3,000 wet tons per week are sent to Puente Hills Landfill from Los Angeles County, out of a total of approximately 9,600 tons per week produced by all County-operated facilities. At an average of 500 tons per day (TPD) disposed in Puente Hills Landfill (6 day week), biosolids utilized almost 4% of Puente Hills daily capacity (13,200 TPD) and 4.6% of the average daily tonnage disposed of at Puente Hills in 1994. This was mentioned in Chapter VII and represents a significant usage of Puente Hills capacity which could be utilized to either extend Puente Hills' landfill life or to accept residential and commercial waste in the future which would otherwise have to be disposed of at out-of-County or out-of-state landfills.

Recommended County Actions:

The Sanitation Districts should institute a policy of 100% composting, land application and NO_x reduction in cement kilns for all County-generated biosolids, with Puente Hills Landfill disposal utilized only as a backup when other alternatives fail in an emergency.

Since sludge was not calculated in the AB 939 aggregated County tonnages, this means that the 500 TPD of material sent to Puente Hills shows up County-wide as an increase in disposed waste over 1990 in the disposal surveys done for AB 939 compliance in 1995. While it is not certain, the small amount shown in the CIWMB interim database was probably as a result of the City of Los Angeles disposed tonnage.

E. MANAGEMENT OF COUNTY LANDFILLS

Landfills in Los Angeles County can be managed to maximize diversion and conserve landfill capacity. The start for this approach would be the adoption of a policy by the County that recognizes that land for urban landfills is a scarce and diminishing commodity. The current landfill tipping fees do not reflect this fact; however, it is demonstrated by growing public objection to new and existing landfills. The County policies should reflect this problem, and take concrete action. The recommendations offered in this Section are some of the actions the County could take.

First, the County should implement Item 5 of the 1988 Action Plan, direct billing for collection and disposal of solid waste. To be most effective, this billing should itemize the various components of the cost: recycling, yard waste, solid waste collection, disposal, etc. The basis for this must be full cost accounting, utilizing an enterprise fund as discussed in Appendix E. The coupling of direct billing with a variable rate structure based on weight or volume has been shown to reduce total generation of waste and to increase diversion in communities that use this approach. A variable rate structure is applicable to both residential and commercial wastes. Currently, larger U.S. private haulers are implementing weight-based systems using scales on their trucks to weigh each container as it is dumped. They are finding that the cost of the system, about $10,000 per truck, is paid for by more accurate billing of generators based upon weight the same way the hauler pays by weight at the landfill. The City of Seattle Case Study provided in Appendix A describes the application of a variable rate system to a residential integrated waste system.

As discussed in Chapter V, prohibiting landfill disposal of specific materials is effective in achieving diversion. Enforcement of bans for such materials as yard waste, white goods designated recyclables, and so on cannot be 100 percent effective for a variety of reasons, as discussed in Chapter V. However, if 70 percent effective, bans would reduce the material being landfilled by approximately 21 percent.

It is recommended that a chemical foam system be adopted as the daily cover method used by all the landfills in the County. This alternative landfill management technique is discussed in Chapter VI. Included as part of this is the recommendation that shredded yard waste no longer be permissible as alternative daily cover. Implementation of this recommendation will increase the capacity of all the landfills by 25 percent (i.e., the space taken up by the use of dirt and other cover materials such as shredded yard waste).

Technology discussed in Chapter VI is under development to accelerate the breakdown and stabilization of the mainly organic material in landfills using shredding, moisture adjustment and leachate recirculation. Los Angeles County could initiate a development project to demonstrate the effectiveness and cost of the approach. This would involve implementing this

management technique in one operating landfill and collecting data on operational and cost elements. If successful, accelerated biostabilization has the potential to double the capacity of existing landfills, based upon the Albany, New York experience.

Recommended County Actions:

- Implement direct billing of a variable rate based upon full cost accounting in the unincorporated areas. It is also recommended that the County meet with the Cities to develop cooperative methods to implement similar systems in all jurisdictions in the County. It is recommended the County and the Cities pass ordinances to require similar billing by private haulers and that the data collected be part of a periodic reporting requirement.

- Prohibit the disposal of the following materials in all public and private class III landfills in the County: materials designated for recyclable collection, yard waste, white goods, tires, vehicle batteries, inert materials, wood, and biosolids.

- Encourage the adoption of foam (or tarp) daily cover in lieu of dirt or green waste alternative daily cover at all landfills in the County. The County could initiate a demonstration program at one landfill to test effectiveness of various products, and provide a site for training public and private landfill staff.

- Prohibit the use of shredded greenwaste as alternative daily cover.

- Initiate a demonstration project for accelerated biostabilization of landfilled organic wastes, documenting costs and experiences, and providing training to other landfill owners and operators.

- Require all commercial/industrial waste disposal to be MRF-processed, at transfer stations or at the landfill sites.

- Develop commercial/industrial waste Materials Processing Facilities (MRFs) at landfills located in the County, as discussed in Chapter VII. MRFs may be publicly-sponsored, private enterprises, or joint efforts.

F. MANAGEMENT OF TRANSFORMATION FACILITIES

While the County does not have direct control over the operations of two existing waste-to-energy (transformation) facilities in the County, the Sanitation Districts have direct participation in both facilities. The 380 TPD City of Commerce facility is operated by the

Sanitation Districts. In the case of the Southeast Resource Recovery Facility (SRRF) in the City of Long Beach, the Sanitation Districts entered into a Joint Powers Authority (JPA) agreement; this JPA owns the SERRF in Long Beach. In addition, the County has the power to direct waste from County-operated transfer stations and through County waste collection contracts to these two facilities.

It is recommended that the County:

- In consultation with the operators of the Commerce and Long Beach facilities, direct waste from County-operated transfer stations to the waste-to-energy facilities in amounts sufficient to maintain MCR (maximum continuous rating) at each facility;

- Manage incoming wastes at transfer stations so that largely non-combustible loads are diverted to landfill or inert landfill disposal rather than transferred to the waste-to-energy facilities;

- As feasible, require combustible waste collected by the County or by private haulers under County contracts be delivered directly or via transfer stations to the two waste-to-energy facilities; and

- Work with the two cities and the Sanitation Districts to explore potential for expanding capacity of the two facilities to meet permitted limits (3,230 TPD).

G. MANAGEMENT OF COUNTY TRANSFER STATIONS

In 1994, the County of Los Angeles reported that approximately 19 transfer stations were operating in the County.[21] Transfer stations are used by individual communities or solid waste collection firms to optimize their transportation costs. This is accomplished by limiting the use of small collection trucks to picking up wastes from the generators and transferring the waste to more efficient transfer trailers for long-distance hauling to the disposal site. Due to the fact that transfer stations are sited to reduce collection truck route distances, they are designed to serve a defined area and generally range in size from 500 to 3,000 TPD.

[21]County of Los Angeles, Department of Public Works, Waste Management Division, *Nondisposal Facility Element*, March 1994.

Many private transfer stations perform some "dump and pick" operations to recover high grade materials. These operations have little specialized equipment, using a front-end loader and laborers to separate the materials on the tipping floor. The diversion rate for this type of operation ranges from zero to ten percent of the incoming waste. More technically advanced transfer station recovery systems are called mixed waste processing facilities (MWPFs). A minority of the 19 transfer stations in the County have invested in separation equipment to actively process all or a portion of the waste stream and can be classified as MWPFs. Based upon data from facilities surveyed by GAA,[22] the recovery rate for these facilities ranges between 8 and 30 percent of the incoming waste stream. Only one of the 19 transfer stations in the County exceeds 30 percent and processes a significant waste quantity.

In contrast, the 950 TPD MWPF owned by the City of Sunnyvale and operated by Western Waste diverts 46 percent of the incoming waste. This facility operates on a mix of 25 percent residential waste and 75 percent commercial waste. Some source separation takes place prior to collection of the waste delivered to the MWPF. The Sunnyvale MWPF recovers 12 grades of paper, all six plastic resin categories and other plastics, metals, glass, tires, batteries, white goods, waste oil and household hazardous waste. To achieve diversion at this scale, a substantial investment in building and processing equipment must be made. The Sunnyvale facility cost in excess of $23 million. In addition, the waste stream coming into the facility must be managed to facilitate recovery of the separate materials. This means not only segregating waste loads on the tipping floor, but modifying collection routes to reduce contamination of recoverable materials.

Transfer station planning for the future in Los Angeles should incorporate rail transfer for waste and recyclable materials in the siting and design stages. While this will tend to make the facilities larger due to the capital investment necessary, the advantages are more than off-setting. The first advantage is the reduction in truck traffic achieved by using rail transport instead of long-haul transfer trailer trucks. Second, the air emissions of a rail haul system are

[22]Eileen Brettler Berenyi, *the Materials Recycling And Processing Industry In the United States, 1995-96 Yearbook)*, Government Advisory Associates, Inc., 1995.

significantly less than long-haul trucks, a new landfill, or a waste-to-energy facility.[23] These factors combined with the difficulties of siting large landfills in an urban area where available, suitable land is scarce makes rail haul an attractive option. The Sanitation Districts are planning a rail haul transfer system based at the Puente Hills landfill,[24] that would include recovery of materials from the tipping floor prior to transfer (the Puente Hills Materials Recovery Facility), but no implementation has been initiated. It is possible to implement this MWPF in stages. The Sanitation Districts could construct the basic transfer building and implement the diversion activities immediately. Rail spur construction and intermodal transfer equipment could be added at a later time when closure of Puente Hills is imminent. Intensive materials recovery at the proposed Puente Hills MRF could equal the 46 percent diversion accomplished by the City of Sunnyvale MWPF discussed above.

Given the advantages discussed above, why hasn't rail haul been implemented in Los Angeles County? Part of the answer is the lack of full cost accounting for solid waste in the County. For example, the DEIR/DEIS[25] compares the estimated cost of rail haul ($50 per ton) to the estimated cost of landfilling ($20 per ton) at the proposed Elsmere landfill and concludes that the cost differential is too high. This, despite the presentation of information in the DEIR/DEIS that over 75 percent of the waste will arrive in transfer trucks. No cost for these transfer operations was considered.

The 19 transfer stations have a permitted capacity of approximately 20,000 TPD or 57 percent of the 1995 disposal requirement. The cost of transfer, which averages between $15 and $25 per ton, should be added to the disposal cost of most of the waste going to landfill to make any comparison of feasibility. The lack of a direct billing or full cost accounting system for solid waste obscures this issue.

[23]*The Feasibility of Hauling Solid Waste from the San Gabriel Valley to Remote Disposal Sites*, Southern California Association of Governments (SCAG), April 1988.

[24]*Intermodal Facility and a Waste-by-Rail Disposal System Originating from the Puente Hills Materials Recovery Facility, Draft Environmental Impact Report*, Sanitation Districts of Los Angeles County, December 1994.

[25]Page 3-20, DEIR/DEIS.

Recommended County Actions:

- Encourage County Sanitation Districts to begin construction and operation of the proposed Puente Hills Materials Recovery Facility including rail transfer capability as soon as possible;
- Transfer haul combustible loads, as necessary, from the County's transfer facility, and assist in negotiating agreements for transfer of combustible loads from the proposed Puente Hills MRF and existing transfer facilities, sufficient to keep the two waste-to-energy facilities operating at MCR (see Chapter V, section C);
- Encourage diversion at the existing public and private transfer stations in the County, by such measures as a revolving low-interest loan fund for purchase of equipment or expansion of facilities, providing markets information and assistance in developing cooperative marketing activities, etc.
- Incorporate the cost of transfer operations and haul when comparing disposal fees at landfills.
- Develop a system of regional transfer stations that will serve the communities in the County to reduce collection truck travel and optimize waste management. Transfer stations in the system should include diversion and rail transfer capability.

H. MARKET DEVELOPMENT

The County continues to place its planning emphasis on the disposal portion of its integrated waste management strategy. The majority of the County's waste management resources are directed toward landfilling. The official policy of the State of California and the County state that 50 percent of the waste stream shall be diverted from landfills by the year 2000. Because diversion is a new approach to solid waste management, the County and the 88 cities should devote a larger portion of the planning effort and resources of the waste management activity to determining just where the diverted materials will go. As discussed in the materials markets trend description in Chapter VII and in Appendix J, recycling, which is the primary form of diversion, takes place only when the material collected by curbside or other programs is used to make a new product. This makes the manufacturers that utilize the recovered materials critical to diversion.

According to a recent report from U.S. EPA,[26] manufacturers that utilize recovered materials in their manufacturing process to make new products also produce economic and environmental benefits, including: creation of manufacturing jobs; creation of sales revenue and economic growth; reduction in air and water pollution; reduced energy and resource consumption; and reduction of the extraction impacts of developing virgin resources. In contrast to the "recyclers", collectors and processors, the manufacturers receive most of the economic benefits of recycling. For example, a ton of old newspaper is worth about $5 collected at the curb, $25 when sorted to specification, and $570 made into new newsprint. The addition of capitol and labor to the recovered materials through the recycling process creates value. Additionally, while jobs are created during the collection and processing of the materials, almost half of the total job creation occurs in the manufacturing phase. The U.S. EPA report uses the example of the processing of 15,000 tons of old newspaper annually; this creates 30 jobs in collection, 40 jobs in processing, and 75 jobs in the manufacture of new newsprint.

Given the economic trends in Los Angeles County, as discussed in Chapter V, the County would be well served by a policy that focused on the development of the manufacturing of new products aspects of the recycling process. The key to this development and the economic benefits it can produce is market demand for the recovered materials. It is a truism that when there is no market for a product, the economic activity associated with the product drops to zero. As discussed in the sections on recovered materials market trends, the industrial sector of the economy has made major investments in the use of recovered materials as feedstocks. There are many things local governments can do to support and assist industry in this. Some examples of specific programs that have been implemented were compiled by the Local Government Commission in the report *Capturing the Local Economic Benefit of Recycling*. The section of this report, Local Officials Are Playing a Critical Role, is reprinted in Appendix I. They boil down to two recommendations for the County:

- Establish a policy of purchasing and using products that are recovered, reprocessed or made from recovered materials; and

[26]United States Environmental Protection Agency, *Manufacturing From Recyclables: 24 Case Studies of Successful Recycling Enterprises*, No. 530 R95001, February 1995.

- Make industries that add value to secondary materials or use recovered materials in new products a high priority in the County's economic development program.

I. PUBLIC EDUCATION

A County of Los Angeles public education campaign is an essential part of successfully stepping into a proactive role in solid waste reduction/diversion efforts. The County's public education approach would vary by the type of audience. Audiences the County must reach include:

- Residents of the unincorporated areas (for whom the County provides collection services directly or on contract);
- The County public-at-large, including the residents of the 88 cities; and
- The commercial/industrial sector.

1. Residents of County Service Areas

A public information campaign directed to residents of the unincorporated areas that are served by County or County-sponsored collections would primarily convey practical information on "how to" and "why to" participate in source reduction and recycling efforts. The tools available include flyers or brochures distributed along residential collection routes or at central locations such as supermarkets; press releases to local newspapers, advertisers, and community newsletters; presentations to civic organizations; participation or sponsorship of local events; and so on. Spots and programs on radio and television, both commercial and public stations, are very effective. For example, Santa Monica has run extensive programs on waste diversion and disposal. Continual reminders of how and what to recycle are needed to maintain effective residential participation in recycling programs; the information may be developed and distributed by the County or by their contractors under County supervision. Whatever efforts are undertaken to reach this audience must be coordinated with the County-wide campaign discussed below.

2. County-wide Public Information Campaign

Each of the incorporated jurisdictions in the County has developed their own recycling/source reduction program, as outlined in their SRREs and implemented by the community. Each will have its own public information component to support the program. However, the County must develop a County-wide Plan that incorporates all of the SRREs (including the SRRE prepared by the County for the unincorporated areas). Preparation of this County-wide Plan is an opportunity for the County to also develop a coordinated public information campaign that enhances the efforts taken by each locality. The County's function in this campaign is that of cheerleader and role model. Highlights might include:

- Develop a model recycling program for all County offices, facilities and operations. Document the development of each type of program, including such factors as waste audits, program planning, costs, employee education, market development, and track program results. Use these "case study" model programs as training materials for private sector recycling/source reduction development projects.
- Develop a County-wide "reduce-recycle" theme advertising campaign. The campaign theme would then be used for all County public relations efforts and would be made available to local jurisdictions to support their efforts.
- County-wide media campaigns, such as public transit "remember to recycle" posters or broadcast media Public Service Announcement (PSA) spots.
- County-sponsored support programs, such as seminars for local recycling staff, a regional on-line materials exchange, and a County-maintained data bank on regional markets and market prices for recovered materials.
- Development of local media advertisements or public information materials that can be personalized by the local jurisdictions, such as a "home composting" ad or brochure that leaves room for the addition of local contact names, telephone numbers, and addresses.
- A County-wide program targeted to public and private primary and secondary schools that will supplement local school programs, such as a travelling theater show for specific age groups or County-wide art contests.
- Provide continual feed-back on how well this program is doing as is done in other public campaigns.

3. Commercial/Industrial Sectors

County efforts in this area are crucial. The commercial waste stream represents 32.3 percent of the overall waste flow in Los Angeles County; and industrial is 17.0 percent, for a total of 44.4 percent.[27] This fraction includes County government offices, agencies and service providers, as well as private businesses and multi-family housing. Without the cooperation of this broad sector, efforts toward significant reductions in the amount of waste requiring disposal are futile. The business sector has not embraced recycling as wholeheartedly as the public/residential sector (with some prominent exceptions, such as set recycling efforts in the film industry). This attitude on the part of business is understandable as 84 percent of the 212,252 employers in the County are small businesses employing less than 20 people. Small business are more apt to feel they cannot "afford" to recycle and do not understand how it can benefit their bottom line. Larger firms often get caught up in bureaucratic procedures similar to government agencies. The focus of the commercial/industrial/institutional sector is on manufacturing a product and selling it on the market, providing a service and bringing in new customers, or otherwise fulfilling their business aims and goals. However, the message that source reduction and recycling are part of "good business" must be conveyed.

Recommended County Actions:

- Convince businesses that source reduction and recycling, properly implemented, can reduce their operating costs. Make businesses aware of the value of their discards.
- Let the business sector (including County government) know that recycling is appreciated by their customers. Generating customer approval is good business.
- Promote local jurisdiction "waste audits" for businesses, provide technical support.
- Make businesses aware of the liabilities of their discards. Source reduction or elimination of hazardous wastes can pay off in reduced disposal costs. Additionally, under the Superfund law, what you threw away yesterday can come back to haunt you in the future.
- Make sure businesses (including County government) understand the consequences of not participating -- State fines (up to $10,000 a day) for not reaching 50 percent diversion impact everyone's taxes; new business and job creation opportunities are lost; and waste transfer and landfill costs will go up.

[27]Totals do not add to 100% due to rounding. *Source Reduction and Recycling Element (SRRE) for Unincorporated Los Angeles County*, County of Los Angeles, Department of Public Works, December 1991. See Appendix G.

J. PUBLIC POLICY INITIATIVES

The operative public policy that addresses solid waste management in Los Angeles County is the 1988 Action Plan, which, until superseded, has the force of law in the County. Much has changed in both Los Angeles County and in solid waste management in the last eight years. In fact, AB 939 requires that the County change its public policy to divert solid waste from landfills and document this change in an Integrated Solid Waste Management Plan. This plan has not been published, let alone adopted. In the past, the County has taken a leadership role in solid waste management -- it has provided abundant and cheap landfill capacity. It is time for the County to shift its public policy to the new reality, conservation and diversion, and supply the leadership for this new vision.

There are a number of public policy initiatives that the County could take to supply the leadership that 88 cities cannot supply. The programs that can be implemented to carry out these policies are discussed in the body of this report and its appendices.

Recommended County Actions:

- State that it is the County policy to provide the leadership in conservation of the County's resources and diversion of materials from landfills;
- Lead by example, set and achieve high diversion goals, (above 50 percent) for the unincorporated area and the County facilities;
- Establish variable rate direct billing with itemized cost elements for all generators in the unincorporated area;
- Establish an enterprise fund accounting system for all solid waste management in the County;

- Modify the tax structure in the County to provide incentives to divert materials and meet diversion goals and disincentives for not meeting goals;
- Minimize the landfilling of recyclable materials in County landfills by adoption of landfill bans;
- Declare a moratorium on the approval of new landfill sites in the County;
- Minimize the consumption of existing landfill space;
- Promote the development of facilities necessary to achieve additional diversion, such as composting facilities, MRFs, etc.;
- Establish enforcement that supports diversion;
- Establish requirements on private solid waste management firms that operate in the County to maximize diversion including mandatory recycling, variable rate billing, itemized cost element billing, reporting, etc.;
- Develop reporting and database system that support diversion;
- Develop information and technical assistance programs to support the cities and private industry in source reduction and diversion; and
- Work to establish organizational structures among the cities, Sanitation Districts and the County to coordinate and unify the reduction and diversion efforts.

APPENDIX A

APPENDIX A

PRODUCER RESPONSIBILITY OR TAKE IT ALL BACK

A. BACKGROUND

The basic principle of producer responsibility is that selling a product to someone else does not absolve the seller - manufacturer, wholesaler, or retailer - from the responsibility for the disposal of the product when its useful life is over. This concept has been discussed in Europe and the U. S. since the 1970's. The European Community (EC) began legislated enforcement of the concept with implementation in 1985 of the Liquid Food Containers Directive.

The German Packaging Ordinance was passed by the German Parliament in April 1991, about the time the EC started to work on a directive for all packaging. Two years later, France enacted the Eco-Emballages system and Austria enacted the Alsstoff Recycling Austria. The other EC countries adopted or are working on "take it all back" systems that are similar to the German system (e.g. Belgium), or differ widely (e.g. Britain). All of these systems have to meet the aims of the EC Packaging Directive that was adopted in 1995, i.e.:

- To reduce the overall impact of packaging on the environment; and
- To remove trade barriers and distortions of competition among EC members.

Over the next few years will see an effort to reconcile the national programs that are in place with the EC Packaging Directive. This will take considerable political energy. In the meantime, additional "take it all back" directives are being developed for batteries, electronic products and automobiles.

B. THE GERMAN SYSTEM

The German Packaging Ordinance has had a significant impact on that nation's packaging manufacturers; distributors, retailers, and consumer products industries. Industry has the

obligation to take back used packaging and ensure it is reused or recycled. This obligation applies to all packaging. The goal of the regulation is to reduce packaging waste by six to eight million metric tons annually, or 20 to 25 percent of the residential waste stream. Packaging currently accounts for half the volume and one-third the weight of Germany's residential waste stream.

The Ordinance is markedly different from the many North American attempts to control packaging in that it assigns the private sector the responsibility for reducing waste. The German Environment Ministry is adamant that suppliers of a product, not municipal governments, are obligated to take back product packaging.

The implementation of the Ordinance was divided into three phases; each phase focused on a different type of packaging.

The first phase of the Ordinance addressed transport packaging (mostly corrugated cardboard, but also barrels, canisters, cases, sacks, pallets, polystyrene, and shrink wrap) and went into effect December 1, 1991. It required that the 2.3 million metric tons of transport packaging used to deliver goods to retailers be returned for reuse or recycling.

The second phase addressed secondary or distribution packaging -- basically, packaging designed to get the product to the store and promotion packaging, including cartons, canisters, trays, and plastic bags -- and went into effect April 1, 1992. At that time, consumers were permitted to leave secondary packaging in stores.

The third, final, and most controversial and widely publicized phase addressed primary packaging -- i.e. the immediate covering for a product, such as bottles for wine, cans for coffee (sealed with plastic), cans, jars (for mayonnaise, mustard, caviar), aseptic boxes, blister packs, and tubes for tooth paste, etc. -- and went into effect January 1, 1993. Retailers were required to either provide facilities to take back waste packaging or to participate in a privately funded collection system that guarantees minimum recycling rates for specific packaging materials. If those rates were not achieved, the government threatened to impose deposits on a variety of

packaging types. Germans already buy 72 percent of their beverages in refillable glass and plastic containers that carry deposits of from 30 to 70 pfennings (US 18 to 42 cents). The packaging ordinance stipulates that the market share of refillable containers must not fall. By July 1, 1995, the Ordinance had been modified to require that 80 percent of each type of packaging material must be collected. Also, that least 80 percent of each material collected must be separately sorted for recycling.

Reluctant to become repositories for the country's discarded packaging, German retailers, along with 600 packaging firms, consumer products companies, and raw material suppliers, formed a company, Duales System Deutschland (DSD), that created a dual (hence, "Duales") system that was to be separate and distinct from existing municipal garbage collection services. DSD, a Bonn based enterprise, began initial implementation in July 1991, with pilot collection programs in selected regions -- including seven cities. By March, 1992, DSD had signed contracts in 138 regions of the country, serving 21 million people or 25 percent of the population. A goal was to serve 90 percent of German's 80 million people by 1993 was set and a nationwide system of drop-off facilities and collection programs for eligible packaging waste was established.

The DSD system was initially intended to completely replace municipal collection of packaging materials. That, however, led to accusations of DSD creating an illegal monopoly. Thus, its collection strategy was changed to encourage cooperative relationships between it and municipal haulers. Collection for the DSD is now provided by public or private haulers under a contractual agreement with DSD, with each community having a slightly different contractual arrangement, based on existing collection and recycling programs.

The basic DSD concept is to collect glass (sorted by color) and mixed paper at drop-off centers using "igloos." While igloos had been distributed in most regions of the country prior to DSD's existence, more containers since been strategically placed to serve about 500 residents per site. All other packaging materials are collected at curbside in yellow bins. It has been estimated that the implementation of this waste system will ultimately require about 200 sorting and processing facilities because of the increased volume of recyclable materials. The cost of

implementing the DSD system was originally estimated at 7 billion Marks (US $4.2 billion), with annual operating costs of 2 billion Marks (US $1.2 billion). DSD's operating costs for 1994 were about DM 3.3 billion, and costs in 1995 were forecast to be around DM 3.9 billion. Both are well above the original estimates. By 1995, the total network provided an estimated 18,000 jobs.

The DSD raises the revenue to pay for the facilities through the "green dot" system. Under this system, participating companies pay a licensing fee that varies according to the size and material of the package. With these licensing fees, the consumer products companies obtain the right to display the green dot on their packaging. Packages displaying the green dot are guaranteed a market by materials processors and, thus, effectively come with the warranty that they will be recycled. By April, 1992, DSD had sold 5,000 licenses to hundreds of domestic and foreign based companies. By 1995, this number had grown to more than 17,000. Because most of Germany's large retailers have threatened to provide shelf space only to those products carrying the green dot, DSD estimates that 80 percent of all packaging will have the symbol by the end of this year.

Companies using plastic and certain types of aluminum packaging must, prior to using the green dot, obtain additional take-back guarantees from trade associations. Because plastics are the most expensive material to collect and recycle, licensing fees for them are 25 percent higher than for other types of packaging and will soon increase by at least 50 percent. The average is two pfennings (a little more than a US penny) per container. Average consumer prices will rise by half a percent because the additional cost of this green dot licensing will be passed on to consumers. The DSD will thus cost an estimated $120 per household per year, and raise about $1.2 billion annually. Much of this DSD revenue will be spent on a multi-media campaign to educate consumers.

Consumer reaction has been positive to the option of being able to return packaging waste.

C. RESULTS OF GREEN DOT PROGRAM (DSD) TO DATE

The DSD program seems to be a success in terms of the German Packaging Ordinance's original goals. A recent study by a large German retailer concluded that secondary packaging in grocery stores has been reduced by up to 98 percent, or 51,000 metric tons annually. A random survey of 400 DSD members determined that 199 types of packaging materials (26 percent) had recently been entirely eliminated and that a quarter of all products they handle no longer come with any packaging. Of the 146 members that had formerly used plastic blister packs, only one still does. Polyvinyl chloride packaging, which had previously been used by 57 members, has been universally eliminated. Plastic foams also were abandoned after previously being used by 35 respondents. Paper and cardboard often are substituted for packaging that is difficult to recycle. A quarter of packaging materials used by respondents now contains recycled materials.

The DSD system, however, is very expensive and almost went bankrupt. The reasons for its financial difficulties are:

- The emphasis in on materials recovery with very high recycling targets - DSD has to insure that 64 % of the plastic packaging is recycled;
- Short implementation time - 18 months for the countrywide system;
- DSD is responsible for all collection and sorting costs and re-processors receive the material for free;
- DSD concluded unfavorable contracts due to the time constraints and, thus, its weak bargaining position; and
- Firms used the green dot label and did not pay or were late in paying their fees.

In the last year or so DSD has addressed these issues. Contracts have been renegotiated and controls on the use of the green dot tightened up. Also, starting in January 1996, re-processors have been paying the market price for materials.

The DSD system, with its green dot recycling guarantee, provides a financial incentive for industry to design packaging which is easily recyclable. However, it still has been widely criticized. Environmentalists and some politicians view it as an easy way out of more expensive requirements involving deposits and take back requirements for retailers. Other critics contend that the fees for the DSD system are not high enough to eliminate much of the throw-away packaging and that, despite the green dot, some materials, such as plastics, remain too difficult to recycle. Proponents of the DSD system counter that because packaging that is more difficult to recycle will incur higher processing costs, the system provides a built-in incentive for manufacturers to use materials which are easily recycled. They also assert that because the green dot licensing fee is based on the size of the package, it provides a reason for firms to use smaller packaging.

Additionally, DSD's educational campaign has been attacked for appearing to suggest that products bearing the green dot are environmentally friendly.

And, the rapid implementation of the DSD collection system has been blamed for putting large quantities of recovered materials on markets that were not capable of absorbing them. This has caused, it is claimed, the prices paid for these materials to drop and thereby jeopardize the entire recycling effort. While it is true that recovered materials prices have dropped in Europe and worldwide in the past year, it is highly unlikely that this is solely due to the DSD system implementation.

There is a perceived threat to the current prevalent system of returnable bottles, which is seen in Germany as one of the most effective ways to eliminate packaging waste. Such refillable containers would not be part of the DSD system and would not bear the green dot, and hence may be viewed as not being environmentally sound. To address the danger, the Ordinance stipulated that the market share of refillable containers must not drop below the current 72 percent for beer, water, soft drinks, juice and wine, or 17 percent for milk. If the market share goes below those levels, the exemption from mandatory deposits on all beverage containers will not apply. Many environmentalists are not satisfied with those quotas, contending that they preserve the status quo and do nothing to increase the use of returnable containers. Further,

because the returnable bottles favor local bottling and short transportation links, the EC may decide that this approaches a device to restrain trade. This could result in a major political battle.

APPENDIX B

APPENDIX B: DIVERSION ALTERNATIVES

In this Appendix, various technologies and management techniques for solid waste that have been applied in other U.S. communities are discussed. Frequently, examples of community experiences are provided along with a description of the approach to illustrate what practically can be accomplished (as opposed to theoretical diversion estimates). For some technologies, where sufficient operating experience across many facilities is available (such as waste-to-energy) specific examples are not needed.

A. SOURCE REDUCTION

Reduction at the source is the first of California's hierarchy of integrated waste management practices. Defined in AB 939 as "any action which causes a net reduction of solid waste" source reduction represents a proactive, front-end approach to waste diversion. In the SRRE* the County estimates that it will achieve a 4.3 percent diversion of the total waste stream by 2000 through source reduction. The Cities have similar goals. Section 18734.3 of the regulations lists a minimum source reduction alternatives in four categories:

1. Rate structure modifications;
2. Economic incentives;
3. Technical assistance and promotion; and
4. Regulatory programs.

Of these the County rated Rate Structure Modifications the most effective. Within each of the categories there are a number of specific programs that the County and the Cities could adopt and promote. The objective is to get the individual waste generators including the County and the Cities to reduce their waste generation. Seven strategies that waste generators should apply are:

1. Purchase products for recyclability and reduce the use of non-recyclable materials;
2. Reduce packaging and reduce the toxicity of packaging and products;
3. Increase the amount of recycled materials in packaging and products;
4. Replace disposable products with reusable products and products made with recycled materials;
5. Use materials and products more efficiently, i.e. print on both sides of paper;
6. Purchase products with longer useful lives, i.e. 60,000 mile tires, and products designed to be repairable; and
7. Reduce yard waste by on-site management, i.e. "grasscycling".

The key to source reduction is modifying individual behavior. Policies, programs, and incentives that support source reduction goals have been implemented in the communities that are most successful in diverting waste from landfills. These alternatives work synergistically with recycling programs to maximize diversion. This can be seen in the Seattle, Washington case study discussed in Appendix D.

The sections below focus on two types solid waste management approaches that can be used to increase diversion: collection techniques and processing technologies. The collection techniques discussed in Section A are applicable to diverting many types of materials, and bring them into the processing facilities. The processing facilities discussed in Section B can also be applied to different waste stream materials. In order to avoid "double counting" waste stream material diversion achievable by application of these processing technologies, specific materials are discussed separately under each technology heading. These technologies have been applied to divert the Los Angeles waste stream in Chapter VII.

B. COLLECTION

The techniques used to collect MSW have an impact on the diversion potential. Once recyclable materials are mixed in with materials that are potential contaminants, they are harder

to recover. For example, when food waste from a supermarket is placed in the same container as old corrugated containers (OCC), then collected in the same truck, the OCC is contaminated by the food and is less recyclable. The food-contaminated OCC is unacceptable as feedstock to a paperboard manufacturing plant, but could be composted to a lower-value humus product.

The general approach is to identify specific materials in the residential, commercial and industrial waste streams that contain recyclable materials or that should be collected separately to maximize recycling and diversion. Optimization of collection systems and routes has a large economic return for both the public and private sectors because collection generally consumes about two-thirds of every solid waste management dollar (see Appendix E).

Techniques that have potential to increase diversion and improve the quality of recovered materials include the following:

1. Intensive Residential Curbside Collection

This approach adds residential mixed paper (junk mail, OCC, boxboard, phone books, kraft bags, and magazines and catalogues) and textiles to the standard set out and collection. Separate set out and collection of yard waste, if not used, should be added. This alternative may be coupled with new collection techniques such as the split container and truck system used in Visalia, California; or the once per month collection of recyclables used in Seattle, Washington. Based on a survey of 19 California programs[1] the average household set out 189 pounds of mixed paper (excluding newspaper) in 1994. Based upon the addition of mixed paper to County-wide recycling collection to 2,989,552 households, the additional diversion at this rate would be an estimated 283,000 tons. Seattle, Washington averages over 100 pounds per family higher in residential mixed paper collection than the 19 California programs. If an intensive program such as Seattle's was implemented County-wide, an estimated 383,000 tons per year could be diverted. This is only 10 percent of the estimated total paper disposed of in the County in 1994.

[1] *Resource Recycling*, June 1995.

Table C-1. Recovered Paper Volumes from Selected Curbside Recycling Collection Programs
(Pounds per Household per Year)

Program	Households	Paper Fraction[1]	ONP	RMP	OMG	OTD	OCC	Total
Barrie, ON	27,000	59%	169	16[2]	[3]	[3]	44	229
California[4]	947,669	85%	241	151	[5]	[5]	38	430
Evansville, IN	42,000	81%	143	46	[5]	[5]	[6]	189
Goldsboro, NC	11,000	65%	[3]	[3]	[3]	[3]	[3]	251
Green Bay, WI	31,300	75%	[3]	[3]	[3]	[3]	[3]	327
London, ON	83,000	70%	271	6[2]	[3]	[3]	15	292
Portland, OR	125,500	81%	321	73	28	[5]	54	476
Seattle, WA (North)	69,538	74%	335	214	[5]	6	77	632
Seattle, WA (South)	66,640	76%	274	198	[5]	5	82	559
Vancouver, WA	15,524	82%	258	250	4	[5]	37	549

ONP – newspaper
RMP – residential mixed pper
OMG – magazines
OTD – telephone directories
OCC – corrugated cardboard

[1]Of total volume of recyclables collected by curbside recycling collection programs.
[2]Includes only OCC; household fine paper is collected with ONP.
[3]Collected with ONP, shown in Total Column.
[4]Summary of 19 programs that range in size from 10,000 to 275,000 households.
[5]Processed with residential mixed paper.
[6]Small pieces of OCC accepted with RMP; large OCC is not accepted.

Source: *Resource Recycling*, June 1995.

Table C-1 shows mixed paper recovery from programs in 12 cities. The mixed paper is broken into its components: (1) newspaper - ONP, (2) residential mixed paper - OMP, (3) magazines - OMG, (4) telephone directories - OTD, and (5) old corrugated containers - OCC. The cities vary in size and results; however, all show a significant increase in paper recovery over newspaper alone. In 1994, Ecodata, Inc. conducted a survey of 60 randomly selected cities with curbside programs.[2] The diversion rate for the curbside programs averaged 13.4 percent, with a range of 3 percent to 34 percent. Eight cities were identified as high achievers with 20 percent or more diversion: Daytona Beach, Florida; Elmhurst, Illinois; Hoffman Estates, Illinois; North Las Vegas, Nevada; Paramus, New Jersey; Port Huron, Michigan; Stamford, Connecticut; and Valley Stream, New York. Five of the eight cities collect mixed paper at the curbside.

A number of communities have added textiles to their curbside collection programs. These include: Bloomfield, Connecticut; Windsor, Connecticut; and Ann Arbor, Michigan. In October 1994, St. Paul, Minnesota expanded an existing pilot program that collects textiles and reusable items to a city-wide service. These materials have accounted for 1.8 percent of St. Paul's curbside collection.[3]

2. Wet-Dry Collection

Wet/dry collection originated in Europe. The system has the waste generator separate waste into either two or three categories and use two or three bins. The two-bin system is a wet/dry separation. The two streams are collected separately and are processed by different systems. Dry materials are processed at a materials recovery facility (MRF) and the wet fraction is composted. The three-bin system adds a residue bin that is collected separately for disposal. Wet/dry collection has application in both residential and commercial sectors. Applied to the residential sector, recovery well above the 50 percent level has been demonstrated. Santa

[2] *Resource Recycling*, October 1995.

[3] *Resource Recycling*, April 1995.

Barbara County[4] conducted a pilot program with several different collection schemes; both two-bin and three-bin systems. The diversion rates ranged between 57 and 73 percent, with an average of 65 percent. The project recognized that high rainfall had increased yard waste; adjusting for this factor, the average diversion in the Santa Barbara pilot program was 58 percent. A number of communities in Canada and the United States have implemented full-scale wet/dry programs. These include: the City of Guelph and the City of St. Thomas, Ontario; Mackinac Island, Michigan; and East Hampton, New York.

Other communities are separating selected organic waste fractions for collection and processing. These programs target food waste from restaurants, supermarkets and food processing companies for composting. Some programs also include soiled paper, paper mill sludge and other organic materials in the composting mix. Commercial collection of food waste from restaurants, supermarkets and other food service establishments that are collected on a single route could be delivered to a composting facility. The non-food waste from other commercial establishments such as offices then would be free of food contamination and more easily recovered. For example, waste from some office buildings contains 90 percent paper. Without the addition of other materials during collection, waste paper from offices is highly recoverable. There are many examples of high level commercial/industrial waste diversion, ranging from 60 to 90 percent. These include major U.S. and California firms, such as AT&T, IBM, Fetzer Vineyards and Transamerica Corporation.

Separate collection of food waste is a rapidly expanding technique. Programs have been implemented in Freehold, New Jersey; Calgary, Alberta; Jasper National Park, Alberta; and Burlington, Vermont. A number of food market chains are interested in the approach and have initiated programs including Shop-Rite in five states, Safeway in Ontario, and Stew Leonard's in Connecticut. In California, Vons has implemented a program with Community Recycling and Resource Recovery, Inc. This program manages food waste from all 325 Vons stores. The food waste collected in this program is composted at CRRRI's facility in Lamont, California.

[4] *The Santa Barbara County Pilot Waste Collection Project*, Final Report, April 1994.

3. Construction Waste

During construction projects, the general contractor usually provides a roll-off box that is used for waste from all subcontractors on the site. The materials in the roll-off are mixed as a result. If subcontractors had to remove their own waste, or if the general contractor provided separate containers, then lumber from the carpenters, gypsum from the drywall contractor, asphalt shingles from the roofer, and other specialized materials from individual trades would be separately collected and would be recyclable. This is currently being done by Cornerstone Material Recovery, a private firm in the Chicago, Illinois metropolitan area and is expanding to other cities in the United States.[5]

4. Comprehensive Drop-off Centers

To augment other collection alternatives, a system of centers designed to accept all types of waste and recyclable materials will divert additional material. Some of these drop-off facilities accept reusable items such as building materials and furniture, household hazardous waste (e.g., paint, batteries, household cleaners), used oil, auto parts, appliances, yard waste and refuse. Urban Ore in Berkeley, California is an example of a usable material drop-off; it has been operating since the early 1970s. Champion Paper, Inc. has established a system of 1,000 drop-off centers in Houston, Texas. Champion operates these centers under a 20-year contract to collect paper for their Houston plant.

At a drop-off facility, reusable and recyclable items could be accepted at no charge, while refuse requiring disposal could carry a small charge. Fairfax County, Virginia operates a large multi-material drop-off adjacent to its transfer station. The Fairfax facility accepts all the regular recyclable materials, yard waste, white goods, used oil, and wood; all of which are recycled. In addition, conveyors are provided to accept bagged waste and a conveyor transfer system for bulky non-recyclable materials. The facility is staffed to assess fees for larger loads from residents and small commercial operators.

[5] *Biocycle* Magazine, Pages 62-63, August 1992.

C. PROCESSING FOR DIVERSION

1. Materials Recovery Facilities (MRFs)

Material recovery facilities (MRFs) are designed and built to process a variety of solid waste streams. These include: (1) source separated materials from curbside collection or drop-offs, (2) commercial waste with high levels of recyclable materials such as office paper, (3) the dry stream from a wet/dry collection, (4) selected construction and/or demolition (C&D) waste, and (5) mixed municipal solid waste. The source-separated materials facilities are most commonly known as MRFs, commercial mixed waste facilities are often referred to as "dusty MRFs," and C&D or mixed MSW facilities are called "dirty MRFs."

The objective of all MRFs is to recover materials from the waste stream by separating them into marketable commodities. For example, glass is separated from other containers and contaminants, then sorted by color (amber, green and clear). The product is a clean, color-sorted glass that meets the glass manufacturing industry's specifications for glass cullet used to manufacture new glass products. The processes used by a MRF to accomplish these separations can be low-tech (relying primarily on hand-sorting) or high-tech (utilizing mechanical equipment as well as hand-sorting as needed). The materials processed and marketed by MRFs depend on the MRF feedstock.

Source-separated materials MRFs generally include all types of containers (glass, aluminum, steel and plastics); plus various types and grades of paper including newsprint, office paper, mixed paper, corrugated cardboard, etc. In the source-separated MRF, usually only PET and HDPE plastic containers are sorted, although other resins may be recovered. Technology now exists to mechanically separate plastic containers by resin and color; the identification of these are made using a variety of sensors employing x-ray, infra-red and other electromagnetic spectra. The prototype of this machinery is installed in Salem, Oregon and operates at 1,250 pounds per hour. Development of the prototype resulted from Oregon's legislation requiring that all rigid containers be refilled, be recycled or contain recycled material. This is an example of policy driving technology development and implementation.

A national survey of MRFs completed at the end of 1995 identifies and describes 386 facilities, 90 percent of which were in operation or under construction at the time of the survey.[6] No transfer stations with "dump and pick" operations are included in the current MRF list, an indication of the maturity of the MRF technology.

MRFs have the potential to process and market a significant portion of the solid waste stream in Los Angeles County. Even though there are an estimated 200 facilities which do some processing presently operating in Los Angeles County, additional facilities will be needed. MRF processing is an integral part of the strategy recommended for Los Angeles County to implement a diversion-oriented policy that achieves or exceeds the 50 percent goal. The diversion projections discussed in Chapter VII are predicated on the following assumptions:

- Intensive residential curbside collection is instituted County-wide
- Curbside collection is provided to single-family households in the County except those rural areas where population densities do not warrant it;
- Curbside collection is supplemented by a system of comprehensive drop-off facilities, particularly in rural areas not served by curbside collection, and multi-family dwellings;
- Private haulers are mandated to provide recyclable material collection to their contract accounts (businesses, industries, institutions);
- High participation rates for all forms of diversion collection are achieved by high levels of public information and enforcement of mandatory requirements;
- Materials processed by MRFs include: glass, steel and aluminum food and beverage containers; HDPE and PET plastic containers; all clean paper (newsprint, magazines, corrugated cardboard, mixed paper); and textiles;
- Potential contaminants such as food waste are collected and processed separately from commercial/industrial waste;
- MRF residue (non-processible material sent for disposal after processing) is 15 percent; and
- Commercial/industrial wastes are processed in a MRF prior to disposal.

[6] *The Materials Recycling and Processing Industry in the United States*, Eileen Brettler Berenyi, Governmental Advisory Associates, Inc., 1995.

2. Composting Facilities

Composting is defined as the bacterial decomposition of organic materials. All of the composting technologies commercially available today rely on aerobic decomposition (that is, utilizing bacteria that live in the presence of oxygen). Anaerobic digestion of waste stream materials (composting that utilizes organisms existing in an oxygen-free environment) is still in development and is not considered further in this report. Composting reduces the quantity of incoming organic material by about 50 percent by weight, through the loss of moisture and production of carbon dioxide during the decomposition process. When non-digestable materials such as metals, plastics and glass are present in the feedstock, a residue will result. The quantity of residue depends on the quantity of non-compostable material in the feedstock.

During the composting process, high temperatures generated by bacterial activity serve to kill pathogens as well as most seeds and spores. Processing can be relatively low-tech, such as windrow piles that are turned occasionally to maintain proper moisture and temperature for bacterial activity, to high-tech, totally enclosed and mechanized reactors that have been applied to a variety of waste feedstocks. All of the technologies discussed below are focused on processing quantities diverted from the waste stream, as opposed to home composting approaches. Home composting can divert residential yard and food wastes (except meat and dairy wastes). Composting, by its nature, produces odors which must be controlled.

Markets for compost derived from components of the MSW stream are still developing. Composting is used to convert organic material into a usable soil amendment. Compost can be used as mulch, or can amend clay or sandy soils to improve moisture retention and friability. The market for this material is the same as the market for peat moss, including farmers, home gardeners, landscapers, nurseries, potting soil manufacturers, etc. The industries and farms that can utilize these materials in significant amounts are tentative about risking their livelihood on a relatively unfamiliar product. Considerable education efforts, demonstration programs, and scientific studies are still needed to open these markets to the very large amount of materials composting is expected to divert from the waste stream.

a. Yard Waste

Yard waste materials are the most common compost feedstock. All yard waste materials (also called "green waste") must be diverted from disposal in California. Many of the Cities in Los Angeles County collect yard waste separately. In the City of Los Angeles, yard trimmings from the curbside collection program are used by San Joaquin Composting (SJC) as bulking agents for composting the City's biosolids (see below) at SJC's facility in Lost Hills, California. This City program is known as Full Cycle Recycle (FCR). FCR presently diverts all biosolids generated by the City of Los Angeles, and all yard trimmings collected at curbside. As of the beginning of 1995, about 250 tons per day were delivered to SJC, and the remaining material was either composted elsewhere or used as mulch. As the curbside collection program continues to expand, all future yard trimmings collections will be incorporated into the FCR program, thus diverting all residential yard waste generated in the City from disposal. The FCR plan calls for the creation of local facilities that will play a major role by serving as yard trimming drop-off and transfer to SJC sites, and, after processing, centers for bagging and distributing the product, "TOPGRO." TOPGRO is presently bagged at the Lost Hills facility and marketed by an SJC subsidiary, Organix Supply, Inc. TOPGRO is sold by local outlets, such as Fedco membership department stores and Armstrongs' -- The Home and Garden Place. The compost is also used by City agencies in maintaining City-owned parks, gardens, and golf courses, and for facility landscaping.[7]

The green waste fraction of yard wastes (i.e., leaves, grass clippings, weeds, small prunings) can be composted alone or in conjunction with other waste materials, such as biosolids, food wastes, contaminated paper that otherwise cannot be recovered (such as disposable diapers), and similar organic fractions of the waste stream. An estimated 100 compost facilities were in operation in California as of May 1995.

Yard waste is also diverted from disposal through source reduction approaches, specifically, the "don't bag it" method of leaving grass clippings on the lawn to provide nutrients

[7] "Co-Composting in Los Angeles Optimizes Resource Management," *BioCycle*, December 1994.

and reduce waste, and home composting. In Alameda County, California's Master Composter program has trained 39 Master Composters, who, in turn, have trained over 5,000 home composters in the County. In 1993, 6,600 home compost bins were sold by the County program to homeowners. A follow-up survey showed 94 percent of the recipients regularly used their bins. Previous survey work in Alameda County demonstrated that each home compost bin diverts approximately 600 pounds of compostables each year. Based on the participation rates, the County estimates that the 1993 bins divert 1,800 tons from the County waste stream. San Diego County has established a Master Composter demonstration center at Quail Botanical Gardens. The Master Composters trained at the Center commit to 40 hours for teaching the knowledge and skills they have gained to others.[8]

In addition to use as a bulking agent for composting, woody waste (i.e., tree limbs, branches, brush) can be chipped and used as mulch or wood fuel (as discussed above). The Public Utilities Commission's deregulation of the electric utility industry caused a number of wood-waste-to-energy plants to close in California; as a result, the fuel market for wood chips is limited at the moment. Because of a medfly quarantine in Southern California, all yard trimmings have to be processed within the quarantined area before they can be transported elsewhere. Chipping and composting interfere with medfly reproduction.

Yard wastes lend themselves to low-tech composting operations, because the low nitrogen content means relatively low potential for odors during the composting process. Some materials, such as grass clippings, are high-nitrogen and must be handled more carefully to manage odor. Larger facilities may roof over the composting area, the pads may be paved, and some facilities enclose the initial composting area to avoid operational problems, such as excessive moisture from precipitation, over-drying from winds, or materials blowing off-site. Each "improvement" to the system adds to the overall cost.

In January 1995, the California Integrated Waste Management Board (IWMB) issued a ruling that shredded yard waste could be used as alternative daily cover on landfills and that this

[8] "Mastering the Way to Home Composting," *BioCycle*, January 1994.

use would count toward achievement of the 50 percent diversion goal. This reduces the incentives to develop markets for compost and mulch and consumes landfill capacity. The Natural Resources Defense Council (NRDC) initiated a lawsuit against the IWMB. The NRDC contended that this practice is not recycling or diversion, but landfilling. In February 1996, the Sacramento County Superior Court ruled against the IWMB. IWMB has appealed.

California Futures/Global Futures estimates that less than two percent of the potential agricultural demand of 10.6 million tons of compost per year is utilized.[9] Policies in the State and County should provide incentives to meet this potential demand.

b. Food Waste

Composting of food wastes is more problematic than yard waste, because of the potential for generating odors and attracting birds, rodents, and insects. Consequently, food waste composting is generally carried out in enclosed vessels (in-vessel or static-pile systems) during the first stages of decomposition. The later stages of decomposition can be carried out in windrow-type operations that are used for yard wastes. As discussed previously, a number of food waste composting project are operating in the U.S. These include school programs in New Hampshire, Freehold, NJ, Calgary Alberta, Minneapolis-St. Paul, MN, and the Von grocery stores project in Southern California.

It should be noted that food waste is collected, cooked, and used as hog and other animal feed in some parts of the country. In Florida, Walt Disney World has been sending five tons per day of food waste to Kenny Camp Farms since 19092. Two companies are actively marketing processing equipment to make feed pellets from food waste. However, markets are not readily available in Los Angeles County.

The product resulting from food waste composting is higher in valuable nutrients than yard waste compost. The product can be utilized as a fertilizer in addition to its soil amendment

[9]California Futures/Global Futures, *Agricultural Markets for Compost and Mulch: Costs, Benefits and Policy Recommendations*, December 1993.

properties. Because of the higher nutrient content, food waste compost has a higher market value.

c. Biosolids

Biosolids are also referred to as sewage sludge; this material is the solids portion resulting from wastewater treatment. Properly conducted composting processes reduce the pathogen contents to safe levels. The U.S. EPA has published regulations concerning composting (and landspreading) of biosolids (Clean Water Act, Part 503). The Part 503 requirements specify both the process parameters (time, temperature, moisture, etc.) and application limits depending on the product quality.

Because of the high moisture content of the biosolids entering the compost process (usually biosolids have been dewatered but are still 50 to 80 percent water) and the potential for odors, biosolids composting is initially conducted in enclosed vessels. The nearly-completed compost can mature in windrow piles.

Biosolids compost is, if made from uncontaminated feedstocks, a high quality soil amendment and, if properly marketed, will sell easily. In 1994 there were 201 operating biosolids composting facilities in the U.S. and another 117 under development.[10] Of the total 318, a number of commercial biosolids compost products are successfully marketed, including Philadelphia's EarthGro and the Maryland Environment Service's COMPRO, which sells in bulk to developers for $17 per ton and is bagged for consumer sales.

The City of Los Angeles' Full Cycle Recycle program provides feedstock to the TOPGRO manufacturer, as discussed earlier. In addition, Wheelabrator (Biogro) has proposed a facility with capacity for 500 TPD biosolids and 1,000 TPD other organics. This facility is planned for the Antelope Valley.

[10] 1994 Biocycle Biosolids Survey, *BioCycle*, December 1994.

d. Combination Feedstocks (including manure)

One example of a combined feedstock approach is being implemented at the Zoo in Griffith Park. The Griffith Park Composting Project, undertaken by the City of Los Angeles Biosolids Management Division with the Departments of Public Works and Recreation and Parks, will compost Zoo manure with biosolids and green trimmings from the park. If the current demonstration project is successful, a permanent facility will be built. The compost will be sold as a specialty product under the TOPGRO label.[11]

Combining feedstocks requires the compost processor to tailor the facility design, operations and equipment to the needs of the more problematic materials, such as manure. Enclosed buildings, compost vessels, and process air cleaning equipment (to reduce odor emissions) are all needed to reduce environmental impacts of these facilities. Combining feedstocks, however, allows the operator to "design" the end product to meet the specifications of a particular market, including balancing nutrient content, moisture, degree of stabilization, and particle size.

e. Mixed MSW

There were 17 mixed MSW composting facilities operating in the U.S. as of January 1995.[12] However, mixed waste composting is still in the development stage. Most facilities operate at a small scale in order to allow strict control of the waste entering the system. The largest facility in that list that is still operating is the Bedminster BioConversion system in Sevier County, TN. This plant started operation in 1992 and will process 200 TPD when the current expansion is complete. The systems used are high-tech, and in most approaches, the waste must be pre-processed to remove potential contaminants (glass, plastics and other inerts, and items with toxic components such as batteries) so that the resultant compost is low in chemical contaminants.

[11] Reba Fabrikant and Ray Kearney, "CoComposting in Los Angeles Optimizes Resource Management," *Biocycle*, December 1994.

[12] *Municipal Solid Waste Composting: A Status Report*, prepared by GBB for the Solid Waste Association of North America (SWANA), April 1995.

The markets for compost made from mixed MSW have so far been limited. The mixed waste composting process can result in a product that meets the EPA's Part 503 standards for biosolids compost; however, of the 17 operating facilities only one is successfully doing so. Both product quality and market development is needed. It should be noted that the Sevier County, Tennessee facility, which accepts 150 TPD of solid waste and some biosolids, has been successfully marketing its product to agricultural and horticultural users since 1992.

The amount of materials that can be diverted by composting programs differs by feedstocks. Assumptions used in calculating composting diversion are:

- The County bans disposal of all green waste, resulting in 95 percent of this material diverted from disposal. Most will be composted; woody waste will be chipped and used as mulch or as a bulking agent for biosolids composting.
- Food waste is not readily separated and collected from residences, because the material must be collected daily to avoid odor problems. Therefore, the target group for food waste composting would be large producers, such as canneries or other food processors, restaurants, and institutions. The target group is part of the commercial waste stream, where food waste is approximately 13 percent of the waste. Eighty percent of this is projected to be separately collected and composted.
- No biosolids should be landfilled in LA County. The current composting efforts should be expanded to provide capacity for all biosolids produced by wastewater treatment plants. Composting can be supplemented by landspreading programs in some areas of the County.
- Special projects are developed for unique feedstocks (such as LA City's Zoo manure project). These waste streams are too small to impact diversion rates County-wide.
- Mixed MSW composting projects are envisioned as part of Level 3, as discussed in Chapter VII, for residential waste not collected separately.
- Compost markets need to be developed to accommodate the feedstocks listed above before any further compost products could be considered.

4. Construction And Demolition Waste Facilities

With construction and demolition (C&D) materials amounting to as much as 30 percent of municipal solid waste, diversion through C&D recovery operations conserves large amounts of landfill space and adds years of useful life to landfill facilities. The City of Los Angeles calculates that nearly 15 percent of the solid waste stream is construction and demolition (C&D) materials. In some Southern California jurisdictions, C&D materials represent almost half of the total waste stream.[13] C&D materials generation is dependent on economic activity in the construction and building fields. Also, natural disasters can significantly increase the amount of C&D material in the waste stream.

The three basic categories of recoverable materials within C&D are inert materials, shredded wood products, and ferrous metal. Recovered inert materials, such as asphalt, concrete, dirt, rock and brick, are used for land reclamation, landfill final cover, fill for roads and airports, embankments, road base and subbase, aggregate for filter layers in landfills, French drains and bridge abutments, and asphaltic concrete. Uses for shredded wood include landfill cover, boiler fuel, animal bedding, composting bulking medium, pulp mill feedstock, and raw material for particle board. Recovered ferrous metals are used in remanufactured steel.

There are two basic types of facilities that process C&D materials. The first type accepts only clean loads of a single material such as concrete, asphalt, or wood. Processing usually includes size reduction with a hammermill or shredder, followed by sizing through a trommel screen or vibrating deck screen. Some manual sorting may be required to ensure the highest possible quality in the end product.

The second type of facility processes mixed C&D material. The material is brought to a tipping area, usually in a dump truck or roll-off box. Large pieces of materials, such as concrete, wood and metal, are pulled from the pile for processing. The remaining materials are fed into a mechanical processing system.

[13] *Business Recycling and Waste Reduction Guide*, The County of San Bernardino Solid Waste Management Department and The Cities of San Bernardino County.

The steps and equipment involved in mechanical separation and size reduction of C&D waste are generally very similar. Because many systems contain mobile equipment, the configuration of the machinery may be revised as characteristics of the feed and products change. Processing systems typically use trommel, disc or vibrating flat-bed screens to separate rock and soil. Density separation (e.g., pneumatic or hydraulic sink/float operations) is then used to divert wood scrap from heavier fractions. After wood scrap is size reduced though a hammermill or grinder, the material is often subjected to magnetic separation to remove the metal fraction.

Depending on the incoming waste stream, C&D processing facilities can range in size from under 50 tons per day to well over 2,500 tons per day. Cyclean, Inc., an asphalt recovery plant in Los Angeles, has kept over a million tons of asphalt out of the landfill in the last seven years and has saved the City $10 million.[14] Cyclean uses a microwave technology to make hot mix from 100 percent recycled asphalt. In addition to old pavement, crumb rubber from old tires can easily be incorporated into the Cyclean asphalt. The Cyclean product is sold at a discounted rate to the City of Los Angeles.

Pallets and dimension lumber are also reusable. A survey completed by *Pallet Profile Weekly* in December 1993 revealed that 70 percent of all pallets received for recycling are repaired for resale. Only one percent of the pallets are disposed in landfills.[15] The remainder of the pallets are dismantled for repair supplies, or ground into chips for use as boiler fuel, mulch, animal bedding, or particle board furnish. Guadalupe Landfill, in San Jose, California, has taken an innovative approach to managing the high percentage of redwood materials it receives from demolition projects. New World Furniture, an affiliated company, separates and reprocesses the redwood material, then an on-site carpenter re-works the wood to create home and garden items. The company grinds the unsuitable material to a 2-inch minus size, and markets this redwood mulch through Valley's Pride Organics, a Guadalupe Landfill division. In Portland, Oregon, the number of wood processing facilities jumped from three to eleven in

[14] "Paving with Recycled Asphalt," *BioCycle*, September 1994.

[15] Roger Guttentag, "Making Recovery Pallet-able," *Resource Recycling*, November 1994.

1990. Currently, recycling facilities in the area handle 100,000 tons of wood each year.[16] Most of these facilities are now charging nothing for clean, source-separated wood and are selling it for $20.00 to $45.00 per ton.

The diversion potential of C&D recovery operations were well demonstrated in the 94.5 percent recovery rate experienced by the City of Los Angeles and the Los Angeles Sanitation Districts after the Northridge earthquake. Within a month of issuing a contract, a C&D waste processing line was in place at the landfill. From October 1994 through March 1995, the program diverted over 47,437 tons of dirt and 41,873 tons of concrete from landfill disposal.[17]

Based on the above discussion, and the fact that there is ample inert landfill capacity for non-processible C&D wastes, 100 percent of C&D materials should be diverted from disposal in Class III landfills.

5. White Goods

White goods are large appliances such as dishwashers, refrigerators, etc. These materials contain high-quality steel and are recyclable through existing scrap industries. In 1994, the CIWMB database calculation indicates a total of 36,206 tons of white goods were landfilled from MSW generated in the County. This tonnage should be diverted from disposal in the future, either through separate bulk waste collection programs or separated at the transfer station/landfill.

6. Tire Recycling

As material recovery technologies continue to develop, many successful methods of recycling used tires have emerged. In addition to being retreaded for resale, old tires have been successfully diverted from landfill disposal through use as fuel, playground and athletic

[16] Randy Woods, "C&D Debris: Construction & Dismantling?," *Waste Age*, April 1994.

[17] Janet E. Coke, "Recycling Program Diverts Debris from Earthquake Cleanup," *Public Works*, June 1995.

field subbase, reroofing supplement, material for irrigation channels and other civil engineering applications, road subbase, plastics filler, composting supplement to prevent excessive compaction, and as an additive in modified asphalt. One recent estimate predicts that by the end of 1998, market demand for used tires will exceed the amount generated annually.[18]

Because tires have a high Btu value, they can be processed into Tire Derived Fuel and burned with other solid fuels, or they can be fed whole into cement kilns where they serve as fuel and as a source of constituents needed in the manufacture of cement. A report by the CIWMB notes that the consumption potential of burning shredded tires -- only in cement kilns located in California -- is nearly 25 million tires per year, which exceeds the estimated 21 million waste tires generated annually in California.[19]

Processing tires into crumb rubber for use in asphalt and other applications has significant potential. In particular, there is a huge, multi-billion dollar market for this material as a plastics filler. Overseas markets for tire chips for processing into crumb rubber for new tires is growing as well. BAS Recycling built a crumb rubber plant in San Bernardino, California, that has processed over 1.5 million tires to date.[20] BAS received a $100,000 grant from the CIWMB to transform recycled rubber into playground matting. Shredded tires also have been utilized in construction of drainage systems, retaining walls and other civil works, including landfill construction.[21]

Recovery of tires from the solid waste stream is primarily already handled by companies that market new tires at retail or wholesale, by managers of large fleets, and through such local government programs as bulk waste collection and cleanups. Problem tires are those resulting from illegal dumping or those that get buried in with the regular waste (in roll-offs, for

[18] David Riggle, "Finding Markets for Scrap Tires," *BioCycle*, March 1994.

[19] *Tires as a Fuel Supplement: Feasibility Study*, California Integrated Waste Management Board, January 1992.

[20] *Resource Recovery Report*, July 1995.

[21] *Resource Recycling*, October 1995 and *World Wastes*, September 1995.

example). Because the markets are so promising, the County should work with a manufacturer/exporter(s) to develop facilities and a bounty system to attract tires to market and away from disposal. It is assumed that, coupled with the existing systems, new tire programs, while desirable and effective, will not divert sufficient materials to affect the overall waste diversion rate for LA County.

APPENDIX C

APPENDIX C: LANDFILL CAPACITY CONSERVATION TECHNOLOGIES

Conservation of landfill capacity is a rapidly developing field. Getting the most use out of existing, permitted landfill airspace is particularly urgent in those areas where population densities make siting new landfills difficult, such as the East Coast of the United States, or where the geology is unfavorable (e.g., Florida). Consequently, most of the experience in applying techniques to conserve landfill capacity is from these parts of the country. However, it should be noted that experience with landfill conservation has also been gained by private landfill operators interested in obtaining the maximum amount of tipping fees for their permitted capacity. They, too, are obviously better off placing waste in their airspace rather than cover dirt.

Some techniques are available commercially and others are in development that conserve landfill space and thereby reduce the need for siting new landfills. The first three approaches described below are various Alternative Daily Cover (ADC) technologies that reduce the amount of airspace normally filled with dirt. The remainder are operational changes that follow placement of more waste in the available space. A CIWMB-funded study released in May 1995 noted the value of utilizing these techniques. Some of these techniques can be combined to increase savings (e.g., ADC with baling).

Secondary compaction in large landfills is also a conservation factor. Secondary compaction will occur as lifts of waste are layered upon each other. Fresh Kills Landfill, that has served New York City since 1948, is billed as the world's largest landfill. It covers 2,800 acres and presently accepts 13,000 tons per day. In some areas, the waste is piled 20 stories high.[1] Fresh Kills Landfill reports an in-place density of 1,800 pounds per cubic yard after settlement.[2]

[1] "Environmental Quality Shows Gains and Declines Since 1970, a Report Finds," *New York Times*, December 5, 1995

[2] Anne Magnuson, "The Economics of Landfill Compaction," *MSW Management*, November/December 1992.

1. Alternative Daily Cover (ADC)

The functions of daily cover are to: prevent windblown debris, reduce the amount of precipitation seeping into the filled area, suppress odors from decomposing fill, and deter scavengers (birds, rodents, and insects). Most landfills stockpile and use soil excavated during construction of landfill cells as a source of daily cover; however, this material is often not sufficient for the life of the landfill cell. Consequently, dirt must be purchased and trucked to the landfill site at considerable expense. In areas where suitable soil is scarce or landfill space is particularly precious, public and private landfill owners and operators have used ADCs since the late 1980s. ADCs include chemical or foam covers, tarps (also referred to a geosynthetic blankets), and other ADCs that make use of selected components of the waste stream itself for cover material.

Using the conventional daily cover of six inches of dirt consumes about 26 percent of a landfill's capacity.[3] In the case of the currently operating landfills in the County, this accounts for 16,949 cubic yards of wasted landfill airspace daily,[4] based on the Draft *Solid Waste Quarterly Disposal Quantity Reporting Summary* prepared by the Los Angeles Department of Public Works for the first quarter of 1995. In-place compacted density of cover soil is roughly 2000 pounds per cubic yard, so the cover materials represent roughly 10,000 tons per day of MSW capacity. This approach may over-calculate cover soil airspace requirements slightly, because of the higher-than-average compaction resulting from the weight of overlying layers of waste in extremely deep canyon landfills.

2. Chemical Or Foam Cover

The cost of foam can be a deterrent, particularly for small landfills. An expanding market, plus vendor competition, is helping to reduce the cost of foam. The City of Glendale, Arizona arranged for their vendor to retain ownership of the application equipment

[3] Darlene Snow, "Alternative Daily Cover Material," *MSW Management*, September/October 1994.

[4] Assumes 38,461 TPD disposed daily at 1,180 pounds per cubic yard.

as well as supplying the product. This strategy means the landfill owner does not have to pay the equipment capital cost up front, and competitive bidding is facilitated because the landfill is not locked in to using only a foam product compatible with purchased equipment. Additionally, foam application is less labor- and time-consuming than using dirt, thus lowering costs. Logan Miller, the Delaware Authority's Facilities Engineer, says, "About 20 minutes before we close, they will go over half the working face with the compactors and dozers and smooth it...Approximately half the working face will be foamed prior to closing...As soon as you're done you turn off the foam supply, and approximately 10 seconds later you turn off the air supply. What happens is that in 10 seconds air is blowing through all the lines, blowing the foam. You shut it down and you go home."[5]

The following foam-type materials have been identified:

- AC-645 Long Duration Foam, manufactured and marketed by Rusmar, Inc., West Chester, Pennsylvania;
- ConCover 180, by New Waste Concepts, Perrysburg, Ohio;
- SaniFoam SDC (synthetic daily cover), by CoverFoam Services, Inc., Florence, SC; and
- TerraFoam ADC and Pneumax Compressed Air Foam Systems, by Chubb Environmental Security, Exton, Pennsylvania.

AC-645

AC-645 is a single component foam composed of non-hazardous and non-toxic anionic surfactants and polymers. The product is supplied in concentrated form, in bulk or 55-gallon fiber drums, and is diluted with water prior to application. Foam is generated using a pneumatic foam unit (PFU). The foam is biodegradable, odorless, and non-reactive, can withstand light to moderate rainfall, presents no fire or explosion hazard, and can be colored to provide low visibility.

[5] Lynn Merrill, "ADC Gets the Dirt Out!" *MSW Management*, September/October 1995.

The viscous foam, which has a consistency of shaving cream, can be applied manually to the working face of small landfills, such as NPLF, with a completely self-contained and portable hand-line foam generating unit. The 800 gallon solution tank of the model 800/40 PFU requires three drums of concentrated AC-645 per filling. The concentrate has no shelf-life restriction and the mixture can be applied in winds under 50 mph, hot or sub-freezing temperatures, although storage should be at non-freezing temperatures. Since the foam product is single component and requires no mixing, there is no need to clean clogged nozzles, hoses and other components.

AC-645 can maintain properties for 36 hours after application. The foam does not harden or dry out, although it will freeze when applied in subfreezing temperatures, and is not intended for vehicular or human traffic after application. However, the foam will not deteriorate overnight, and traffic can operate on the foam the next morning when additional solid waste is disposed. At that time, the additional solid waste will compress the foam without reduction of airspace.

Use of AC-645 foam improves leachate management at landfills, due to reduction of isolated cell formation, and minimizes the potential for perched zone seeps. In addition, infiltration of precipitation is minimized and run-off is promoted if the foam is applied in a thick continuous layer.

Rusmar, Inc., foam products have been used as daily cover at other landfills. AC-645 has been permitted for use at the Lycoming County Landfill, Montgomery, Pennsylvania; Grand Central Sanitation, Inc. Penn Argyl, Pennsylvania; Wayne Township Landfill, McElkattan, Pennsylvania; Delaware Central Solid Waste Facility, Dover, Delaware; Empire Sanitary Landfill, Taylor, Pennsylvania; Keystone Sanitary Landfill, Dunmore, Pennsylvania; Northern Tier Solid Waste Authority Landfill, Blossburg, Pennsylvania; Winnebago County Sanitary Landfill, Lake Mills, Iowa; Cherry Island Landfill, Wilmington, Delaware; Pioneering Crossing Landfill, Birdsboro, Pennsylvania; City of Casper-Balefill, Regional Solid Waste Facility, Casper, Wyoming; and Taziguas Landfill, Santa Barbara County, Goleta, CA. Other facilities are awaiting permit approval.

Disadvantages in use of this foam product include: initial equipment cost is high; specialized personnel training is required; direct contact with skin and eyes should be avoided to prevent irritation; it may be difficult to place in wet weather and high winds; and it cannot be traversed by vehicular traffic.

AC-645 foam costs between $.06 and $.12 per square foot, when applied 3 inches to 6 inches thick, respectively.[6] The trailer mounted 400/25 PFU costs approximately $45,000, and can cover the landfill working face at a rate of 300 to 500 square feet/minute. Larger more expensive units can more than double the rate of coverage.

ConCover 180

ConCover 180 is a "long duration" foam injected, spray applied slurry, usable in both daily and intermediate cover applications. The dry feed material, consisting of an "advanced blend" of "earth-based" components, in a self-setting soluble binder and "recycled material" (wood pulp and shredded newspaper as a bulking agent), is slurried with water in a CAPS-180 (ConCover All Purpose Sprayer-180) and entrained with air (foamed) just prior to application.

Three models/sizes of sprayers are available, each manually operated with either a deck-mounted cannon with 200-foot range or 150-foot self-coiling hose and reel. The CAPS machines also can be used for dust control, power washing, fire fighting and seeding.

ConCover 180 was developed for use in high humidity situations, and can be applied in all climate conditions, including rain and hot or cold temperatures. The "cured" foam sheds water to provide good run-off. The material is environmentally safe, non-toxic and biodegradable; color is either blue or brown. ConCover 180 also can be pH-adjusted to accommodate a variety of water quality.

[6]Personal Communication, Kathy Smith, Rusmar Incorporated (November 30, 1995).

The smallest equipment available to apply ConCover 180 is the CAPS 900-180, a 940-gallon capacity trailer mounted unit, which can apply approximately 7,000 square feet of foam, approximately 1/2-inch thick, in 15 to 20 minutes. Total capacity is 9,000 square feet. Discharge distance is up to 150 feet. The system is reported[7] to cost approximately $35,000, and foam cost is approximately $.08 per square foot (1/2-inch thick).

ConCover 180 has been used as daily cover in a number of landfills. These include: Cumberland County, Fayetteville, North Carolina; Dane County Department of Public Works, Madison, Wisconsin; Wood County Landfill, Bowling Green, Ohio; and Tremont Landfill Company, Springfield, Ohio.

In general, the disadvantages of ConCover 180 are similar to those previously cited for AC-645.

Sanifoam SDC

Sanifoam SDC is a two-liquid component stable aminoplast resin; the two components consist of a foaming agent and a foam stabilizer. The product is diluted with water prior to application and is foamed with compressed air or nitrogen (compressed air normally would be used at a landfill). A pull behind hand-line applicator such as the model PB250-D with two 500-gallon storage tanks would provide 200,000 square feet coverage per application.

The plastic foam, which sets from a fluid to a solid somewhat softer than styrofoam, in 10 to 60 seconds, provides a reflective resilient surface which supports water run-off 15 minutes after application. Maximum water resistance is attained two hours after application. The product is non-toxic and allows plant growth and rooting if part of final cover; also the foam is non-corrosive, contains no irritating, reactive, or pressure generating compounds, and is non-explosive. The foam is non-flammable and self-extinguishing, conforms to OSHA Standards for the workplace, and poses no significant environmental hazard.

[7]Personal Communication, Tim Johnson, New Waste Concepts (November 30, 1995).

SaniFoam SDC can be applied at any ambient temperature, but solutions and material delivery lines must be protected against freezing. It can be applied in moderate winds up to 35 mph (with handheld equipment only) and during light to moderate rainfalls. Once applied and set up, the material can withstand moderate to heavy rain, depending on thickness and method of application. A 1-inch layer of Sani-Foam SDC is claimed to perform equivalent to 6 inches of compacted soil.

The unmixed SaniFoam stabilizer has a shelf-life of approximately 90 days and should be stored in a heated area during cold weather; the foaming agent has no shelf-life restriction. The nozzle used to spray the foam must be cleaned after each use, and equipment flushed with hot water; a hot water flush/rinse down system is a component of the application equipment. Mixing of SaniFoam components and equipment flushing are performed automatically by the equipment.

SaniFoam SDC has been tested and used at several landfill sites, including: the City of Arlington, Texas; City of Corpus Christy, Texas; Outagamie Solid Waste Authority, Appleton, Wisconsin; CDT Landfill, Inc., Joliet, Illinois; Waste Management of Pennsylvania, Inc., Morrisville, Pennsylvania; Peoria Disposal Company, Peoria, Illinois; E.I. Dupont Facility, Victoria, Texas; and U.S. Army Munitions Plant, Texarkana, Texas.

Similar to other foam products, cost of application equipment is high; minimum cost for the PB250-D Spray Bar applicator is approximately $105,000. However, these units will be provided for free by CoverFoam Services, Inc. if the customer commits to long-term use of the foam product. SaniFoam SDC foam costs approximately $.08 per square foot.[8]

TerraFoam

TerraFoam is a natural, biodegradable protein-based material that stays moist after application. Two TerraFoam products are available. The low expansion product lasts 72 hours

[8]Personal Communication, Ernie Straus, CoverFoam Services, Inc. (November 30, 1995).

or longer when left undisturbed. It is wind- and rain-resistant, inhibits fire from starting or spreading, and can be applied to a landfill surface by Pneumax skid units, custom-designed, foam application vehicles operated by one person. Terrafoam can also be applied using a Pneumax Spray Bar unit for larger applications. A higher expansion TerraFoam product, which is produced with additional air-entrainment, can resist wind and light rain for more than 24 hours. Both products are recommended for six-inch thick application.

TerraFoam is environmentally safe and, after application, begins to degrade through evaporation with total effectiveness depending on climate conditions. The product compresses under solid waste disposed the next working day, thus extending landfill life beyond that filled with soil cover.

Currently, TerraFoam is being used at several landfills in California, including: High Grove Landfill, Riverside; San Marcos Landfill, San Diego County; and Ojai Landfill, San Diego County.

Several sizes of delivery equipment are manufactured: a tractor mounted system for large landfills, skid mounted on truck body, and a small trailer mounted unit. The trailer mounted unit can be served by water truck, is simple, requires little clean-up time and components need not be pre-mixed.

The average cost of a 4 to 6-inch thick blanket of TerraFoam is approximately $.10 per square foot. The cost of the small trailer mounted TerraMAC unit is approximately $30,000; application rate is about 250 square feet per minute (5,000 square feet in 20 minutes).

2. Tarp Cover

Tarps or geosynthetic materials are another form of alternative daily cover that can provide dramatic savings in landfill airspace. Although tarps cost considerably more per square foot than dirt, they are cost-efficient due to their reusability.

The following geosynthetic materials have been identified:

- Airspace Saver, manufactured and marketed by Wire Rope Specialists, Baton Rouge, Louisiana;
- Aqua-Shed, by Aqua-Shed Manufacturing Corporation, Florence, South Carolina;
- Covertech C-440, manufactured by Fabrene Inc., Mississauga, Ontario, Canada, and marketed by Covertech Fabricating, Inc., Etobicoke, Ontario, Canada;
- Daily Landfill Covers manufactured by Belton Industries, Inc., Atlanta, Georgia, and marketed by Pallen Enterprises, Inc., Conyers, Georgia;
- Fabrisoil, by Phillips Fibers Corporation, Greenville, South Carolina;
- GeoCover 601, by New Waste Concepts, Perrysburg, Ohio;
- Permalon X-150, by Reef Industries, Houston, Texas;
- Sani-Cover, manufactured by Amoco Fabrics & Fiber Co., Atlanta, Georgia (series 100 and 200) and Hoechst Celanese Corporation, Spartanburg, South Carolina (Series 300), and marketed by Fluid Systems, Inc., Cincinnati, Ohio; and
- Typar DLC (daily landfill cover), manufactured by Reemay, Inc., Old Hickory, Tennessee, and marketed by Exxon Chemical, Summerville, South Carolina.

Geosynthetic products used for ADCs generally are distributed as sheets or panels in rolls or pallets (accordion pleated and rolled or folded). The panels are placed manually or with use of wheeled or track-type vehicles. After application and overlapping, these materials generally are prevented from blowing loose using tires or sandbags as weights. Concrete blocks also are used, but may damage the product if not used with care. Prior to deposition of solid waste during the next working day, the panels are removed and stored for reuse near the working face.

Most geosynthetic products either are woven, nonwoven or are produced as a film. Films resist water and landfill gas penetration whereas the other products generally will allow some gas and water to penetrate to some degree, depending on pore size. This can provide problems in application or roll-back when water increases weight during rainy weather or when water in pores freezes during cold weather use. Geosynthetic products generally are inert, non-reactive,

lightweight, strong, reusable, and flame resistant.

Final cost of a geosynthetic panel is determined by the number of times it can be reapplied (recycled). After final use, the panel can be discarded in the landfill.

Airspace Saver

Airspace Saver is a woven polyethylene fabric, coated on both sides with additional polyethylene to render it water resistant.[9] Maximum standard panel size is 48 x 50 feet; multiple panels can be overlapped to cover a larger area. The manufacturer also can custom fabricate larger pieces by heat welding 12-foot wide panels.

The product is supplied accordion pleated and rolled. Nylon web straps are spaced 12 feet apart and secured to the panels either in one direction or two directions in a checkerboard pattern across the panels. D-rings are attached to the ends of the web steps for ease of installation. The manufacturer will optionally sew a 3/8-inch chain or wire rope into the perimeter of finished panels to aid security in windy weather.

Two products are available. Product TJBX is a 7.2 mil thick fabric weighing approximately 5 oz. per square yard. Cost is $.25 per square foot; rated life is 6 to 10 months, depending on how the material is handled. Product TGNN is 17.2 mils thick, weighing 9.6 oz. per square yard. Cost is $.40 per square foot, with life rated at 1 to 1 1/2 years (some products have displayed a life of approximately 2 years). Cost of chain or wire rope around the perimeter of the finished panel is approximately $2 per linear foot.

Airspace Saver is used in a number of landfills as daily cover. These landfills include, for instance: City of Lynchburg, City Landfill, Lynchburg, Virginia; Chesterfield County, Virginia; and Lunenburg County Landfill, Lunenburg, Virginia. Product TGNN is used at each of these landfills.

[9]Personal Communication, Marion Yarborough, Wire Rope Specialists (May 6, 1993).

The following Waste Management, Inc. landfills use Airspace Saver daily cover: Skyline Landfill, Ferris, Texas; Gulf Coast Landfill, Ft. Meyers, Florida; Hickory Hill Landfill, Ridgeland, South Carolina; Piedmont Landfill, Kernersville, North Carolina; Brushy Hill Landfill, Little Rock, Arkansas; East Oak Landfill, Oklahoma City, Oklahoma; Central Disposal, Pompano, Florida; Plantation Landfill, Sibley, Mississippi; Quarry Landfill, Tulsa, Oklahoma; and Westside Landfill, Aledo, Texas. Airspace Saver also is used at Thurston County Public Works, Hawk Prairie Landfill, Olympia, Washington; and Winnebago Reclamation, Rockford, Illinois.

Aqua-Shed

Aqua-Shed is a lightweight, reusable, tan colored PVC sheet. For long-term use, as intermediate cover, the sheets are coated on one side with a polybutene aqueous emulsion glue for adherence to the landfill surface. The sheets are 6 mils in thickness and supplied in palletized cardboard boxes in sizes from 168 square feet (28 x 6 feet) to 4800 square feet (100 x 48 feet); this sheet thickness may make installation difficult on windy days. Weight of an Aqua-Shed panel is approximately 50 pounds per 1,000 square feet. Panels soon will be available in rolls.

The panels are not combustible (self-extinguishing) and can elongate 300 percent before breaking; the material is easy to patch. Installation can be accomplished by two persons without mechanical equipment.

Aqua-Shed has been used as daily and intermediate cover on the Kona Municipal Landfill, Hilo, Hawaii. It is reported that Aqua-Shed has reduced incidences of fires at the landfill.[10] The product also has been used at the Bath Landfill, Bath, Maine, where it is noted that the panels could not be punctured with the operator's steel-wheeled compactor.[11]

[10]Department of Public Works, Hilo, Hawaii. Letter signed by Galan M. Kuba, P.E., Solid Waste Division (April 7, 1992).

[11]Kimball Chase Company, Inc., Bath, Maine. Letter signed by Stephen C. DeWick, P.E., Vice President (April 14, 1992).

Cost of Aqua-Shed (unglued) is $.10 per square foot, F.O.B. Florence, South Carolina. Aqua-shed cover is reported to last 90 to 700 days, depending on how it is handled.

Covertech C-440

Covertech C-440 is a clear or pigmented (colored) woven polyolefin fabric.[12] The material is made of high density polyethylene tapes coated on both sides with low density polyethylene. Reinforced web straps support the material on both sides every 12 feet in both directions, with straps extending over the hem with a D-ring. This design allows for easy installation over compacted solid waste using existing equipment or manpower. None of the woven polyolefins are considered hazardous under normal conditions. The material is stable, chemically inert, and does not present a health hazard.

Due to the fabric's high slip factor (compared to non-woven materials) the cover can be dragged easily on and off solid waste. If the area to be covered is small (e.g., 48 x 50 feet), two to four persons can easily drag it over the working face. The material is secured with tires or sandbags; however, the manufacturer will include an optional chain in the hem for added weight around the perimeter.

Life expectancy of Covertech C-440 is between 10 and 18 months, depending on use. Cost is $.40 per square foot, and it is supplied with one dimension in multiples of 12 feet, up to 72 feet (stock size is 48 x 50 feet).

Covertech C-440 has been used at a number of landfills: Pottstown Landfill (Waste Management of PA, Inc.), Pottstown, Pennsylvania; Kankakee Recycling & Disposal Facility (Waste Management of Illinois, Inc.), Kankakee, Illinois; B.F.I. Charlotte Motor Speedway Landfill, Charlotte, North Carolina; B.F.I. Samson County Landfill (Roseborough, North Carolina); B.F.I. Muskigum Landfill (Zanesville, Ohio); and others.

[12]This product is identical to Airspace Saver.

Daily Landfill Covers

Daily Landfill Covers are fabricated to specific requirements from wide width panels of woven polypropylene. A wide-range of fabric weights (ranging from 3.8 to 8 oz./square yard), strengths and blanket configurations are offered. The basic cover can be manufactured with pockets on each corner to facilitate ease of movement in all directions either manually or with machinery.

The material generally is available in 12.5 foot or 15 foot widths which can be fabricated, double-stitched, into covers up to 75 feet wide and any desired length. Rolls come on 4-inch diameter heavy duty corrugated cores.

Panels are either black, grey, or white in color, and also can be supplied with straps and D-rings at corners. Of six styles offered,[13] styles 796 and 113 generally are used by landfill operators. Style 796 is a 5.4 oz. per square yard black fabric costing $.20 to $.22 per square foot, depending on size. Style 113 costs $.30 to $.32 per square foot and weight 8 oz./square yard. Cost includes web straps and D-rings.[14]

Daily Landfill Covers are used at a number of landfills. Style 796 is used at the Hall County, Georgia, Landfill and City of Macon, Georgia, Landfill. Style 113 is used in 75 x 100-foot panels at BFI and Chambers Development Company landfills, and others. These include, for instance: Roberts Road Landfill, Fayetteville, Georgia (BFI); Oak Ridge Landfill, Dorchester, South Carolina (Chambers) and Chambers Atlanta Landfill, Georgia.

Fabrisoil

Fabrisoil reusable ADCM is a nonwoven, needlepunched polypropylene fabric which is heat set on both surfaces. The staple fiber, needlepunched, heat set construction provides a 3-

[13]Styles 768, 507, 776, 777, 796 and 113.

[14]Personal Communication, Gregory T. Pallen, Pallen Enterprises (May 6, 1993).

dimensional structure which resists snagging on solid waste, and will not de-laminate on reuse.

Generally, a Fabrisoil panel can be used as long as two weeks or more. The panels are shipped folded accordion-style, then rolled up.

Fabrisoil is strong enough to be pulled into place with existing equipment, and if the area is small (say 30 x 50 feet), two persons can easily install. Edges are secured every 20 feet with tires or sandbags. If it is windy, more anchoring may be required. Typically a 100 x 100-foot area can be covered in 10 to 15 minutes. This represents a reduction in time of installation of 85 percent compared to installation using soil as daily cover.

Fabrisoil has been used on more than 20 landfills. At the Rowan County Landfill, Salisbury, North Carolina, the average working face is 100 x 100 feet. At the McLean County Landfill, Bloomington, Illinois (owner-operator John Sexton Contractors Company), life of the Fabrisoil is 15 to 20 uses, saving about 167 cubic yards of airspace per day (daily working face measure 90 x 100 feet).

Fabrisoil costs about $2 per square yard (approximately $.22 per square foot).

GeoCover 601

GeoCover 601 is a nonwoven geosynthetic polypropylene fabric. Each GeoCover 601 panel is custom made specifically for the customer and is delivered to the landfill site ready to use. The manufacturer suggests that panels be no wider than 80 feet. The cover is lightweight (6 oz. per square yard) and has a very low moisture absorption rate, making it easy to handle. The panels are constructed with webbing sewn around the perimeter and with handles every 20 feet.

The product is rolled or dragged, either manually or with on-site landfill equipment, across the surface of the landfill; life of the material depends on how it is handled. For instance, use in Wayne, Michigan, has displayed a life of approximately 30 days. At a site in

Minnesota, a 6-month life was observed.

The product is "certified" for use at landfills in 15 states.[15] Cost is $1.20 per square yard.

Permalon X-150

Permalon X-150 is described as an "alloyed high-density, PE membrane." The product is manufactured with 12 layers of polyethylene oriented in the machine direction, the transverse direction and at 45 degree angles to both directions. Stock size sheets are available up to 100 x 100 feet, constructed of 4-foot wide heat-seamed panels; larger sheets are available up to 200 x 200 feet. All covers can be custom fabricated with grommets, pipeloops, etc. . Thickness of Permalon X-150 is 8.6 mils, with a weight of 30.4 lb per 1,000 square feet.

The product is watertight, but currently is not fire retardant.[16] Cost of Permalon X-150 is $.10 to $.14 per square foot depending on quantity ordered. Currently, the manufacturer is testing an improved product, with geotextile backing (6 oz. nonwoven). Cost is projected to be $.18 to $.20 per square foot.

Permalon X-150 is used at the North Western Landfill (Mid-American Waste Systems), Parkersburg, West Virginia, and the County Environmental Landfill (Envirite Corporation), Pontiac, Illinois.[17]

Sani-Cover

Sani-Cover is available in woven polypropylene (Series 200), non-woven needlepunched polypropylene (Series 100), and non-woven needlepunched "Trevira" 100 percent continuous

[15]Personal Communication, Berthold Rossnagel, New Waste Concepts (May 4, 1993).

[16]Personal Communication, Lynn Ciolli, Reef Industries (May 6, 1993).

[17]Personal Communication, Ralph Jelic, R.A. Jelic Company (May 7, 1993).

filament polyester fabric (Series 300), to serve various field conditions. Non-woven polypropylene and polyester panels provide higher elongation characteristics which reduce the possibility of sharp or pointed objects tearing or puncturing Sani-Cover during deployment. Woven polypropylene, on the other hand, displays water repellency for use in rainy climates.

Sani-Cover is designed for quick and easy deployment using minimal time and labor. For instance, bars can be inserted into pockets sewn into the finished panel for ease in pulling across the landfill working face. The product either can be installed using on-site landfill equipment or it can be deployed manually.

A standard size panel, approximately 100 x 100 feet, can be installed by three persons in approximately 10 minutes.[18] Panels can achieve a lifecycle of more than 60 days use. The cost of Sani-Cover is $.15 per square foot, F.O.B. plant at Dallas, South Carolina.

Sani-Cover is being used at more than 100 landfill sites around the country. On the east coast, these sites include: City of Waco, South Carolina; City of Greensboro, North Carolina; Caldwell County (Hudson, North Carolina); Southern Solid Waste Management Center, Georgetown, Delaware; and Millersville Landfill, Anne Arundel County, Maryland.

At the Millersville Landfill, two Series 200 panels, each measuring 150 x 150 feet, were purchased at a cost of $6,000. The first panels was replaced after seven weeks use. As of May 1993, the second panel had been in use three weeks. Material from the first panel currently is being used to line stormwater diversion ditches and other structures, thereby extending the useful life. Landfill personnel at Millersville are satisfied with Sani-Cover.[19]

[18]Personal Communication, David Powell, Fluid Systems (May 5, 1993).

[19]Personal Communication, Dub Deeson, Millersville Landfill, Anne Arundel County, Maryland (May 27, 1993).

Typar DLC

Typar DLC is made from thermally-spunbonded (non-needlepunched) polypropylene fibers.[20] Standard size fabric panels, in stock, measure 46 x 100 feet; however, the manufacturer can fabricate custom-made panels in any size. Panels are shipped accordion-folded and rolled for ease of application. Depending on how panels are handled, use can extend for at least a year (the vendor advertises a 6-month life). Panels do not snag; however, if necessary, they can be repaired easily.

Although the product is permeable, Typar-DLC tends to shed water. In addition, the product does not take on water or excess soil during use, which would increase weight and cause problems in handling.

Typar DLC can be installed using existing machinery or can be handled manually. A 46 x 100 foot panel weighs approximately 200 pounds (about 6.25 oz. per square yard and can be deployed in 10 or 15 minutes by three people). Cost is $530 (about $0.11.5 per square foot).

Among others, Typar Daily Landfill Cover is being used at the Pekin Metro Landfill, Pekin, Illinois; Clinton Landfill, Clinton, Illinois, and Taswell County Landfill (Waste Management of Illinois), East Peoria, Illinois, where service life of panels has exceeded six months.

3. Other ADC Technologies

Alternative daily covers used by some communities make use of materials that would otherwise be part of the waste stream. An example is the fine material generated by Construction and Demolition debris (C&D waste) processing that consists primarily of soil and shredded wood utilized by Waste Management at the Collier County Landfill in Florida. C&D processing now diverts much of the C&D material from disposal, and the fines ADC, which

[20]Personal Communication, Tom Miller, Exxon Chemical (May 7, 1993).

would have been landfilled in the past, now saves the operator $250,000 per year that would have been spent on cover dirt.[21]

Another ADC that is familiar to Los Angeles County is the use of ground green wastes. The Los Angeles Sanitation Districts estimate that up to 600,000 tons (roughly half) of the green wastes could be used as ADC per year. However, because of opposition by the Natural Resources Defense Council (NRDC), the CIWMB may change its policy of counting the use of green wastes used as ADC toward achieving the County diversion goal. The CIWMB considered the problem, and recently confirmed its decision to accept green waste ADC as diversion until such time that adequate markets for green waste compost and mulch develop.

Finally, several commercial slurry products make use of recycycled materials. The following slurry-type materials have been identified:

- ConCover, manufactured and marketed by New Waste Concepts, Perrysburg, Ohio; and
- Posi-Shell, by Landfill Service Corporation, Apalachin, New York.

ConCover

ConCover is an ADCM engineered for use as a daily landfill cover with a life expectancy of 1 to 10 days. The "earth based" polymer spray-applied slurry is composed of two components: a fiber matrix and polymer binding agent. The fiber matrix (bulking agent) is prepared with recycled shredded newspapers and wood pulp.

ConCover can be mixed and applied with the same equipment used to apply ConCover 180, described earlier in this Appendix (see Foam Products). Complete coverage can be attained with a 1/4-inch thick layer, which provides protection equivalent to 6 inches of soil. In approximately 60 minutes, the cover will resist climate conditions; prior to that time, the product

[21] Lynn Merrill, "ADC Gets the Dirt Out!," *MSW Management*, September/October 1995.

is subject to deterioration if an extreme rainfall takes place. ConCover performs best in lower humidity conditions.

At the landfill in Wood County, Ohio, ConCover replaces approximately 150 cubic yards of daily soil cover, saving approximately 43,000 cubic yards of air space annually.[22] Each morning, the mobile spray equipment is filled with 200 gallons of water, to be used for dust control and on-site fires, if necessary. At the end of the day, landfill personnel add bags of ConCover (and an additive, if it is raining). The mixed slurry is then applied over the 150 x 40 foot working face in about 15 minutes, forming a crust in 30 minutes to 1 hour.

ConCover also is used at two landfills in the State of Iowa. These include the Linn County Landfill, which serves the area around Cedar Rapids, and the Webster County Landfill, which services the area around Ft. Dodge.

The cost of ConCover is $.07 per square foot, with equipment cost the same as cited with ConCover 180.

Posi-Shell

Posi-Shell is an environmentally compatible combination of: a filler consisting of a mixture of solids containing 100 percent recycled cellulose fibers and plastics; and a recycled alkaline mineral binder liquid; which is formulated to be mixed either with water or landfill leachate, and sprayed onto the landfill surface. The mineral binder component acts to neutralize odors and contaminants present in landfill leachate. After application, the Posi-Shell slurry hardens to an earth-tone, non-flammable coating.

A horizontal mobile silo is used to store and dispense the binder and a mobile Posi-Shell Applicator mixes ingredients supplied in Posi-Pak bags, and maintains the slurry in constant agitation prior to application. Larger landfills may require multiple set-ups. The mobile

[22]Landfill Uses Old Newspapers as Daily Cover Materials. Pollution Engineering, pp. 122-123 (September 1991).

The increased moisture content from recirculating leachate promotes biological activity, resulting in faster decomposition of organic materials and a concomitant increase in the rate of landfill gas production. The more rapid loss of solids from decomposition in the landfill speeds the consolidation of the landfilled material and the resultant settling.

Laboratory studies of leachate recirculation have shown that decomposition periods can be reduced to 18 to 36 months, as opposed to the 20- to 30-year period normally associated with refuse decomposition.[24] Although these studies are done on small-scale models and field tests do not reveal such dramatic increases in stabilization rates, leachate recirculation has proven to have a considerable effect on waste decomposition in landfills. At the Alachua County Southwest Landfill in Florida, it was assessed that in cells with leachate recirculation, the half-life of the waste's biodegradable mass was decreased to 3 to 5 years; this compares to a half-life of 10 or more years for the waste in untreated sections of the landfill.[25]

2. Biostabilization

An evolving concept of landfilling, stabilized placement or biostabilization, is gaining significant interest as a means to substantially conserve landfill space, particularly where disposal capacity is at a premium and conservation of natural soils is important. In the biostabilization process, following the removal of recyclables, solid waste to be landfilled is shredded and the moisture content is adjusted (preferably to between 40 and 60 percent). The shredded waste is then aerated for a period of 60 to 90 days. Following the aeration period, the waste is compacted with standard landfill compaction equipment. Experience at an operating facility in Albany, New York indicates that after biostabilization, 50 to 100 percent more refuse can be placed in the landfill cell when compared with conventional landfilling.[26]

[24]Kevin O'Leary, "Development of Leachate Disposal Processes," *Waste Age*, July 1995.

[25]T. Townsend, W. Miller, R. Bishop, and J. Carter, "Combining Systems for Leachate Recirculation and Landfill Gas Collection," *Solid Waste Technologies*, July/August 1994.

[26]David L. Hansen, "Biostabilization of Landfill Waste," *Waste Age*, June 1995.

3. Baling

Baling solid waste prior to landfill disposal is another technique that has proven to conserve landfill space. By operating the landfill as a balefill, on average, 45 percent greater compaction will be achieved when compared with conventional compaction methods. Typical bales (3' x 5' x 4') of MSW weigh up to 3,000 pounds, and a well-designed and operated balefill may consume less than half of the equivalent active fill or cell area as a conventional landfill operation for the same tonnage of waste and the same height of fill.

At the Jonesboro Landfill in Craighead County, Arkansas, an initial density of 1,500 pounds per cubic yard is achieved by feeding the waste through a baler prior to disposal (a 25 percent increase over the density estimated for Elsmere).

4. Landfill Reclamation (Mining)

Landfill reclamation, or landfill mining, is the excavation and mechanical processing of previously landfilled material to recover materials or landfill airspace, reduce the size of the landfill, or transfer material from an unlined to a lined landfill.

An extensive evaluation of a landfill mining site was performed in Collier County, Florida by the U.S. EPA's Risk Reduction Engineering Laboratory. During a two-week demonstration period in 1992, County staff mechanically processed 292 tons of excavated material through coarse and fine screens, an air knife/de-stoner, and magnetic separators into nine fractions. Two of these fractions -- a soil fraction and a ferrous metal fraction -- were determined to be reusable. The recovery of ferrous metals averaged about 75 percent with a purity of 82 percent.[27]

A reclamation project at the Frey Farm Landfill, in Lancaster, Pennsylvania, involves continual hauling of the excavated waste to a neighboring WTE facility. The Lancaster County

[27]John T. Aquino, "Reclaiming Landfills: Amazing Interest," *Waste Age*, February, 1994.

Solid Waste Management Authority (LCSWMA) reports that revenues from the sale of electricity and recovered ferrous metal offset operating costs of the landfill reclamation project and result in net revenues of $3.94 for every ton of reclaimed refuse delivered to the WTE facility. Additionally, the mining operations are creating 2,500 cubic yards of vacant landfill space each week.[28]

[28]John T. Aquino, "Landfill Reclamation Attracts Attention - and Questions," *Waste Age*, December 1994.

APPENDIX D

APPENDIX D: SEATTLE, WASHINGTON CASE STUDY

A. INTRODUCTION

The successful recycling program in the City of Seattle, Washington proves that diversion rates of 50 percent and beyond are realistic and obtainable. The latest recycling program studies reveal that Seattle experienced a 48.2 percent recovery rate in 1993. Given that Seattle's diversion rate has leaped from 22.0 percent in 1985, to 40.0 percent in 1990, to 48.2 percent in 1993, it can be inferred that the current recycling rate is well over 50 percent.[1] The following is a summary of the management and success of Seattle's waste and recyclables collection system.

B. BACKGROUND AND LEGISLATIVE FRAMEWORK

Seattle's Solid Waste Utility was established in 1961 to manage collection and disposal of waste in the City of Seattle. It is a public Utility of the City of Seattle and a division of the City's Engineering Department. The Utility, which was established as an Enterprise Fund, is self-supporting, primarily by user fees, and receives no subsidies from the City's General Fund.

The Utility functions both in an administrative role and as a direct-service provider. It contracts with private companies for residential waste and residential recyclables collection and processing services; develops overall policies that affect private collection of commercial waste; and contracts for solid waste transport and disposal, as well as certain household hazardous waste transport and disposal services. It also owns and operates transfer stations and a permanent household hazardous waste drop-off facility.

Resolution 25872, adopted by Seattle's City Council on August 14, 1978, called for establishment of recycling goals, and stressed the importance of market stability, source separation, and support for the existing recycling organizations. Recycling targets in the City

[1] "City of Seattle November/December Curbside Recycling Report," City of Seattle, February 1995.

have been steadily increasing since the late 1970s. In 1988, the City Council adopted Resolution 27871 establishing the solid waste management policies that are the basis for Seattle's Integrated Solid Waste Management Plan (the Plan). The Plan is adopted by the City under the authority of the Revised Code of Washington, 70.95.080 (1), which allows the City to "prepare and deliver to the County auditor of the County in which it is located, its plan for its own solid waste management for integration into the comprehensive County plan."

The Plan sets waste reduction and recycling goals of 40 percent by 1991, 50 percent by 1993, and 60 percent by 1998, and it directs the Utility to implement the waste reduction, recycling, composting, and disposal programs necessary to achieve these goals. Resolution 27871 also mandates a schedule for implementation of these programs and expresses the intent of the City of Seattle to manage the disposal of its residential and commercial solid waste independent of King County.

C. COLLECTION AND TRANSFER SYSTEM

1. Residential Collection

The City contracts with two local companies, U.S. Disposal (owned by Rabanco, Inc.) and General Disposal (owned by Waste Management, Inc.), for mandatory, weekly residential waste collection (including single-family households and multi-family properties of up to four units) in three areas of the City. The contractors serve approximately 250,000 households. Customers are offered a choice between curb/alley and backyard collection, with a 40-percent rate discount incentive for choosing curb/alley collection. For curb/alley customers, contractors supply containers sized according to the customer's chosen level of service, ranging from a mini-can (19 gallons) to a 90-gallon cart. A pre-paid trash sticker is also available for excess waste.

Waste generated by Seattle households and collected by the two City contractors is hauled to one of two City-owned transfer stations. The waste is then transferred to City trucks and hauled by the City to the rail yard transfer station. It is then rail-hauled to Columbia Ridge

Landfill in Arlington, Oregon, which is owned and operated by Washington Waste Systems, a subsidiary of Waste Management, Inc.

In 1988, the City began offering curbside collection of recyclables to residents. Curbside recycling services are offered on a voluntary, subscription basis to 148,500 single-family households and multi-family units (up to four-plexes) by two local hauling companies: Recycle America and Recycle Seattle. The North-side contractor, Recycle America (a Waste Management Company), provides weekly pick-up of recyclables in three, 15-gallon stacking bins -- one for newspaper, one for mixed paper (all forms of residentially-generated paper, e.g., newspaper, magazines, junk mail, cereal boxes, and corrugated cardboard), and one for glass, plastic (PETE and HDPE), and metal (tin, aluminum, and bimetal) containers. The South-side contractor, Recycle Seattle (a Rabanco Company), provides monthly pick-up of the same materials in 60- or 90-gallon wheeled toters. To alleviate some of the glass breakage occurring during commingled collection of the materials, Recycle Seattle has provided customers with a small container for glass storage that hooks onto the outside of each toter.

The City also provides contracted curbside collection of yard trimmings. Curbside yard trimming collection service is provided by two companies: (1) General Disposal Corporation provides weekly pickup year-round; and (2) U.S. Disposal Service provides bi-weekly pick-up from March through October, and monthly pick-up from November through February. Yard trimmings are also accepted from businesses and residents at the two City transfer stations. All yard trimmings collected in the City are then hauled to Rabanco's Cedar Grove Compost Facility for processing. The City also operates an education program to encourage backyard composting.

Except for yard trimmings, there is no additional charge for curbside recycling services. Residents are charged monthly for yard trimming collection; the cost of collecting other recyclables is included in the residential fee structure. A multi-family recycling program targeted at multi-family residences with more than four units began in 1993.

In addition to the City's curbside recycling program, the two City transfer stations provide drop boxes for all materials accepted at the curb, as well as vehicle batteries, motor oil,

oil filter containers, mattresses, "sharps" (i.e., needles), ferrous and non-ferrous scrap metal, and used lumber and wood. Residents can drop off these materials free of charge. White goods and used automobile tires are accepted for a charge.

The Utility participates in the Regional Household Hazardous Waste Program and has owned and operated a permanent household hazardous waste facility (located next to the South Transfer Station) since 1988. The facility is open to both City and County residents.

2. Commercial Collection

Commercial solid waste collection in Seattle is regulated by the Washington Utilities and Transportation Commission (WUTC). Although the City has the authority to contract for commercial waste collection, and may do so in the future, Seattle's businesses and industries are served by four collection companies holding certificates from the WUTC. The City monitors WUTC decisions and, through the Plan, establishes recycling service levels, rate structure requirements, and data-reporting requirements necessary to meet the City's recycling goals. Although the City does not set rates for commercial collection, it participates in WUTC rate hearings to ensure a rate structure that encourages waste reduction and recycling in accordance with the Plan.

3. Government/Institutional Sector Collection

City government buildings are considered a residential customer; they use dumpsters and receive waste-collection services from Rabanco and Waste Management. Other government buildings and most City institutions contract for waste collection with private haulers.

4. Transfer Stations

There are four transfer stations located in Seattle where collection vehicles transfer waste to larger transfer trailers (rail cars) for long-haul to the Columbia Ridge Landfill in Arlington, Oregon. Two of the transfer stations are owned and operated by the City within the Enterprise Fund. Generally, the two City-operated transfer stations serve the self-haul customers and the residential collection contractors hired by the City.

The two private transfer stations are owned and operated by two private companies that collect waste from commercial accounts in Seattle and outside of the City. One such facility, owned by Rabanco, receives, processes, and transfers many different types of materials, including recyclables from the residential curbside recycling contract, commercial paper loads, construction and demolition debris, and commercial MSW. The Eastmont Development Transfer Station, owned and operated by Waste Management, receives waste from Bayside Disposal and other collection firms operated by Waste Management in the Seattle area. Waste from commercial and industrial accounts inside and outside of the City and residential waste from outside of Seattle are delivered to the Eastmont Development site.

D. VARIABLE RATES

The City Utility has instituted a weight-based rate system, which is calculated by the size of the container provided to each generator. As shown in Table A-1, rates range from a 12-gallon "Micro Can" at $9.37 per month up to a 90-gallon cart at $44.94 per month for curbside collection. The Utility has experimented with on-board weighing systems to provide more accurate weight-based fees, but has not implemented a full-scale program.

Collection service also provides, for the larger can sizes, the option of backyard (rather than curbside/alley) service for an additional cost. Note that there are no charges for recyclables collection, and the $3.00/month rate for yard waste collection is set low enough to encourage resident diversion.

Table D-1. City of Seattle, Washington Rates

Residential Monthly Rates of Containers

	Weight Limits	Curb/alley	Backyard
Micro Can (12 gal)	- 20 lbs.	$ 9.37	not available
Mini Can (19 gal)	- 30 lbs.	$11.50	not available
32 Gallon Can	- 60 lbs.	$14.98	$20.96
60 Gallon Cart or (2 32-gal)	- 120 lbs.	$29.96	$41.94
90 Gallon Cart or (2 32-gal)	- 180 lbs.	$44.94	$62.92
Yardwaste 5 units/week	- 60 lbs.	$ 3.00	not available

Disposal Stations Fees and Charges
(Reyclables can be dropped off free of charge)

	White Goods (large appl.)	Garbage, Tires and Mattresses	Clean Yard Waste Clean Wood Waste
Passenger vehicle	$14.00/item	$ 7.00/trip --	$ 6.00/trip
Non-passenger vehicle	$14.00/item	$83.00/ton	$64.00/ton
Minimum disposal fee			
Non-passenger vehicle	$14.00/item	$13.50/trip	$10.00/trip

"Clean" means a load is entirely yard waste or entirely wood waste. Mixed loads will be charged the garbage rate. If you bring yard waste and garbage in the same vehicle, you pay the rate for garbage.

Yard waste and garbage must be separated prior to disposal.

If you bring appliances and garbage in the same vehicle, you pay the rate for garbage plus $5 per appliance.

Source: *The Economics of Recycling and Solid Waste Management for the 90s*, Harvey Gershman, GBB, Municipal Waste Management Association, March 24, 1994.

Similarly, there is no fee for recyclables drop-off at Disposal Stations, where residents can bring bulk wastes.

E. RECYCLABLES DIVERSION

The key to the success of the City of Seattle's recycling program is the participation rate among eligible households. As of December, 1994, 91.1 percent of the 149,500 eligible households are participating in the City recycling program. On the North Side of the City, 98.9 percent of the households participate. In addition, Seattle averages five new sign-ups per day.[2]

The latest quantitative analysis of the recycling program, which is for the year 1993, revealed that the City of Seattle experienced a 48.2 percent diversion rate. The breakdown of generation and diversion rates for each waste component is included as Table A-2.

In 1985, 22.0 percent of the waste in Seattle was being recovered, and in 1990, a 40.0 percent diversion was experienced. Given the 1993 diversion rate of 48.2 percent, and recognizing the upward trend in recycling recovery rates, it seems Seattle is on target to reach the 1998 goal of 60 percent diversion.

[2] "City of Seattle November/December Curbside Recycling Report," City of Seattle, February 1995.

Table D-2. Summary of Recycling Program Impacts For Scenario 1 (in tons per year)

SECTOR: RESIDENTIAL COLLECTION
YEAR: 1993

Source ----->	Utility, New and Private Recycling			Generation and Disposal		Recycling %
Material	Util & New Recycling (1)	Exist Priv Activity (2)	Total Recycled (3=1+2)	Total Generated (4)	Total Disposed (5=4-3)	Percent Recycled (3/4)
NEWSPAPER	19917.2	17175.7	37092.9	45099.4	8006.5	82.2
CORRUGATED-KRAF	5317.2	4158.9	9476.1	18413.0	8936.8	51.5
COMPUT-OFF PAP	0.0	2903.2	2903.2	3387.0	483.8	85.7
MIXED SCRAP	15357.3	2825.0	18182.4	27577.3	9394.9	65.9
OTHER PAPER	0.0	0.0	0.0	25144.0	25144.0	0.0
PLASTICS	321.7	248.4	570.1	17849.8	17279.7	3.2
YARD WASTE	37821.3	0.0	37821.3	40805.2	2983.9	92.7
WOOD	0.0	0.0	0.0	1927.1	1927.1	0.0
FOOD WASTE	0.0	0.0	0.0	24408.1	24408.1	0.0
OTHER ORGANICS	0.0	303.5	303.5	9670.5	9367.0	3.1
BEVERAGE GLASS	4445.7	55.1	4500.8	7208.3	2707.4	62.4
CONTAINER GLASS	7685.0	3100.5	10785.5	15429.6	4644.1	69.9
OTHER GLASS	0.0	0.0	0.0	385.6	385.6	0.0
FOOD CANS	1583.3	1000.5	2583.8	4697.0	2113.2	55.0
OTHER FERROUS	0.1	0.0	0.1	607.1	607.0	0.0
ALUM BEVERAGE	987.5	1989.9	2977.4	3659.7	682.3	81.4
OTHER ALUM	0.0	0.0	0.0	256.8	256.8	0.0
OTHER NON FERROUS	0.0	0.0	0.0	289.2	289.2	0.0
CONSTRUCT DEBRIS	0.0	0.0	0.0	924.6	924.6	0.0
MISCELLANEOUS	0.0	163.3	163.3	16595.2	16431.9	1.0
TOTAL	93436.5	33923.9	127360.3	264328.1	136967.8	48.2

APPENDIX E

APPENDIX E: ENTERPRISE FUNDS AND FULL COST ACCOUNTING

This Appendix discusses some of the cost issues relevant to integrated solid waste management planning. It is not possible to develop a detailed cost plan for the recommendations made in the report. To do so would require obtaining present cost data from the County and the County Sanitation Districts of Los Angeles County, as well as from each of the Cities in the County.

Determining the actual cost of solid waste management is one of the most difficult tasks encountered by communities developing integrated solid waste management plans. Many costs, particularly overhead costs such as personnel management, are handled by separate departments. The amount of time allocated to management of solid waste personnel must be estimated as part of the overall cost of solid waste. In addition, divisions often share equipment, marshalling yards or supervisory personnel, or pitch in together to provide emergency services, making it difficult to identify solid waste-specific costs.

The objective in this Appendix is to get the County thinking about how to develop a coherent integrated solid waste management system and help communities control costs. The County can function in a key coordinating role. This does not mean that the County shoulders all costs or manages all facilities; it means that the County actively supports the Cities and facilitates their operations. Elaborate solid waste systems can be very costly if program components are added piecemeal. County leadership can be critical in this area through:

- preparing the County Comprehensive Plan to coordinate efforts between the various County jurisdictions or provides joint City/County-sponsored facilities;
- developing facilities that serve multiple jurisdictions (e.g., transfer stations) that, through economies of scale, keep costs down despite possible longer haul distances;
- developing County model programs, including a variable rate fee system for County-collected areas and technology demonstration programs for landfill operations (see Chapter IX.F); and
- maintaining the economic viability of existing facilities, for example, through waste transfer to the WTE facilities (Chapter IX.H) or developing a policy of purchasing

supplies from recycling enterprises ("Buy Recycled") that utilize recyclables collected in Los Angeles County.

In addition to the coordinating role, the County can pioneer some innovative ways of financing solid waste management programs that also foster diversion of waste from disposal, including: enterprise fund accounting, and variable rate fees ("unit pricing"). Also discussed in this Appendix are the relative share of the solid waste dollar cost for different system components, and factors influencing costs. These two topics provide background for Report discussions.

A. ENTERPRISE FUNDS

Operating an integrated solid waste management system as an enterprise fund allows communities to track the true cost of service, and keeps the funding for services separate from the political vagaries of the government budgeting process. In an enterprise fund, all revenues and costs go to a cost center. Revenues do not go to the General Fund, debt service is not paid for by Finance, benefits by Personnel, or fuel by the Transportation Department, etc., which is often the case when solid waste is part of a jurisdiction's operation. Future post-closure costs and sinking funds are established in enterprise accounting, and it possible to tell the cost for solid waste service and charge for it -- by the ton, by the household, by the business address, etc.

B. VARIABLE RATES

Local governments need to find ways to charge the generator for the service received in order to get solid waste costs out of the General Fund. Direct billing of customers for the solid waste service received is a key component of enterprise fund accounting. These fees, plus other revenues such as from the sale of recovered materials, make up the funds used to pay costs. Generator billing should be done in a way that encourages source reduction as well as maximizes diversion. A variable rate system (also called "unit pricing") goes far to accomplish this and is also an important part of enterprise accounting for solid waste management. Variable rate pricing has been the norm in commercial collection for years -- the generator is billed based

either on the weight of the material collected by the hauler, or by the size of the waste storage container used by the generator. For the residential customer, it can mean higher costs for more waste, or lower costs for less waste and more recycling. For the commercial generator, it can mean differential fees (or no fee) for loads that can be recycled. As consumerism is applied to solid waste services, the generator will have incentive to dispose of less and to set aside more materials for recycling. An example of a variable rate fee system is provided in Appendix A, Case Study of the City of Seattle.

C. COSTS FOR SOLID WASTE SERVICES

The solid waste dollar goes to many functions, depending upon the make-up of the specific system. Shown in Figure E-1 is a pie chart, developed from data from several cities, that graphically portrays how the solid waste dollar is split up. Administrative costs for each of the components are included in each portion of the pie. As can be seen, collection-related costs comprise over 60 percent of the pie, followed by disposal at 30 percent, and lastly by processing at 8 percent. It should be noted that solid waste collection includes bulk waste and special collections (such as post-special event collections and disaster debris), while recycling collection costs include yard waste collection as well as curbside service for materials. The pie chart shows recycling-related collection costs at 20 percent -- or almost one-third of the collection expenditures. Recycling costs overall can represent over one-quarter of the way the solid waste dollar is spent.

In addition to the above service-related and direct administrative costs, a community can expend considerable funds on specialized services, such as Household Hazardous Waste (HHW) collection and public information campaigns to encourage recycling and HHW diversion. Many communities have turned to surcharges on landfill or transfer station tipping fees as a means of funding new diversion programs, particularly for programs such as HHW that have a high unit cost and do not produce revenues to help pay for the program. Monies collected through surcharges can "get lost" in the General Fund; enterprise fund accounting can keep these resources dedicated to solid waste management programs.

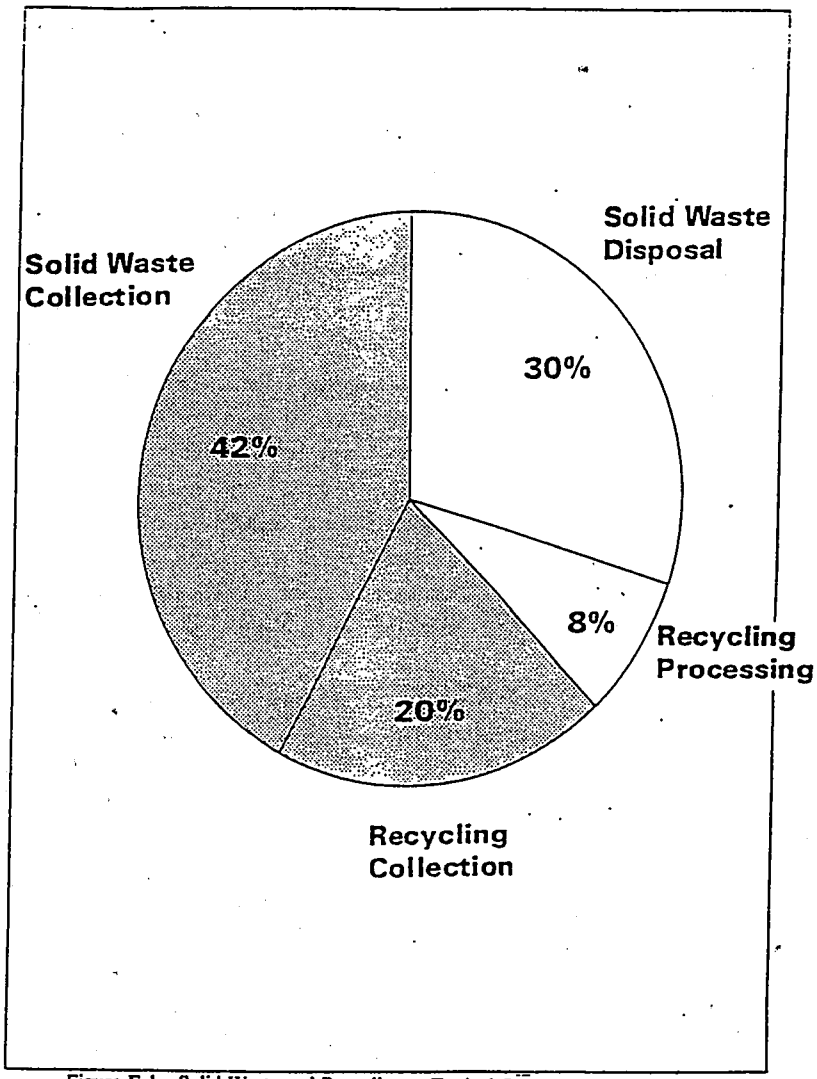


Figure E-1. Solid Waste and Recycling -- Typical System Cost Components

D. FACTORS INFLUENCING COSTS

Trends that influence recycling and solid waste disposal costs are discussed in various Report Chapters, and are summarized here by the service component. Overall, the cost of solid waste management is rising, but offsetting trends are discussed as well.

1. Collection

Two factors are driving the cost of solid waste collection. First, obtaining high-quality recyclables from the waste stream often means curbside collection of source-separated designated materials. This adds specialized recycling collection trucks and personnel routed through the same neighborhoods as the solid waste collection packer trucks. Yard wastes are also collected through a separate route system. Bulk wastes may also be collected separately using open-bed trucks equipped with a grapple. Each additional collection system will increase the number of trucks and personnel needed to get the job done.

Second, as the solid waste management system has evolved, the equipment industry has been evolving along with it. Automated collection equipment allows a single driver to complete a route, rather than the two- or three-man crews required for traditional packer trucks. Sophisticated routing software and GIS mapping allow a jurisdiction to consolidate routes, so that as recycling collection expands, solid waste collection routes can be adjusted proportionally, and optimum routes (i.e., the most material in the least time) can be devised for each type of collection. Other equipment features, such as split packers, allow a single truck to perform double duty while on a route. These options can be used to reduce the cost of collection.

Communities are innovating to contain the costs resulting from these trends. Automated collection has been applied to recyclable materials as well as refuse. Rebanco in Seattle has utilized authomated recycling collection in 96 gallon carts and reduced the collection frequency to once per month. Guelph, Ontario is implementing wet/dry collection citywide in the city, with a population of 80,000. This followed an extensive pilot program to establish the cost and effectiveness of the program. Because the collection function represents a majority of the solid

waste management cost, efficiency in this area has the largest reduction in overall cost for the investment.

2. Transfer

Collection costs can also be contained by adding transfer station(s) to the system. As discussed in Chapter IX, transfer stations can reduce collection costs by keeping collection packer truck routes as short as possible (less than 30 miles). A transfer trailer can carry three times the amount of waste as a packer truck and rail cars can carry six times the amount. Shifting the waste to larger-capacity, more efficient transfer vehicles for transport to the disposal site reduces the number of personnel and vehicles needed.

Even though transfer operations add capital and operations costs for transfer stations and vehicles, they have the potential to significantly reduce the overall cost. The reduction in the non-productive time for the route collection trucks has a double pay-off. First, the cost per collection route is reduced and second, the route collection trucks can collect from additional routes. This lowers the investment in trucks and crews.

3. Solid Waste Disposal

Class III Sanitary Landfills are still the primary method of managing solid waste in Los Angeles County. The cost of landfill disposal is a political issue as well as a technical one. The true cost of local landfill disposal is not reflected in $20.00 per ton tipping fees. Some long-term costs of landfill disposal can be deferred (rather than paid out of tipping fees), particularly closure, post-closure, and Title V Remediation Funds, plus, for existing landfills, the cost of the site may have already been paid for and does not reflect current land values. However, a jurisdiction may choose to keep landfill prices low in order to keep waste from leaving to lower-cost disposal sites in order to maintain cash flow at the landfill, or (as in the case of Orange or Riverside Counties) may reduce the price to attract waste from outside the jurisdiction and thus increase cash flow in the short term.

The actual cost of landfill disposal is driven by the cost of the land, pre-development costs for planning and permitting, plus the construction and operation costs of the facility over its life. The U.S. EPA promulgated new rules for landfill management on October 9, 1991. These rules, as subsequently adopted by the State of California, set standards for:

- Location. Includes limits on proximity to airports, 100-year floodplains, wetlands, fault areas, seismic impact areas, and unstable areas.
- Design. Requires composite liner and leachate collection systems to maintain less than 30-cm depth of leachate over liner. Liner systems combine compacted clay and synthetic membranes. Leachate collection piping is sandwiched in a porous layer between liners.
- Operations. Requires exclusion of Hazardous Wastes and bulk or uncontainerized liquid wastes, daily cover and control of disease vectors, methane gas monitoring and control and other air emissions control (i.e., no open burning), access restrictions to prevent illegal dumping, control of precipitation run-on and runoff, and recordkeeping for groundwater monitoring, methane gas, inspection reports, and closure/post-closure plans. No discharges to surface water are permitted.
- Groundwater Monitoring. Monitoring wells required within compliance area. Testing required for 62 pollutants (15 heavy metals and 47 volatile organic chemicals). If pollutants exceed background levels, testing must be conducted for another 245 hazardous inorganic and organic constituents. If specified levels of pollutants found, a corrective action procedure must be initiated.
- Closure and Care. Written closure plan required. Closure include a cap designed to minimize infiltration and erosion, including infiltration layer minimum of 18 inches and permeability no greater than $1x10^{-5}$ cm/sec of material. Care of the facility required for 30 years after closure, including regular inspections for cap integrity and well monitoring.
- Financial Assurance. Must provide detailed estimates of costs for closure and post-closure and to perform corrective action as required; must provide an acceptable mechanism to guarantee funding for these future activities.

In addition to the cost of the modern sanitary landfill, the State of California requires landfills to fund Article V Remediation Costs. Article V regulations require establishment of a fund to cover potential remediation of contaminated groundwater caused by landfills.

The impact of these rules has been to increase the cost per acre of constructing landfills; this, in turn, has resulted in a trend toward development of very large landfills that can keep costs down through the larger volume of waste that can be disposed of at the site. Given the size of these new landfills, there is a parallel trend toward developing new facilities in remote areas with rail or highway access where land is cheaper and large tracts available.

4. Processing

Through the 1970s and 1980s, transformation, or waste-to-energy, facilities were seen as a preferred alternative to increasingly scarce and costly landfill disposal. Facilities financed and built during that period have tip fees in the $30.00 per ton range. As a result of changes in tax law as well as increased air pollution control requirements, tip fees for new facilities would be close to $100.00 per ton.

Trends in recycling markets are discussed in detail in Chapter VII, Section B. There is a present downturn in markets following on the heels of a rapid expansion. As in the case of other commodities, market prices and opportunities for recovered materials will fluctuate; however, it is expected that markets will remain strong as a result of new final market and export market development. The processing costs of materials recovery facilities (MRF) vary among communities and average $50 per ton according to a recent NSWMA study. This includes both the capital costs and the operations and maintenance costs. Revenues from the sale of materials can off-set these costs, depending on the markets.

Unlike other recyclable materials, the markets for yard waste compost products have yet to expand. Processors are producing good material; the problem lies more in learning to present the product in a manner acceptable to the potential major markets (farmers, horticultural firms, etc.). These markets have specific needs and require a proven product. The specifications for compost products derived from waste materials need to reflect the traditional soil amendments used by these markets (e.g., peat moss), so that the user can understand how the compost can be applied to their needs.

APPENDIX F

APPENDIX F. YEAR-BY-YEAR TABLES FOR LANDFILL CAPACITY PROJECTIONS

The following tables provide year-by-year projections of the waste generation and disposal rates for Los Angeles County. The last column in each table, Unsatisfied Need or Daily Disposal Capacity Shortfall, projects the amount of generated waste in excess of the available disposal capacity. The first year a value in the Unsatisfied Need column is greater than zero denotes the "crisis" year, when the quantity of waste generated is larger than the available disposal capacity. As the tables are modified (based on the incremental adjustments discussed in Chapter V, Chapter VI, and Chapter VIII), the "crisis" year is postponed. Ultimately, the solid waste disposal system for Los Angeles County is proven to have much longer useful life than originally projected.

Table F-1. Projected Daily Disposal Capacity Shortfall
Scenario 1 -- Base Case With Historical Acceptance Rates

Scenario 1

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Processing Facility Diversion	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50 129		25.0	0	1 760	-	35,837	5 649	1 910	6 194	1 755	3 613	2 065
1996	52 332		30.0	0	1 760	(2,000)	32,872	5 546	1 875	6 060	1 723	3 547	2,529
1997	53 587		35 0	0	1 760	(3,500)	29,572	7 157	2 420	0	2,223	4 578	0
1998	53 714		40.0	0	1 760	(3 500)	26 968	7 936	2,811	0	2 465	5,078	0
1999	54 05		45 0	0	1 760	(3,500)	24 471	8 183	0	0	2,542	5 234	0
2000	54 903		50.0	0	1,760	(3 500)	22,192	6,672	0	0	2,072	6 506	0
20	56 188		50.0	0	1 760	(6 000)	20,334	8,650	0	0	2 68	0	0
2002	57 26		50.0	0	1 760	(6,000)	20,874	8 879	0	0	2 758	0	0
2003	58 344		50.0	0	1,760	(6,000)	21,412	9,108	0	0	2,829	0	0
2004	59 302		50.0	0	1,760	(6,000)	21,891	9,312	0	0	2 893	0	0
2005	60 212		50.0	0	1,760	(6,000)	22,346	9,508	0	0	2,953	0	0
2006	61 052		50.0	0	1,760	(6,000)	22,766	9,968	0	0	3 103	0	0
20	61 822		50.0	0	1,760	(6,000)	23,151	7,762	0	0	3 400	0	0
2008	62 524		50.0	0	1 760	(6 000)	23,502	0	0	0	3 019	0	0
2009	63 158		50.0	0	1 760	(6,000)	23,819	0	0	0	0	0	0
20	63 725		50.0	0	1 760	(6,000)	24 103	0	0	0	0	0	0
20	65 166		50.0	0	1,760	(6,000)	24,824	0	0	0	0	0	0
20	65 922		50.0	0	1 760	(6,000)	25,201	0	0	0	0	0	0
20	66 818		50.0	0	1,760	(6,000)	25,649	0	0	0	0	0	0
2014	67 78		50.0	0	1 760	(6,000)	26,134	0	0	0	0	0	0
20	68 68		50.0	0	1 760	(6,000)	26,583	0	0	0	0	0	0
20	69 51		50.0	0	1,760	(6,000)	26,995	0	0	0	0	0	0
20	70 302		50.0	0	1,760	(6,000)	27,391	0	0	0	0	0	0
20	71 118		50.0	0	1 760	(6,000)	27 799	0	0	0	0	0	0
20	71 948		50.0	0	1,760	(6,000)	28,214	0	0	0	0	0	0
20	72 800		50.0	0	1 760	(6,000)	28,640	0	0	0	0	0	0
20	73 669		50 0	0	1 760	(6 000)	29 075	0	0	0	0	0	0
20	74 554		50.0	0	1,760	(6,000)	29 517	0	0	0	0	0	0
20	75 450		50.0	0	1,760	(6,000)	29,965	0	0	0	0	0	0
2024	76 349		50.0	0	1,760	(6,000)	30,414	0	0	0	0	0	0
2025	236		50.0	0	1,760	(6,000)	30,858	0	0	0	0	0	0
2026	78 094		50.0	0	1,760	(6,000)	31,287	0	0	0	0	0	0
20	78 900		50.0	0	1,760	(6,000)	31,690	0	0	0	0	0	0
20	79 765		50.0	0	1,760	(6,000)	32,123	0	0	0	0	0	0
2029	80 516		50.0	0	1 760	(6,000)	32,548	0	0	0	0	0	0
20	81 468		50.0	0	1 760	(6,000)	32,974	0	0	0	0	0	0
20	82 334		50.0	0	1,760	(6,000)	33,407	0	0	0	0	0	0
20	83 209		50.0	0	1,760	(6,000)	33,844	0	0	0	0	0	0
2033	84 085		50.0	0	1 760	(6,000)	34,282	0	0	0	0	0	0
2034	84 956		50.0	0	1,760	(6,000)	34 718	0	0	0	0	0	0
2035	85 823		50.0	0	1,760	(6,000)	35 151	0	0	0	0	0	0
2036	86 684		50.0	0	1 760	(6,000)	35,582	0	0	0	0	0	0
20	87 543		50.0	0	1 760	(6,000)	36,011	0	0	0	0	0	0
2038	88 396		50.0	0	1,760	(6,000)	36 440	0	0	0	0	0	0
2039	89 255		50.0	0	1 760	(6,000)	36,868	0	0	0	0	0	0
20	90 114		50.0	0	1,760	(6,000)	37,297	0	0	0	0	0	0
20	90 97		50 0	0	1,760	(6,000)	37,728	0	0	0	0	0	0
20	91 844		50.0	0	1,760	(6,000)	38,162	0	0	0	0	0	0
2043	92 714		50.0	0	1 760	(6,000)	38,597	0	0	0	0	0	0
Total Capacity Used (Tons)								32,556,392	2,812,688	3,829,578	11,363,644	8,909,008	1,433,224

Table F-1. Projected Daily Disposal Capacity Shortfall
Scenario 1 – Base Case With Historical Acceptance Rates
(*Continued*)

	P	Q	R	S	T	U	V	W	X	Y	Z	AA
4	D WASTE FACILITIES AND POTENTIAL EXPANSIONS											
5	WASTE DISPOSAL RATES											
6	POLITAN AREA - 1995											
9	Landfill Waste Acceptance Rate - (tpd-6)											
12	Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Park	Antelope Valley Dump	Azusa Land Reclamation	Burbank	Waste Management of Lancaster	Pebbly Beach Disposal	U.S. Navy	Whittier-Savage Canyon	Unsatisfied Need
14	3 407	5 162	1,807	9	387	3,097	84	516	2	0.5	181	0
15	3 344	2,257	773	9	380	3,040	82	507	2	0.5	177	0
16	4 318	0	2,289	12	490	5,095	106	654	3	0.7	229	0
17	4 786	0	2,538	13	544	0	117	426	3	0.7	254	0
18	4 935	0	2,617	13	561	0	121	0	3	0.7	262	0
19	4 023	0	2,133	11	457	0	99	0	2	0.6	213	0
20	5 216	0	2,766	14	593	0	128	0	3	0.8	277	0
21	5 354	0	2,839	15	606	0	131	0	3	0.8	284	0
22	5 492	0	2,913	15	624	0	135	0	3	0.8	291	0
23	5 615	0	2,978	15	638	0	138	0	3	0.9	298	0
24	5 732	0	3,040	16	651	0	141	0	3	0.9	304	0
25	5 309	0	3,194	16	684	0	148	0	4	0.9	319	0
26	0	0	3,500	34	750	0	240	0	8	1.0	350	7 107
27	0	0	3,500	91	6	0	240	0	20	1.0	350	16,274
28	0	0	3,500	102	0	0	240	0	24	1.0	350	19 602
29	0	0	3,500	102	0	0	240	0	24	1.0	350	19 886
30	0	0	3,500	102	0	0	240	0	33	1.0	350	20,599
31	0	0	2,025	102	0	0	240	0	0	1.0	350	22,483
32	0	0	0	102	0	0	240	0	0	1.0	350	24,956
33	0	0	0	102	0	0	240	0	0	1.0	350	25 441
34	0	0	0	102	0	0	240	0	0	1.0	350	25,890
35	0	0	0	102	0	0	240	0	0	1.0	350	26,302
36	0	0	0	102	0	0	240	0	0	1.0	350	26,698
37	0	0	0	102	0	0	240	0	0	1.0	350	27,106
38	0	0	0	102	0	0	240	0	0	1.0	350	27 521
39	0	0	0	102	0	0	240	0	0	1.0	350	27 947
40	0	0	0	102	0	0	240	0	0	1.0	350	28,382
41	0	0	0	102	0	0	240	0	0	1.0	350	28,824
42	0	0	0	102	0	0	240	0	0	1.0	66	29,556
43	0	0	0	99	0	0	240	0	0	1.0	0	30,074
44	0	0	0	0	0	0	240	0	0	1.0	0	30,617
45	0	0	0	0	0	0	240	0	0	1.0	0	31,046
46	0	0	0	0	0	0	240	0	0	1.0	0	31 449
47	0	0	0	0	0	0	240	0	0	1.0	0	31 882
48	0	0	0	0	0	0	240	0	0	1.0	0	32,307
49	0	0	0	0	0	0	240	0	0	1.0	0	32,733
50	0	0	0	0	0	0	240	0	0	1.0	0	33,166
51	0	0	0	0	0	0	240	0	0	1.0	0	33,603
52	0	0	0	0	0	0	240	0	0	1.0	0	34,041
53	0	0	0	0	0	0	240	0	0	1.0	0	34,477
54	0	0	0	0	0	0	240	0	0	1.0	0	34,910
55	0	0	0	0	0	0	240	0	0	1.0	0	35,341
56	0	0	0	0	0	0	240	0	0	1.0	0	35,770
57	0	0	0	0	0	0	240	0	0	1.0	0	36,199
58	0	0	0	0	0	0	240	0	0	1.0	0	36,627
59	0	0	0	0	0	0	240	0	0	1.0	0	37,056
60	0	0	0	0	0	0	240	0	0	1.0	0	37,487
61	0	0	0	0	0	0	240	0	0	1.0	0	37,921
62	0	0	0	0	0	0	240	0	0	1.0	0	38,356
63												45000
64	17 948 944	2 314 568	15,728,208	596 864	2,300,978	3,504 336	3,216 593	655 952	44 680	14 297	2 731 448	

Table F-2. Projected Daily Disposal Capacity Shortfall
Scenario 2 – Waste Exports

Scenario 2

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Processing Facility Diversion	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50 129		25.0	0	1,760	-	35,837	5 649	1,910	5 194	1,755	3 613	2,065
1996	52 332		30.0	0	1,760	(2,000)	32,872	5,546	1 875	6 060	1 723	3 547	2,529
1997	53 587		35.0	0	1,760	(3,500)	29,572	7 157	2,420	0	2,223	4 578	0
1998	53 714		40.0	0	1,760	(3,500)	26 968	7,936	2 811	0	2,465	5,076	0
1999	54 057		45.0	0	1,760	(3,500)	24,471	8,183	0	0	2,542	5,234	0
2000	54 903		50.0	0	1,760	(3,500)	22,192	6,672	0	0	2,072	6,506	0
2001	56 188		50.0	0	1,760	(6,000)	20,334	8,650	0	0	2,687	0	0
2002	57 267		50.0	0	1,760	(6,000)	20,874	8,879	0	0	2,758	0	0
2003	58 344		50.0	0	1,760	(6,000)	21,412	9,108	0	0	2,829	0	0
2004	59 302		50.0	0	1,760	(6,000)	21,891	9,312	0	0	2,893	0	0
2005	60 212		50.0	0	1,760	(6,000)	22,346	9,506	0	0	2,953	0	0
2006	61 052		50.0	0	1,760	(6,000)	22,786	9,968	0	0	3,103	0	0
2007	61,822		50.0	0	1,760	(6,000)	23,151	7,762	0	0	3,400	0	0
2008	62,524		50.0	0	1,760	(6,000)	23,502	0	0	0	3,019	0	0
2009	63 158		50.0	0	1,760	(6,000)	23,819	0	0	0	0	0	0
2010	63 725		50.0	0	1,760	(6,000)	24,103	0	0	0	0	0	0
2011	65 168		50.0	0	1,760	(6,000)	24,824	0	0	0	0	0	0
2012	65,922		50.0	0	1,760	(6,000)	25,201	0	0	0	0	0	0
2013	66 818		50.0	0	1,760	(6,000)	25,649	0	0	0	0	0	0
2014	67 787		50.0	0	1,760	(6,000)	26,134	0	0	0	0	0	0
2015	68 687		50.0	0	1,760	(6,000)	26,583	0	0	0	0	0	0
2016	69 511		50.0	0	1,760	(6,000)	26,995	0	0	0	0	0	0
2017	70 302		50.0	0	1,760	(6,000)	27 391	0	0	0	0	0	0
2018	71 118		50.0	0	1,760	(6,000)	27,799	0	0	0	0	0	0
2019	71 948		50.0	0	1,760	(6,000)	28,214	0	0	0	0	0	0
2020	72 800		50.0	0	1,760	(6,000)	28,640	0	0	0	0	0	0
2021	73 669		50.0	0	1,760	(6,000)	29,075	0	0	0	0	0	0
2022	74 554		50.0	0	1,760	(6,000)	29,517	0	0	0	0	0	0
2023	75 450		50.0	0	1,760	(6,000)	29,965	0	0	0	0	0	0
2024	76 349		50.0	0	1,760	(6,000)	30 414	0	0	0	0	0	0
2025	77 236		50.0	0	1,760	(6,000)	30 856	0	0	0	0	0	0
2026	78 094		50.0	0	1,760	(6,000)	31,287	0	0	0	0	0	0
2027	78 900		50.0	0	1,760	(6,000)	31,690	0	0	0	0	0	0
2028	79 765		50.0	0	1,760	(6,000)	32,123	0	0	0	0	0	0
2029	80 616		50.0	0	1,760	(6,000)	32,548	0	0	0	0	0	0
2030	81 468		50.0	0	1,760	(6,000)	32,974	0	0	0	0	0	0
2031	82 334		50.0	0	1,760	(6,000)	33,407	0	0	0	0	0	0
2032	83 209		50.0	0	1,760	(6,000)	33,844	0	0	0	0	0	0
2033	84 085		50.0	0	1,760	(6,000)	34,282	0	0	0	0	0	0
2034	84 956		50.0	0	1,760	(6,000)	34,718	0	0	0	0	0	0
2035	85 823		50.0	0	1,760	(6,000)	35,151	0	0	0	0	0	0
2036	86 684		50.0	0	1,760	(6,000)	35,582	0	0	0	0	0	0
2037	87 543		50.0	0	1,760	(6,000)	36,011	0	0	0	0	0	0
2038	88 389		50.0	0	1,760	(6,000)	36 440	0	0	0	0	0	0
2039	89 255		50.0	0	1,760	(6,000)	36 868	0	0	0	0	0	0
2040	90 114		50.0	0	1,760	(6,000)	37,297	0	0	0	0	0	0
2041	90 9[illegible]		50.0	0	1,760	(6,000)	37 728	0	0	0	0	0	0
2042	91 844		50.0	0	1,760	(6,000)	38 162	0	0	0	0	0	0
2043	92 714		50.0	0	1,760	(6,000)	38,597	0	0	0	0	0	0
		Total Capacity Used (Tons)						32,556,392	2,812,688	3,829,579	11,363,944	8,909,008	1 433,224

Table F-2. Projected Daily Disposal Capacity Shortfall
Scenario 2 – Waste Exports
(Continued)

	O	Q	R	S	T	U	V	W	X	Y	Z	AA
4	D WASTE FACILITIES AND POTENTIAL EXPANSIONS											
5	WASTE DISPOSAL RATES											
6	POLITAN AREA - 1995											
9	Landfill Waste Acceptance Rate - (tpd-6)											
12	Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Park	Antelope Valley Dump	Azusa Land Reclamation	Burbank	Waste Management of Lancaster	Pebbly Beach Disposal	U.S. Navy	Whittier-Savage Canyon	Unsatisfied Need
14	3,407	5,162	1,807	9	387	3,097	84	516	2	0.5	181	0
15	3,344	2,257	1,773	9	380	3,040	82	507	2	0.5	177	0
16	4,316	0	2,289	12	490	5,095	106	654	3	0.7	229	0
17	4,786	0	2,538	13	544	0	117	426	3	0.7	254	0
18	4,935	0	2,617	13	561	0	121	0	3	0.7	262	0
19	4,023	0	2,133	11	457	0	99	0	2	0.6	213	0
20	5,216	0	2,766	14	593	0	128	0	3	0.8	277	0
21	5,354	0	2,839	15	608	0	131	0	3	0.8	284	0
22	5,492	0	2,913	15	624	0	135	0	3	0.8	291	0
23	5,615	0	2,978	15	638	0	138	0	3	0.9	298	0
24	5,732	0	3,040	16	651	0	141	0	3	0.9	304	0
25	5,309	0	3,194	16	684	0	148	0	4	0.9	319	0
26	0	0	3,500	34	750	0	240	0	8	1.0	350	7,107
27	0	0	3,500	91	61	0	240	0	20	1.0	350	16,274
28	0	0	3,500	102	0	0	240	0	24	1.0	350	19,602
29	0	0	3,500	102	0	0	240	0	24	1.0	350	19,886
30	0	0	3,500	102	0	0	240	0	33	1.0	350	20,569
31	0	0	2,025	102	0	0	240	0	0	1.0	350	22,483
32	0	0	0	102	0	0	240	0	0	1.0	350	24,956
33	0	0	0	102	0	0	240	0	0	1.0	350	25,441
34	0	0	0	102	0	0	240	0	0	1.0	350	25,890
35	0	0	0	102	0	0	240	0	0	1.0	350	26,302
36	0	0	0	102	0	0	240	0	0	1.0	350	26,698
37	0	0	0	102	0	0	240	0	0	1.0	350	27,106
38	0	0	0	102	0	0	240	0	0	1.0	350	27,521
39	0	0	0	102	0	0	240	0	0	1.0	350	27,947
40	0	0	0	102	0	0	240	0	0	1.0	350	28,382
41	0	0	0	102	0	0	240	0	0	1.0	350	28,824
42	0	0	0	102	0	0	240	0	0	1.0	66	29,556
43	0	0	0	99	0	0	240	0	0	1.0	0	30,074
44	0	0	0	0	0	0	240	0	0	1.0	0	30,617
45	0	0	0	0	0	0	240	0	0	1.0	0	31,046
46	0	0	0	0	0	0	240	0	0	1.0	0	31,449
47	0	0	0	0	0	0	240	0	0	1.0	0	31,882
48	0	0	0	0	0	0	240	0	0	1.0	0	32,307
49	0	0	0	0	0	0	240	0	0	1.0	0	32,733
50	0	0	0	0	0	0	240	0	0	1.0	0	33,166
51	0	0	0	0	0	0	240	0	0	1.0	0	33,603
52	0	0	0	0	0	0	240	0	0	1.0	0	34,041
53	0	0	0	0	0	0	240	0	0	1.0	0	34,477
54	0	0	0	0	0	0	240	0	0	1.0	0	34,910
55	0	0	0	0	0	0	240	0	0	1.0	0	35,341
56	0	0	0	0	0	0	240	0	0	1.0	0	35,770
57	0	0	0	0	0	0	240	0	0	1.0	0	36,199
58	0	0	0	0	0	0	240	0	0	1.0	0	36,627
59	0	0	0	0	0	0	240	0	0	1.0	0	37,056
60	0	0	0	0	0	0	240	0	0	1.0	0	37,487
61	0	0	0	0	0	0	240	0	0	1.0	0	37,921
62	0	0	0	0	0	0	240	0	0	1.0	0	38,356
63												45000
64	17,948,944	2,314,568	15,728,208	596,864	2,300,976	3,504,336	3,216,503	655,952	44,680	14,297	2,731,448	

Table F-3. Projected Daily Disposal Capacity Shortfall
Scenario 3 – Landfill Bans for Inert Materials and Biosolids

Scenario 3

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50,129		25.0	2,597	1,760	-	33,240	5,240	1,771	5,745	1,828	3,351	1,915
1996	52,332	500	30.0	2,711	1,760	(2,000)	29,662	4,808	1,626	5,272	1,494	3,075	2,679
1997	53,587	500	35.0	2,776	1,760	(3,500)	26,296	6,016	2,034	0	1,869	3,847	0
1998	53,714	500	40.0	2,782	1,760	(3,500)	23,686	6,510	3,584	0	2,022	4,183	0
1999	54,057	500	45.0	2,800	1,760	(3,500)	21,171	7,060	0	0	2,199	4,528	0
2000	54,903	500	50.0	2,844	1,760	(3,500)	18,846	6,303	0	0	1,958	4,031	0
2001	56,188	500	50.0	2,911	1,760	(6,000)	16,923	4,834	0	0	1,502	5,556	0
2002	57,267	500	50.0	2,966	1,760	(6,000)	17,407	7,405	0	0	2,300	0	0
2003	58,344	500	50.0	3,022	1,760	(6,000)	17,890	7,610	0	0	2,364	0	0
2004	59,302	500	50.0	3,072	1,760	(6,000)	18,319	7,793	0	0	2,421	0	0
2005	60,212	500	50.0	3,119	1,760	(6,000)	18,727	7,966	0	0	2,475	0	0
2006	61,052	500	50.0	3,162	1,760	(6,000)	19,104	8,126	0	0	2,524	0	0
2007	61,822	500	50.0	3,202	1,760	(6,000)	19,449	8,273	0	0	2,570	0	0
2008	62,524	500	50.0	3,239	1,760	(6,000)	19,763	8,741	0	0	2,715	0	0
2009	63,158	500	50.0	3,272	1,760	(6,000)	20,047	7,643	0	0	3,400	0	0
2010	63,725	500	50.0	3,301	1,760	(6,000)	20,302	0	0	0	2,982	0	0
2011	65,168	500	50.0	3,376	1,760	(6,000)	20,948	0	0	0	0	0	0
2012	65,922	500	50.0	3,415	1,760	(6,000)	21,286	0	0	0	0	0	0
2013	66,816	500	50.0	3,461	1,760	(6,000)	21,688	0	0	0	0	0	0
2014	67,787	500	50.0	3,511	1,760	(6,000)	22,122	0	0	0	0	0	0
2015	68,687	500	50.0	3,558	1,760	(6,000)	22,525	0	0	0	0	0	0
2016	69,511	500	50.0	3,601	1,760	(6,000)	22,895	0	0	0	0	0	0
2017	70,302	500	50.0	3,642	1,760	(6,000)	23,249	0	0	0	0	0	0
2018	71,118	500	50.0	3,684	1,760	(6,000)	23,615	0	0	0	0	0	0
2019	71,948	500	50.0	3,727	1,760	(6,000)	23,987	0	0	0	0	0	0
2020	72,800	500	50.0	3,771	1,760	(6,000)	24,369	0	0	0	0	0	0
2021	73,669	500	50.0	3,816	1,760	(6,000)	24,759	0	0	0	0	0	0
2022	74,554	500	50.0	3,862	1,760	(6,000)	25,155	0	0	0	0	0	0
2023	75,450	500	50.0	3,908	1,760	(6,000)	25,557	0	0	0	0	0	0
2024	76,349	500	50.0	3,955	1,760	(6,000)	25,959	0	0	0	0	0	0
2025	77,236	500	50.0	4,001	1,760	(6,000)	26,357	0	0	0	0	0	0
2026	78,094	500	50.0	4,045	1,760	(6,000)	26,742	0	0	0	0	0	0
2027	78,900	500	50.0	4,087	1,760	(6,000)	27,103	0	0	0	0	0	0
2028	79,765	500	50.0	4,132	1,760	(6,000)	27,491	0	0	0	0	0	0
2029	80,616	500	50.0	4,176	1,760	(6,000)	27,872	0	0	0	0	0	0
2030	81,468	500	50.0	4,220	1,760	(6,000)	28,254	0	0	0	0	0	0
2031	82,334	500	50.0	4,265	1,760	(6,000)	28,642	0	0	0	0	0	0
2032	83,209	500	50.0	4,310	1,760	(6,000)	29,034	0	0	0	0	0	0
2033	84,085	500	50.0	4,356	1,760	(6,000)	29,427	0	0	0	0	0	0
2034	84,956	500	50.0	4,401	1,760	(6,000)	29,817	0	0	0	0	0	0
2035	85,823	500	50.0	4,446	1,760	(6,000)	30,206	0	0	0	0	0	0
2036	86,684	500	50.0	4,490	1,760	(6,000)	30,592	0	0	0	0	0	0
2037	87,543	500	50.0	4,535	1,760	(6,000)	30,977	0	0	0	0	0	0
2038	88,399	500	50.0	4,579	1,760	(6,000)	31,360	0	0	0	0	0	0
2039	89,255	500	50.0	4,623	1,760	(6,000)	31,744	0	0	0	0	0	0
2040	90,114	500	50.0	4,668	1,760	(6,000)	32,129	0	0	0	0	0	0
2041	90,977	500	50.0	4,713	1,760	(6,000)	32,516	0	0	0	0	0	0
2042	91,844	500	50.0	4,758	1,760	(6,000)	32,905	0	0	0	0	0	0
2043	92,714	500	50.0	4,803	1,760	(6,000)	33,294	0	0	0	0	0	0
Total Capacity Used (Tons)								32,556,392	2,812,666	3,437,315	11,363,644	8,909,008	1,433,224

Table F-3. Projected Daily Disposal Capacity Shortfall
Scenario 3 – Landfill Bans for Inert Materials and Biosolids
(*Continued*)

	O	Q	R	S	T	U	V	W	X	Y	Z	AA
1												
2												
3												
4	D WASTE FACILITIES AND POTENTIAL EXPANSIONS											
5	WASTE DISPOSAL RATES											
6	POLITAN AREA - 1995											
7												
8												
9	Landfill Waste Acceptance Rate - (tpd-6)											
10												
11												
12	Sunshine	Chiquita		Brand	Antelope Valley	Azusa Land		Waste Management	Pebbly Beach		Whittier-	Unsatisfied
13	Canyon	Canyon	Calabasas	Park	Dump	Reclamation	Burbank	of Lancaster	Disposal	U.S. Navy	Canyon	Need
14	3 160	4 788	1 676	9	359	2,873	78	479	2	0 5	168	0
15	2 900	2,631	1 538	8	329	2,636	71	439	2	0 4	154	0
16	3 628	0	1.924	10	412	5,723	89	550	2	0.5	192	0
17	3 925	0	2,082	11	446	0	96	635	2	0 6	208	0
18	4 269	0	2.264	12	485	0	105	0	3	0.6	226	0
19	3 80	0	2.015	10	432	0	93	0	2	0.6	202	0
20	2 915	0	1 546	8	331	0	72	0	2	0.4	155	0
21	4 465	0	2.368	12	507	0	110	0	3	0	237	0
22	4 589	0	2,434	13	521	0	113	0	3	0 7	243	0
23	4 699	0	2,492	13	534	0	115	0	3	0.7	249	0
24	4 804	0	2.547	13	546	0	118	0	3	0 7	255	0
25	4 900	0	2.599	13	557	0	120	0	3	0.7	260	0
26	4 989	0	2.646	14	567	0	122	0	3	0.8	265	0
27	4 486	0	2.795	14	599	0	129	0	3	0.8	280	0
28	0	0	3 500	28	748	0	240	0	6	1 0	350	4 130
29	0	0	3.500	77	0	0	240	0	17	1 0	350	13 134
30	0	0	3.500	93	0	0	240	0	21	1.0	350	16.743
31	0	0	3.500	95	0	0	240	0	21	1 0	350	17 079
32	0	0	3.500	97	0	0	240	0	21	1 0	350	17.479
33	0	0	1.987	102	0	0	240	0	21	1 0	350	19 421
34	0	0	0	102	0	0	240	0	0	1.0	350	21.832
35	0	0	0	102	0	0	240	0	0	1 0	350	22.202
36	0	0	0	102	0	0	240	0	0	1 0	350	22.556
37	0	0	0	102	0	0	240	0	0	1 0	350	22.922
38	0	0	0	102	0	0	240	0	0	1 0	350	23.294
39	0	0	0	102	0	0	240	0	0	1 0	350	23.676
40	0	0	0	102	0	0	240	0	0	1 0	350	24.066
41	0	0	0	102	0	0	240	0	0	1.0	350	24 462
42	0	0	0	102	0	0	240	0	0	1 0	350	24 864
43	0	0	0	102	0	0	240	0	0	1 0	350	25.266
44	0	0	0	102	0	0	240	0	0	1 0	62	25.952
45	0	0	0	102	0	0	240	0	0	1 0	0	26 399
46	0	0	0	37	0	0	240	0	0	1.0	0	26.825
47	0	0	0	0	0	0	240	0	0	1.0	0	27.250
48	0	0	0	0	0	0	240	0	0	1 0	0	27.631
49	0	0	0	0	0	0	240	0	0	1 0	0	28.013
50	0	0	0	0	0	0	240	0	0	1.0	0	28.401
51	0	0	0	0	0	0	240	0	0	1 0	0	28.793
52	0	0	0	0	0	0	240	0	0	1 0	0	29.186
53	0	0	0	0	0	0	240	0	0	1.0	0	29.576
54	0	0	0	0	0	0	240	0	0	1.0	0	29.965
55	0	0	0	0	0	0	240	0	0	1.0	0	30.351
56	0	0	0	0	0	0	240	0	0	1.0	0	30.736
57	0	0	0	0	0	0	240	0	0	1 0	0	31.119
58	0	0	0	0	0	0	240	0	0	1 0	0	31.503
59	0	0	0	0	0	0	240	0	0	1 0	0	31 888
60	0	0	0	0	0	0	240	0	0	1 0	0	32.275
61	0	0	0	0	0	0	240	0	0	1.0	0	32.664
62	0	0	0	0	0	0	240	0	0	1.0	0	33.053
63												45000
64	17 948 944	2 314 568	15.728.208	598 864	2,300 976	3,504 336	3.067 380	655,952	44 680	13 677	2 731 448	

Table F-4. Projected Daily Disposal Capacity Shortfall
Scenario 4 – City and Unincorporated Diversion at 70 Percent

Scenario 4

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50 129		25 0	2,597	1,760	-	33,240	5,240	1,771	5 745	1 628	3,351	1 915
1996	52 332	500	30.0	2,711	1,760	(2,000)	29,662	4,806	1,626	5,272	1 494	3,075	2,679
1997	53 587	500	35.0	2,778	1,760	(3,500)	26,296	6,016	2,034	0	1,869	3 847	0
1998	53 714	500	40.0	2,782	1,760	(3,500)	23,686	6,510	3,584	0	2,022	4 163	0
1999	54 057	500	45 0	2,800	1,760	(3,500)	21,171	7,060	0	0	2,199	4,528	0
2000	54 903	500	50.0	2,844	1,760	(3,500)	18,848	8,303	0	0	1,958	4 031	0
2001	56 188	500	50.5	2,911	1,760	(6,000)	16,659	4,722	0	0	1,467	5 558	0
2002	57 257	500	50.9	2,966	1,760	(6,000)	16,869	7,176	0	0	2,229	0	0
2003	58 344	500	51 4	3,022	1,760	(6,000)	17,087	7,260	0	0	2,255	0	0
2004	59 302	500	51.9	3,072	1,760	(6,000)	17,204	7,318	0	0	2,273	0	0
2005	60 212	500	52.4	3,119	1,760	(6,000)	17,312	7,364	0	0	2,288	0	0
2006	61 052	500	52.8	3,162	1,760	(6,000)	17,382	7,394	0	0	2,297	0	0
2007	61 822	500	53.3	3,202	1,760	(6,000)	17,415	7,406	0	0	2,301	0	0
2008	62 524	500	53.8	3,239	1,760	(6,000)	17,412	6,235	0	0	1,937	0	0
2009	63 158	500	54 2	3,272	1,760	(6,000)	17,378	9,941	0	0	3,088	0	0
2010	63 725	500	54 7	3,301	1,760	(6,000)	17,306	3,573	0	0	3,400	0	0
2011	65 168	500	55 2	3,376	1,760	(6,000)	17,579	0	0	0	1,718	0	0
2012	65 822	500	55.6	3,415	1,760	(6,000)	17,568	0	0	0	0	0	0
2013	66 818	500	56.1	3,461	1,760	(6,000)	17,605	0	0	0	0	0	0
2014	67 [illegible]	500	56.6	3,511	1,760	(6,000)	17,682	0	0	0	0	0	0
2015	68 587	500	57 1	3,558	1,760	(6,000)	17,683	0	0	0	0	0	0
2016	69 511	500	57 5	3,601	1,760	(6,000)	17,667	0	0	0	0	0	0
2017	70 302	500	58.0	3,642	1,760	(6,000)	17,632	0	0	0	0	0	0
2018	71 [illegible]	500	58.5	3,684	1,760	(6,000)	17,599	0	0	0	0	0	0
2019	71 948	500	58.9	3,727	1,760	(6,000)	17,562	0	0	0	0	0	0
2020	72 500	500	58.9	3,771	1,760	(6,000)	17,668	0	0	0	0	0	0
2021	73 569	500	58.9	3,816	1,760	(6,000)	18,180	0	0	0	0	0	0
2022	74 554	500	58.9	3,862	1,760	(6,000)	18,498	0	0	0	0	0	0
2023	75 450	500	58.9	3,908	1,760	(6,000)	18,819	0	0	0	0	0	0
2024	76 349	500	58.9	3,955	1,760	(6,000)	19,142	0	0	0	0	0	0
2025	77 236	500	58.9	4,001	1,760	(6,000)	19,460	0	0	0	0	0	0
2026	78 094	500	58.9	4,045	1,760	(6,000)	19,768	0	0	0	0	0	0
2027	78 900	500	58.9	4,087	1,760	(6,000)	20,057	0	0	0	0	0	0
2028	79 765	500	58.9	4,132	1,760	(6,000)	20,368	0	0	0	0	0	0
2029	80 616	500	58.9	4,176	1,760	(6,000)	20,673	0	0	0	0	0	0
2030	81 468	500	58.9	4,220	1,760	(6,000)	20,979	0	0	0	0	0	0
2031	82 334	500	58.9	4,265	1,760	(6,000)	21,290	0	0	0	0	0	0
2032	83 209	500	58.9	4,310	1,760	(6,000)	21,604	0	0	0	0	0	0
2033	84 065	500	58.9	4,356	1,760	(6,000)	21,918	0	0	0	0	0	0
2034	84 956	500	58.9	4,401	1,760	(6,000)	22,231	0	0	0	0	0	0
2035	85 823	500	58.9	4,446	1,760	(6,000)	22,542	0	0	0	0	0	0
2036	86 684	500	58.9	4,490	1,760	(6,000)	22,851	0	0	0	0	0	0
2037	87 543	500	58.9	4,535	1,760	(6,000)	23,159	0	0	0	0	0	0
2038	88 399	500	58.9	4,579	1,760	(6,000)	23,466	0	0	0	0	0	0
2039	89 255	500	58.9	4,623	1,760	(6,000)	23,774	0	0	0	0	0	0
2040	90 114	500	58.9	4,668	1,760	(6,000)	24,082	0	0	0	0	0	0
2041	90 9[illegible]	500	58.9	4,713	1,760	(6,000)	24,392	0	0	0	0	0	0
2042	91 844	500	58.9	4,758	1,760	(6,000)	24,703	0	0	0	0	0	0
2043	92 714	500	58.9	4,803	1,760	(6,000)	25,015	0	0	0	0	0	0
			Total Capacity Used (Tons)					32,556,392	2,812,668	3,437,315	11,363,944	8,909,008	1,433,224

Table F-4. Projected Daily Disposal Capacity Shortfall
Scenario 4 – City and Unincorporated Diversion at 70 Percent
(*Continued*)

	P	Q	R	S	T	U	V	W	X	Y	Z	AA
1												
2												
3												
4	D WASTE FACILITIES AND POTENTIAL EXPANSIONS											
5	WASTE DISPOSAL RATES											
6	POLITAN AREA - 1995											
7												
8												
9	Landfill Waste Acceptance Rate - (tpd-6)											
10												
11												
12	Sunshine	Chiquita			Antelope	Azusa		Waste	Pebbly		Whittier-	
13	Canyon	Canyon	Calabasas	Brand Park	Valley Dump	Land Reclamation	Burbank	Management of Lancaster	Beach Disposal	U.S. Navy	Savage Canyon	Unsatisfied Need
14	3 160	4 788	1,678	9	359	2,873	78	479	2	0 5	168	0
15	2.900	2,631	1,538	8	329	2,636	71	439	2	0 4	154	0
16	3 628	0	1,924	10	412	5,723	89	550	2	0 5	192	0
17	3,925	0	2,082	11	446	0	96	635	2	0 6	208	0
18	4 269	0	2,264	12	485	0	105	0	3	0 6	226	0
19	3 80	0	2.015	10	432	0	93	0	2	0 6	202	0
20	2 846	0	1 510	8	324	0	70	0	2	0 4	151	0
21	4 327	0	2,295	12	492	0	106	0	3	0 7	229	0
22	4 378	0	2,322	12	497	0	107	0	3	0 7	232	0
23	4 413	0	2,340	12	501	0	108	0	3	0 7	234	0
24	4 441	0	2,355	12	505	0	109	0	3	0 7	235	0
25	4 459	0	2,364	12	507	0	109	0	3	0 7	236	0
26	4 467	0	2,369	12	508	0	110	0	3	0 7	237	0
27	6 515	0	1,994	10	427	0	92	0	2	0 6	199	0
28	0	0	3,179	16	681	0	147	0	4	0 9	318	0
29	0	0	3,500	32	469	0	240	0	7	1 0	350	5 734
30	0	0	3,500	71	0	0	240	0	16	1 0	350	11 684
31	0	0	3,500	78	0	0	240	0	17	1 0	350	13 381
32	0	0	3,500	79	0	0	240	0	17	1 0	350	13 418
33	0	0	3,500	79	0	0	240	0	18	1 0	350	13 475
34	0	0	685	102	0	0	240	0	31	1 0	350	16.274
35	0	0	0	102	0	0	240	0	0	1 0	350	16 974
36	0	0	0	102	0	0	240	0	0	1 0	350	16 939
37	0	0	0	102	0	0	240	0	0	1 0	350	16 906
38	0	0	0	102	0	0	240	0	0	1 0	350	16 869
39	0	0	0	102	0	0	240	0	0	1 0	350	17 175
40	0	0	0	102	0	0	240	0	0	1 0	350	17 487
41	0	0	0	102	0	0	240	0	0	1 0	350	17 805
42	0	0	0	102	0	0	240	0	0	1 0	350	18,126
43	0	0	0	102	0	0	240	0	0	1 0	350	18 449
44	0	0	0	102	0	0	240	0	0	1 0	282	18.835
45	0	0	0	102	0	0	240	0	0	1 0	0	19 425
46	0	0	0	102	0	0	240	0	0	1 0	0	19 714
47	0	0	0	83	0	0	240	0	0	1 0	0	20 044
48	0	0	0	0	0	0	240	0	0	1 0	0	20 432
49	0	0	0	0	0	0	240	0	0	1 0	0	20 738
50	0	0	0	0	0	0	240	0	0	1 0	0	21 049
51	0	0	0	0	0	0	240	0	0	1 0	0	21,363
52	0	0	0	0	0	0	240	0	0	1 0	0	21,677
53	0	0	0	0	0	0	240	0	0	1 0	0	21 990
54	0	0	0	0	0	0	240	0	0	1 0	0	22.301
55	0	0	0	0	0	0	240	0	0	1 0	0	22,610
56	0	0	0	0	0	0	240	0	0	1 0	0	22,918
57	0	0	0	0	0	0	240	0	0	1 0	0	23,225
58	0	0	0	0	0	0	240	0	0	1 0	0	23,533
59	0	0	0	0	0	0	240	0	0	1 0	0	23 841
60	0	0	0	0	0	0	240	0	0	1 0	0	24.151
61	0	0	0	0	0	0	240	0	0	1 0	0	24 462
62	0	0	0	0	0	0	240	0	0	1 0	0	24.774
63												
64	17 948 944	2.314 568	15,728,206	586 864	2,300 976	3,504 336	3 011.297	655,952	44 580	13 481	2,731 448	45000

Table F-5. Projected Daily Disposal Capacity Shortfall
Scenario 5 – Capacity Saving By Use of Foam Cover

Scenario 5

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50,129		25.0	2,597	1,780	-	33,240	5,240	1,771	5,745	1,828	3,351	1,915
1996	52,332	500	30.0	2,711	1,780	(2,000)	29,662	4,287	1,449	4,700	1,332	2,742	3,689
1997	53,587	500	35.0	2,778	1,780	(3,500)	26,296	6,627	2,240	0	2,059	4,238	0
1998	53,714	500	40.0	2,782	1,780	(3,500)	23,686	5,509	1,862	0	1,711	3,523	0
1999	54,057	500	45.0	2,800	1,780	(3,500)	21,171	5,655	3,675	0	1,757	3,617	0
2000	54,903	500	50.0	2,844	1,780	(3,500)	18,848	6,303	0	0	1,958	4,031	0
2001	56,188	500	50.5	2,911	1,780	(6,000)	16,859	5,571	0	0	1,731	3,563	0
2002	57,257	500	50.9	2,966	1,780	(6,000)	16,689	5,641	0	0	1,752	3,606	0
2003	58,344	500	51.4	3,022	1,780	(6,000)	17,067	4,638	0	0	1,441	8,164	0
2004	59,302	500	51.9	3,072	1,780	(6,000)	17,204	7,318	0	0	2,273	0	0
2005	60,212	500	52.4	3,119	1,780	(6,000)	17,312	7,364	0	0	2,288	0	0
2006	61,052	500	52.8	3,162	1,780	(6,000)	17,382	7,394	0	0	2,297	0	0
2007	61,822	500	53.3	3,202	1,780	(6,000)	17,415	7,408	0	0	2,301	0	0
2008	62,524	500	53.8	3,239	1,780	(6,000)	17,412	7,407	0	0	2,301	0	0
2009	63,158	500	54.2	3,272	1,780	(6,000)	17,376	7,391	0	0	2,296	0	0
2010	63,725	500	54.7	3,301	1,780	(6,000)	17,306	7,362	0	0	2,287	0	0
2011	65,168	500	55.2	3,376	1,780	(6,000)	17,579	7,478	0	0	2,323	0	0
2012	65,922	500	55.6	3,415	1,780	(6,000)	17,568	7,361	0	0	2,287	0	0
2013	66,618	500	56.1	3,451	1,780	(6,000)	17,605	11,352	0	0	2,596	0	0
2014	67,787	500	56.6	3,511	1,780	(6,000)	17,662	0	0	0	3,400	0	0
2015	68,687	500	57.1	3,556	1,780	(6,000)	17,683	0	0	0	2,418	0	0
2016	69,511	500	57.5	3,601	1,780	(6,000)	17,667	0	0	0	0	0	0
2017	70,300	500	58.0	3,642	1,780	(6,000)	17,632	0	0	0	0	0	0
2018	71,118	500	58.5	3,684	1,780	(6,000)	17,599	0	0	0	0	0	0
2019	71,948	500	58.9	3,727	1,780	(6,000)	17,562	0	0	0	0	0	0
2020	72,500	500	58.9	3,771	1,760	(6,000)	17,868	0	0	0	0	0	0
2021	73,569	500	58.9	3,816	1,760	(6,000)	18,180	0	0	0	0	0	0
2022	74,554	500	58.9	3,862	1,760	(6,000)	18,496	0	0	0	0	0	0
2023	75,450	500	58.9	3,908	1,760	(6,000)	18,819	0	0	0	0	0	0
2024	76,349	500	58.9	3,955	1,760	(6,000)	19,142	0	0	0	0	0	0
2025	77,236	500	58.9	4,001	1,760	(6,000)	19,460	0	0	0	0	0	0
2026	78,094	500	58.9	4,045	1,760	(6,000)	19,768	0	0	0	0	0	0
2027	78,900	500	58.9	4,087	1,760	(6,000)	20,057	0	0	0	0	0	0
2028	79,765	500	58.9	4,132	1,760	(6,000)	20,368	0	0	0	0	0	0
2029	80,616	500	58.9	4,176	1,760	(6,000)	20,673	0	0	0	0	0	0
2030	81,458	500	58.9	4,220	1,760	(6,000)	20,979	0	0	0	0	0	0
2031	82,334	500	58.9	4,265	1,760	(6,000)	21,290	0	0	0	0	0	0
2032	83,206	500	58.9	4,310	1,760	(6,000)	21,604	0	0	0	0	0	0
2033	84,065	500	58.9	4,356	1,760	(6,000)	21,916	0	0	0	0	0	0
2034	84,956	500	58.9	4,401	1,760	(6,000)	22,231	0	0	0	0	0	0
2035	85,823	500	58.9	4,446	1,760	(6,000)	22,542	0	0	0	0	0	0
2036	86,684	500	58.9	4,490	1,760	(6,000)	22,851	0	0	0	0	0	0
2037	87,543	500	58.9	4,535	1,760	(6,000)	23,159	0	0	0	0	0	0
2038	88,399	500	58.9	4,579	1,760	(6,000)	23,466	0	0	0	0	0	0
2039	89,256	500	58.9	4,623	1,760	(6,000)	23,774	0	0	0	0	0	0
2040	90,114	500	58.9	4,668	1,760	(6,000)	24,082	0	0	0	0	0	0
2041	90,977	500	58.9	4,713	1,760	(6,000)	24,392	0	0	0	0	0	0
2042	91,844	500	58.9	4,758	1,760	(6,000)	24,703	0	0	0	0	0	0
2043	92,714	500	58.9	4,803	1,760	(6,000)	25,015	0	0	0	0	0	0
Total Capacity Used (Tons)								39,718,796	3,431,479	3,258,816	13,864,012	10,868,990	1,748,533

Table F-5. Projected Daily Disposal Capacity Shortfall
Scenario 5 – Capacity Saving By Use of Foam Cover
(*Continued*)

	P	Q	R	S	T	U	V	W	X	Y	Z	AA
1												
2												
3												
4	D WASTE FACILITIES AND POTENTIAL EXPANSIONS											
5	WASTE DISPOSAL RATES											
6	POLITAN AREA - 1995											
7												
8												
9	Landfill Waste Acceptance Rate - (tpd-d)											
10												
11												
12	Sunshine	Chiquita		Brand	Antelope Valley	Azusa Land		Waste Management	Pebbly Beach		Whittier-	
13	Canyon	Canyon	Calabassas	Park	Dump	Reclamation	Burbank	of Lancaster	Disposal	U.S. Navy	Savage Canyon	Unsatisfied Need
14	3,160	4,788	1,676	9	359	2,873	78	479	2	0.5	168	0
15	2,585	4,263	1,371	7	294	2,350	63	392	2	0.4	137	0
16	3,996	0	2,119	11	454	3,633	98	605	2	0.6	212	0
17	3,322	0	1,782	9	377	4,848	82	503	2	0.5	176	0
18	3,410	0	1,806	9	387	0	84	586	2	0.5	181	0
19	3,80	0	2,015	10	432	0	93	0	2	0.6	202	0
20	3,359	0	1,781	9	382	0	82	0	2	0.5	178	0
21	3,402	0	1,804	9	387	0	83	0	2	0.5	180	0
22	2,797	0	1,483	8	318	0	69	0	2	0.4	148	0
23	4,413	0	2,340	12	501	0	108	0	3	0.7	234	0
24	4,441	0	2,355	12	505	0	109	0	3	0.7	265	0
25	4,459	0	2,364	12	507	0	109	0	3	0.7	236	0
26	4,467	0	2,369	12	508	0	110	0	3	0.7	237	0
27	4,466	0	2,369	12	508	0	110	0	3	0.7	237	0
28	4,457	0	2,364	12	506	0	109	0	3	0.7	236	0
29	4,439	0	2,354	12	504	0	109	0	3	0.7	235	0
30	4,506	0	2,391	12	512	0	111	0	3	0.7	239	0
31	4,703	0	2,354	12	504	0	109	0	3	0.7	235	0
32	0	0	2,674	14	573	0	124	0	3	0.8	267	0
33	0	0	3,500	42	479	0	240	0	9	1.0	350	9,641
34	0	0	3,500	68	0	0	240	0	15	1.0	350	11,091
35	0	0	3,500	79	0	0	240	0	18	1.0	350	13,460
36	0	0	3,500	79	0	0	240	0	17	1.0	350	13,445
37	0	0	3,500	79	0	0	240	0	17	1.0	350	13,412
38	0	0	3,500	78	0	0	240	0	17	1.0	350	13,375
39	0	0	748	102	0	0	240	0	33	1.0	350	16,394
40	0	0	0	102	0	0	240	0	2	1.0	350	17,485
41	0	0	0	102	0	0	240	0	0	1.0	350	17,805
42	0	0	0	102	0	0	240	0	0	1.0	350	18,126
43	0	0	0	102	0	0	240	0	0	1.0	350	18,449
44	0	0	0	102	0	0	240	0	0	1.0	350	18,767
45	0	0	0	102	0	0	240	0	0	1.0	350	19,075
46	0	0	0	102	0	0	240	0	0	1.0	350	19,364
47	0	0	0	102	0	0	240	0	0	1.0	350	19,675
48	0	0	0	102	0	0	240	0	0	1.0	350	19,980
49	0	0	0	102	0	0	240	0	0	1.0	350	20,286
50	0	0	0	102	0	0	240	0	0	1.0	350	20,597
51	0	0	0	102	0	0	240	0	0	1.0	350	20,911
52	0	0	0	102	0	0	240	0	0	1.0	55	21,520
53	0	0	0	102	0	0	240	0	0	1.0	0	21,888
54	0	0	0	102	0	0	240	0	0	1.0	0	22,199
55	0	0	0	73	0	0	240	0	0	1.0	0	22,537
56	0	0	0	0	0	0	240	0	0	1.0	0	22,918
57	0	0	0	0	0	0	240	0	0	1.0	0	23,225
58	0	0	0	0	0	0	240	0	0	1.0	0	23,533
59	0	0	0	0	0	0	240	0	0	1.0	0	23,841
60	0	0	0	0	0	0	240	0	0	1.0	0	24,151
61	0	0	0	0	0	0	240	0	0	1.0	0	24,462
62	0	0	0	0	0	0	240	0	0	1.0	0	24,774
63												45000
64	21,897,712	2,823,773	19,188,414	728,174	2,807,191	4,275,290	2,820,486	800,261	54,510	12,904	3,332,367	

Table F-6. Projected Daily Disposal Capacity Shortfall
Scenario 5A -- Capacity Saving By Use of Biostabilization

Scenario 5

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50,129		25.0	1,948	1,760	-	33,589	5,342	1,606	5,857	1,660	3,417	1,952
1996	52,332	500	30.0	1,898	1,760	(2,000)	30,475	4,462	1,508	4,892	1,386	2,854	1,631
1997	53,587	500	35.0	1,804	1,760	(3,500)	27,267	6,872	2,323	0	2,135	4,395	0
1998	53,714	500	40.0	1,669	1,760	(3,500)	24,799	6,250	2,113	0	1,941	3,997	0
1999	54,057	500	45.0	1,540	1,760	(3,500)	22,431	5,308	1,794	0	1,649	3,395	0
2000	54,903	500	50.0	1,422	1,760	(3,500)	20,270	5,917	2,000	0	1,538	3,784	0
2001	56,168	500	50.5	1,442	1,760	(6,000)	18,128	5,401	1,978	0	1,678	3,454	0
2002	57,267	500	50.9	1,455	1,760	(6,000)	18,380	6,146	0	0	1,909	3,931	0
2003	58,344	500	51.4	1,468	1,760	(6,000)	18,621	6,227	0	0	1,934	3,982	0
2004	59,302	500	51.9	1,478	1,760	(6,000)	18,798	6,286	0	0	1,953	4,020	0
2005	60,212	500	52.4	1,486	1,760	(6,000)	18,945	5,678	0	0	1,763	5,602	0
2006	61,052	500	52.8	1,492	1,760	(6,000)	19,052	8,104	0	0	2,518	0	0
2007	61,822	500	53.3	1,496	1,760	(6,000)	19,121	8,134	0	0	2,527	0	0
2008	62,524	500	53.8	1,498	1,760	(6,000)	19,154	8,147	0	0	2,531	0	0
2009	63,158	500	54.2	1,497	1,760	(6,000)	19,150	8,146	0	0	2,531	0	0
2010	63,725	500	54.7	1,495	1,760	(6,000)	19,112	8,130	0	0	2,525	0	0
2011	65,168	500	55.2	1,513	1,760	(6,000)	19,442	8,270	0	0	2,569	0	0
2012	65,922	500	55.6	1,515	1,760	(6,000)	19,468	8,281	0	0	2,573	0	0
2013	66,818	500	56.1	1,519	1,760	(6,000)	19,547	8,315	0	0	2,583	0	0
2014	67,787	500	56.6	1,525	1,760	(6,000)	19,649	8,358	0	0	2,596	0	0
2015	68,687	500	57.1	1,528	1,760	(6,000)	19,713	9,440	0	0	2,932	0	0
2016	69,511	500	57.5	1,530	1,760	(6,000)	19,739	9,309	0	0	3,400	0	0
2017	70,302	500	58.0	1,530	1,760	(6,000)	19,744	0	0	0	3,400	0	0
2018	71,118	500	58.5	1,530	1,760	(6,000)	19,752	0	0	0	2,104	0	0
2019	71,948	500	58.9	1,531	1,760	(6,000)	19,758	0	0	0	0	0	0
2020	72,800	500	58.9	1,549	1,760	(6,000)	20,090	0	0	0	0	0	0
2021	73,669	500	58.9	1,567	1,760	(6,000)	20,429	0	0	0	0	0	0
2022	74,554	500	58.9	1,586	1,760	(6,000)	20,773	0	0	0	0	0	0
2023	75,450	500	58.9	1,605	1,760	(6,000)	21,122	0	0	0	0	0	0
2024	76,349	500	58.9	1,624	1,760	(6,000)	21,472	0	0	0	0	0	0
2025	77,236	500	58.9	1,643	1,760	(6,000)	21,818	0	0	0	0	0	0
2026	78,094	500	58.9	1,661	1,760	(6,000)	22,152	0	0	0	0	0	0
2027	78,900	500	58.9	1,679	1,760	(6,000)	22,466	0	0	0	0	0	0
2028	79,765	500	58.9	1,697	1,760	(6,000)	22,803	0	0	0	0	0	0
2029	80,616	500	58.9	1,715	1,760	(6,000)	23,134	0	0	0	0	0	0
2030	81,466	500	58.9	1,733	1,760	(6,000)	23,466	0	0	0	0	0	0
2031	82,334	500	58.9	1,752	1,760	(6,000)	23,803	0	0	0	0	0	0
2032	83,209	500	58.9	1,770	1,760	(6,000)	24,144	0	0	0	0	0	0
2033	84,085	500	58.9	1,789	1,760	(6,000)	24,485	0	0	0	0	0	0
2034	84,956	500	58.9	1,807	1,760	(6,000)	24,824	0	0	0	0	0	0
2035	85,823	500	58.9	1,826	1,760	(6,000)	25,161	0	0	0	0	0	0
2036	86,684	500	58.9	1,844	1,760	(6,000)	25,497	0	0	0	0	0	0
2037	87,543	500	58.9	1,862	1,760	(6,000)	25,831	0	0	0	0	0	0
2038	88,399	500	58.9	1,881	1,760	(6,000)	26,165	0	0	0	0	0	0
2039	89,255	500	58.9	1,899	1,760	(6,000)	26,498	0	0	0	0	0	0
2040	90,114	500	58.9	1,917	1,760	(6,000)	26,833	0	0	0	0	0	0
2041	90,977	500	58.9	1,935	1,760	(6,000)	27,169	0	0	0	0	0	0
2042	91,844	500	58.9	1,954	1,760	(6,000)	27,507	0	0	0	0	0	0
2043	92,714	500	58.9	1,972	1,760	(6,000)	27,845	0	0	0	0	0	0
Total Capacity Used (Tons)								48,834,588	4,219,032	3,353,809	17,045,916	13,363,512	1,117,936

Table F-6. Projected Daily Disposal Capacity Shortfall
Scenario 5A -- Capacity Saving By Use of Biostabilization
(*Continued*)

	P	Q	R	S	T	U	V	W	X	Y	Z	AA
1												
2												
3												
4	D WASTE FACILITIES AND POTENTIAL EXPANSIONS											
5	WASTE DISPOSAL RATES											
6	POLITAN AREA - 1995											
7												
8												
9	Landfill Waste Acceptance Rate - (tpd-d)											
10												
11												
12	Sunshine	Chiquita		Brand	Antelope Valley	Azusa Land		Waste Management	Pebbly Beach		Whittier-	Unsatisfied
13	Canyon	Canyon	Calabassas	Park	Dump	Reclamation	Burbank	of Lancaster	Disposal	U.S. Navy	Savage Canyon	Need
14	3,222	4,881	1,708	9	366	2,929	79	488	2	0.5	171	0
15	2,691	6,247	1,427	7	306	2,446	66	406	2	0.4	143	0
16	4,144	0	2,197	11	471	3,787	102	628	3	0.6	220	0
17	3,769	0	1,999	10	428	3,426	93	571	2	0.6	200	0
18	3,201	0	1,697	9	364	4,260	79	485	2	0.5	170	0
19	3,568	0	1,892	10	405	0	88	574	2	0.5	189	0
20	3,257	0	727	9	370	0	80	0	2	0.5	173	0
21	3,706	0	1,965	10	421	0	91	0	2	0.6	197	0
22	3,755	0	1,991	10	427	0	92	0	2	0.6	199	0
23	3,791	0	2,010	10	431	0	93	0	2	0.6	201	0
24	3,422	0	1,815	9	389	0	84	0	2	0.5	181	0
25	4,887	0	2,592	13	555	0	120	0	3	0.7	259	0
26	4,905	0	2,601	13	557	0	120	0	3	0.7	260	0
27	4,913	0	2,605	13	558	0	121	0	3	0.7	261	0
28	4,912	0	2,605	13	558	0	121	0	3	0.7	260	0
29	4,902	0	2,600	13	557	0	120	0	3	0.7	260	0
30	4,987	0	2,645	14	567	0	122	0	3	0.8	264	0
31	4,994	0	2,648	14	567	0	123	0	3	0.8	265	0
32	5,014	0	2,659	14	570	0	123	0	3	0.8	266	0
33	5,040	0	2,673	14	573	0	124	0	3	0.8	267	0
34	3,214	0	3,019	16	647	0	140	0	3	0.9	302	0
35	0	0	3,500	23	750	0	206	0	5	1.0	350	2,194
36	0	0	3,500	47	225	0	240	0	11	1.0	350	11,970
37	0	0	3,500	79	0	0	240	0	17	1.0	350	13,461
38	0	0	3,500	88	0	0	240	0	20	1.0	350	15,560
39	0	0	3,500	90	0	0	240	0	20	1.0	350	15,890
40	0	0	3,500	91	0	0	240	0	20	1.0	350	16,226
41	0	0	3,500	93	0	0	240	0	21	1.0	350	16,569
42	0	0	3,500	94	0	0	240	0	21	1.0	350	16,916
43	0	0	541	102	0	0	240	0	27	1.0	350	20,212
44	0	0	0	102	0	0	240	0	0	1.0	350	21,125
45	0	0	0	102	0	0	240	0	0	1.0	350	21,459
46	0	0	0	102	0	0	240	0	0	1.0	350	21,773
47	0	0	0	102	0	0	240	0	0	1.0	350	22,110
48	0	0	0	102	0	0	240	0	0	1.0	350	22,441
49	0	0	0	102	0	0	240	0	0	1.0	350	22,773
50	0	0	0	102	0	0	240	0	0	1.0	350	23,110
51	0	0	0	102	0	0	240	0	0	1.0	350	23,451
52	0	0	0	102	0	0	240	0	0	1.0	350	23,792
53	0	0	0	102	0	0	240	0	0	1.0	350	24,131
54	0	0	0	102	0	0	240	0	0	1.0	350	24,458
55	0	0	0	102	0	0	240	0	0	1.0	350	24,804
56	0	0	0	102	0	0	240	0	0	1.0	350	25,138
57	0	0	0	102	0	0	240	0	0	1.0	350	25,472
58	0	0	0	102	0	0	240	0	0	1.0	350	25,805
59	0	0	0	102	0	0	240	0	0	1.0	24	26,465
60	0	0	0	102	0	0	240	0	0	1.0	0	26,626
61	0	0	0	102	0	0	240	0	0	1.0	0	27,164
62	0	0	0	85	0	0	240	0	0	1.0	0	27,520
63												45000
64	26,923,416	3,471,852	23,592,312	895,296	3,451,464	5,256,504	2,765,989	983,928	67,020	12,932	4,097,172	

Table F-7. Projected Daily Disposal Capacity Shortfall
Scenario 6A -- Extensive Recycling Using 70 Percent Goal Countywide
(*Continued*)

	P	Q	R	S	T	U	V	W	X	Y	Z	AA
4	D WASTE FACILITIES AND POTENTIAL EXPANSIONS											
5	WASTE DISPOSAL RATES											
6	POLITAN AREA - 1995											
9	Landfill Waste Acceptance Rate - (tpd-8)											
12	Sunshine	Chiquita		Brand	Antelope Valley	Azusa Land		Waste Management	Pebbly Beach		Whittier-	Unsatisfied
13	Canyon	Canyon	Calabasas	Park	Dump	Reclamation	Burbank	of Lancaster	Disposal	U.S. Navy	Savage Canyon	Need
14	3 160	4 788	1 676	9	359	2,873	78	479	2	0.5	168	0
15	2.585	4 263	1 371	7	294	2 350	63	392	2	0 4	137	0
16	3 996	0	2 119	11	454	3 633	98	605	2	0 6	212	0
17	3.322	0	762	9	377	4 848	82	503	2	0 5	176	0
18	3 410	0	1 806	9	387	0	84	586	2	0.5	181	0
19	3 801	0	2 015	10	432	0	93	0	2	0.6	202	0
20	3 299	0	1 750	9	375	0	81	0	2	0.5	175	0
21	3 279	0	1 739	9	373	0	80	0	2	0.5	174	0
22	2 509	0	1.331	7	285	0	62	0	2	0 4	133	0
23	4 091	0	2.169	11	465	0	100	0	2	0.6	217	0
24	4 031	0	2.138	11	458	0	99	0	2	0.6	214	0
25	3 961	0	2 100	11	450	0	97	0	2	0.6	210	0
26	3 879	0	2.057	11	441	0	95	0	2	0.6	206	0
27	3 786	0	2.008	10	430	0	93	0	2	0.6	201	0
28	3 684	0	1 954	10	419	0	90	0	2	0.6	195	0
29	3 573	0	1 895	10	406	0	88	0	2	0.5	189	0
30	3 535	0	1 874	10	402	0	87	0	2	0.5	187	0
31	3 431	0	1 819	9	390	0	84	0	2	0.5	182	0
32	3 335	0	1 769	9	379	0	82	0	2	0.5	177	0
33	3 519	0	1,867	9	357	0	77	0	2	0.5	167	0
34	0	0	294	2	63	0	14	0	0	0 1	29	0
35	0	0	3 500	26	750	0	233	0	6	1.0	350	3.507
36	0	0	3 500	27	251	0	240	0	6	1 0	350	3 523
37	0	0	3 500	42	0	0	240	0	9	1 0	350	5 284
38	0	0	3 500	46	0	0	240	0	10	1 0	350	6 170
39	0	0	3 500	47	0	0	240	0	10	1 0	350	6 389
40	0	0	3 500	48	0	0	240	0	11	1 0	350	6 612
41	0	0	3,186	102	0	0	240	0	33	1 0	350	7 078
42	0	0	0	102	0	0	240	0	33	1 0	350	10 495
43	0	0	0	102	0	0	240	0	14	1 0	350	10.747
44	0	0	0	102	0	0	240	0	0	1.0	350	10.969
45	0	0	0	102	0	0	240	0	0	1.0	350	11.211
46	0	0	0	102	0	0	240	0	0	1.0	350	11.419
47	0	0	0	102	0	0	240	0	0	1 0	350	11 642
48	0	0	0	102	0	0	240	0	0	1 0	350	11.862
49	0	0	0	102	0	0	240	0	0	1 0	350	12.082
50	0	0	0	102	0	0	240	0	0	1 0	350	12.308
51	0	0	0	102	0	0	240	0	0	1.0	350	12.532
52	0	0	0	102	0	0	240	0	0	1 0	350	12.758
53	0	0	0	102	0	0	240	0	0	1 0	350	12.983
54	0	0	0	102	0	0	240	0	0	1 0	299	13.257
55	0	0	0	102	0	0	240	0	0	1 0	0	13.779
56	0	0	0	102	0	0	240	0	0	1 0	0	14.001
57	0	0	0	102	0	0	240	0	0	1 0	0	14.222
58	0	0	0	102	0	0	240	0	0	1 0	0	14 443
59	0	0	0	70	0	0	240	0	0	1 0	0	14 696
60	0	0	0	0	0	0	240	0	0	1.0	0	14 969
61	0	0	0	0	0	0	240	0	0	1 0	0	15,213
62	0	0	0	0	0	0	240	0	0	1.0	0	15 438
63												45000
64	21 897 712	2 823 773	19 188 414	728 174	2,807 191	4 275 290	2 633 331	800 261	54 510	12.052	3 332 367	

Table F-8. Projected Daily Disposal Capacity Shortfall
Scenario 6B – Extensive Recycling Using Landfill Bans

Scenario 6

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50 129		25.0	1,948	1,760	-	33,889	5,342	1,806	5,857	1,660	3 417	1,952
1996	52 332	500	30.0	1,896	1,760	(2,000)	30,474	3,752	1,268	4,114	1 166	2 400	7,304
1997	53 587	500	35.0	1,804	1,760	(3,500)	27,268	6,872	2,323	0	2,135	4,395	0
1998	53 714	500	40.0	8,392	1 760	(3,500)	18,078	3,838	1,297	0	1 192	2 455	0
1999	54 057	500	45.0	7 742	1,760	(3,500)	16,229	4 649	1,572	0	1 444	2 973	0
2000	54 903	500	50.0	7,148	1 760	(3,500)	14 543	3,950	2,732	0	1,227	2,526	0
2001	56 188	500	50.5	7,247	1,760	(6,000)	12,323	4,121	0	0	1,280	2 636	0
2002	57,267	500	50.9	7,316	1,760	(6,000)	12,519	4,186	0	0	1 300	2,677	0
2003	58 344	500	51.4	7,382	1,760	(6,000)	12,707	4,249	0	0	1,320	2 718	0
2004	59 302	500	51.9	7 431	1,760	(6,000)	12,845	4,296	0	0	1,334	2,747	0
2005	60 212	500	52.4	7 471	1,760	(6,000)	12,960	3,006	0	0	934	5 893	0
2006	61 052	500	52.8	7,501	1,760	(6,000)	13,044	5,549	0	0	1,724	0	0
2007	61 822	500	53.3	7,520	1,760	(6,000)	13,097	5,571	0	0	1,731	0	0
2008	62 524	500	53.8	7,528	1,760	(6,000)	13,123	5,582	0	0	1 734	0	0
2009	63 156	500	54 2	7,527	1,760	(6,000)	13,120	5,581	0	0	1 734	0	0
2010	63 725	500	54 7	7,517	1,760	(6,000)	13,090	5,566	0	0	1,730	0	0
2011	65 188	500	55.2	7,608	1,760	(6,000)	13,347	5,678	0	0	1,764	0	0
2012	65 922	500	55.6	7 615	1,760	(6,000)	13,368	5,686	0	0	1 766	0	0
2013	66 618	500	56.1	7,637	1,760	(6,000)	13,430	5,713	0	0	1 775	0	0
2014	67 787	500	56.6	7,664	1,760	(6,000)	13,509	5,746	0	0	1,785	0	0
2015	68 66	500	57.1	7 682	1,760	(6,000)	13,559	5,766	0	0	1 792	0	0
2016	69 511	500	57.5	7,689	1,760	(6,000)	13,579	5,776	0	0	1 794	0	0
2017	70 302	500	58.0	7,691	1 760	(6,000)	13,583	5,732	0	0	1 781	0	0
2018	71 118	500	58.5	7,693	1,760	(6,000)	13,590	11,092	0	0	1,037	0	0
2019	71 948	500	58.9	7 695	1 760	(6,000)	13,594	0	0	0	3 400	0	0
2020	72 800	500	58.9	7,766	1,760	(6,000)	13,853	0	0	0	3 400	0	0
2021	73 669	500	58.9	7,879	1,760	(6,000)	14,117	0	0	0	498	0	0
2022	74 554	500	58.9	7,973	1,760	(6,000)	14,386	0	0	0	0	0	0
2023	75 450	500	58.9	8,069	1,760	(6,000)	14,658	0	0	0	0	0	0
2024	76 349	500	58.9	8 165	1,760	(6,000)	14,931	0	0	0	0	0	0
2025	77 236	500	58.9	8,260	1,760	(6,000)	15,201	0	0	0	0	0	0
2026	78 094	500	58.9	8,352	1,760	(6,000)	15,461	0	0	0	0	0	0
2027	78 900	500	58.9	8,438	1 760	(6,000)	15,706	0	0	0	0	0	0
2028	79 765	500	58.9	8,531	1 760	(6,000)	15,969	0	0	0	0	0	0
2029	80 616	500	58.9	8,622	1,760	(6,000)	16,228	0	0	0	0	0	0
2030	81 468	500	58.9	8,713	1,760	(6,000)	16,486	0	0	0	0	0	0
2031	82 334	500	58.9	8,805	1,760	(6,000)	16,749	0	0	0	0	0	0
2032	83 206	500	58.9	8,899	1,760	(6,000)	17,015	0	0	0	0	0	0
2033	84 085	500	58.9	8,993	1 760	(6,000)	17,281	0	0	0	0	0	0
2034	84 956	500	58.9	9,086	1,760	(6,000)	17,546	0	0	0	0	0	0
2035	85 823	500	58.9	9,178	1,760	(6,000)	17,809	0	0	0	0	0	0
2036	86 684	500	58.9	9,271	1,760	(6,000)	18,071	0	0	0	0	0	0
2037	87 543	500	58.9	9,362	1,760	(6,000)	18,331	0	0	0	0	0	0
2038	88 399	500	58.9	9,454	1,760	(6,000)	18,592	0	0	0	0	0	0
2039	89 256	500	58.9	9,546	1,760	(6,000)	18,852	0	0	0	0	0	0
2040	90 114	500	58.9	9 637	1,760	(6,000)	19,112	0	0	0	0	0	0
2041	90 97	500	58.9	9,730	1,760	(6,000)	19,375	0	0	0	0	0	0
2042	91 844	500	58.9	9,822	1,760	(6,000)	19 638	0	0	0	0	0	0
2043	92 714	500	58.9	9,915	1,760	(6,000)	19,902	0	0	0	0	0	0
Total Capacity Used (Tons)								39 718 796	3,431 479	3 110,867	13 864 012	10 868 990	2 887 918

Table F-8. Projected Daily Disposal Capacity Shortfall
Scenario 6B – Extensive Recycling Using Landfill Bans
(*Continued*)

	P	C	R	S	T	U	V	W	X	Y	Z	AA
1												
2												
3												
4	D WASTE FACILITIES AND POTENTIAL EXPANSIONS											
5	WASTE DISPOSAL RATES											
6	POLITAN AREA - 1995											
7												
8												
9	Landfill Waste Acceptance Rate - (tpd-6)											
10												
11						Antelope	Azusa		Waste	Pebbly		Whittier-	
12	Sunshine	Chiquita		Brand	Valley	Land		Management	Beach		Savage	Unsatisfied
13	Canyon	Canyon	Calabasas	Park	Dump	Reclamation	Burbank	of Lancaster	Disposal	U.S. Navy	Canyon	Need
14	3 221	4 881	1 706	9	366	2,929	79	488	2	0.5	171	0
15	2 262	4 170	1,200	6	257	2,057	56	343	1	0.3	120	0
16	4 144	0	2,197	11	471	3,787	102	628	3	0 6	220	0
17	2 314	0	1,227	6	263	4,950	57	351	1	0 4	123	0
18	2 803	0	1 487	8	319	0	69	756	2	0 4	149	0
19	2 382	0	1 263	6	271	0	58	0	1	0 4	126	0
20	2 485	0	1 318	7	282	0	61	0	2	0 4	132	0
21	2 524	0	1 339	7	287	0	62	0	2	0 4	134	0
22	2 562	0	1 359	7	291	0	63	0	2	0 4	136	0
23	2 590	0	1 374	7	294	0	64	0	2	0 4	137	0
24	1 813	0	961	5	206	0	44	0	1	0 3	96	0
25	3 346	0	1 774	9	380	0	82	0	2	0 5	177	0
26	3 360	0	1 782	9	382	0	82	0	2	0 5	178	0
27	3 356	0	1 785	9	383	0	83	0	2	0 5	179	0
28	3 365	0	1 785	9	382	0	83	0	2	0 5	178	0
29	3 358	0	1 781	9	382	0	82	0	2	0 5	178	0
30	3 424	0	1 816	9	389	0	84	0	2	0 5	182	0
31	3 429	0	1 818	9	390	0	84	0	2	0 5	182	0
32	3 445	0	1 827	9	391	0	85	0	2	0 5	183	0
33	3 465	0	1 838	9	394	0	85	0	2	0 5	184	0
34	3 478	0	1 844	9	395	0	85	0	2	0 5	184	0
35	3 483	0	1 847	9	396	0	85	0	2	0 5	185	0
36	3 564	0	1 833	9	393	0	85	0	2	0 5	183	0
37	0	0	1 068	5	229	0	49	0	1	0 3	107	0
38	0	0	3,500	30	750	0	240	0	7	1 0	350	5 317
39	0	0	3,500	33	55	0	240	0	7	1 0	350	6 266
40	0	0	3,500	61	0	0	240	0	14	1.0	350	9 454
41	0	0	3,500	64	0	0	240	0	14	1 0	350	10,217
42	0	0	3,500	65	0	0	240	0	15	1 0	350	10 487
43	0	0	3,500	67	0	0	240	0	15	1 0	350	10,759
44	0	0	2,271	102	0	0	240	0	33	1.0	350	12,203
45	0	0	0	102	0	0	240	0	27	1.0	350	14 742
46	0	0	0	102	0	0	240	0	0	1.0	350	15,013
47	0	0	0	102	0	0	240	0	0	1 0	350	15,276
48	0	0	0	102	0	0	240	0	0	1.0	350	15,535
49	0	0	0	102	0	0	240	0	0	1.0	350	15,793
50	0	0	0	102	0	0	240	0	0	1.0	350	16,056
51	0	0	0	102	0	0	240	0	0	1.0	350	16,322
52	0	0	0	102	0	0	240	0	0	1 0	350	16,588
53	0	0	0	102	0	0	240	0	0	1.0	350	16,853
54	0	0	0	102	0	0	240	0	0	1.0	350	17 116
55	0	0	0	102	0	0	240	0	0	1.0	350	17,378
56	0	0	0	102	0	0	240	0	0	1 0	350	17,638
57	0	0	0	102	0	0	240	0	0	1.0	208	18,041
58	0	0	0	102	0	0	240	0	0	1.0	0	18,508
59	0	0	0	102	0	0	240	0	0	1.0	0	18,769
60	0	0	0	102	0	0	240	0	0	1.0	0	19,032
61	0	0	0	83	0	0	240	0	0	1 0	0	19,314
62	0	0	0	0	0	0	240	0	0	1.0	0	19,661
63												45000
64	21 897 712	2 823 773	19 188 414	726 174	2 807 191	4 275 290	2 424 087	800 261	54 510	11 206	3,332,367	

Table F-9. Projected Daily Disposal Capacity Shortfall
Scenario 7 – Landfill Expansions

Scenario 7

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50 129		25 0	2,597	1,760	-	33 240	5,240	1 771	5 745	1 828	3,351	1,915
1996	52,332	500	30.0	2,711	1,760	(2,000)	29,662	4,345	1 469	4,763	1 350	2,779	3,669
1997	53 567	500	35.0	2,776	1,760	(3,500)	26,296	5,387	1,821	0	1 673	3 445	0
1998	53 714	500	40.0	2,782	1,760	(3,500)	23,686	4 198	1 419	0	1 304	2 685	0
1999	54 057	500	45 0	2,800	1 760	(3,500)	21 171	6,191	2,093	0	1,923	3,959	0
2000	54 903	500	50.0	2 844	1,760	(3,500)	18,848	5,329	2,425	0	1 655	3,406	0
2001	56 188	500	50.5	2,911	1,760	(6,000)	16,659	5,406	0	0	1 679	3 457	0
2002	57,267	500	50.9	2,966	1,760	(6,000)	16,889	5,474	0	0	1 700	3,501	0
2003	58 344	500	51.4	3,022	1,760	(6,000)	17,067	5,538	0	0	1,720	3,542	0
2004	59 302	500	51.9	3,072	1,760	(6,000)	17,204	5,116	0	0	1,589	4 709	0
2005	60,212	500	52.4	3,119	1,760	(6,000)	17,312	7,089	0	0	2,202	0	0
2006	61 052	500	52.8	3,162	1,760	(6,000)	17,382	7,117	0	0	2,211	0	0
2007	61 822	500	53.3	3,202	1,760	(6,000)	17 415	7,131	0	0	2,215	0	0
2008	62,524	500	53.8	3,239	1,760	(6,000)	17 412	7 130	0	0	2,215	0	0
2009	63 158	500	54.2	3,272	1,760	(6,000)	17,378	7,115	0	0	2,210	0	0
2010	63 725	500	54 7	3,301	1,760	(6,000)	17,306	7,066	0	0	2,201	0	0
2011	65 168	500	55.2	3,376	1,760	(6,000)	17,579	7 198	0	0	2,236	0	0
2012	65 922	500	55.6	3,415	1,760	(6,000)	17,566	7,194	0	0	2,235	0	0
2013	66 818	500	56.1	3,461	1,760	(6,000)	17,605	7,209	0	0	2,239	0	0
2014	67 737	500	56.6	3,511	1,760	(6,000)	17 662	7,232	0	0	2,247	0	0
2015	68 687	500	57.1	3,558	1,760	(6,000)	17 683	7,241	0	0	2,249	0	0
2016	69 511	500	57.5	3,601	1,760	(6,000)	17 667	7,234	0	0	2,247	0	0
2017	70 302	500	58 0	3,642	1,760	(6 000)	17,632	7,565	0	0	1,506	0	0
2018	71 118	500	58.5	3,684	1,760	(6,000)	17 599	8,256	0	0	0	0	0
2019	71 948	500	58.9	3,727	1,760	(6 000)	17 562	8,239	0	0	0	0	0
2020	72 800	500	58.9	3 771	1 760	(6 000)	17 868	8,383	0	0	0	0	0
2021	73 669	500	58.9	3 816	1,760	(6,000)	18,180	8,529	0	0	0	0	0
2022	74 554	500	58.9	3,862	1,760	(6,000)	18,496	8,678	0	0	0	0	0
2023	75 450	500	58.9	3,908	1,760	(6,000)	18,819	7,666	0	0	0	0	0
2024	76 349	500	58.9	3,955	1,760	(6,000)	19 142	0	0	0	0	0	0
2025	77 236	500	58.9	4 001	1,760	(6,000)	19 460	0	0	0	0	0	0
2026	78 094	500	58.9	4 045	1,760	(6,000)	19,768	0	0	0	0	0	0
2027	78 900	500	58.9	4 087	1,760	(6,000)	20,057	0	0	0	0	0	0
2028	79 765	500	58.9	4,132	1,760	(6,000)	20,368	0	0	0	0	0	0
2029	80 616	500	58.9	4,176	1,760	(6,000)	20,673	0	0	0	0	0	0
2030	81 468	500	58.9	4,220	1,760	(6,000)	20,979	0	0	0	0	0	0
2031	82 334	500	58.9	4,265	1,760	(6,000)	21,290	0	0	0	0	0	0
2032	83,209	500	58.9	4,310	1,760	(6,000)	21 604	0	0	0	0	0	0
2033	84 065	500	58.9	4,356	1,760	(6,000)	21 918	0	0	0	0	0	0
2034	84 956	500	58.9	4 401	1,760	(6,000)	22,231	0	0	0	0	0	0
2035	85 823	500	58.9	4 446	1,760	(6,000)	22,542	0	0	0	0	0	0
2036	86 664	500	58.9	4 490	1,760	(6,000)	22,851	0	0	0	0	0	0
2037	87 543	500	58.9	4 535	1,760	(6,000)	23,159	0	0	0	0	0	0
2038	88 399	500	58.9	4 579	1,760	(6,000)	23,466	0	0	0	0	0	0
2039	89 255	500	58.9	4,623	1,760	(6,000)	23,774	0	0	0	0	0	0
2040	90 114	500	58.9	4 668	1,760	(6,000)	24 082	0	0	0	0	0	0
2041	90 977	500	58.9	4 713	1,760	(6,000)	24,392	0	0	0	0	0	0
2042	91 844	500	58.9	4,758	1,760	(6,000)	24,703	0	0	0	0	0	0
2043	92,714	500	58.9	4,803	1,760	(6,000)	25,015	0	0	0	0	0	0
Total Capacity Used (Tons)								61,000,000	3,431,479	3,278,641	13,864,012	10,868,990	1,748,533

Table F-9. Projected Daily Disposal Capacity Shortfall
Scenario 7 – Landfill Expansions
(*Continued*)

	C	D	R	S	T	U	V	W	X	Y	Z	AA
4	D WASTE FACILITIES AND POTENTIAL EXPANSIONS											
5	WASTE DISPOSAL RATES											
6	POLITAN AREA - 1995											
9	Landfill Waste Acceptance Rate - (tpd-d)											
12	Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Park	Antelope Valley Dump	Azusa Land Reclamation	Burbank	Waste Management of Lancaster	Pebbly Beach Disposal	U.S. Navy	Whittier-Savage Canyon	Unsatisfied Need
14	3 160	4 788	1 676	9	359	2,873	78	479	2	0 5	168	0
15	2 820	3 969	1,389	7	296	2,382	64	397	2	0 4	139	0
16	3 248	0	1 723	9	369	2,953	80	492	2	0 5	172	0
17	2 531	0	1 342	7	288	5 496	62	384	2	0 4	134	0
18	3 733	0	1 980	10	424	0	92	566	2	0 6	198	0
19	3 213	0	1 704	9	365	0	79	487	2	0 5	170	0
20	3 250	0	1 729	9	370	0	80	494	2	0 5	173	0
21	3 30	0	1 750	9	375	0	81	500	2	0 5	175	0
22	3 340	0	1 771	9	379	0	82	506	2	0 5	177	0
23	3 065	0	1 636	8	351	0	76	467	2	0 5	164	0
24	4 275	0	2 267	12	486	0	105	648	3	0 6	227	0
25	4 292	0	2 278	12	488	0	105	650	3	0 7	228	0
26	4 300	0	2 280	12	489	0	106	652	3	0 7	228	0
27	4 299	0	2 280	12	489	0	106	651	3	0 7	228	0
28	4 290	0	2 275	12	488	0	105	650	3	0 7	228	0
29	4 273	0	2 266	12	486	0	105	647	3	0 6	227	0
30	4 34	0	2 302	12	493	0	107	658	3	0 7	230	0
31	4 338	0	2 300	12	493	0	106	657	3	0 7	230	0
32	4 347	0	2 305	12	494	0	107	659	3	0 7	231	0
33	4 361	0	2 313	12	496	0	107	661	3	0 7	231	0
34	4 366	0	2 315	12	496	0	107	662	3	0 7	232	0
35	4 362	0	2 313	12	496	0	107	661	3	0 7	231	0
36	4 562	0	2 419	12	518	0	112	691	3	0 7	242	0
37	4 979	0	2 640	14	566	0	122	754	3	0 8	264	0
38	4 962	0	2 635	14	565	0	122	753	3	0 8	263	0
39	5 005	0	2 681	14	574	0	124	766	3	0 8	268	0
40	5 143	0	2 727	14	584	0	126	779	3	0 8	273	0
41	5 233	0	2 775	14	595	0	128	793	3	0 8	278	0
42	5 600	0	1 432	20	750	0	177	1,000	4	1 0	350	819
43	5 600	0	0	39	750	0	240	1,000	9	1 0	350	10,153
44	5 600	0	0	39	750	0	240	1,000	9	1 0	350	10,471
45	5 600	0	0	40	750	0	240	1,000	9	1 0	350	10,778
46	5 600	0	0	41	750	0	240	1,000	9	1 0	350	11,087
47	5 600	0	0	46	750	0	240	126	10	1 0	350	12,245
48	5 600	0	0	47	750	0	240	0	10	1 0	350	12,675
49	5 600	0	0	48	750	0	240	0	11	1 0	350	12,980
50	5 600	0	0	49	750	0	240	0	11	1 0	350	13,289
51	5 600	0	0	49	750	0	240	0	24	1 0	350	13,589
52	5 600	0	0	54	352	0	240	0	0	1 0	350	14,320
53	5 600	0	0	56	0	0	240	0	0	1 0	350	14 964
54	5 600	0	0	57	0	0	240	0	0	1 0	350	15,294
55	5 600	0	0	60	0	0	240	0	0	1 0	124	15,826
56	5 600	0	0	61	0	0	240	0	0	1 0	0	16,257
57	5 600	0	0	62	0	0	240	0	0	1 0	0	16,563
58	5 600	0	0	63	0	0	240	0	0	1 0	0	16,870
59	5 600	0	0	64	0	0	240	0	0	1 0	0	17 177
60	2 54	0	0	102	0	0	240	0	0	1 0	0	21,508
61	0	0	0	102	0	0	240	0	0	1 0	0	24,360
62	0	0	0	102	0	0	240	0	0	1 0	0	24,672
63												45000
64	3 200 000	2 732,200	19 188 414	471,515	6 466,000	4 275 290	2 420 380	6 954 000	54,510	11 907	3 332,367	

APPENDIX G

APPENDIX G: INTERNATIONAL TECHNOLOGY APPLICATIONS

This Appendix was prepared by Dr. Eugene Grigsby and Dr. Leobardo Estrada, based on information provided by personal contacts supplemented by a literature search. Included in this review are London, England; Hong Kong; and Japan. These international sites display in varying degrees characteristics that make their circumstances applicable to issues in Los Angeles County, including size of population, population densities, economic and social conditions, and level of technical sophistication.

As can be seen from the following writeups, use of landfills is the most common method of municipal solid waste (MSW) disposal. The issue of dwindling disposal capacity is a problem for all three of the locations examined. Recycling is receiving a major push, as is reuse of existing landfills. In Japan, waste-to-energy is a major alternative to the use of landfills. It would appear that London will increasingly turn to waste-to-energy to solve its growing landfill capacity problem. It should also be noted that in Japan a downturn in the economy had a dramatic impact on the volume of waste generation.

Lessons for Los Angeles

1. Economic downturn significantly impacts waste generation. Los Angeles is still in the throes of a recession; therefore, previous projections relative to waste generation are no longer valid.

2. Population growth and population composition also directly affect the waste stream. The rate of growth has slowed and the number of lower-income households have increased, thus the previous projections of waste generation are no longer valid. (Note that in Hong Kong, where there are a large number of low-income households, the majority of the waste is from commercial and industrial sources).

3. No world class city has found a single quick, easy solution to solid waste management.

4. Alternatives to utilization of landfill are being strongly encouraged and implemented.

5. Strategies include a combination of reuse of older landfill sites, recycling and waste-to-energy with minimal reliance on landfills.

A. LONDON

The 1995 population of Greater London, England is 6.8 million. The population density in the City of London is 10,429 people per square mile.

Households in London produce on average 1.2 tons of waste per year. The 33 London local authorities collect 3.7 million tons of household and commercial waste annually. The London Waste Regulation Authority (LWRA) is responsible for supervising four statutory waste disposal authorities and three voluntary groups. The LWRA is also responsible for supervising and licensing the disposal of an additional 8.8 million tons of waste handled by private waste disposal companies. The LWRA also has responsibility for regulating the annual disposal of 129,000 tons of hazardous waste. Figure D-1 shows that in 1993-94, 5 percent of the waste was recovered, with the remainder disposed of in landfills.

Approximately 90 percent of London's waste is placed in landfill sites outside of the City's boundaries. According to the LWRA's recently produced report, *Today's Waste, Tomorrow's Resources: The Waste Management Plan for Greater London 1995-2015*, waste disposal in London should be based on a hierarchy of waste management: waste prevention and re-use, waste recycling and energy recovery, and the safe disposal of non-recoverable residues. Increased emphasis is being placed on waste reduction and recycling.

By the year 2000, it is anticipated that 25 percent of all household waste in London will be recycled. However, only 20 percent of the total municipal solid waste stream is anticipated to be recycled in London by the year 2005.

Use of landfills will remain the most viable disposal option, but the Authority recommends that no new landfill sites accepting putrescible waste be permitted. The Authority recognizes that new landfill sites will be difficult to obtain and, therefore, recommends the reuse of existing sites.

For the last 20 years, London has had only one municipal waste combustion facility. A new waste-to-energy combined heat and power plant is under construction. It is anticipated that construction of additional waste-to-energy facilities will have a significant effect on the need for landfills by reducing each ton of raw waste to approximately 0.30 tons of ash.

B. HONG KONG

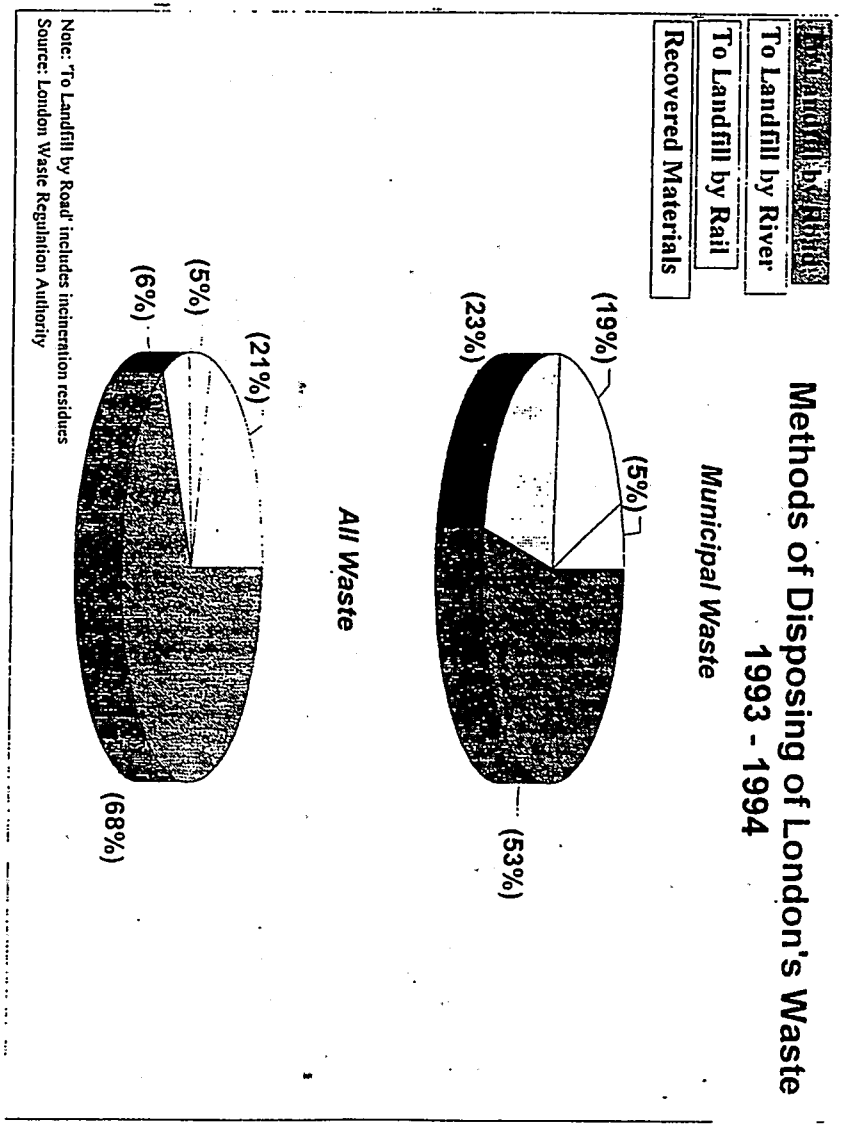
Hong Kong has experienced explosive growth in the past. This rate has slowed down, probably due to the impending transfer of government to mainland China in 1996. A population increase of only 5 percent is projected for the years 1991-2000. The 1995 population is 5.8 million, in a total area of 409 square miles (including the New Territories as well as the City of Hong Kong). The population density of the City of Hong Kong is the highest in the world. In 1994, about 3 million tons of municipal solid waste generated from homes, offices and factories ended up in garbage bins. The waste could grow to 4.8 million tons by the year 2006. Composition of Hong Kong MSW is shown in Figure D-2.

Three-quarters of the solid waste and nearly all of the hazardous chemical waste are generated by industry and commerce. Much of this is demolition debris, and the government has initiated a recycling program for this material. However, it is estimated that over half of the waste currently disposed of at landfills could be diverted for land reclamation purposes. Recovery and recycling of reusable materials will also become more attractive as waste producers seek to minimize their waste disposal bills.

The government has embarked on a program to recover costs of waste disposal services directly from the users. Until recently, there has been no fee for disposal at the landfills. The initial scheme for recovering costs, both for landfill disposal and for services provided by the Chemical Waste Treatment Center, is to create economic incentives for waste producers to practice waste management and to exploit waste recycling and reuse opportunities. In addition, Hong Kong is planning several waste-to-energy facilities to supplement their three landfills.

Figure G-1

Methods of Disposing of London's Waste
1993 - 1994



Note: 'To Landfill by Road' includes incineration residues
Source: London Waste Regulation Authority

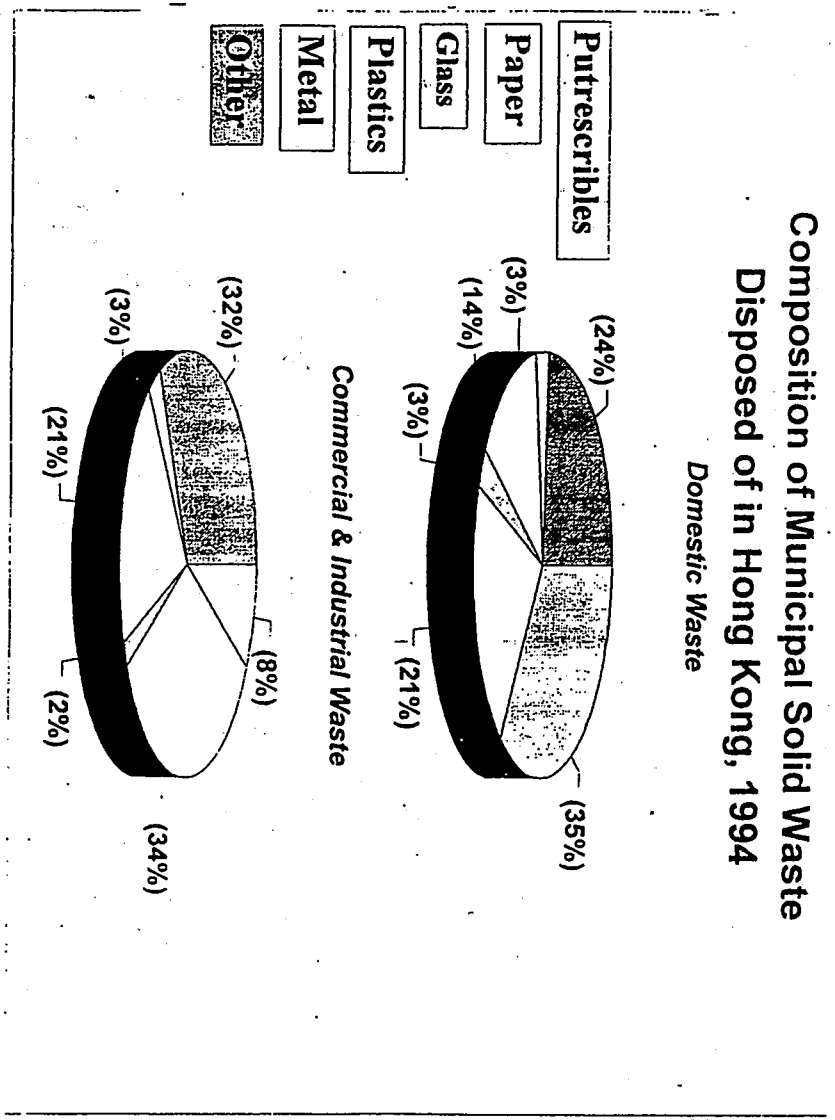


Figure G-2

Preliminary findings from a 1994 survey conducted by the Hong Kong Waste Disposal Authority indicates that current recovery and recycling activities in Hong Kong account for 53 percent of the total waste generated by commercial and industrial sectors. This suggests a very significant and robust level of recycling activity. However, the corresponding figure for the domestic sector is only 8 percent.

C. JAPAN

The islands of Japan comprise approximately 144,000 square miles, with a population density of 868 persons per square mile. The 1995 population is 125.1 million, of whom 77 percent are residents of urban areas. The amount of MSW generated in Japan increased at a rate of about one percent per year between 1975 and 1985. However, in the following four years, MSW grew nearly four percent annually to reach about 50.4 million tons in 1990. While no national data are available beyond 1990, the Tokyo metropolitan government reports that MSW decreased from a peak of 4.9 million tons in 1989 to 4.7 million tons in 1991. This annual two percent drop is attributed primarily to the economic downturn the country has experienced.

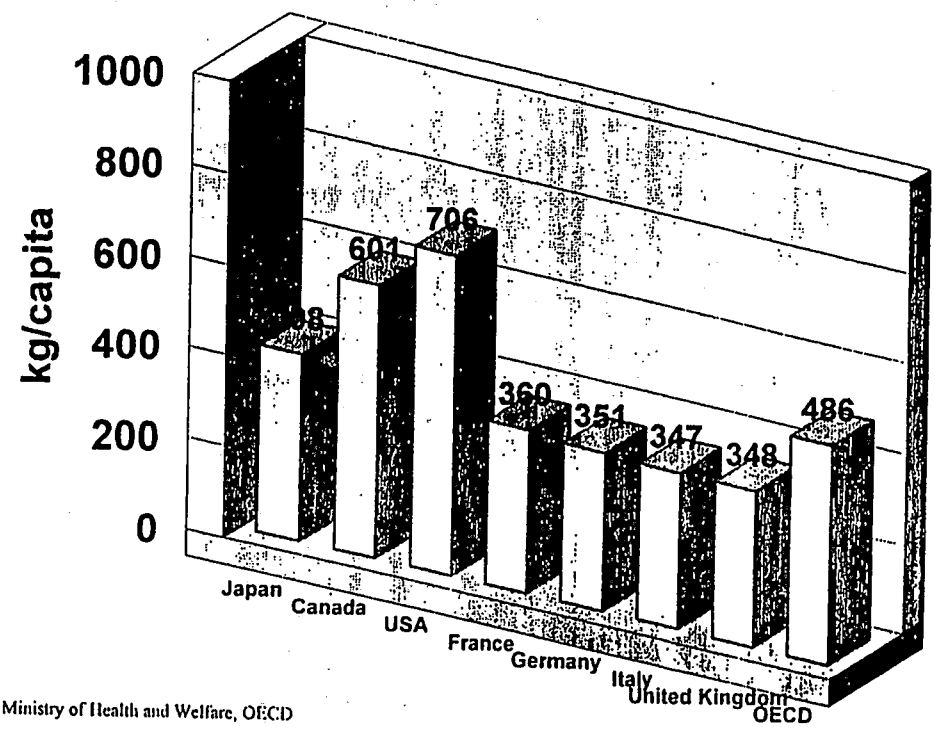
Japanese MSW generation levels per capita compare favorably with those of a number of other Organization for Economic Cooperation and Development (OECD) countries, but the rate of increase in the late 1980s was among the highest in the OECD. Figure D-3 shows per capita waste generation rates for OECD countries in 1990. Much of the growth in MSW generation since 1986 has been in the commercial sector, e.g., copier, telefax and office automation discards. The increase in waste generation from 1985 through 1990 is shown in Figure D-4.

The objectives of Japanese MSW management are:

"To control the discharge of waste, to perform appropriate waste sorting, storage, collection, transportation, recycling, disposal and so forth, and to cleanse the living environment in order to preserve it and improve public health."

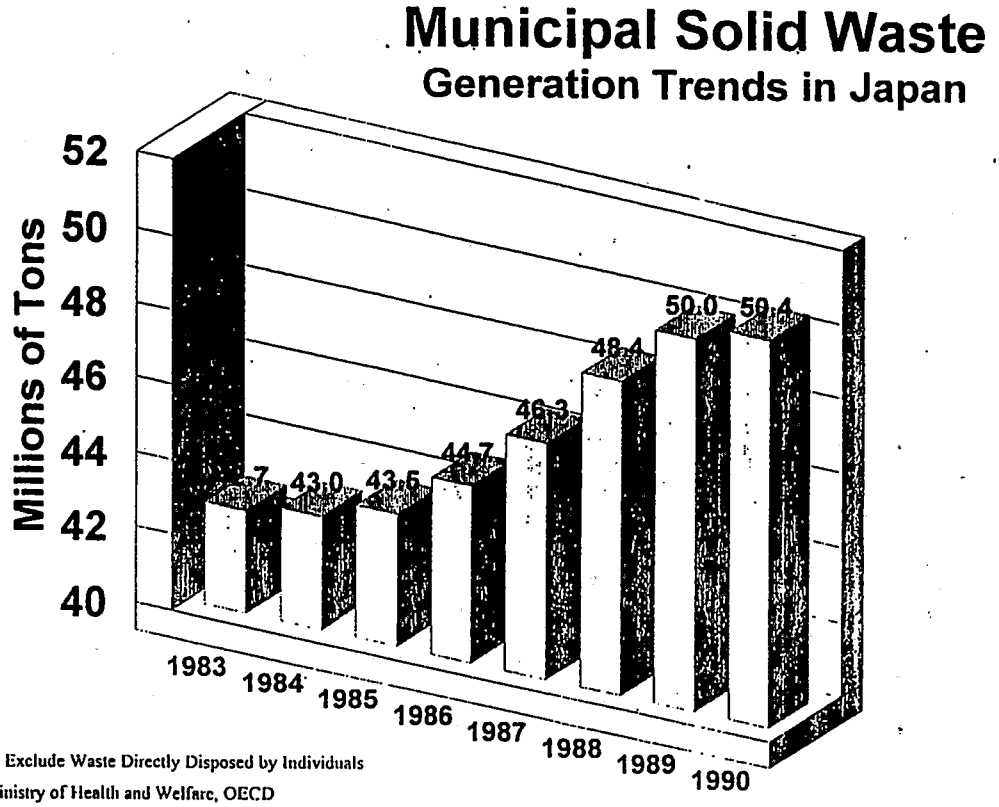
(Reference 1, OECD, p. 52)

Figure G-3. Municipal Solid Waste
State, 1990



Source: Ministry of Health and Welfare, OECD

Figure G-4



Note: Data Exclude Waste Directly Disposed by Individuals

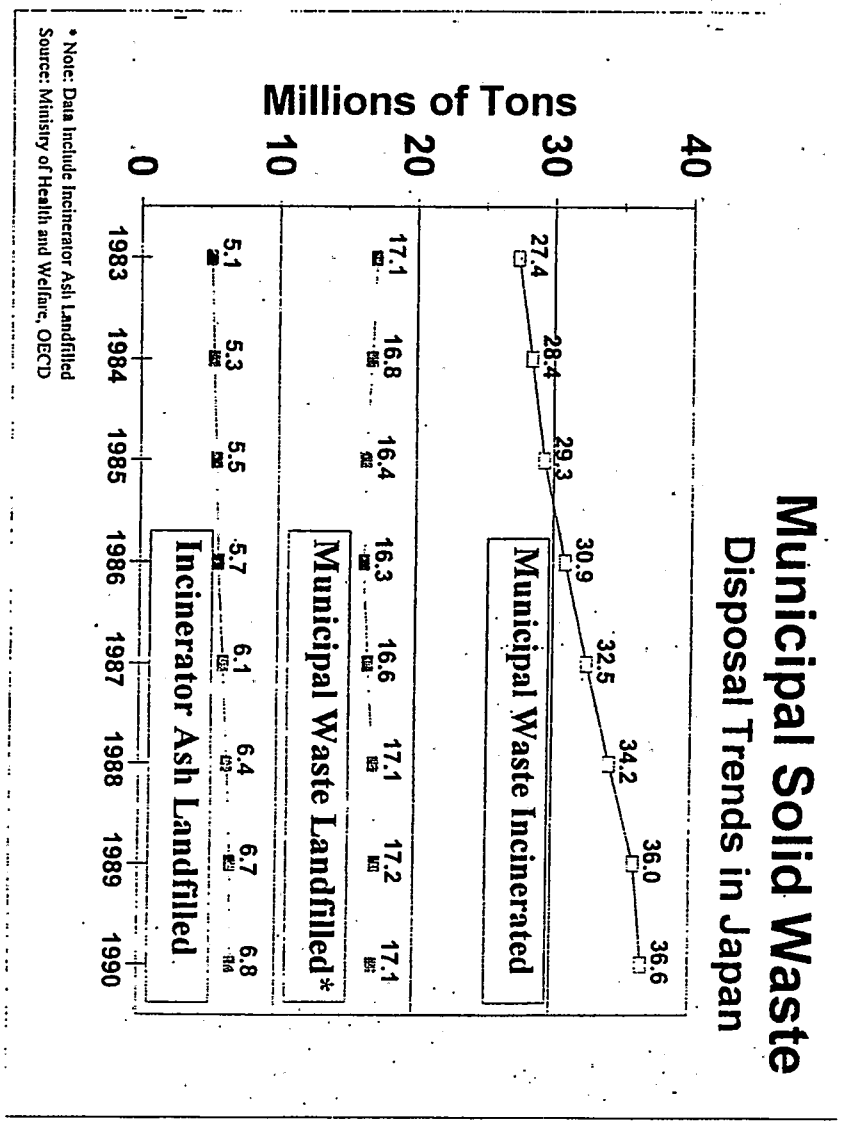
Source: Ministry of Health and Welfare, OECD

The Japanese concept of waste reduction is essentially to cut the amount of waste disposed of in or on the land. Waste separated at source for reuse or recycling counts as waste reduction. Since the shortage of landfill capacity is serious, the primary purpose of promoting resource recovery, recycling and reuse in Japan is not to conserve resources or to reduce imports but rather to reduce the amount of waste going to landfill. Disposal trends from 1983 through 1990 are shown on Figure G-5.

Japan's heavy reliance on waste-to-energy can be explained by its objective of avoiding landfill while assuring environmentally sound disposal. About 75 percent of MSW is combusted. Combustion reduces the mass of MSW by roughly 82 per cent and its volume by over 95 per cent. Since the ash is landfilled along with untreated MSW, and landfill life depends on volume, the ash represents a relatively small burden on national landfill capacity. Japan has addressed some of the issues related to siting by operating extremely clean facilities equipped with state-of-the-art emission controls. Also, the plants are aesthetically designed and co-located with desirable land uses such as recreation centers and swimming pools.

Current landfill capacity for MSW is expected to be exhausted before the turn of the century. Capacity shortage has led to illegal dumping of MSW and industrial waste. Because of this illegal dumping problem, Japan has decided that 84 percent of MSW must be processed for reduction through waste-to-energy or crushing by March 1996. This will mean adding seven million tons per year of waste-to-energy capacity over the next three years. In addition, the Japanese are building industrial waste treatment plants and night soil and septic tank sludge facilities.

Figure G-5



SOURCES

1. *OCED Environmental Performance Reviews*, JAPAN, Organization For Economic Co-Operation And Development, 1994.

2. *Environment Hong Kong 1995*, Environmental Protection Department, 1995.

3. *Today's Waste, Tomorrow's Resources The Waste Management Plan for Greater London 1995-2015*, London Waste Regulation Authority, January 1995.

4. *London 95*, London Research Centre, Volume I, 1995.

5. *World Almanac*, 1995 (for population data).

APPENDIX H

APPENDIX H: TABLES AND METHODOLOGY USED FOR DIVERSION RATE CALCULATIONS

The annual diversion rates for Los Angeles County were projected by identifying the composition of the waste stream and the individual diversion rate for each waste component. The waste steam composition for each generating sector (residential, commercial, and industrial), which is shown as Table H-2, was taken from the *Source Reduction and Recycling Element for Unincorporated Los Angeles County* (County of Los Angeles Department of Public Works, December 1991).

The anticipated diversion rate for each component of the waste stream is based on three levels of recycling effort. The diversion rates associated with each of the levels (and for each generating sector) is shown as Table HG-3. The various levels of recycling intensity are discussed in detail in Chapter VII. The current diversion rate, Level 1, is based on the current recycling effort. The individual diversion rates for each waste component are typical diversion rates experienced by other communities and are based on the overall diversion. Levels 2 and 3, which are anticipated to be reached in years 2000 and 2005 respectively, represent incremental increases in the intensity of recycling efforts. Similar to Level 1, Levels 2 and 3 represent typical diversion rates experienced by other communities at equivalent recycling levels of intensity.

Table H-1 shows the projected annual diversion rates for Los Angeles County. The first step in identifying the diversion rates is dividing the total waste stream into the three major generating sectors, residential, commercial, industrial. The percentages for each sector were taken from the *Source Reduction and Recycling Element for Unincorporated Los Angeles County* (SRRE). The SRRE includes a miscellaneous sector, which generates 3.2 percent of waste stream. This 3.2 percent was divided into prorated fractions and added to the residential, commercial, and industrial sectors. For the purpose of diversion rate estimates, the percentage of waste generation allocated to the residential, commercial, and industrial sector were 50.6, 32.3, and 17.0 respectively.

After the total waste stream is divided into the three generating sectors, which are shown as the third, fourth, and fifth column of Table H-1, the waste from each generating sector is multiplied by the composition percentages from Table H-2. The annual generation of each waste component (for each generating sector) are listed in Appendix Tables H-4 through G-18. Adjacent to each generation rate is the diversion rate, taken from Table H-3. The diversion rates are assumed to increase linearly between the different Levels of recycling intensity.

For each year in Tables H-4 through H-18, the generation of each waste component is multiplied by the respective diversion rate. The summation of these products is total amount of waste recovered from the generating sector. The annual amount of recovered waste is shown in the last column of Tables H-8 (residential), G-13 (commercial), and G-18 (industrial). These values are also included in Table H-1 and a corresponding diversion rate by generating sector is provided. The recovered wastes from each generating sector are added together in the second to last column in Table H-1. Dividing this value by the total waste generation rate provides the annual percent diversion rate.

TABLE H-1
COUNTY OF LOS ANGELES
PROJECTED WASTE GENERATION AND RECOVERY RATES BASED ON CITY OF LOS ANGELES WASTE COMPOSTITION DATA
(TPD–6)

Year	Total Waste Generation Rate	Residential Waste Generation Rate	Commercial Waste Generation Rate	Industrial Waste Generation Rate	Residential Waste Recovery Rate	Residential Percent Recovery Rate	Commercial Waste Recovery Rate	Commercial Percent Recovery Rate	Industrial Waste Recovery Rate	Industrial Percent Recovery Rate	Total Waste Recovery Rate	Total Percent Recovery Rate
1995	49,677	21,461	22,355	5,812	5,138	23.94	3,575	15.99	1,385	23.83	10,097	20.33
1996	50,258	21,712	22,616	5,880	6,398	29.47	4,926	21.78	1,731	29.44	13,054	25.97
1997	50,762	21,929	22,843	5,939	7,673	34.99	6,297	27.57	2,082	35.05	16,052	31.62
1998	51,290	22,157	23,081	6,001	8,978	40.52	7,699	33.36	2,440	40.66	19,117	37.27
1999	51,793	22,375	23,307	6,060	10,302	46.04	9,124	39.15	2,804	46.27	22,230	42.92
2000	52,303	22,595	23,536	6,119	11,652	51.57	10,576	44.94	3,175	51.88	25,403	48.57
2001	52,756	22,790	23,740	6,172	12,080	53.00	10,939	46.08	3,288	53.27	26,307	49.87
2002	53,212	22,988	23,945	6,228	12,514	54.44	11,308	47.22	3,403	54.66	27,225	51.16
2003	53,652	23,178	24,144	6,277	12,950	55.87	11,678	48.37	3,518	56.04	28,146	52.46
2004	54,079	23,362	24,336	6,327	13,388	57.31	12,049	49.51	3,634	57.43	29,071	53.76
2005	54,494	23,542	24,523	6,376	13,829	58.74	12,422	50.66	3,750	58.82	30,001	55.05
2006	54,902	23,718	24,706	6,424	14,272	60.18	12,798	51.80	3,867	60.21	30,938	56.35
2007	55,308	23,893	24,889	6,471	14,720	61.61	13,178	52.95	3,986	61.59	31,884	57.65
2008	55,716	24,070	25,072	6,519	15,174	63.04	13,562	54.09	4,106	62.98	32,842	58.94
2009	56,129	24,248	25,258	6,567	15,635	64.48	13,952	55.24	4,227	64.37	33,813	60.24
2010	56,548	24,429	25,447	6,616	16,102	65.91	14,347	56.38	4,351	65.76	34,799	61.54
2011	56,975	24,613	25,639	6,668	16,576	67.35	14,748	57.52	4,476	67.15	35,801	62.84
2012	57,412	24,802	25,836	6,717	17,059	68.78	15,157	58.67	4,604	68.53	36,820	64.13
2013	57,863	24,997	26,038	6,770	17,552	70.22	15,574	59.81	4,734	69.92	37,860	65.43
2014	58,330	25,199	26,249	6,825	18,055	71.65	16,001	60.96	4,867	71.31	38,922	66.73
2015	58,802	25,403	26,461	6,880	18,565	73.08	16,433	62.10	5,001	72.70	40,000	68.02
2016	59,289	25,613	26,680	6,937	19,086	74.52	16,874	63.25	5,139	74.08	41,100	69.32
2017	59,785	25,827	26,903	6,995	19,616	75.95	17,323	64.39	5,279	75.47	42,219	70.62
2018	60,288	26,045	27,130	7,054	20,155	77.39	17,780	65.54	5,421	76.86	43,356	71.91
2019	60,799	26,265	27,360	7,114	20,702	78.82	18,244	66.68	5,566	78.25	44,512	73.21
2020	61,316	26,488	27,592	7,174	21,258	80.26	18,714	67.83	5,713	79.64	45,686	74.51
2021	61,835	26,713	27,826	7,235	21,438	80.26	18,873	67.83	5,761	79.64	46,073	74.51
2022	62,353	26,936	28,059	7,295	21,618	80.26	19,031	67.83	5,810	79.64	46,458	74.51
2023	62,869	27,159	28,291	7,356	21,797	80.26	19,188	67.83	5,858	79.64	46,843	74.51
2024	63,382	27,381	28,522	7,416	21,975	80.26	19,345	67.83	5,905	79.64	47,225	74.51
2025	63,892	27,601	28,751	7,475	22,151	80.26	19,501	67.83	5,953	79.64	47,605	74.51
2026	64,396	27,819	28,978	7,534	22,326	80.26	19,654	67.83	6,000	79.64	47,980	74.51
2027	64,890	28,033	29,201	7,592	22,498	80.26	19,805	67.83	6,046	79.64	48,349	74.5
2028	65,377	28,243	29,420	7,649	22,666	80.25	19,954	67.83	6,091	79.64	48,712	74.5
2029	65,855	28,449	29,635	7,705	22,832	80.26	20,100	67.83	6,136	79.64	49,068	74.51
2030	66,326	28,653	29,847	7,760	22,995	80.26	20,243	67.83	6,180	79.64	49,419	74.51
2031	66,788	28,852	30,054	7,814	23,155	80.25	20,384	67.83	6,223	79.64	49,763	74.51
2032	67,239	29,047	30,258	7,867	23,312	80.26	20,522	67.83	6,265	79.64	50,099	74.51
2033	67,682	29,239	30,457	7,919	23,466	80.26	20,657	67.83	6,306	79.64	50,429	74.51
2034	68,118	29,427	30,653	7,970	23,617	80.26	20,790	67.83	6,347	79.64	50,754	74.51
2035	68,547	29,612	30,846	8,020	23,765	80.26	20,921	67.83	6,387	79.64	51,074	74.51
2036	68,971	29,796	31,037	8,070	23,912	80.26	21,051	67.83	6,426	79.64	51,389	74.51
2037	69,390	29,977	31,226	8,119	24,058	80.26	21,179	67.83	6,465	79.64	51,702	74.51
2038	69,806	30,156	31,412	8,167	24,202	80.26	21,306	67.83	6,504	79.64	52,011	74.51
2039	70,218	30,334	31,598	8,215	24,345	80.26	21,431	67.83	6,542	79.64	52,318	74.51
2040	70,629	30,512	31,783	8,264	24,487	80.26	21,557	67.83	6,581	79.64	52,624	74.51
2041	71,015	30,679	31,957	8,309	24,621	80.26	21,675	67.83	6,617	79.64	52,913	74.51
2042	71,403	30,846	32,131	8,354	24,755	80.26	21,793	67.83	6,653	79.64	53,201	74.51
2043	71,791	31,014	32,306	8,400	24,890	80.25	21,911	67.83	6,689	79.64	53,491	74.51

TABLE H-2
COUNTY OF LOS ANELES
WASTE STREAM COMPOSITION BY GENERATING SECTOR

Waste Component	Pecent Compostion by Weight		
	Residential	Commercial	Industrial
PAPER			
Corrugated Containers	5.9	11.3	11:6
Mixed Paper	16.2	12.4	21.3
Newspaper	7.5	2.5	1.0
High Grade Ledger	1.3	1.8	0.9
Computer Printouts	0.0	0.0	0.0
Other Paper	0.0	0.0	0.0
SUBTOTAL	30.9	28.0	34.8
PLASTIC			
PVC	0.0	0.0	0.0
PET Containers	0.6	0.1	0.1
HDPE Containers	1.3	1.2	0.1
Film Plastics	2.1	1.7	13.8
Polystyrene	0.0	0.0	0.0
Other Plastics	3.3	1.7	2.8
SUBTOTAL	7.3	4.7	16.8
GLASS			
Refillable Glass	0.4	0.0	0.0
CA Redemption Glass	1.6	0.7	1.0
Other Recyclable Glass	2.3	0.5	1.4
Non–recyclable Glass	1.0	0.1	0.2
SUBTOTAL	5.3	1.3	2.6
METALS			
Aluminum Cans	0.6	0.1	0.1
Ferrous/Tin Cans	3.1	5.0	1.6
Bimetal Containers	0.0	0.0	0.0
Non–ferrous Metals	1.2	0.8	1.4
White Goods	0.3	0.0	0.0
Other Metals	0.1	0.0	0.0
SUBTOTAL	5.3	5.9	3.1
YARD WASTE			
Yard Waste	19.0	6.9	3.9
SUBTOTAL	19.0	6.9	3.9
ORGANICS			
Food Waste	12.8	8.9	3.7
Wood Waste	3.5	19.1	13.1
Tires and Rubber	1.0	1.3	1.6
Crop Residue	0.0	0.0	0.0
Manure	0.2	0.0	0.0
Textiles and Leather	3.6	4.8	15.9
Other Organics	1.1	1.4	1.1
SUBTOTAL	22.2	35.5	35.4
OTHER WASTES			
Inert Solids	9.2	10.8	2.2
Hazardous Waste	0.6	0.3	0.3
SUBTOTAL	9.8	11.1	2.5
SPECIAL WASTE			
Ash	0.1	0.0	0.0
Industrial Sludge	0.0	0.0	0.0
Sewage Sludge	0.0	0.4	0.0
Asbestos	0.0	0.0	0.0
Auto Shredder	0.0	0.0	0.0
Auto Bodies	0.0	0.0	0.0
Other Special Waste	0.6	6.0	0.7
SUBTOTAL	0.7	6.4	0.7
TOTAL	100.0	100.0	100.0

Source: "Phase IV Report: Solid Waste Management Policy Plan," City of Los Angeles Department of Public Works, October 1993.

TABLE H-3
COUNTY OF LOS ANELES
CURRENT AND PROJECTED RECOVERY RATES FOR EACH WASTE COMPONENT BY GENERATING SECTOR

	Residential				Commercial				Industrial			
Waste Component	1990 Percent Recovery Rate	(1995) Level 1 Current Percent Recovery Rate	(2000) Level 2 Projected Percent Recovery Rate	(2020) Level 3 Projected Percent Recovery Rate	1990 Percent Recovery Rate	(1995) Level 1 Current Percent Recovery Rate	(2000) Level 2 Projected Percent Recovery Rate	(2020) Level 3 Projected Percent Recovery Rate	1990 Percent Recovery Rate	(1995) Level 1 Current Percent Recovery Rate	(2000) Level 2 Projected Percent Recovery Rate	(2020) Level 3 Projected Percent Recovery Rate
PAPER												
Corrugated Containers	3.92	20	75	95	15.28	50	70	85	11.79	55	70	85
Mixed Paper	1.35	20	60	95	7.05	30	55	85	2.81	30	55	85
Newspaper	23.21	55	65	95	8.16	30	55	85	8.33	25	50	80
High Grade Ledger	4.48	20	60	95	21.80	30	55	85	7.68	25	50	80
Computer Printouts	0.00	20	65	95	0.00	30	55	85	0.00	25	50	80
Other Paper	0.82	20	50	95	1.06	20	35	50	2.44	15	30	40
PLASTIC												
PVC	0.00	0	0	0	0.00	0	20	50	0.00	0	20	50
PET Containers	8.48	25	50	70	2.42	25	45	65	4.44	25	40	60
HDPE Containers	1.05	30	55	75	0.00	30	45	65	0.00	25	40	60
Film Plastics	0.00	0	25	50	0.00	10	40	50	0.00	25	50	75
Polystyrene	0.00	0	25	50	0.00	0	0	0	0.00	0	0	0
Other Plastics	0.37	10	25	50	100.00	10	20	50	0.15	10	20	50
GLASS												
Refillable Glass	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
CA Redemption Glass	28.29	70	80	85	4.72	20	50	80	8.02	20	40	70
Other Recyclable Glass	12.25	65	80	85	0.45	20	50	80	5.85	20	40	70
Non-recyclable Glass	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
METALS												
Aluminum Cans	58.63	65	75	85	6.24	65	75	90	10.39	65	85	90
Ferrous/Tin Cans	0.02	50	70	80	0.03	50	70	90	0.00	50	80	70
Bimetal Containers	0.58	10	25	50	0.42	10	25	50	7.23	20	50	70
Non-ferrous Metals	13.66	10	25	50	15.67	20	35	50	14.54	20	40	60
White Goods	35.44	25	60	90	0.00	0	0	0	0.00	0	0	0
Other Metals	2.87	15	30	50	0.00	15	30	50	0.00	15	30	50
YARD WASTE												
Yard Waste	4.17	50	75	90	9.91	20	75	90	16.30	35	75	90
ORGANICS												
Food Waste	0.00	0	0	95	0.53	0	45	80	0.00	0	45	80
Wood Waste	0.83	0	25	95	0.35	0	50	90	5.56	25	50	90
Tires and Rubber	13.79	0	25	50	11.97	20	50	90	6.38	20	50	90
Crop Residue	0.00	0	0	95	0.00	0	0	0	0.00	0	0	0
Manure	0.00	0	0	95	0.00	0	0	0	0.00	0	0	0
Textiles and Leather	0.30	0	50	80	0.00	0	50	80	0.00	0	50	80
Other Organics	0.00	0	0	95	0.00	0	0	0	0.00	0	0	0
OTHER WASTES												
Inert Solids	0.00	0	10	20	0.00	0	0	0	0.96	10	50	80
Hazardous Waste	0.00	0	0	90	0.00	0	0	0	0.00	0	0	0
SPECIAL WASTE												
Ash	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Industrial Sludge	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Sewage Sludge	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Asbestos	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Auto Shredder	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Auto Bodies	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Other Special Waste	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0

TABLE H-4
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – RESIDENTIAL SECTOR

Year	Corrugated Containers		Mixed Paper		Newspaper		High Grade Ledger		Computer Printouts		Other Paper		PVC	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	1,266	20.0	3,477	20.0	1,610	55	279	20	0	20	0	20	0	0
1996	1,281	31.0	3,517	32.0	1,628	61	282	32	0	33	0	26	0	0
1997	1,294	42.0	3,553	44.0	1,645	67	285	44	0	46	0	32	0	0
1998	1,307	53.0	3,589	56.0	1,662	73	288	56	0	59	0	38	0	0
1999	1,320	64.0	3,625	68.0	1,678	79	291	68	0	72	0	44	0	0
2000	1,333	75.0	3,660	80.0	1,695	85	294	80	0	85	0	50	0	0
2001	1,345	76.0	3,692	80.8	1,709	86	296	81	0	86	0	52	0	0
2002	1,356	77.0	3,724	81.5	1,724	86	299	82	0	86	0	55	0	0
2003	1,367	78.0	3,755	82.3	1,738	87	301	82	0	87	0	57	0	0
2004	1,378	79.0	3,785	83.0	1,752	87	304	83	0	87	0	59	0	0
2005	1,389	80.0	3,814	83.8	1,766	88	306	84	0	88	0	61	0	0
2006	1,399	81.0	3,842	84.5	1,779	88	308	85	0	88	0	64	0	0
2007	1,410	82.0	3,871	85.3	1,792	89	311	85	0	89	0	66	0	0
2008	1,420	83.0	3,899	86.0	1,805	89	313	86	0	89	0	68	0	0
2009	1,431	84.0	3,928	86.8	1,819	90	315	87	0	90	0	70	0	0
2010	1,441	85.0	3,957	87.5	1,832	90	318	88	0	90	0	73	0	0
2011	1,452	86.0	3,987	88.3	1,846	91	320	88	0	91	0	75	0	0
2012	1,463	87.0	4,018	89.0	1,860	91	322	89	0	91	0	77	0	0
2013	1,475	88.0	4,049	89.8	1,875	92	325	90	0	92	0	79	0	0
2014	1,487	89.0	4,082	90.5	1,890	92	328	91	0	92	0	82	0	0
2015	1,499	90.0	4,115	91.3	1,905	93	330	91	0	93	0	84	0	0
2016	1,511	91.0	4,149	92.0	1,921	93	333	92	0	93	0	86	0	0
2017	1,524	92.0	4,184	92.8	1,937	94	336	93	0	94	0	88	0	0
2018	1,537	93.0	4,219	93.5	1,953	94	339	94	0	94	0	91	0	0
2019	1,550	94.0	4,255	94.3	1,970	95	341	94	0	95	0	93	0	0
2020	1,563	95.0	4,291	95.0	1,987	95	344	95	0	95	0	95	0	0
2021	1,576	95.0	4,327	95.0	2,003	95	347	95	0	95	0	95	0	0
2022	1,589	95.0	4,364	95.0	2,020	95	350	95	0	95	0	95	0	0
2023	1,602	95.0	4,400	95.0	2,037	95	353	95	0	95	0	95	0	0
2024	1,615	95.0	4,436	95.0	2,054	95	356	95	0	95	0	95	0	0
2025	1,628	95.0	4,471	95.0	2,070	95	359	95	0	95	0	95	0	0
2026	1,641	95.0	4,507	95.0	2,086	95	362	95	0	95	0	95	0	0
2027	1,654	95.0	4,541	95.0	2,102	95	364	95	0	95	0	95	0	0
2028	1,666	95.0	4,575	95.0	2,118	95	367	95	0	95	0	95	0	0
2029	1,679	95.0	4,609	95.0	2,134	95	370	95	0	95	0	95	0	0
2030	1,691	95.0	4,642	95.0	2,149	95	372	95	0	95	0	95	0	0
2031	1,702	95.0	4,674	95.0	2,164	95	375	95	0	95	0	95	0	0
2032	1,714	95.0	4,706	95.0	2,179	95	378	95	0	95	0	95	0	0
2033	1,725	95.0	4,737	95.0	2,193	95	380	95	0	95	0	95	0	0
2034	1,736	95.0	4,767	95.0	2,207	95	383	95	0	95	0	95	0	0
2035	1,747	95.0	4,797	95.0	2,221	95	385	95	0	95	0	95	0	0
2036	1,758	95.0	4,827	95.0	2,235	95	387	95	0	95	0	95	0	0
2037	1,769	95.0	4,856	95.0	2,248	95	390	95	0	95	0	95	0	0
2038	1,779	95.0	4,885	95.0	2,262	95	392	95	0	95	0	95	0	0
2039	1,790	95.0	4,914	95.0	2,275	95	394	95	0	95	0	95	0	0
2040	1,800	95.0	4,943	95.0	2,288	95	397	95	0	95	0	95	0	0
2041	1,810	95.0	4,970	95.0	2,301	95	399	95	0	95	0	95	0	0
2042	1,820	95.0	4,997	95.0	2,313	95	401	95	0	95	0	95	0	0
2043	1,830	95.0	5,024	95.0	2,326	95	403	95	0	95	0	95	0	0

TABLE H-5
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – RESIDENTIAL SECTOR (continued)

Year	PET Containers		HDPE Containers		Film Plastics		Polystyrene		Other Plastics		Refillable Glass		CA Redemption Glass	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	129	25	279	30	451	0	0	0	708	10	86	0	343	70
1996	130	30	282	35	456	5	0	5	716	13	87	0	347	72
1997	132	35	285	40	461	10	0	10	724	16	88	0	351	74
1998	133	40	288	45	465	15	0	15	731	19	89	0	355	76
1999	134	45	291	50	470	20	0	20	738	22	89	0	358	78
2000	136	50	294	55	474	25	0	25	746	25	90	0	362	80
2001	137	51	296	56	479	26	0	26	752	26	91	0	365	80
2002	138	52	299	57	483	28	0	28	759	28	92	0	368	81
2003	139	53	301	58	487	29	0	29	765	29	93	0	371	81
2004	140	54	304	59	491	30	0	30	771	30	93	0	374	81
2005	141	55	306	60	494	31	0	31	777	31	94	0	377	81
2006	142	56	308	61	498	33	0	33	783	33	95	0	379	82
2007	143	57	311	62	502	34	0	34	788	34	96	0	382	82
2008	144	58	313	63	505	35	0	35	794	35	96	0	385	82
2009	145	59	315	64	509	36	0	36	800	36	97	0	388	82
2010	147	60	318	65	513	38	0	38	806	38	98	0	391	83
2011	148	61	320	66	517	39	0	39	812	39	98	0	394	83
2012	149	62	322	67	521	40	0	40	818	40	99	0	397	83
2013	150	63	325	68	525	41	0	41	825	41	100	0	400	83
2014	151	64	328	69	529	43	0	43	832	43	101	0	403	84
2015	152	65	330	70	533	44	0	44	838	44	102	0	406	84
2016	154	66	333	71	538	45	0	45	845	45	102	0	410	84
2017	155	67	336	72	542	46	0	46	852	46	103	0	413	84
2018	156	68	339	73	547	48	0	48	859	48	104	0	417	85
2019	158	69	341	74	552	49	0	49	867	49	105	0	420	85
2020	159	70	344	75	556	50	0	50	874	50	106	0	424	85
2021	160	70	347	75	561	50	0	50	882	50	107	0	427	85
2022	162	70	350	75	566	50	0	50	889	50	108	0	431	85
2023	163	70	353	75	570	50	0	50	896	50	109	0	435	85
2024	164	70	356	75	575	50	0	50	904	50	110	0	438	85
2025	166	70	359	75	580	50	0	50	911	50	110	0	442	85
2026	167	70	362	75	584	50	0	50	918	50	111	0	445	85
2027	168	70	364	75	589	50	0	50	925	50	112	0	449	85
2028	169	70	367	75	593	50	0	50	932	50	113	0	452	85
2029	171	70	370	75	597	50	0	50	939	50	114	0	455	85
2030	172	70	372	75	602	50	0	50	946	50	115	0	458	85
2031	173	70	375	75	606	50	0	50	952	50	115	0	462	85
2032	174	70	378	75	610	50	0	50	959	50	116	0	465	85
2033	175	70	380	75	614	50	0	50	965	50	117	0	468	85
2034	177	70	383	75	618	50	0	50	971	50	118	0	471	85
2035	178	70	385	75	622	50	0	50	977	50	118	0	474	85
2036	179	70	387	75	626	50	0	50	983	50	119	0	477	85
2037	180	70	390	75	630	50	0	50	989	50	120	0	480	85
2038	181	70	392	75	633	50	0	50	995	50	121	0	482	85
2039	182	70	394	75	637	50	0	50	1,001	50	121	0	485	85
2040	183	70	397	75	641	50	0	50	1,007	50	122	0	488	85
2041	184	70	399	75	644	50	0	50	1,012	50	123	0	491	85
2042	185	70	401	75	648	50	0	50	1,018	50	123	0	494	85
2043	186	70	403	75	651	50	0	50	1,023	50	124	0	496	85

TABLE H-6
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – RESIDENTIAL SECTOR (continued)

Year	Other Recyclable Glass		Non-recyclable Glass		Aluminum Cans		Ferrous/Tin Cans		Bimetal Containers		Non-ferrous Metals		White Goods	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	494	65	215	0	129	65	665	50	0	10	258	10	64	25
1996	499	68	217	0	130	67	673	54	0	13	261	13	65	36
1997	504	71	219	0	132	69	680	58	0	16	263	16	66	47
1998	510	74	222	0	133	71	687	62	0	19	266	19	66	58
1999	515	77	224	0	134	73	694	66	0	22	268	22	67	69
2000	520	80	226	0	136	75	700	70	0	25	271	25	68	80
2001	524	80	228	0	137	76	707	71	0	26	273	26	68	81
2002	529	81	230	0	138	76	713	71	0	28	276	28	69	81
2003	533	81	232	0	139	77	719	72	0	29	278	29	70	82
2004	537	81	234	0	140	77	724	72	0	30	280	30	70	82
2005	541	81	235	0	141	78	730	73	0	31	282	31	71	83
2006	546	82	237	0	142	78	735	73	0	33	285	33	71	83
2007	550	82	239	0	143	79	741	74	0	34	287	34	72	84
2008	554	82	241	0	144	79	746	74	0	35	289	35	72	84
2009	558	82	242	0	145	80	752	75	0	36	291	36	73	85
2010	562	83	244	0	147	80	757	75	0	38	293	38	73	85
2011	566	83	246	0	148	81	763	76	0	39	295	39	74	86
2012	570	83	248	0	149	81	769	76	0	40	298	40	74	86
2013	575	83	250	0	150	82	775	77	0	41	300	41	75	87
2014	580	84	252	0	151	82	781	77	0	43	302	43	76	87
2015	584	84	254	0	152	83	787	78	0	44	305	44	76	88
2016	589	84	256	0	154	83	794	78	0	45	307	45	77	88
2017	594	84	258	0	155	84	801	79	0	46	310	46	77	89
2018	599	85	260	0	156	84	807	79	0	48	313	48	78	89
2019	604	85	263	0	158	85	814	80	0	49	315	49	79	90
2020	609	85	265	0	159	85	821	80	0	50	318	50	79	90
2021	614	85	267	0	160	85	828	80	0	50	321	50	80	90
2022	620	85	269	0	162	85	835	80	0	50	323	50	81	90
2023	625	85	272	0	163	85	842	80	0	50	326	50	81	90
2024	630	85	274	0	164	85	849	80	0	50	329	50	82	90
2025	635	85	276	0	166	85	856	80	0	50	331	50	83	90
2026	640	85	278	0	167	85	862	80	0	50	334	50	83	90
2027	645	85	280	0	168	85	869	80	0	50	336	50	84	90
2028	650	85	282	0	169	85	876	80	0	50	339	50	85	90
2029	654	85	284	0	171	85	882	80	0	50	341	50	85	90
2030	659	85	287	0	172	85	888	80	0	50	344	50	86	90
2031	664	85	289	0	173	85	894	80	0	50	346	50	87	90
2032	668	85	290	0	174	85	900	80	0	50	349	50	87	90
2033	672	85	292	0	175	85	906	80	0	50	351	50	88	90
2034	677	85	294	0	177	85	912	80	0	50	353	50	88	90
2035	681	85	296	0	178	85	918	80	0	50	355	50	89	90
2036	685	85	298	0	179	85	924	80	0	50	358	50	89	90
2037	689	85	300	0	180	85	929	80	0	50	360	50	90	90
2038	694	85	302	0	181	85	935	80	0	50	362	50	90	90
2039	698	85	303	0	182	85	940	80	0	50	364	50	91	90
2040	702	85	305	0	183	85	946	80	0	50	366	50	92	90
2041	706	85	307	0	184	85	951	80	0	50	368	50	92	90
2042	709	85	308	0	185	85	956	80	0	50	370	50	93	90
2043	713	85	310	0	186	85	961	80	0	50	372	50	93	90

TABLE H-7
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS -- RESIDENTIAL SECTOR (continued)

Year	Other Metals		Yard Waste		Food Waste		Wood Waste		Tires and Rubber		Orop Residue		Manure	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	21	15	4,077	50	2,747	0	751	0	215	0	0	0	43	0
1996	22	18	4,125	55	2,779	0	760	5	217	5	0	0	43	0
1997	22	21	4,167	60	2,807	0	768	10	219	10	0	0	44	0
1998	22	24	4,210	65	2,836	0	776	15	222	15	0	0	44	0
1999	22	27	4,251	70	2,864	0	783	20	224	20	0	0	45	0
2000	23	30	4,293	75	2,892	0	791	25	226	25	0	0	45	0
2001	23	31	4,330	76	2,917	5	798	29	228	26	0	5	46	5
2002	23	32	4,368	77	2,942	10	805	32	230	28	0	10	46	10
2003	23	33	4,404	77	2,967	14	811	36	232	29	0	14	46	14
2004	23	34	4,439	78	2,990	19	818	39	234	30	0	19	47	19
2005	24	35	4,473	79	3,013	24	824	43	235	31	0	24	47	24
2006	24	36	4,506	80	3,036	29	830	46	237	33	0	29	47	29
2007	24	37	4,540	80	3,058	33	836	50	239	34	0	33	48	33
2008	24	38	4,573	81	3,081	38	842	53	241	35	0	38	48	38
2009	24	39	4,607	82	3,104	43	849	57	242	36	0	43	48	43
2010	24	40	4,641	83	3,127	48	855	60	244	38	0	48	49	48
2011	25	41	4,676	83	3,150	52	861	64	246	39	0	52	49	52
2012	25	42	4,712	84	3,175	57	868	67	248	40	0	57	50	57
2013	25	43	4,749	85	3,200	62	875	71	250	41	0	62	50	62
2014	25	44	4,788	86	3,225	67	882	74	252	43	0	67	50	67
2015	25	45	4,826	86	3,252	71	889	78	254	44	0	71	51	71
2016	26	46	4,866	87	3,278	76	896	81	256	45	0	76	51	76
2017	26	47	4,907	88	3,306	81	904	85	258	46	0	81	52	81
2018	26	48	4,948	89	3,334	86	912	88	260	48	0	86	52	86
2019	26	49	4,990	89	3,362	90	919	92	263	49	0	90	53	90
2020	26	50	5,033	90	3,391	95	927	95	265	50	0	95	53	95
2021	27	50	5,075	90	3,419	95	935	95	267	50	0	95	53	95
2022	27	50	5,118	90	3,448	95	943	95	269	50	0	95	54	95
2023	27	50	5,160	90	3,476	95	951	95	272	50	0	95	54	95
2024	27	50	5,202	90	3,505	95	958	95	274	50	0	95	55	95
2025	28	50	5,244	90	3,533	95	966	95	276	50	0	95	55	95
2026	28	50	5,286	90	3,561	95	974	95	278	50	0	95	56	95
2027	28	50	5,326	90	3,588	95	981	95	280	50	0	95	56	95
2028	28	50	5,366	90	3,615	95	989	95	282	50	0	95	56	95
2029	28	50	5,405	90	3,642	95	996	95	284	50	0	95	57	95
2030	29	50	5,444	90	3,668	95	1,003	95	287	50	0	95	57	95
2031	29	50	5,482	90	3,693	95	1,010	95	289	50	0	95	58	95
2032	29	50	5,519	90	3,718	95	1,017	95	290	50	0	95	58	95
2033	29	50	5,555	90	3,743	95	1,023	95	292	50	0	95	58	95
2034	29	50	5,591	90	3,767	95	1,030	95	294	50	0	95	59	95
2035	30	50	5,626	90	3,790	95	1,036	95	296	50	0	95	59	95
2036	30	50	5,661	90	3,814	95	1,043	95	298	50	0	95	60	95
2037	30	50	5,696	90	3,837	95	1,049	95	300	50	0	95	60	95
2038	30	50	5,730	90	3,860	95	1,055	95	302	50	0	95	60	95
2039	30	50	5,763	90	3,883	95	1,062	95	303	50	0	95	61	95
2040	31	50	5,797	90	3,905	95	1,068	95	305	50	0	95	61	95
2041	31	50	5,829	90	3,927	95	1,074	95	307	50	0	95	61	95
2042	31	50	5,861	90	3,948	95	1,080	95	308	50	0	95	62	95
2043	31	50	5,893	90	3,970	95	1,085	95	310	50	0	95	62	95

TABLE H-8
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – RESIDENTIAL SECTOR (continued)

Year	Textiles and Leather		Other Organics		Inert Solids		Hazardous Waste		Special Waste		TOTAL
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	RECOVERED
1995	773	0	236	0	1,974	0	129	0	150	0	5,138
1996	782	10	239	0	1,997	2	130	0	152	0	6,398
1997	789	20	241	0	2,017	4	132	0	154	0	7,673
1998	798	30	244	0	2,038	6	133	0	155	0	8,978
1999	805	40	246	0	2,058	8	134	0	157	0	10,302
2000	813	50	249	0	2,079	10	136	0	158	0	11,652
2001	820	52	251	5	2,097	11	137	5	160	0	12,080
2002	828	53	253	10	2,115	11	138	9	161	0	12,514
2003	834	55	255	14	2,132	12	139	14	162	0	12,950
2004	841	56	257	19	2,149	12	140	18	164	0	13,388
2005	847	58	259	24	2,166	13	141	23	165	0	13,829
2006	854	59	261	29	2,182	13	142	27	166	0	14,272
2007	860	61	263	33	2,198	14	143	32	167	0	14,720
2008	867	62	265	38	2,214	14	144	36	168	0	15,174
2009	873	64	267	43	2,231	15	145	41	170	0	15,635
2010	879	65	269	48	2,247	15	147	45	171	0	16,102
2011	886	67	271	52	2,264	16	148	50	172	0	16,576
2012	893	68	273	57	2,282	16	149	54	174	0	17,059
2013	900	70	275	62	2,300	17	150	59	175	0	17,552
2014	907	71	277	67	2,318	17	151	63	176	0	18,055
2015	914	73	279	71	2,337	18	152	68	178	0	18,565
2016	922	74	282	76	2,356	18	154	72	179	0	19,086
2017	930	76	284	81	2,376	19	155	77	181	0	19,616
2018	938	77	286	86	2,396	19	156	81	182	0	20,155
2019	946	79	289	90	2,416	20	158	86	184	0	20,702
2020	954	80	291	95	2,437	20	159	90	185	0	21,258
2021	962	80	294	95	2,458	20	160	90	187	0	21,438
2022	970	80	296	95	2,478	20	162	90	189	0	21,618
2023	978	80	299	95	2,499	20	163	90	190	0	21,797
2024	986	80	301	95	2,519	20	164	90	192	0	21,975
2025	994	80	304	95	2,539	20	166	90	193	0	22,151
2026	1,001	80	306	95	2,559	20	167	90	195	0	22,326
2027	1,009	80	308	95	2,579	20	168	90	196	0	22,498
2028	1,017	80	311	95	2,598	20	169	90	198	0	22,666
2029	1,024	80	313	95	2,617	20	171	90	199	0	22,832
2030	1,031	80	315	95	2,636	20	172	90	201	0	22,995
2031	1,039	80	317	95	2,654	20	173	90	202	0	23,155
2032	1,046	80	320	95	2,672	20	174	90	203	0	23,312
2033	1,053	80	322	95	2,690	20	175	90	205	0	23,466
2034	1,059	80	324	95	2,707	20	177	90	206	0	23,617
2035	1,066	80	326	95	2,724	20	178	90	207	0	23,765
2036	1,073	80	328	95	2,741	20	179	90	209	0	23,912
2037	1,079	80	330	95	2,758	20	180	90	210	0	24,058
2038	1,086	80	332	95	2,774	20	181	90	211	0	24,202
2039	1,092	80	334	95	2,791	20	182	90	212	0	24,345
2040	1,098	80	336	95	2,807	20	183	90	214	0	24,487
2041	1,104	80	337	95	2,822	20	184	90	215	0	24,621
2042	1,110	80	339	95	2,838	20	185	90	216	0	24,755
2043	1,116	80	341	95	2,853	20	186	90	217	0	24,890

TABLE H-9
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – COMMERCIAL SECTOR

Year	Corrugated Containers		Mixed Paper		Newspaper		High Grade Ledger		Computer Printouts		Other Paper		PVC	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	2,526	50	2,772	30	559	30	402	30	0	30	0	20	0	0
1996	2,556	54	2,804	35	565	35	407	35	0	35	0	23	0	4
1997	2,581	58	2,833	40	571	40	411	40	0	40	0	26	0	8
1998	2,608	62	2,862	45	577	45	415	45	0	45	0	29	0	12
1999	2,634	66	2,890	50	583	50	420	50	0	50	0	32	0	16
2000	2,660	70	2,918	55	588	55	424	55	0	55	0	35	0	20
2001	2,683	70.75	2,944	56.5	593	56.5	427	56.5	0	56.5	0	35.75	0	21.5
2002	2,706	71.5	2,969	58	599	58	431	58	0	58	0	36.5	0	23
2003	2,728	72.25	2,994	59.5	604	59.5	435	59.5	0	59.5	0	37.25	0	24.5
2004	2,750	73	3,018	61	608	61	438	61	0	61	0	38	0	26
2005	2,771	73.75	3,041	62.5	613	62.5	441	62.5	0	62.5	0	38.75	0	27.5
2006	2,792	74.5	3,064	64	618	64	445	64	0	64	0	39.5	0	29
2007	2,812	75.25	3,086	65.5	622	65.5	448	65.5	0	65.5	0	40.25	0	30.5
2008	2,833	76	3,109	67	627	67	451	67	0	67	0	41	0	32
2009	2,854	76.75	3,132	68.5	631	68.5	455	68.5	0	68.5	0	41.75	0	33.5
2010	2,875	77.5	3,155	70	636	70	458	70	0	70	0	42.5	0	35
2011	2,897	78.25	3,179	71.5	641	71.5	461	71.5	0	71.5	0	43.25	0	36.5
2012	2,919	79	3,204	73	646	73	465	73	0	73	0	44	0	38
2013	2,942	79.75	3,229	74.5	651	74.5	469	74.5	0	74.5	0	44.75	0	39.5
2014	2,966	80.5	3,255	76	656	76	472	76	0	76	0	45.5	0	41
2015	2,990	81.25	3,281	77.5	662	77.5	476	77.5	0	77.5	0	46.25	0	42.5
2016	3,015	82	3,308	79	667	79	480	79	0	79	0	47	0	44
2017	3,040	82.75	3,336	80.5	673	80.5	484	80.5	0	80.5	0	47.75	0	45.5
2018	3,066	83.5	3,364	82	678	82	488	82	0	82	0	48.5	0	47
2019	3,092	84.25	3,393	83.5	684	83.5	492	83.5	0	83.5	0	49.25	0	48.5
2020	3,118	85	3,421	85	690	85	497	85	0	85	0	50	0	50
2021	3,144	85	3,450	85	696	85	501	85	0	85	0	50	0	50
2022	3,171	85	3,479	85	701	85	505	85	0	85	0	50	0	50
2023	3,197	85	3,508	85	707	85	509	85	0	85	0	50	0	50
2024	3,223	85	3,537	85	713	85	513	85	0	85	0	50	0	50
2025	3,249	85	3,565	85	719	85	518	85	0	85	0	50	0	50
2026	3,275	85	3,593	85	724	85	522	85	0	85	0	50	0	50
2027	3,300	85	3,621	85	730	85	526	85	0	85	0	50	0	50
2028	3,324	85	3,648	85	735	85	530	85	0	85	0	50	0	50
2029	3,349	85	3,675	85	741	85	533	85	0	85	0	50	0	50
2030	3,373	85	3,701	85	746	85	537	85	0	85	0	50	0	50
2031	3,396	85	3,727	85	751	85	541	85	0	85	0	50	0	50
2032	3,419	85	3,752	85	756	85	545	85	0	85	0	50	0	50
2033	3,442	85	3,777	85	761	85	548	85	0	85	0	50	0	50
2034	3,464	85	3,801	85	766	85	552	85	0	85	0	50	0	50
2035	3,486	85	3,825	85	771	85	555	85	0	85	0	50	0	50
2036	3,507	85	3,849	85	776	85	559	85	0	85	0	50	0	50
2037	3,528	85	3,872	85	781	85	562	85	0	85	0	50	0	50
2038	3,550	85	3,895	85	785	85	565	85	0	85	0	50	0	50
2039	3,571	85	3,918	85	790	85	569	85	0	85	0	50	0	50
2040	3,591	85	3,941	85	795	85	572	85	0	85	0	50	0	50
2041	3,611	85	3,963	85	799	85	575	85	0	85	0	50	0	50
2042	3,631	85	3,984	85	803	85	578	85	0	85	0	50	0	50
2043	3,651	85	4,006	85	808	85	582	85	0	85	0	50	0	50

TABLE H-10
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – COMMERCIAL SECTOR (continued)

Year	PET Containers		HDPE Containers		Film Plastics		Polystyrene		Other Plastics		Refillable Glass		CA Redemption Glass	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	22	25	268	30	380	10	0	0	380	10	0	0	156	20
1996	23	29	271	33	384	16	0	0	384	12	0	0	158	26
1997	23	33	274	36	388	22	0	0	388	14	0	0	160	32
1998	23	37	277	39	392	28	0	0	392	16	0	0	162	38
1999	23	41	280	42	396	34	0	0	396	18	0	0	163	44
2000	24	45	282	45	400	40	0	0	400	20	0	0	165	50
2001	24	46	285	46	404	40.5	0	0	404	21.5	0	0	166	51.5
2002	24	47	287	47	407	41	0	0	407	23	0	0	168	53
2003	24	48	290	48	410	41.5	0	0	410	24.5	0	0	169	54.5
2004	24	49	292	49	414	42	0	0	414	26	0	0	170	56
2005	25	50	294	50	417	42.5	0	0	417	27.5	0	0	172	57.5
2006	25	51	296	51	420	43	0	0	420	29	0	0	173	59
2007	25	52	299	52	423	43.5	0	0	423	30.5	0	0	174	60.5
2008	25	53	301	53	426	44	0	0	426	32	0	0	176	62
2009	25	54	303	54	429	44.5	0	0	429	33.5	0	0	177	63.5
2010	25	55	305	55	433	45	0	0	433	35	0	0	178	65
2011	26	56	308	56	436	45.5	0	0	436	36.5	0	0	179	66.5
2012	26	57	310	57	439	46	0	0	439	38	0	0	181	68
2013	26	58	312	58	443	46.5	0	0	443	39.5	0	0	182	69.5
2014	26	59	315	59	446	47	0	0	446	41	0	0	184	71
2015	26	60	318	60	450	47.5	0	0	450	42.5	0	0	185	72.5
2016	27	61	320	61	454	48	0	0	454	44	0	0	187	74
2017	27	62	323	62	457	48.5	0	0	457	45.5	0	0	188	75.5
2018	27	63	326	63	461	49	0	0	461	47	0	0	190	77
2019	27	64	328	64	465	49.5	0	0	465	48.5	0	0	192	78.5
2020	28	65	331	65	469	50	0	0	469	50	0	0	193	80
2021	28	65	334	65	473	50	0	0	473	50	0	0	195	80
2022	28	65	337	65	477	50	0	0	477	50	0	0	196	80
2023	28	65	339	65	481	50	0	0	481	50	0	0	198	80
2024	29	65	342	65	485	50	0	0	485	50	0	0	200	80
2025	29	65	345	65	489	50	0	0	489	50	0	0	201	80
2026	29	65	348	65	493	50	0	0	493	50	0	0	203	80
2027	29	65	350	65	496	50	0	0	496	50	0	0	204	80
2028	29	65	353	65	500	50	0	0	500	50	0	0	206	80
2029	30	65	356	65	504	50	0	0	504	50	0	0	207	80
2030	30	65	358	65	507	50	0	0	507	50	0	0	209	80
2031	30	65	361	65	511	50	0	0	511	50	0	0	210	80
2032	30	65	363	65	514	50	0	0	514	50	0	0	212	80
2033	30	65	365	65	518	50	0	0	518	50	0	0	213	80
2034	31	65	368	65	521	50	0	0	521	50	0	0	215	80
2035	31	65	370	65	524	50	0	0	524	50	0	0	216	80
2036	31	65	372	65	528	50	0	0	528	50	0	0	217	80
2037	31	65	375	65	531	50	0	0	531	50	0	0	219	80
2038	31	65	377	65	534	50	0	0	534	50	0	0	220	80
2039	32	65	379	65	537	50	0	0	537	50	0	0	221	80
2040	32	65	381	65	540	50	0	0	540	50	0	0	222	80
2041	32	65	383	65	543	50	0	0	543	50	0	0	224	80
2042	32	65	386	65	546	50	0	0	546	50	0	0	225	80
2043	32	65	388	65	549	50	0	0	549	50	0	0	226	80

TABLE H-11
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – COMMERCIAL SECTOR (continued)

Year	Other Recyclable Glass		Non-recyclable Glass		Aluminum Cans		Ferrous/Tin Cans		Bimetal Containers		Non-ferrous Metals		White Goods	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	112	20	22	0	22	65	1,118	50	0	10	179	20	0	0
1996	113	26	23	0	23	67	1,131	54	0	13	181	23	0	0
1997	114	32	23	0	23	69	1,142	58	0	16	183	26	0	0
1998	115	38	23	0	23	71	1,154	62	0	19	185	29	0	0
1999	117	44	23	0	23	73	1,165	66	0	22	186	32	0	0
2000	118	50	24	0	24	75	1,177	70	0	25	188	35	0	0
2001	119	51.5	24	0	24	75.75	1,187	71	0	26.25	190	35.75	0	0
2002	120	53	24	0	24	76.5	1,197	72	0	27.5	192	36.5	0	0
2003	121	54.5	24	0	24	77.25	1,207	73	0	28.75	193	37.25	0	0
2004	122	56	24	0	24	78	1,217	74	0	30	195	38	0	0
2005	123	57.5	25	0	25	78.75	1,226	75	0	31.25	196	38.75	0	0
2006	124	59	25	0	25	79.5	1,235	76	0	32.5	198	39.5	0	0
2007	124	60.5	25	0	25	80.25	1,244	77	0	33.75	199	40.25	0	0
2008	125	62	25	0	25	81	1,254	78	0	35	201	41	0	0
2009	126	63.5	25	0	25	81.75	1,263	79	0	36.25	202	41.75	0	0
2010	127	65	25	0	25	82.5	1,272	80	0	37.5	204	42.5	0	0
2011	128	66.5	26	0	26	83.25	1,282	81	0	38.75	205	43.25	0	0
2012	129	68	26	0	26	84	1,292	82	0	40	207	44	0	0
2013	130	69.5	26	0	26	84.75	1,302	83	0	41.25	208	44.75	0	0
2014	131	71	26	0	26	85.5	1,312	84	0	42.5	210	45.5	0	0
2015	132	72.5	26	0	26	86.25	1,323	85	0	43.75	212	46.25	0	0
2016	133	74	27	0	27	87	1,334	86	0	45	213	47	0	0
2017	135	75.5	27	0	27	87.75	1,345	87	0	46.25	215	47.75	0	0
2018	136	77	27	0	27	88.5	1,356	88	0	47.5	217	48.5	0	0
2019	137	78.5	27	0	27	89.25	1,368	89	0	48.75	219	49.25	0	0
2020	138	80	28	0	28	90	1,380	90	0	50	221	50	0	0
2021	139	80	28	0	28	90	1,391	90	0	50	223	50	0	0
2022	140	80	28	0	28	90	1,403	90	0	50	224	50	0	0
2023	141	80	28	0	28	90	1,415	90	0	50	226	50	0	0
2024	143	80	29	0	29	90	1,426	90	0	50	228	50	0	0
2025	144	80	29	0	29	90	1,438	90	0	50	230	50	0	0
2026	145	80	29	0	29	90	1,449	90	0	50	232	50	0	0
2027	146	80	29	0	29	90	1,460	90	0	50	234	50	0	0
2028	147	80	29	0	29	90	1,471	90	0	50	235	50	0	0
2029	148	80	30	0	30	90	1,482	90	0	50	237	50	0	0
2030	149	80	30	0	30	90	1,492	90	0	50	239	50	0	0
2031	150	80	30	0	30	90	1,503	90	0	50	240	50	0	0
2032	151	80	30	0	30	90	1,513	90	0	50	242	50	0	0
2033	152	80	30	0	30	90	1,523	90	0	50	244	50	0	0
2034	153	80	31	0	31	90	1,533	90	0	50	245	50	0	0
2035	154	80	31	0	31	90	1,542	90	0	50	247	50	0	0
2036	155	80	31	0	31	90	1,552	90	0	50	248	50	0	0
2037	156	80	31	0	31	90	1,561	90	0	50	250	50	0	0
2038	157	80	31	0	31	90	1,571	90	0	50	251	50	0	0
2039	158	80	32	0	32	90	1,580	90	0	50	253	50	0	0
2040	159	80	32	0	32	90	1,589	90	0	50	254	50	0	0
2041	160	80	32	0	32	90	1,598	90	0	50	256	50	0	0
2042	161	80	32	0	32	90	1,607	90	0	50	257	50	0	0
2043	162	80	32	0	32	90	1,615	90	0	50	258	50	0	0

TABLE H-12
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – COMMERCIAL SECTOR (continued)

Year	Other Metals		Yard Waste		Food Waste		Wood Waste		Tires and Rubber		Crop Residue		Manure	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	0	15	1,542	20	1,990	0	4,270	0	291	20	0	0	0	0
1996	0	18	1,561	31	2,013	9	4,320	10	294	26	0	0	0	0
1997	0	21	1,576	42	2,033	18	4,363	20	297	32	0	0	0	0
1998	0	24	1,593	53	2,054	27	4,408	30	300	38	0	0	0	0
1999	0	27	1,608	64	2,074	36	4,452	40	303	44	0	0	0	0
2000	0	30	1,624	75	2,095	45	4,495	50	306	50	0	0	0	0
2001	0	31	1,638	75.75	2,113	46.75	4,534	52	309	52	0	0	0	0
2002	0	32	1,652	76.5	2,131	48.5	4,574	54	311	54	0	0	0	0
2003	0	33	1,666	77.25	2,149	50.25	4,611	56	314	56	0	0	0	0
2004	0	34	1,679	78	2,166	52	4,648	58	316	58	0	0	0	0
2005	0	35	1,692	78.75	2,183	53.75	4,684	60	319	60	0	0	0	0
2006	0	36	1,705	79.5	2,199	55.5	4,719	62	321	62	0	0	0	0
2007	0	37	1,717	80.25	2,215	57.25	4,754	64	324	64	0	0	0	0
2008	0	38	1,730	81	2,231	59	4,789	66	326	66	0	0	0	0
2009	0	39	1,743	81.75	2,248	60.75	4,824	68	328	68	0	0	0	0
2010	0	40	1,756	82.5	2,265	62.5	4,860	70	331	70	0	0	0	0
2011	0	41	1,769	83.25	2,282	64.25	4,897	72	333	72	0	0	0	0
2012	0	42	1,783	84	2,299	66	4,935	74	336	74	0	0	0	0
2013	0	43	1,797	84.75	2,317	67.75	4,973	76	338	76	0	0	0	0
2014	0	44	1,811	85.5	2,336	69.5	5,013	78	341	78	0	0	0	0
2015	0	45	1,826	86.25	2,355	71.25	5,054	80	344	80	0	0	0	0
2016	0	46	1,841	87	2,375	73	5,096	82	347	82	0	0	0	0
2017	0	47	1,856	87.75	2,394	74.75	5,138	84	350	84	0	0	0	0
2018	0	48	1,872	88.5	2,415	76.5	5,182	86	353	86	0	0	0	0
2019	0	49	1,888	89.25	2,435	78.25	5,226	88	356	88	0	0	0	0
2020	0	50	1,904	90	2,456	80	5,270	90	359	90	0	0	0	0
2021	0	50	1,920	90	2,477	80	5,315	90	362	90	0	0	0	0
2022	0	50	1,938	90	2,497	80	5,359	90	365	90	0	0	0	0
2023	0	50	1,952	90	2,518	80	5,404	90	368	90	0	0	0	0
2024	0	50	1,968	90	2,538	80	5,448	90	371	90	0	0	0	0
2025	0	50	1,984	90	2,559	80	5,491	90	374	90	0	0	0	0
2026	0	50	1,999	90	2,579	80	5,535	90	377	90	0	0	0	0
2027	0	50	2,015	90	2,599	80	5,577	90	380	90	0	0	0	0
2028	0	50	2,030	90	2,618	80	5,619	90	382	90	0	0	0	0
2029	0	50	2,045	90	2,638	80	5,660	90	385	90	0	0	0	0
2030	0	50	2,059	90	2,656	80	5,701	90	388	90	0	0	0	0
2031	0	50	2,074	90	2,675	80	5,740	90	391	90	0	0	0	0
2032	0	50	2,088	90	2,693	80	5,779	90	393	90	0	0	0	0
2033	0	50	2,102	90	2,711	80	5,817	90	396	90	0	0	0	0
2034	0	50	2,115	90	2,728	80	5,855	90	398	90	0	0	0	0
2035	0	50	2,128	90	2,745	80	5,892	90	401	90	0	0	0	0
2036	0	50	2,142	90	2,762	80	5,928	90	403	90	0	0	0	0
2037	0	50	2,155	90	2,779	80	5,964	90	406	90	0	0	0	0
2038	0	50	2,167	90	2,796	80	6,000	90	408	90	0	0	0	0
2039	0	50	2,180	90	2,812	80	6,035	90	411	90	0	0	0	0
2040	0	50	2,193	90	2,829	80	6,071	90	413	90	0	0	0	0
2041	0	50	2,205	90	2,844	80	6,104	90	415	90	0	0	0	0
2042	0	50	2,217	90	2,860	80	6,137	90	418	90	0	0	0	0
2043	0	50	2,229	90	2,875	80	6,170	90	420	90	0	0	0	0

TABLE H-13
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – COMMERCIAL SECTOR (continued)

Year	Textiles and Leather		Other Organics		Inert Solids		Hazardous Waste		Special Waste		TOTAL
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	RECOVERED
1995	1,073	0	313	0	2,414	0	67	0	1,431	0	3,575
1996	1,086	10	317	0	2,443	0	68	0	1,447	0	4,926
1997	1,096	20	320	0	2,467	0	69	0	1,462	0	6,297
1998	1,108	30	323	0	2,493	0	69	0	1,477	0	7,699
1999	1,119	40	326	0	2,517	0	70	0	1,492	0	9,124
2000	1,130	50	330	0	2,542	0	71	0	1,506	0	10,576
2001	1,140	51.5	332	0	2,564	0	71	0	1,519	0	10,939
2002	1,149	53	335	0	2,586	0	72	0	1,533	0	11,308
2003	1,159	54.5	338	0	2,608	0	72	0	1,545	0	11,678
2004	1,168	56	341	0	2,628	0	73	0	1,557	0	12,049
2005	1,177	57.5	343	0	2,648	0	74	0	1,569	0	12,422
2006	1,186	59	346	0	2,668	0	74	0	1,581	0	12,798
2007	1,195	60.5	348	0	2,688	0	75	0	1,593	0	13,178
2008	1,203	62	351	0	2,708	0	75	0	1,605	0	13,562
2009	1,212	63.5	354	0	2,728	0	76	0	1,617	0	13,952
2010	1,221	65	356	0	2,748	0	76	0	1,629	0	14,347
2011	1,231	66.5	359	0	2,769	0	77	0	1,641	0	14,748
2012	1,240	68	362	0	2,790	0	78	0	1,653	0	15,157
2013	1,250	69.5	365	0	2,812	0	78	0	1,666	0	15,574
2014	1,260	71	367	0	2,835	0	79	0	1,680	0	16,001
2015	1,270	72.5	370	0	2,858	0	79	0	1,694	0	16,433
2016	1,281	74	374	0	2,881	0	80	0	1,708	0	16,874
2017	1,291	75.5	377	0	2,906	0	81	0	1,722	0	17,323
2018	1,302	77	380	0	2,930	0	81	0	1,736	0	17,780
2019	1,313	78.5	383	0	2,955	0	82	0	1,751	0	18,244
2020	1,324	80	386	0	2,980	0	83	0	1,766	0	18,714
2021	1,336	80	390	0	3,005	0	83	0	1,781	0	18,873
2022	1,347	80	393	0	3,030	0	84	0	1,796	0	19,031
2023	1,358	80	396	0	3,055	0	85	0	1,811	0	19,188
2024	1,369	80	399	0	3,080	0	86	0	1,825	0	19,345
2025	1,380	80	403	0	3,105	0	86	0	1,840	0	19,501
2026	1,391	80	406	0	3,130	0	87	0	1,855	0	19,654
2027	1,402	80	409	0	3,154	0	88	0	1,869	0	19,805
2028	1,412	80	412	0	3,177	0	88	0	1,883	0	19,954
2029	1,422	80	415	0	3,201	0	89	0	1,897	0	20,100
2030	1,433	80	418	0	3,223	0	90	0	1,910	0	20,243
2031	1,443	80	421	0	3,246	0	90	0	1,923	0	20,384
2032	1,452	80	424	0	3,268	0	91	0	1,936	0	20,522
2033	1,462	80	426	0	3,289	0	91	0	1,949	0	20,657
2034	1,471	80	429	0	3,311	0	92	0	1,962	0	20,790
2035	1,481	80	432	0	3,331	0	93	0	1,974	0	20,921
2036	1,490	80	435	0	3,352	0	93	0	1,986	0	21,051
2037	1,499	80	437	0	3,372	0	94	0	1,998	0	21,179
2038	1,508	80	440	0	3,393	0	94	0	2,010	0	21,306
2039	1,517	80	442	0	3,413	0	95	0	2,022	0	21,431
2040	1,526	80	445	0	3,433	0	95	0	2,034	0	21,557
2041	1,534	80	447	0	3,451	0	96	0	2,045	0	21,675
2042	1,542	80	450	0	3,470	0	96	0	2,056	0	21,793
2043	1,551	80	452	0	3,489	0	97	0	[illegible]	[illegible]	21,911

TABLE H-14
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – INDUSTRIAL SECTOR

Year	Corrugated Containers		Mixed Paper		Newspaper		High Grade Ledger		Computer Printouts		Other Paper		PVC	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	674	55	1,238	30	58	25	52	25	0	25	0	15	0	0
1996	682	58	1,252	35	59	30	53	30	0	30	0	18	0	4
1997	689	61	1,265	40	59	35	53	35	0	35	0	21	0	8
1998	696	64	1,278	45	60	40	54	40	0	40	0	24	0	12
1999	703	67	1,291	50	61	45	55	45	0	45	0	27	0	16
2000	710	70	1,303	55	61	50	55	50	0	50	0	30	0	20
2001	716	70.75	1,315	56.5	62	51.5	56	51.5	0	51.5	0	30.5	0	21.5
2002	722	71.5	1,326	58	62	53	56	53	0	53	0	31	0	23
2003	728	72.25	1,337	59.5	63	54.5	56	54.5	0	54.5	0	31.5	0	24.5
2004	734	73	1,348	61	63	56	57	56	0	56	0	32	0	26
2005	740	73.75	1,358	62.5	64	57.5	57	57.5	0	57.5	0	32.5	0	27.5
2006	745	74.5	1,368	64	64	59	58	59	0	59	0	33	0	29
2007	751	75.25	1,378	65.5	65	60.5	58	60.5	0	60.5	0	33.5	0	30.5
2008	756	76	1,389	67	65	62	59	62	0	62	0	34	0	32
2009	762	76.75	1,399	68.5	66	63.5	59	63.5	0	63.5	0	34.5	0	33.5
2010	767	77.5	1,409	70	66	65	60	65	0	65	0	35	0	35
2011	773	78.25	1,420	71.5	67	66.5	60	66.5	0	66.5	0	35.5	0	36.5
2012	779	79	1,431	73	67	68	60	68	0	68	0	36	0	38
2013	785	79.75	1,442	74.5	68	69.5	61	69.5	0	69.5	0	36.5	0	39.5
2014	792	80.5	1,454	76	68	71	61	71	0	71	0	37	0	41
2015	798	81.25	1,465	77.5	69	72.5	62	72.5	0	72.5	0	37.5	0	42.5
2016	805	82	1,478	79	69	74	62	74	0	74	0	38	0	44
2017	811	82.75	1,490	80.5	70	75.5	63	75.5	0	75.5	0	38.5	0	45.5
2018	818	83.5	1,502	82	71	77	63	77	0	77	0	39	0	47
2019	825	84.25	1,515	83.5	71	78.5	64	78.5	0	78.5	0	39.5	0	48.5
2020	832	85	1,528	85	72	80	65	80	0	80	0	40	0	50
2021	839	85	1,541	85	72	80	65	80	0	80	0	40	0	50
2022	846	85	1,554	85	73	80	66	80	0	80	0	40	0	50
2023	853	85	1,567	85	74	80	66	80	0	80	0	40	0	50
2024	860	85	1,580	85	74	80	67	80	0	80	0	40	0	50
2025	867	85	1,592	85	75	80	67	80	0	80	0	40	0	50
2026	874	85	1,605	85	75	80	68	80	0	80	0	40	0	50
2027	881	85	1,617	85	76	80	68	80	0	80	0	40	0	50
2028	887	85	1,629	85	76	80	69	80	0	80	0	40	0	50
2029	894	85	1,641	85	77	80	69	80	0	80	0	40	0	50
2030	900	85	1,653	85	78	80	70	80	0	80	0	40	0	50
2031	906	85	1,664	85	78	80	70	80	0	80	0	40	0	50
2032	913	85	1,676	85	79	80	71	80	0	80	0	40	0	50
2033	919	85	1,687	85	79	80	71	80	0	80	0	40	0	50
2034	924	85	1,698	85	80	80	72	80	0	80	0	40	0	50
2035	930	85	1,708	85	80	80	72	80	0	80	0	40	0	50
2036	936	85	1,719	85	81	80	73	80	0	80	0	40	0	50
2037	942	85	1,729	85	81	80	73	80	0	80	0	40	0	50
2038	947	85	1,740	85	82	80	74	80	0	80	0	40	0	50
2039	953	85	1,750	85	82	80	74	80	0	80	0	40	0	50
2040	959	85	1,760	85	83	80	74	80	0	80	0	40	0	50
2041	964	85	1,770	85	83	80	75	80	0	80	0	40	0	50
2042	969	85	1,779	85	84	80	75	80	0	80	0	40	0	50
2043	974	85	1,789	85	84	80	76	80	0	80	0	40	0	50

TABLE H-15
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – INDUSTRIAL SECTOR (continued)

Year	PET Containers		HDPE Containers		Film Plastics		Polystyrene		Other Plastics		Refillable Glass		CA Redemption Glass	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	6	25	6	25	802	25	0	0	163	10	0	0	58	20
1996	6	28	6	28	811	30	0	0	165	12	0	0	59	24
1997	6	31	6	31	820	35	0	0	166	14	0	0	59	28
1998	6	34	6	34	828	40	0	0	168	16	0	0	60	32
1999	6	37	6	37	836	45	0	0	170	18	0	0	61	36
2000	6	40	6	40	844	50	0	0	171	20	0	0	61	40
2001	6	41	6	41	852	51.25	0	0	173	21.5	0	0	62	41.5
2002	6	42	6	42	859	52.5	0	0	174	23	0	0	62	43
2003	6	43	6	43	866	53.75	0	0	176	24.5	0	0	63	44.5
2004	6	44	6	44	873	55	0	0	177	26	0	0	63	46
2005	6	45	6	45	880	56.25	0	0	179	27.5	0	0	64	47.5
2006	6	46	6	46	886	57.5	0	0	180	29	0	0	64	49
2007	6	47	6	47	893	58.75	0	0	181	30.5	0	0	65	50.5
2008	7	48	7	48	900	60	0	0	183	32	0	0	65	52
2009	7	49	7	49	906	61.25	0	0	184	33.5	0	0	66	53.5
2010	7	50	7	50	913	62.5	0	0	185	35	0	0	66	55
2011	7	51	7	51	920	63.75	0	0	187	36.5	0	0	67	56.5
2012	7	52	7	52	927	65	0	0	188	38	0	0	67	58
2013	7	53	7	53	934	66.25	0	0	190	39.5	0	0	68	59.5
2014	7	54	7	54	942	67.5	0	0	191	41	0	0	68	61
2015	7	55	7	55	949	68.75	0	0	193	42.5	0	0	69	62.5
2016	7	56	7	56	957	70	0	0	194	44	0	0	69	64
2017	7	57	7	57	965	71.25	0	0	196	45.5	0	0	70	65.5
2018	7	58	7	58	973	72.5	0	0	198	47	0	0	71	67
2019	7	59	7	59	982	73.75	0	0	199	48.5	0	0	71	68.5
2020	7	60	7	60	990	75	0	0	201	50	0	0	72	70
2021	7	60	7	60	998	75	0	0	203	50	0	0	72	70
2022	7	60	7	60	1,007	75	0	0	204	50	0	0	73	70
2023	7	60	7	60	1,015	75	0	0	206	50	0	0	74	70
2024	7	60	7	60	1,023	75	0	0	208	50	0	0	74	70
2025	7	60	7	60	1,032	75	0	0	209	50	0	0	75	70
2026	8	60	8	60	1,040	75	0	0	211	50	0	0	75	70
2027	8	60	8	60	1,048	75	0	0	213	50	0	0	76	70
2028	8	60	8	60	1,056	75	0	0	214	50	0	0	76	70
2029	8	60	8	60	1,063	75	0	0	216	50	0	0	77	70
2030	8	60	8	60	1,071	75	0	0	217	50	0	0	78	70
2031	8	60	8	60	1,078	75	0	0	219	50	0	0	78	70
2032	8	60	8	60	1,086	75	0	0	220	50	0	0	79	70
2033	8	60	8	60	1,093	75	0	0	222	50	0	0	79	70
2034	8	60	8	60	1,100	75	0	0	223	50	0	0	80	70
2035	8	60	8	60	1,107	75	0	0	225	50	0	0	80	70
2036	8	60	8	60	1,114	75	0	0	226	50	0	0	81	70
2037	8	60	8	60	1,120	75	0	0	227	50	0	0	81	70
2038	8	60	8	60	1,127	75	0	0	229	50	0	0	82	70
2039	8	60	8	60	1,134	75	0	0	230	50	0	0	82	70
2040	8	60	8	60	1,140	75	0	0	231	50	0	0	83	70
2041	8	60	8	60	1,147	75	0	0	233	50	0	0	83	70
2042	8	60	8	60	1,153	75	0	0	234	50	0	0	84	70
2043	8	60	8	60	1,159	75	0	0	235	50	0	0	84	70

TABLE H-16
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – INDUSTRIAL SECTOR (continued)

Year	Other Recyclable Glass		Non-recyclable Glass		Aluminum Cans		Ferrous/Tin Cans		Bimetal Containers		Non-ferrous Metals		White Goods	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	81	20	12	0	6	65	93	50	0	20	81	20	0	0
1996	82	24	12	0	6	69	94	52	0	26	82	24	0	0
1997	83	28	12	0	6	73	95	54	0	32	83	28	0	0
1998	84	32	12	0	6	77	96	56	0	38	84	32	0	0
1999	85	36	12	0	6	81	97	58	0	44	85	36	0	0
2000	86	40	12	0	6	85	98	60	0	50	86	40	0	0
2001	86	41.5	12	0	6	85.25	99	60.5	0	51	86	41	0	0
2002	87	43	12	0	6	85.5	100	61	0	52	87	42	0	0
2003	88	44.5	13	0	6	85.75	100	61.5	0	53	88	43	0	0
2004	89	46	13	0	6	86	101	62	0	54	89	44	0	0
2005	89	47.5	13	0	6	86.25	102	62.5	0	55	89	45	0	0
2006	90	49	13	0	6	86.5	103	63	0	56	90	46	0	0
2007	91	50.5	13	0	6	86.75	104	63.5	0	57	91	47	0	0
2008	91	52	13	0	7	87	104	64	0	58	91	48	0	0
2009	92	53.5	13	0	7	87.25	105	64.5	0	59	92	49	0	0
2010	93	55	13	0	7	87.5	106	65	0	60	93	50	0	0
2011	93	56.5	13	0	7	87.75	107	65.5	0	61	93	51	0	0
2012	94	58	13	0	7	88	107	66	0	62	94	52	0	0
2013	95	59.5	14	0	7	88.25	108	66.5	0	63	95	53	0	0
2014	96	61	14	0	7	88.5	109	67	0	64	96	54	0	0
2015	96	62.5	14	0	7	88.75	110	67.5	0	65	96	55	0	0
2016	97	64	14	0	7	89	111	68	0	66	97	56	0	0
2017	98	65.5	14	0	7	89.25	112	68.5	0	67	98	57	0	0
2018	99	67	14	0	7	89.5	113	69	0	68	99	58	0	0
2019	100	68.5	14	0	7	89.75	114	69.5	0	69	100	59	0	0
2020	100	70	14	0	7	90	115	70	0	70	100	60	0	0
2021	101	70	14	0	7	90	116	70	0	70	101	60	0	0
2022	102	70	15	0	7	90	117	70	0	70	102	60	0	0
2023	103	70	15	0	7	90	118	70	0	70	103	60	0	0
2024	104	70	15	0	7	90	119	70	0	70	104	60	0	0
2025	105	70	15	0	7	90	120	70	0	70	105	60	0	0
2026	105	70	15	0	8	90	121	70	0	70	105	60	0	0
2027	106	70	15	0	8	90	121	70	0	70	106	60	0	0
2028	107	70	15	0	8	90	122	70	0	70	107	60	0	0
2029	108	70	15	0	8	90	123	70	0	70	108	60	0	0
2030	109	70	16	0	8	90	124	70	0	70	109	60	0	0
2031	109	70	16	0	8	90	125	70	0	70	109	60	0	0
2032	110	70	16	0	8	90	126	70	0	70	110	60	0	0
2033	111	70	16	0	8	90	127	70	0	70	111	60	0	0
2034	112	70	16	0	8	90	128	70	0	70	112	60	0	0
2035	112	70	16	0	8	90	128	70	0	70	112	60	0	0
2036	113	70	16	0	8	90	129	70	0	70	113	60	0	0
2037	114	70	16	0	8	90	130	70	0	70	114	60	0	0
2038	114	70	16	0	8	90	131	70	0	70	114	60	0	0
2039	115	70	16	0	8	90	131	70	0	70	115	60	0	0
2040	116	70	17	0	8	90	132	70	0	70	116	60	0	0
2041	116	70	17	0	8	90	133	70	0	70	116	60	0	0
2042	117	70	17	0	8	90	134	70	0	70	117	60	0	0
2043	118	70	17	0	8	90	134	70	0	70	118	60	0	0

TABLE H-17
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – INDUSTRIAL SECTOR (continued)

Year	Other Metals		Yard Waste		Food Waste		Wood Waste		Tires and Rubber		Crop Residue		Manure	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	0	15	227	35	215	0	761	25	93	20	0	0	0	0
1996	0	18	229	43	218	9	770	30	94	26	0	0	0	0
1997	0	21	232	51	220	18	778	35	95	32	0	0	0	0
1998	0	24	234	59	222	27	786	40	96	38	0	0	0	0
1999	0	27	236	67	224	36	794	45	97	44	0	0	0	0
2000	0	30	239	75	226	45	802	50	98	50	0	0	0	0
2001	0	31	241	75.75	228	47.25	809	52	99	52	0	0	0	0
2002	0	32	243	76.5	230	49.5	816	54	100	54	0	0	0	0
2003	0	33	245	77.25	232	51.75	822	56	100	56	0	0	0	0
2004	0	34	247	78	234	54	829	58	101	58	0	0	0	0
2005	0	35	249	78.75	236	56.25	835	60	102	60	0	0	0	0
2006	0	36	251	79.5	238	58.5	841	62	103	62	0	0	0	0
2007	0	37	252	80.25	239	60.75	848	64	104	64	0	0	0	0
2008	0	38	254	81	241	63	854	66	104	66	0	0	0	0
2009	0	39	256	81.75	243	65.25	860	68	105	68	0	0	0	0
2010	0	40	258	82.5	245	67.5	867	70	106	70	0	0	0	0
2011	0	41	260	83.25	247	69.75	873	72	107	72	0	0	0	0
2012	0	42	262	84	249	72	880	74	107	74	0	0	0	0
2013	0	43	264	84.75	250	74.25	887	76	108	76	0	0	0	0
2014	0	44	266	85.5	253	76.5	894	78	109	78	0	0	0	0
2015	0	45	268	86.25	255	78.75	901	80	110	80	0	0	0	0
2016	0	46	271	87	257	81	909	82	111	82	0	0	0	0
2017	0	47	273	87.75	259	83.25	916	84	112	84	0	0	0	0
2018	0	48	275	88.5	261	85.5	924	86	113	86	0	0	0	0
2019	0	49	277	89.25	263	87.75	932	88	114	88	0	0	0	0
2020	0	50	280	90	265	90	940	90	115	90	0	0	0	0
2021	0	50	282	90	268	90	948	90	116	90	0	0	0	0
2022	0	50	285	90	270	90	956	90	117	90	0	0	0	0
2023	0	50	287	90	272	90	964	90	118	90	0	0	0	0
2024	0	50	289	90	274	90	971	90	119	90	0	0	0	0
2025	0	50	292	90	277	90	979	90	120	90	0	0	0	0
2026	0	50	294	90	279	90	987	90	121	90	0	0	0	0
2027	0	50	296	90	281	90	995	90	121	90	0	0	0	0
2028	0	50	298	90	283	90	1,002	90	122	90	0	0	0	0
2029	0	50	300	90	285	90	1,009	90	123	90	0	0	0	0
2030	0	50	303	90	287	90	1,017	90	124	90	0	0	0	0
2031	0	50	305	90	289	90	1,024	90	125	90	0	0	0	0
2032	0	50	307	90	291	90	1,031	90	126	90	0	0	0	0
2033	0	50	309	90	293	90	1,037	90	127	90	0	0	0	0
2034	0	50	311	90	295	90	1,044	90	128	90	0	0	0	0
2035	0	50	313	90	297	90	1,051	90	128	90	0	0	0	0
2036	0	50	315	90	299	90	1,057	90	129	90	0	0	0	0
2037	0	50	317	90	300	90	1,064	90	130	90	0	0	0	0
2038	0	50	319	90	302	90	1,070	90	131	90	0	0	0	0
2039	0	50	320	90	304	90	1,076	90	131	90	0	0	0	0
2040	0	50	322	90	306	90	1,083	90	132	90	0	0	0	0
2041	0	50	324	90	307	90	1,088	90	133	90	0	0	0	0
2042	0	50	326	90	309	90	1,094	90	134	90	0	0	0	0
2043	0	50	328	90	311	90	1,100	90	134	90	0	0	0	0

TABLE H-18
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – INDUSTRIAL SECTOR (continued)

Year	Textiles and Leather		Other Organics		Inert Solids		Hazardous Waste		Special Waste		TOTAL
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	RECOVERED
1995	924	0	64	0	128	10	17	0	41	0	1,385
1996	935	10	65	0	129	18	18	0	41	0	1,731
1997	944	20	65	0	131	26	18	0	42	0	2,082
1998	954	30	66	0	132	34	18	0	42	0	2,440
1999	964	40	67	0	133	42	18	0	42	0	2,804
2000	973	50	67	0	135	50	18	0	43	0	3,175
2001	981	51.5	68	0	136	51.5	19	0	43	0	3,288
2002	990	53	68	0	137	53	19	0	44	0	3,403
2003	998	54.5	69	0	138	54.5	19	0	44	0	3,518
2004	1,006	56	70	0	139	56	19	0	44	0	3,634
2005	1,014	57.5	70	0	140	57.5	19	0	45	0	3,750
2006	1,021	59	71	0	141	59	19	0	45	0	3,867
2007	1,029	60.5	71	0	142	60.5	19	0	45	0	3,986
2008	1,038	62	72	0	143	62	20	0	46	0	4,106
2009	1,044	63.5	72	0	144	63.5	20	0	46	0	4,227
2010	1,052	65	73	0	146	65	20	0	46	0	4,351
2011	1,060	66.5	73	0	147	66.5	20	0	47	0	4,476
2012	1,068	68	74	0	148	68	20	0	47	0	4,604
2013	1,076	69.5	74	0	149	69.5	20	0	47	0	4,734
2014	1,085	71	75	0	150	71	20	0	48	0	4,867
2015	1,094	72.5	76	0	151	72.5	21	0	48	0	5,001
2016	1,103	74	76	0	153	74	21	0	49	0	5,139
2017	1,112	75.5	77	0	154	75.5	21	0	49	0	5,279
2018	1,122	77	78	0	155	77	21	0	49	0	5,421
2019	1,131	78.5	78	0	156	78.5	21	0	50	0	5,566
2020	1,141	80	79	0	158	80	22	0	50	0	5,713
2021	1,150	80	80	0	159	80	22	0	51	0	5,761
2022	1,160	80	80	0	160	80	22	0	51	0	5,810
2023	1,170	80	81	0	162	80	22	0	51	0	5,858
2024	1,179	80	82	0	163	80	22	0	52	0	5,905
2025	1,189	80	82	0	164	80	22	0	52	0	5,953
2026	1,198	80	83	0	166	80	23	0	53	0	6,000
2027	1,207	80	84	0	167	80	23	0	53	0	6,046
2028	1,216	80	84	0	168	80	23	0	54	0	6,091
2029	1,225	80	85	0	170	80	23	0	54	0	6,136
2030	1,234	80	85	0	171	80	23	0	54	0	6,180
2031	1,242	80	86	0	172	80	23	0	55	0	6,223
2032	1,251	80	87	0	173	80	24	0	55	0	6,265
2033	1,259	80	87	0	174	80	24	0	55	0	6,306
2034	1,267	80	88	0	175	80	24	0	56	0	6,347
2035	1,275	80	88	0	176	80	24	0	56	0	6,387
2036	1,283	80	89	0	178	80	24	0	56	0	6,426
2037	1,291	80	89	0	179	80	24	0	57	0	6,465
2038	1,299	80	90	0	180	80	25	0	57	0	6,504
2039	1,306	80	90	0	181	80	25	0	58	0	6,542
2040	1,314	80	91	0	182	80	25	0	58	0	6,581
2041	1,321	80	91	0	183	80	25	0	58	0	6,617
2042	1,328	80	92	0	184	80	25	0	58	0	6,653
2043	1,336	80	92	0	185	80	25	0	59	0	6,689

TABLE H-19
COUNTY OF LOS ANGELES
PROJECTED WASTE GENERATION AND RECOVERY RATES
BASED ON WASTE COMPOSITION DATA FROM UNINCORPORATED AREAS
(TPD–6)

Year	Total Waste Generation Rate	Residential Waste Generation Rate	Commercial Waste Generation Rate	Industrial Waste Generation Rate	Residential		Commercial		Industrial		Total	
					Waste Recovery Rate	Percent Recovery Rate	Waste Recovery Rate	Percent Recovery Rate	Waste Recovery Rate	Percent Recovery Rate	Waste Recovery Rate	Percent Recovery Rate
1995	49,677	25,147	16,065	8,468	5,833	23.20	2,928	18.23	1,862	21.99	10,624	21.39
1996	50,258	25,441	16,253	8,567	7,121	27.99	3,877	23.86	2,350	27.43	13,348	26.56
1997	50,762	25,696	16,416	8,653	8,424	32.78	4,840	29.49	2,843	32.86	16,107	31.73
1998	51,290	25,964	16,586	8,743	9,756	37.57	5,824	35.12	3,348	38.29	18,928	36.90
1999	51,793	26,218	16,749	8,829	11,108	42.37	6,824	40.74	3,861	43.73	21,793	42.08
2000	52,303	26,476	16,914	8,916	12,486	47.16	7,844	46.37	4,383	49.16	24,713	47.25
2001	52,756	26,706	17,060	8,993	13,075	48.96	8,110	47.54	4,538	50.46	25,724	48.76
2002	53,212	26,937	17,208	9,071	13,674	50.76	8,381	48.71	4,695	51.76	26,750	50.27
2003	53,652	27,160	17,350	9,146	14,276	52.56	8,653	49.87	4,853	53.06	27,782	51.78
2004	54,079	27,376	17,488	9,218	14,883	54.37	8,926	51.04	5,012	54.36	28,820	53.29
2005	54,494	27,586	17,623	9,289	15,494	56.17	9,200	52.20	5,171	55.67	29,865	54.80
2006	54,902	27,792	17,755	9,359	16,111	57.97	9,476	53.37	5,331	56.97	30,918	56.31
2007	55,308	27,998	17,886	9,428	16,734	59.77	9,754	54.54	5,493	58.27	31,982	57.82
2008	55,716	28,205	18,018	9,497	17,366	61.57	10,037	55.70	5,657	59.57	33,060	59.34
2009	56,129	28,414	18,151	9,568	18,006	63.37	10,323	56.87	5,824	60.87	34,153	60.85
2010	56,548	28,626	18,287	9,639	18,656	65.17	10,613	58.04	5,993	62.17	35,262	62.36
2011	56,975	28,841	18,425	9,712	19,317	66.98	10,908	59.20	6,164	63.47	36,389	63.87
2012	57,412	29,063	18,566	9,787	19,989	68.78	11,206	60.37	6,339	64.77	37,535	65.38
2013	57,863	29,291	18,712	9,863	20,673	70.58	11,514	61.53	6,517	66.07	38,704	66.89
2014	58,330	29,528	18,863	9,943	21,372	72.38	11,827	62.70	6,699	67.37	39,898	68.40
2015	58,802	29,767	19,016	10,023	22,081	74.18	12,145	63.87	6,883	68.67	41,109	69.91
2016	59,289	30,013	19,173	10,106	22,805	75.98	12,469	65.03	7,072	69.97	42,345	71.42
2017	59,785	30,264	19,333	10,191	23,541	77.78	12,799	66.20	7,263	71.27	43,602	72.93
2018	60,288	30,519	19,496	10,277	24,289	79.59	13,134	67.37	7,458	72.57	44,881	74.44
2019	60,799	30,777	19,661	10,364	25,049	81.39	13,475	68.53	7,656	73.87	46,179	75.95
2020	61,316	31,039	19,829	10,452	25,821	83.19	13,820	69.70	7,857	75.17	47,498	77.46
2021	61,835	31,302	19,997	10,540	26,040	83.19	13,937	69.70	7,924	75.17	47,901	77.46
2022	62,353	31,564	20,164	10,629	26,258	83.19	14,054	69.70	7,990	75.17	48,302	77.46
2023	62,869	31,825	20,331	10,717	26,475	83.19	14,170	69.70	8,056	75.17	48,701	77.46
2024	63,382	32,085	20,497	10,804	26,691	83.19	14,286	69.70	8,122	75.17	49,099	77.46
2025	63,892	32,343	20,662	10,891	26,906	83.19	14,401	69.70	8,187	75.17	49,494	77.46
2026	64,396	32,598	20,825	10,977	27,118	83.19	14,515	69.70	8,252	75.17	49,884	77.46
2027	64,890	32,848	20,985	11,061	27,326	83.19	14,626	69.70	8,315	75.17	50,267	77.46
2028	65,377	33,095	21,142	11,144	27,531	83.19	14,736	69.70	8,377	75.17	50,644	77.46
2029	65,855	33,337	21,297	11,226	27,733	83.19	14,843	69.70	8,439	75.17	51,015	77.46
2030	66,326	33,575	21,449	11,306	27,931	83.19	14,950	69.70	8,499	75.17	51,379	77.46
2031	66,788	33,809	21,598	11,385	28,125	83.19	15,054	69.70	8,558	75.17	51,737	77.46
2032	67,239	34,037	21,744	11,462	28,315	83.19	15,155	69.70	8,616	75.17	52,087	77.46
2033	67,682	34,262	21,887	11,537	28,502	83.19	15,255	69.70	8,673	75.17	52,430	77.46
2034	68,118	34,482	22,028	11,611	28,685	83.19	15,353	69.70	8,729	75.17	52,767	77.46
2035	68,547	34,700	22,167	11,685	28,866	83.19	15,450	69.70	8,784	75.17	53,100	77.46
2036	68,971	34,914	22,304	11,757	29,045	83.19	15,546	69.70	8,838	75.17	53,428	77.46
2037	69,390	35,126	22,440	11,828	29,221	83.19	15,640	69.70	8,892	75.17	53,753	77.46
2038	69,806	35,337	22,574	11,899	29,396	83.19	15,734	69.70	8,945	75.17	54,075	77.46
2039	70,218	35,545	22,707	11,969	29,570	83.19	15,827	69.70	8,998	75.17	54,394	77.46
2040	70,629	35,753	22,840	12,039	29,743	83.19	15,919	69.70	9,050	75.17	54,712	77.46
2041	71,015	35,949	22,965	12,105	29,906	83.19	16,007	69.70	9,100	75.17	55,012	77.46
2042	71,403	36,145	23,091	12,171	30,069	83.19	16,094	69.70	9,150	75.17	55,312	77.46
2043	71,791	36,342	23,216	12,237	30,232	83.19	16,181	69.70	9,199	75.17	55,613	77.46

TABLE H-20
COUNTY OF LOS ANELES
WASTE STREAM COMPOSITION BY GENERATING SECTOR

Waste Component	Pecent Compostion by Weight		
	Residential	Commercial	Industrial
PAPER			
Corrugated Containers	3.6	13.6	11.1
Mixed Paper	7.8	9.3	6.7
Newspaper	6.8	3.8	3.1
High Grade Ledger	0.8	6.0	2.6
Computer Printouts	0.0	0.0	0.0
Other Paper	7.4	7.8	2.8
SUBTOTAL	26.5	40.6	26.3
PLASTIC			
PVC	0.0	1.6	0.7
PET Containers	0.3	0.2	0.1
HDPE Containers	1.1	1.0	0.6
Film Plastics	2.6	4.4	2.6
Polystyrene	2.0	2.2	3.8
Other Plastics	1.2	0.0	0.4
SUBTOTAL	7.2	9.4	8.1
GLASS			
Refillable Glass	0.0	0.0	0.0
CA Redemption Glass	1.9	0.8	0.4
Other Recyclable Glass	3.3	0.9	1.0
Non-recyclable Glass	0.6	0.9	1.4
SUBTOTAL	5.7	2.6	2.9
METALS			
Aluminum Cans	0.5	0.4	0.2
Tin Cans	1.0	0.9	1.0
Ferrous Metals	1.8	4.6	3.6
Non-ferrous Metals	0.3	0.4	0.8
White Goods	0.1	0.0	0.0
Other Metals	0.8	2.4	1.0
SUBTOTAL	4.5	8.7	6.6
YARD WASTE			
Yard Waste	20.8	5.0	5.9
SUBTOTAL	20.8	5.0	5.9
ORGANICS			
Food Waste	14.6	13.4	1.9
Wood Waste	2.6	7.5	16.6
Tires and Rubber	1.0	1.7	3.0
Crop Residue	0.0	0.0	0.0
Manure	0.3	0.8	0.0
Diapers	4.5	0.5	0.0
Textiles and Leather	3.3	5.5	2.6
Other Organics	2.5	2.1	1.0
SUBTOTAL	28.7	31.4	25.2
OTHER WASTES			
Inert Solids	5.7	1.6	24.2
Hazardous Waste	0.9	0.7	0.9
SUBTOTAL	6.6	2.3	25.1
SPECIAL WASTE			
Ash	0.0	0.0	0.0
Industrial Sludge	0.0	0.0	0.0
Sewasge Sludge	0.0	0.0	0.0
Asbestos	0.0	0.0	0.0
Auto Shredder	0.0	0.0	0.0
Auto Bodies	0.0	0.0	0.0
Other Special Waste	0.0	0.0	0.0
SUBTOTAL	0.0	0.0	0.0
TOTAL	100.0	100.0	100.0

Source: "Source Reduction and Recycling Element for Unincorporated Los Angeles County," County of Los Angeles Department of Public Works, December, 1991.

APPENDIX I

APPENDIX I: COST ISSUES

This Appendix discusses some of the cost issues relevant to integrated solid waste management planning. It is not possible to develop a detailed cost plan for the recommendations made in the report. To do so would require obtaining present cost data from the County and the County Sanitation Districts of Los Angeles County, as well as from each of the Cities in the County.

Determining the actual cost of solid waste management is one of the most difficult tasks encountered by communities developing integrated solid waste management plans. Many costs, particularly overhead costs such as personnel management, are handled by separate departments. The amount of time allocated to management of solid waste personnel must be estimated as part of the overall cost of solid waste. In addition, divisions often share equipment, marshalling yards or supervisory personnel, or pitch in together to provide emergency services, making it difficult to identify solid waste-specific costs.

The objective in this Appendix is to get the County thinking about how to develop a coherent integrated solid waste management system and help communities control costs. The County can function in a key coordinating role. This does not mean that the County shoulders all costs or manages all facilities; it means that the County actively supports the Cities and facilitates their operations. Elaborate solid waste systems can be very costly if program components are added piecemeal. County leadership can be critical in this area through:

- preparing the County Comprehensive Plan to coordinate efforts between the various County jurisdictions or provides joint City/County-sponsored facilities;
- developing facilities that serve multiple jurisdictions (e.g., transfer stations) that, through economies of scale, keep costs down despite possible longer haul distances;
- developing County model programs, including a variable rate fee system for County-collected areas and technology demonstration programs for landfill operations (see Chapter IX.F); and

- maintaining the economic viability of existing facilities, for example, through waste transfer to the WTE facilities (Chapter IX.H) or developing a policy of purchasing supplies from recycling enterprises ("Buy Recycled") that utilize recyclables collected in Los Angeles County.

In addition to the coordinating role, the County can pioneer some innovative ways of financing solid waste management programs that also foster diversion of waste from disposal, including: enterprise fund accounting, and variable rate fees ("unit pricing"). Also discussed in this Appendix are the relative share of the solid waste dollar cost for different system components, and factors influencing costs. These two topics provide background for Report discussions.

A. ENTERPRISE FUNDS

Operating an integrated solid waste management system as an enterprise fund allows communities to track the true cost of service, and keeps the funding for services separate from the political vagaries of the government budgeting process. In an enterprise fund, all revenues and costs go to a cost center. Revenues do not go to the General Fund, debt service is not paid for by Finance, benefits by Personnel, or fuel by the Transportation Department, etc., which is often the case when solid waste is part of a jurisdiction's operation. Future post-closure costs and sinking funds are established in enterprise accounting, and it possible to tell the cost for solid waste service and charge for it -- by the ton, by the household, by the business address, etc.

B. VARIABLE RATES

Local governments need to find ways to charge the generator for the service received in order to get solid waste costs out of the General Fund. Direct billing of customers for the solid waste service received is a key component of enterprise fund accounting. These fees, plus other revenues such as from the sale of recovered materials, make up the funds used to pay costs. Generator billing should be done in a way that encourages source reduction as well as maximizes diversion. A variable rate system (also called "unit pricing") goes far to accomplish this and

is also an important part of enterprise accounting for solid waste management. Variable rate pricing has been the norm in commercial collection for years -- the generator is billed based either on the weight of the material collected by the hauler, or by the size of the waste storage container used by the generator. For the residential customer, it can mean higher costs for more waste, or lower costs for less waste and more recycling. For the commercial generator, it can mean differential fees (or no fee) for loads that can be recycled. As consumerism is applied to solid waste services, the generator will have incentive to dispose of less and to set aside more materials for recycling. An example of a variable rate fee system is provided in Appendix A, Case Study of the City of Seattle.

C. COSTS FOR SOLID WASTE SERVICES

The solid waste dollar goes to many functions, depending upon the make-up of the specific system. Shown in Figure I-1 is a pie chart, developed from data from several cities, that graphically portrays how the solid waste dollar is split up. Administrative costs for each of the components are included in each portion of the pie. As can be seen, collection-related costs comprise over 60 percent of the pie, followed by disposal at 30 percent, and lastly by processing at 8 percent. It should be noted that solid waste collection includes bulk waste and special collections (such as post-special event collections and disaster debris), while recycling collection costs include yard waste collection as well as curbside service for materials. The pie chart shows recycling-related collection costs at 20 percent -- or almost one-third of the collection expenditures. Recycling costs overall can represent over one-quarter of the way the solid waste dollar is spent.

In addition to the above service-related and direct administrative costs, a community can expend considerable funds on specialized services, such as Household Hazardous Waste (HHW) collection and public information campaigns to encourage recycling and HHW diversion. Many communities have turned to surcharges on landfill or transfer station tipping fees as a means of funding new diversion programs, particularly for programs such as HHW that have a high unit cost and do not produce revenues to help pay for the program. Monies collected through surcharges can "get lost" in the General Fund; enterprise fund accounting can keep these

resources dedicated to solid waste management programs.

D. FACTORS INFLUENCING COSTS

Trends that influence recycling and solid waste disposal costs are discussed in various Report Chapters, and are summarized here by the service component. Overall, the cost of solid waste management is rising, but offsetting trends are discussed as well.

1. Collection

Two factors are driving the cost of solid waste collection. First, obtaining high-quality recyclables from the waste stream often means curbside collection of source-separated designated materials. This adds specialized recycling collection trucks and personnel routed through the same neighborhoods as the solid waste collection packer trucks. Yard wastes are also collected through a separate route system. Bulk wastes may also be collected separately using open-bed trucks equipped with a grapple. Each additional collection system will increase the number of trucks and personnel needed to get the job done.

Second, as the solid waste management system has evolved, the equipment industry has been evolving along with it. Automated collection equipment allows a single driver to complete a route, rather than the two- or three-man crews required for traditional packer trucks. Sophisticated routing software and GIS mapping allow a jurisdiction to consolidate routes, so that as recycling collection expands, solid waste collection routes can be adjusted proportionally, and optimum routes (i.e., the most material in the least time) can be devised for each type of collection. Other equipment features, such as split packers, allow a single truck to perform double duty while on a route. These options can be used to reduce the cost of collection.

Communities are innovating to contain the costs resulting from these trends. Automated collection has been applied to recyclable materials as well as refuse. Rebanco in Seattle has utilized authomated recycling collection in 96 gallon carts and reduced the collection frequency to once per month. Guelph, Ontario is implementing wet/dry collection citywide in the city,

with a population of 80,000. This followed an extensive pilot program to establish the cost and effectiveness of the program. Because the collection function represents a majority of the solid waste management cost, efficiency in this area has the largest reduction in overall cost for the investment.

2. Transfer

Collection costs can also be contained by adding transfer station(s) to the system. As discussed in Chapter IX, transfer stations can reduce collection costs by keeping collection packer truck routes as short as possible (less than 30 miles). A transfer trailer can carry three times the amount of waste as a packer truck and rail cars can carry six times the amount. Shifting the waste to larger-capacity, more efficient transfer vehicles for transport to the disposal site reduces the number of personnel and vehicles needed.

Even though transfer operations add capital and operations costs for transfer stations and vehicles, they have the potential to significantly reduce the overall cost. The reduction in the non-productive time for the route collection trucks has a double pay-off. First, the cost per collection route is reduced and second, the route collection trucks can collect from additional routes. This lowers the investment in trucks and crews.

3. Solid Waste Disposal

Class III Sanitary Landfills are still the primary method of managing solid waste in Los Angeles County. The cost of landfill disposal is a political issue as well as a technical one. The true cost of local landfill disposal is not reflected in $20.00 per ton tipping fees. Some long-term costs of landfill disposal can be deferred (rather than paid out of tipping fees), particularly closure, post-closure, and Title V Remediation Funds, plus, for existing landfills, the cost of the site may have already been paid for and does not reflect current land values. However, a jurisdiction may choose to keep landfill prices low in order to keep waste from leaving to lower-cost disposal sites in order to maintain cash flow at the landfill, or (as in the

case of Orange or Riverside Counties) may reduce the price to attract waste from outside the jurisdiction and thus increase cash flow in the short term.

The actual cost of landfill disposal is driven by the cost of the land, pre-development costs for planning and permitting, plus the construction and operation costs of the facility over its life. The U.S. EPA promulgated new rules for landfill management on October 9, 1991. These rules, as subsequently adopted by the State of California, set standards for:

- Location. Includes limits on proximity to airports, 100-year floodplains, wetlands, fault areas, seismic impact areas, and unstable areas.
- Design. Requires composite liner and leachate collection systems to maintain less than 30-cm depth of leachate over liner. Liner systems combine compacted clay and synthetic membranes. Leachate collection piping is sandwiched in a porous layer between liners.
- Operations. Requires exclusion of Hazardous Wastes and bulk or uncontainerized liquid wastes, daily cover and control of disease vectors, methane gas monitoring and control and other air emissions control (i.e., no open burning), access restrictions to prevent illegal dumping, control of precipitation run-on and runoff, and recordkeeping for groundwater monitoring, methane gas, inspection reports, and closure/post-closure plans. No discharges to surface water are permitted.
- Groundwater Monitoring. Monitoring wells required within compliance area. Testing required for 62 pollutants (15 heavy metals and 47 volatile organic chemicals). If pollutants exceed background levels, testing must be conducted for another 245 hazardous inorganic and organic constituents. If specified levels of pollutants found, a corrective action procedure must be initiated.
- Closure and Care. Written closure plan required. Closure include a cap designed to minimize infiltration and erosion, including infiltration layer minimum of 18 inches and permeability no greater than $1x10^{-5}$ cm/sec of material. Care of the facility required for 30 years after closure, including regular inspections for cap integrity and well monitoring.
- Financial Assurance. Must provide detailed estimates of costs for closure and post-closure and to perform corrective action as required; must provide an acceptable mechanism to guarantee funding for these future activities.

In addition to the cost of the modern sanitary landfill, the State of California requires landfills to fund Article V Remediation Costs. Article V regulations require establishment of a fund to cover potential remediation of contaminated groundwater caused by landfills.

The impact of these rules has been to increase the cost per acre of constructing landfills; this, in turn, has resulted in a trend toward development of very large landfills that can keep costs down through the larger volume of waste that can be disposed of at the site. Given the size of these new landfills, there is a parallel trend toward developing new facilities in remote areas with rail or highway access where land is cheaper and large tracts available.

4. Processing

Through the 1970s and 1980s, transformation, or waste-to-energy, facilities were seen as a preferred alternative to increasingly scarce and costly landfill disposal. Facilities financed and built during that period have tip fees in the $30.00 per ton range. As a result of changes in tax law as well as increased air pollution control requirements, tip fees for new facilities would be close to $100.00 per ton.

Trends in recycling markets are discussed in detail in Chapter VII, Section B. There is a present downturn in markets following on the heels of a rapid expansion. As in the case of other commodities, market prices and opportunities for recovered materials will fluctuate; however, it is expected that markets will remain strong as a result of new final market and export market development. The processing costs of materials recovery facilities (MRF) vary among communities and average $50 per ton according to a recent NSWMA study. This includes both the capital costs and the operations and maintenance costs. Revenues from the sale of materials can off-set these costs, depending on the markets.

Unlike other recyclable materials, the markets for yard waste compost products have yet to expand. Processors are producing good material; the problem lies more in learning to present the product in a manner acceptable to the potential major markets (farmers, horticultural firms, etc.). These markets have specific needs and require a proven product. The specifications for

compost products derived from waste materials need to reflect the traditional soil amendments used by these markets (e.g., peat moss), so that the user can understand how the compost can be applied to their needs.

APPENDIX J

APPENDIX J: RECYCLING MARKETS

There are two types of markets available for all classes of recyclable materials: intermediate and final markets. The category of intermediate markets includes processors of scrap material and brokers of recyclable materials. Final markets (also called end-users) encompass the utilization of materials in the manufacture of new products in industrial plants or mills. Final markets are the last step in the recycling process. As described below, there is a lot of overlap in the functions performed by these markets.

Materials recovered from the municipal solid waste stream need upgrading in order to be marketed as raw materials to manufacturing industries. This upgrade processing step is usually carried out by an intermediate at the local level. Intermediate markets include scrap processors, materials recovery facilities (MRFs) and brokers. Materials recovery facilities may be publicly or privately owned, and generally accept source separated recyclables collected from households through drop-off or curbside collection programs. A scrap processor generally purchases a wide variety of scrap materials from industrial, commercial, and private sources. These two types of processing facilities are collectively referred to as scrap processors in this discussion. When a processor has enough of a particular material, the material is processed to final market specifications and then is transported to market. By contrast, a scrap broker arranges the final market destination of the processed goods -- a scrap broker may never see the material that is bought and sold. A scrap processor may serve as both processor and broker. The materials upgrade is but one service that the intermediate markets provide; they may also furnish storage containers, pickup for filled containers, and provide delivery of processed materials to the final market. The cost of these intermediate services is included in the price that is charged to the final market for the goods.

The final market manufactures products from the purchased recyclable materials. Usually a final market will accept only one type of material, but some final markets are now purchasing multiple materials -- processing some for their own use and acting as intermediate markets for others. Final markets generally pay higher prices for recyclable materials than do intermediate markets because final markets often rely on intermediate markets to process needed materials

for conformity to higher standards of acceptability. Although one cannot overlook the services that the intermediate market can provide, the price paid for goods by the final market is often sufficiently higher than that paid by the intermediate market to warrant bypassing the latter and selling recyclables directly to the final market. Also, in some situations, final markets are more easily accessed than intermediate markets.

1. Specifications and Agreements

Each material marketed or sold has a description or specification so that the buyer knows what is to be received. While many markets or firms have their own specifications, industry groups such as the Institute of Scrap Recycling Industries (ISRI) publish specifications that are widely accepted. Specifications address issues such as (1) allowable levels of contaminants, (2) moisture content, and (3) shipping preparation (for example, baled with a specific density). Specifications, when utilized in good faith, allow both the buyer and seller to agree on the quality of the commodity without a detailed inspection of every shipment.

The development of specifications for recovered materials has paralleled the expansion of the recycling industry. Secondary or recovered materials have grown into major domestic and international trade elements. This growth makes it impractical, if not impossible, for buyer and seller to do business on a personal basis. In the last 20 years, the amount of secondary paper consumed has doubled, resulting in more paper recovered in 1993 than was landfilled. The volume of market purchases and the standardization of these purchases, through specifications and contracts, has routinized transactions. This maturation of the secondary materials market encouraged the Chicago Board of Trade to establish trading in 1995 of recovered materials in a manner similar to virgin materials commodity trading. At the same time, procedures and protocols to deal with discrepancies in weight, quality and schedule have developed. ISRI and the Chicago Board of Trade through the American Arbitration Association, offer arbitration services to resolve disputes, as do other entities.

To avoid the fluctuations of commodities markets and the costs of small lot trading, many communities or their private recycler enter into contracts for the sale of materials over several

years. The terms of these agreements vary from one to twenty years; however, five-year contracts are common. When a contract requires one party to construct a facility to process material (such as a publicly-procured materials recovery facility), the contract term is tied to the facility life or amortization period, usually 15 to 20 years.

The price in these long-term contracts is usually adjusted using one of the recognized publishers of price data. *Official Board Markets* and *Recycling Times* are two major publishers of price data. In the last several years, the number of materials recovered from MSW quoted in these publications have grown along with the markets.

2. Processing Facilities

Whether source separated or not, material collected from waste generators needs to be processed to meet market specifications. The functions a processing facility performs are: (1) receiving, (2) storage, (3) separation, (4) cleaning, (5) size reduction, (6) densification, and (7) shipping preparation. These functions usually are contained in an industrial/warehouse type of building and include both mechanical and manual techniques. The choice of processing depends upon: materials processed, amount of material, and specifications or requirements of the markets.

The sponsorship, ownership, and operation of processing facilities can be either public or private, depending upon community situations. Prior to the recent push for recycling, processing was primarily done by private firms in the traditional secondary materials industry. These firms performed the processing necessary to prepare materials such as glass, paper, aluminum, and steel for use by industry.

When the aluminum can was introduced as a beverage container almost 20 years ago, the aluminum industry made a commitment to recycle these cans. The industry built a separate infrastructure, including: (1) collection points, (2) trucks, (3) processing facilities and (4) smelter modifications. This infrastructure cost of millions of dollars, and resulted in a current recycling rate of 65 percent.

Traditional scrap processors and the aluminum can recycling industry are only a part of the overall recycling business. The infrastructure necessary to recycle greater quantities and types of materials will require billions of dollars of investment. Processing facilities for 50 percent of the solid waste generated in Los Angeles County in 1994 (not counting yard waste) would process approximately seven million tons of material. A facility processing materials at the rate of 200 tons per day would cost about $2 to $8 million in the Los Angeles region. To have sufficient capacity using 200 TPD plants operating six days per week, 112 plants would be required. This requirement, based upon the $6 million capital cost, would involve an investment of $225 to $900 million. This is a lot of recycling infrastructure; some of which has been constructed. Sufficient capacity does not yet exist in Los Angeles County.

In addition to general processing facilities, infrastructure investment is needed for each of the recovered materials discussed below.

3. Recyclable Materials

a. Paper

Five types of paper are considered in this section: (1) old newsprint (ONP), (2) old corrugated containers (OCC), (3) printing and office paper (POP), (4) old magazines (OMG) and (5) mixed papers.

According to the American Forest & Paper Association, in 1995 more than 42 million tons of paper were recovered in the United States, with almost 33 million tons of that total recycled into new products in the U.S. Another 10 million tons was exported. Recovery has risen every year since 1985, doubling in this decade.

The major source of ONP is individual homes. ONP is used primarily in the manufacture of newsprint and paperboard. These represent 34 and 22 percent demand respectively. A small percentage of ONP is used in making tissue, cellulose insulation, and other products. Seventeen percent of ONP is exported. Demand has slackened in the last six

months due to high inventories and lower exports. A level period is expected in the immediate future.

The majority of old corrugated cardboard (OCC) ends its useful life at retail, wholesale, and industrial establishments, with a lesser portion discarded in individual homes. OCC is the most commonly recycled paper product, with 78 percent used in the manufacture of new containerboard and paperboard products. Fifteen percent of OCC is exported.

Printing and Office Paper (POP), which has the highest value of all postconsumer paper, is generated primarily in commercial offices such as financial institutions and large insurance groups. Government offices also generate considerable amounts of POP. While POP is present in the home, it is usually generated in much smaller quantities and is difficult to separate from lower value paper, such as envelopes. Twenty-eight percent of recycled POP is used in the manufacture of tissue paper (i.e., bathroom and facial tissue, towels, and napkins), with 26 percent used for writing, duplicating, and computer papers. Twenty percent of POP is exported.

The demand for the lower grades of paper -- ONP and OCC -- has historically fluctuated widely. Because so much recycled paper is used in paperboard production and construction (i.e., wallboard and insulation), when the construction industry declines or the economy is weak, the demand for and price of low-grade paper falls. Conversely, when housing construction improves and the economy is sound, demand and prices for lower grades of paper typically are strong. Because its primary end use is in basic consumer products (e.g., writing paper and tissue) the demand and price for POP is steadier and higher than for the lower grades.

As discussed below, paper manufacturers have added pulping capacity to utilize recovered paper as feedstock. This increased capacity for utilizing recovered paper has increased demand; domestic mill consumption of recovered paper rose 8 percent in 1995. Mixed paper can be recovered from both residential and commercial generators. In the last two years, there has been a trend toward recovering mixed paper from residences. In addition, the newest technology for de-inking ONP requires the use of up to 20 percent coated papers (i.e., old magazines or OMG), which has, in turn, created a market for this type of recovered paper.

Along with the growth in paper recycling has been an investment by the paper industry in plants to process recovered paper. Currently, more than 200 paper plants in the U.S. use 100 percent recovered paper as their feedstock. Another 175 plants depend upon recovered paper for a portion of their feed. Development of pulping facilities for recovered paper feedstock has involved a multi-billion investment in industrial infrastructure to date; this investment is continuing. The prices for all grades of paper rose sharply in 1995 as the result of the demand created by these new pulping plants. These prices peaked in mid-summer, then dropped due to high inventories and poor demand. The investment in new plants will prevent demand and prices from falling to 1990 levels.

b. Glass

Glass is manufactured primarily from sand and silicon dioxide. Other materials used in glass manufacturing include sodium, soda ash, and calcium from limestone. Glass manufacturers produce three categories of products: containers, flat glass, and pressed/blown glass. Glass containers account for 70 percent of all the glass manufactured and make up approximately 90 percent of the glass in municipal solid waste (MSW). Flat glass is used mainly for windows. Pressed and blown glass includes ornamental and decorative glass and other glass products such as light bulbs. These three types of glass have different chemistries and cannot be melted together to make new products. Only container glass is pertinent to this discussion. Container glass represented approximately 3.0 percent of the waste stream in Los Angeles in 1990.

Glass containers are manufactured primarily in three colors: clear (flint), brown (amber), and green. Nationally, approximately 65 to 70 percent of all containers are flint, and roughly equal amounts (15 to 18 percent) of glass containers are amber or green. Thus, the demand for recovered flint container glass is greater than the demand for either amber or green.

The glass industry uses waste glass (known as cullet) as an alternative to raw materials. Before 1970, almost all cullet used in the manufacturing process was from "in house" sources. Since 1970, when only 24,000 tons of cullet were purchased by the glass industry, cullet use from private and municipal recycling has increased to more than one million tons annually. In

1981, the price paid for cullet was generally consistent around the country, averaging about $30 per ton. By 1983, the price rose to $40 per ton and remained steady until the latter half of 1988. Since then, the price has varied with more differences among regions and by glass color. In 1995, the prices were approximately $50 per ton for flint, $40 per ton for brown, and $20 per ton for green glass. Glass prices dropped somewhat over the course of 1995, due to lagging demand.

With today's glass-processing technology, it is possible to use nearly 100 percent cullet in glass furnaces. This increased use of cullet is advantageous because cullet melts at a lower temperature than the raw materials, allowing the glass manufacturer to save energy. Also, lower furnace temperatures prolong furnace refractory life. However, while glass container recycling has been increasing, the recycling rate for 1994 was only 37 percent.

Glass has been declining as a fraction of the waste stream due to its replacement by plastic, aluminum and other containers. Low prices, low market demand for green glass in particular, and problems with glass contamination of other recyclables during collection, coupled with stringent specifications for furnace-ready cullet caused some communities to drop glass from their recycling programs. Other communities have maintained glass recycling and are marketing a mixed broken glass for lower-value uses such as aggregate and filter sands.

c. Ferrous Metals

In recent years, the market demand for ferrous metals (i.e., steel and iron) scrap has fluctuated, but has generally been rising. However, prices have fluctuated with no real pattern. The problems in steel scrap markets are linked to the decline in U.S. steel-production capacity. According to *Phoenix Quarterly*, U.S. steel production capacity peaked in 1977 at 160 million net tons. Production capacity dropped to 110 million metric tons in the mid-1980s. The Institute of Scrap Recycling Industries (ISRI) believes several factors contributed to the elimination of U.S. steel production capacity, including an oversupply of the market by foreign government-controlled steel producers and decreased demand for steel products. Offsetting this market decline to some extent is increased application of electric furnace technology and the

"mini mill" in the U.S. These smelters use a higher percentage (up to 100 percent) steel scrap as feedstock. Also, the export market has been strong.

Most of the ferrous metal in residential MSW falls into two categories: bulky ferrous (e.g., appliances) and container ferrous (e.g., food and beverage cans). There are actually two types of steel cans in residential MSW: bi-metal cans, made of a steel body and aluminum top; and "all" steel cans. The all steel cans also have two types: "tin" cans that are steel coated with a layer of tin to retard rusting, and tin-free cans. Bi-metal cans used in beverage applications largely have been replaced by aluminum cans. In the past, container ferrous was regarded as a low-quality product, and was not a primary target for recycling programs. However, the Steel Recycling Institute recently began promoting the recyclability of bi-metal and steel cans (including aerosol and paint cans), noting that the cans may go directly into existing furnaces with no special pre-processing.

The detinning industry processes "tin" cans and other tin-plated scrap to chemically remove the tin, then selling both the tin and steel to end-user markets. In the past, this industry was a major market for ferrous cans. Today, only one detinning processor remains in the U.S. and the long-term outlook is pessimistic due to the declining use of tin.

Ferrous metals, except major appliances, represent about 3.3 percent of the Los Angeles County waste stream in 1990. Prices recorded for steel cans from January through October 1995 were steady between $63 and $65 per ton. Note that steel is traded in long tons which weigh 2,240 pounds.

Appliances and other large steel items in municipal waste are referred to as white goods. These can be shredded along with automobiles to produce a high quality scrap. The market, therefore, is the traditional scrap processor with large-scale shredding equipment. Some white goods made prior to 1979 have capacitors containing PCBs. Most scrap processors insist that these capacitors be removed prior to their acceptance at processing facilities. Additionally, chlorofluorocarbons (such as freon) used as refrigerants in some appliances need to be removed and recycled or disposed of properly, rather than vented to the atmosphere. Some jurisdictions

have contracted for removal of PCBs and chlorofluorocarbons, processing and marketing with a single contractor. When white goods are shredded along with automobiles, the resulting scrap sells for $40.00 to 60.00 per ton more than ferrous can scrap on the west coast.

d. Aluminum

Aluminum, found in a variety of mineral structures, is recovered primarily from bauxite, an ore found principally in South America, Africa, and the Caribbean. Sources of bauxite within the United States are found in Alabama, Arkansas, and Georgia. Extraction of aluminum from bauxite requires a large amount of electricity. Aluminum in municipal waste is found in several forms or alloys: food container aluminum (cans and foil); aluminum housewares (e.g., pots, pans, and appliances); extrusions (e.g., lawn furniture); and castings (e.g., auto parts and more expensive cooking equipment). Food container aluminum, particularly aluminum cans, has the highest market value because the alloy from which it is made is almost pure aluminum.

Aluminum has a high value for its weight. However, it represents only a minor fraction of MSW. The 1990 solid waste composition in Los Angeles County indicates that aluminum cans were 0.6 percent of the waste stream.

In the 1970s, the U.S. aluminum industry turned to recycling as a major source of material. According to the Aluminum Association, almost 25 percent of all the aluminum used in the United States in 1988 came from recycled aluminum. The recycling rate of aluminum cans in 1990 was 61 percent, and the rate rose to 65.4 percent in 1994. The U.S. aluminum industry, particularly corporations such as Alcoa, Reynolds Metals, Alcan, and Kaiser, strongly supports aluminum recycling and has made significant investment in recycling infrastructure over the last two decades. It is estimated that there are 10,000 individual aluminum recycling facilities in the U.S. Firms in the industry actively are seeking other aluminum alloys in addition to cans in order to increase recycling.

There have been recent variations in prices paid in the Western states by processors and end-users for aluminum used beverage containers since 1990. The drop in price between 1992

and 1995 reflects the dumping of aluminum on the world market by the Russians in an effort to gain hard currency. This highlights the impact of international events upon U.S. recycling markets. These events are both normal and unpredictable. The price at the end users peaked in January 1995 at over $1,400 per ton and dropped to approximately $1,200 on the west coast in December.

e. Plastics

There are six plastic resin types typically found in MSW: high density polyethylene (HDPE), low-density polyethylene (LDPE), polyethylene terephthalate (PET), polyvinyl chloride (PVC), polypropylene (PP), and polystyrene (PE). These and other resin types can be recycled into a variety of products, including fiberfill for pillows, sleeping bags, jackets, etc.; molded products such as tubs, bins and shower stalls; and lumber-like products for vehicle stops, park benches, dock pilings, etc.

In Los Angeles County, plastic was a small, but increasing, portion of the 1990 solid waste stream. Nationally, plastic rose from less than one percent of MSW in 1960 to 6.9 percent in 1990 by weight. By volume, plastics are a higher proportion of the waste stream, estimated at roughly. 10 percent. Because recovered plastic is a lightweight, high-volume material, it requires more storage space and has higher transportation costs than higher-density recyclable commodities. For example, two-liter PET soda bottles contain entrapped air; as a result, they take up a great amount of space (the density is 1.3 pounds per cubic foot) and are difficult to compact. Plastic that has been shredded or punctured and baled can be transported much more economically; for example, shredded PET density is 25 pounds per cubic foot. In 1990, approximately 1.2 percent of the Los Angeles County solid waste stream was composed of recoverable HDPE or PET containers. These two resins most commonly are included in recycling programs and have been increasingly recycled. PET soft drink container and HDPE natural containers were recycled at 48.6 and 25.9 percent respectively in 1994. Other plastics are recycled significantly less.

HDPE prices have fluctuated widely in the past two years, peaking in March 1995 at $0.28 per pound. The recent trend has been downward, due to rising inventories and weak worldwide demand resulting from reductions in the use of recycled HDPE in products. HDPE prices were approximately $0.12 per pound in December 1995. PET prices have risen in 1995 from about $0.08 to $0.25 per pound. PET prices have been much more stable, in major part because of demand in the Far East market and due to increased use of PET in food packaging. Poor cotton harvests have contributed to this demand (PET competes with cotton in many fiber applications).

In spite of the constraints in collecting postconsumer plastics from the residential waste stream, there is a growing interest in recycling this material for social and environmental reasons. Fueled by this trend, the opportunities to recycle plastics are increasing.

Letter 3.8-27

North Valley Coalition

December 5, 1997

RECEIVED
CITY OF LOS ANGELES
DEC 0 5 1997
ENVIRONMENTAL
UNIT

City of Los Angeles
Planning Department
221 North Figueroa Street
Los Angeles, California 90012

Re: Proposed Sunshine Canyon Landfill Expansion

In response to (1) the Sunshine Canyon Landfill Expansion Environmental Impact Report, and (2) BFI's application for a zoning change in connection with the landfill expansion, the following questions and comments are submitted by members of the North Valley Coalition and other members of the community. Please provide a copy of your response to: 964

North Valley Coalition
13222 Whistler Lane
Granada Hills, CA 91344

December 5, 1997

RECEIVED
CITY OF LOS ANGELES
DEC 0 5 1997
ENVIRONMENTAL
UNIT

City of Los Angeles
Planning Department
221 North Figueroa Street
Los Angeles, California 90012

Re: Proposed Sunshine Canyon Landfill Expansion

In response to (1) the Sunshine Canyon Landfill Expansion Environmental Impact Report, and (2) BFI's application for a zoning change in connection with the landfill expansion, the following questions and comments are submitted:

Importance of Protecting Groundwater Quality

How important is it to protect groundwater resources in the area where the landfill is proposed to be sited or expanded from pollution by landfill leachate? 965

Should the people who dispose of garbage today pay the true cost of garbage disposal to protect future generations' groundwater resources from impaired use? 966

Do US EPA Subtitle D regulations require protection of groundwater resources from impaired use by landfill-derived leachate at the proposed landfill or landfill expansion site for as long as the wastes in the landfill will be a threat? 967

Adequacy of Staff Review of Submitted Materials

Exhibit 1 is an example of a list of the enclosures that have been submitted to the regulatory agency on the technical deficiencies of the proposed landfill. 968

Were these materials reviewed by the staff in connection with developing the permitting of the landfill? If not, why not?

Pollutional Characteristics of MSW Landfill Leachate

Is the staff familiar with the composition of municipal landfill leachate? 969

Please examine Exhibit 2 and indicate if you find that the information provided on the composition of MSW leachate is representative of municipal landfill leachate.

Based on the results of the studies of approximately 100 landfills shown in Exhibit 2, do small amounts of municipal landfill leachate represent a significant potential threat to pollute large amounts of groundwater? 970

 (Page 1 omitted)

Exhibit 1

List of Enclosures

"Review of Regulatory Compliance of the Western Regional Sanitary Landfill Placer County, California"

Water Quality Evaluation and Management Solid and Hazardous Waste Landfills

Municipal Solid Waste Landfills and Groundwater Quality Protection Issues

"Impact of Municipal and Industrial Non-Hazardous Waste Landfills on Public Health and the Environment: An Overview"

"Landfills Offer False Sense of Security"

"Dry Tomb Landfills"

"Groundwater Pollution by Municipal Landfills: Leachate Composition, Detection and Water Quality Significance"

"A Groundwater Protection Strategy for Lined Landfills"

"Detection of the Failure of Landfill Liner Systems"

"Landfill Leachate Management: Overview of Issues"

"Landfill Post-Closure Care: Can Owners Guarantee the Money Will Be There?"

"Landfilling of Solid & Hazardous Waste: Facing Long-Term Liability"

"No Guarantee" for Post Closure Care Funding

"Municipal Landfill Post-Closure Care Funding: The '30-year Post-Closure Care' Myth"

"Review of Proposed Landfills: Questions that Should be Answered"

"Evaluation of the Potential for a Proposed or Existing Landfill to Pollute Groundwaters"

"Subtitle D Municipal Landfills vs. Classical Sanitary Landfills: Are Subtitle D. Landfills a Real Improvement?"

"Cost of Groundwater Quality Protection in MSW Landfilling"

"Geosynthetic Liner Systems for Municipal Solid Waste Landfills: An Inadequate Technology for Protection of Groundwater Quality?"

"Permitting of New Hazardous Waste Landfills and Landfill Expansions: A Summary of Public Health, Groundwater Resource and Environmental Issues"

"Municipal Solid Waste Management in Lined, 'Dry Tomb' Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality"

"Overview of Landfill Post Closure Issues"

Exhibit 1 (continued

"Comments on Tisinger and Giroud 'The Durability of HDPE Geomembranes'"

"Recommended Design, Operation, Closure and Post-Closure Approaches for Municipal Solid Waste and Hazardous Waste Landfills"

"Addressing Justifiable NIMBY: A Prescription for MSW Management"

"Environmental Impacts of Alternative Approaches for Municipal Solid Waste Management: An Overview"

"Environmental Ethics: The Whole Truth"

"Disposal" of Municipal Solid Wastes

"Petition to the State Water Resources Control Board to Review California Regional Water Quality Control Board Waste Discharge Requirements for University of California, Davis Class III Landfill Yolo County Order 96-228 Adopted on August 9, 1996"

Recent Publications of G. Fred Lee & Anne Jones-Lee

Lectures and Shortcourses Available from Drs. G. Fred Lee and Anne Jones-Lee

Recent and Scheduled Presentations of Drs. G. Fred Lee & Anne Jones-Lee

G. Fred Lee and Anne Jones-Lee Summary of Experience & Activities

Summary Information

Copies of these enclosures are available from Dr. Lee upon request. Many are available as downloadable files from Dr. Lee's web site: http://members.aol.com/gfredlee/gfl.htm.

Exhibit 2

Concentration Ranges for Components of Municipal Landfill Leachate

Parameter	"Typical" Concentration Range	"Average"*
BOD_5	1,000 - 30,000	10,500
COD	1,000 - 50,000	15,000
TOC	700 - 10,000	3,500
Total Volatile Acids (as Acetic Acid)	70 - 28,000	—
Total Kjeldahl Nitrogen (as N)	10 - 500	500
Nitrate (as N)	0.1 - 10	4
Ammonia (as N)	100 - 400	300
Total Phosphate (PO_4)	0.5 - 50	30
Orthophosphate (PO_4)	1 - 60	22
Total Alkalinity (as $CaCO_3$)	500 - 10,000	3,600
Total Hardness (as $CaCO_3$)	500 - 10,000	4,200
Total Solids	3,000 - 50,000	16,000
Total Dissolved Solids	1,000 - 20,000	11,000
Specific Conductance (μmhos/cm)	2,000 - 8,000	6,700
pH	5 - 7.5	63
Calcium	100 - 3,000	1,000
Magnesium	30 - 500	700
Sodium	200 - 1,500	700
Chloride	100 - 2,000	980
Sulfate	10 - 1,000	380
Chromium (total)	0.05 - 1	0.9
Cadmium	0.001 - 0.1	0.05
Copper	0.02 - 1	0.5
Lead	0.1 - 1	0.5
Nickel	0.1 - 1	1.2
Iron	10 - 1,000	430
Zinc	0.5 - 30	21
Methane Gas	60%	
Carbon Dioxide	40%	

All values mg/L except as noted

* Based on 63 Landfills Reported by CH2M Hill (1989)

After: Lee *et al.* (1986)

LEACHATE COMPOSITION TABLE

Component:	units	Overall Average	DATA AVERAGE COMPOSITION Age of Refuse (Years) <1	1 - 2	<2	2 - 3	2 - 4	3 - 5	4 - 10	5 - 10	>10
COD	mg/l	15,110	27,781	12,104	10,134	23,347	19,429	15,275	7,900	7,056	6,361
BOD	mg/l	10,504	24,630	7,390	14,218	15,335	11,375	7,289	4,253	3,470	6,231
TOC	mg/l	3,583	8,237	2,871	5,069	4,881	4,253	1,810	1,598	1,598	1,234
pH	mg/l	6.29	5.83	6.12	6.00	6.46	6.11	6.65	6.25	6.25	6.66
TS	mg/l	15,696	41,032		41,032	15,085	10,099	7,250	6,187	6,187	
TDS	mg/l	11,286	26,487	15,962	21,224	14,940	13,633	12,181	5,858	5,858	1,459
TSS	mg/l	497	348	661	506	330	640	659	340	361	310
VSS	mg/l	303	256	602	371	210	273	306	406	496	170
TVS	mg/l	6,836	28,378		28,378	4,152	3,320	2,904			
VDS	mg/l										
Sp Cond	μmohs/cm	6,780	7,467	6,237	7,775	6,294	7,789	6,780	4,779	4,779	3,417
Alk.	$CaCO_3$	3,684	7,108	2,282	5,214	3,783	3,307	2,431	3,379	3,379	1,482
Hard.	$CaCO_3$	4,258	7,965	1,927	5,866	2,598	6,581	7,073	3,613	3,613	877
Tot P	mg/l	6.97	16.85	6.72	12.61	10.74	8.58	2.82	2.48	2.48	2.42
o-P	mg/l	22.55	66.23	6.17	42.20	6.97	6.50	12.73	6.18	6.18	1.40
PO_4(inorg)	mg/l	3.40	6.16	2.28	4.67	2.35	2.23	1.28	0.69	1.20	6.90
NH_4-N	mg/l	300.55	434.7	235.4	318.29	325.3	318.32	302.1	220.89	209.7	87.73
NO_3+NO_2	N-mg/l	3.85	8.73	4.68	6.15	1.48	2.15	3.73	0.77	0.74	0.74
Org-N	mg/l	148.63	448.36	90.89	258.12	167.00	132.95	43.18	32.08	37.90	27.36
TKN	mg/l	449.45	883	339	580.76	492	452.33	345	217.81	206	200.06
Ca	mg/l	1,004	2,456	622	1,377	1,163	1,343	1,705	598	598	166
Mg	mg/l	717	308	224	258	348	1,154	2,768	2,010	2,010	115
Na	mg/l	702	1,046	920	972	576	577	580	643	643	331
K	mg/l	654	1,720	518	998	599	850	387	300	300	172
SO_4	mg/l	382	667	281	461	674	632	576	51	51	64
Cl	mg/l	980	1,358	1,106	1,224	982	997	1,022	1,024	1,024	354
Fe	Tot-mg/l	427	1,380	223	691	452	559	717	219	211	121
Mn	Tot-mg/l	17.28	28.66	12.60	18.71	22.69	23.94	31.13	9.55	0.07	2.29
Zn	Tot-mg/l	20.66	104.00	17.66	30.01	29.13	26.05	16.07	3.50	1.60	25.99
Cu	Tot-mg/l	0.48	0.27	0.54	0.45	0.20	0.44	0.90	0.24	0.29	0.78
Cd	Tot-mg/l	0.061	0.075	0.061	0.066	0.037	0.037	0.034	0.071	0.079	0.029
Pb	Tot-mg/l	0.617	1.256	0.630	0.754	0.431	0.429	0.248	0.362	0.396	0.684
Hg	Tot-mg/l	0.018		0.008	0.008	0.014	0.012	0.008	0.005	0.005	0.037
Se	Tot-mg/l	0.641	2.700		2.700	0.290	0.290		0.100	0.100	0.058
Cr	Tot-mg/l	0.944	9.100	0.060	4.580	0.207	0.198	0.153	0.155	0.167	0.568
Ni	Tot-mg/l	1.21	13.00	0.04	4.38	0.32	0.49	0.75	0.21	0.10	0.65

Source: CH2M HILL Data Base, 1989

Threat of the Proposed Landfill to Impair Groundwater Quality

What is the staff's understanding of how long the wastes in the proposed landfill or landfill expansion will be a threat? 971

What is the basis for any assessment that the wastes in this landfill will be a threat for less than hundreds to a thousand or more years? 972

Landfill Liner Issues

What will be the liner for the proposed landfill?
Is it a minimum Subtitle D single composite liner? 973

What is your estimate of how long a 60 mil HDPE liner (plastic sheeting) in the proposed landfill liner will function as an effective barrier to prevent leachate from passing through the liner on its way to cause groundwater pollution? 974

What is the basis for your estimate?

Do you believe the plastic liner for the proposed landfill will be able to prevent leachate from passing through it in sufficient quantities to prevent groundwater pollution by landfill leachate for as long as the wastes in the landfill will be a threat? 975

Is the staff aware that landfill liner companies only warrant the flexible membrane liners for a period of 20 years? 976

Does the staff know that this warranty is pro-rated over this period and that the landfill owner/operator must remove the wastes above the defective area so the liner can be fixed? 977

How does a landfill owner know precisely where a liner is leaking? 978

Is this warranty of significant value in protecting groundwater from pollution by landfill leachate? 979

Does this highly limited warranty reflect the fact that landfill liner companies believe the flexible membrane liners they manufacture will protect groundwaters from impaired use for as long as the wastes in the landfill will be a threat? 980

Is it your position that the plastic sheeting liner and compacted clay layer, i.e. composite liner, in the proposed landfill will be an effective barrier to prevent leachate from passing through it on its way to polluting the groundwaters underlying the landfill for as long as the wastes will be a threat? 981

Subtitle D Regulations

Is the staff familiar with the part of the US EPA's Subtitle D regulations proposed in 1988 which stated.

> *"First, even the best liner and leachate collection system will ultimately fail due to natural deterioration, and recent improvements in MSWLF (municipal solid waste landfill) containment technologies suggest that releases may be delayed by many decades at some landfills."*

Further, the US EPA in their Criteria for Municipal Solid Waste Landfills (July 1988) stated,

> *"Once the unit is closed, the bottom layer of the landfill will deteriorate over time and, consequently, will not prevent leachate transport out of the unit."* 982

US EPA, "Solid Waste Disposal Facility Criteria; Proposed Rule," Federal Register 53(168):33314-33422, 40 CFR Parts 257 and 258, US EPA, Washington, D.C., August 30 (1988a).

US EPA, "Criteria for Municipal Solid Waste Landfills, "US EPA Washington D.C., July (1988b).

Do you disagree with the US EPA's reported finding, as part of promulgating Subtitle D, that the single composite liner will eventually deteriorate and allow leachate to pass through it and thereby not be collected in the leachate collection system?

If you do not agree, what is the basis for your disagreement?

What new information has been developed that shows that plastic sheeting liners of the type that are proposed for the landfill will prevent leachate from passing through them for as long as the wastes in the landfill waste management cells will be a threat? 983

Subtitle D Landfill Design Requirements

Is the staff familiar with US EPA Solid Waste Disposal Criteria Final Rule, October 9, 1991, Subpart D (Subtitle D) requirements for groundwater quality protection §258.40 Design Criteria which requires, 984

> *"(a)(1) The design must ensure that the concentration values listed in Table 1 of this section will not be exceeded in the uppermost aquifer at the relevant point of compliance..."*

Also, the US EPA states in their Subtitle D regulations,

> *"For landfills located where ground water is currently used or reasonably expected to be used for drinking water, the performance standard requires States to prevent contamination from exceeding drinking water standards."*

Exhibit 3 presents Table 1 from the US EPA Subtitle D requirements.

Exhibit 3

"Environmental Protection Agency

NOTE TO SUBPART D: 40 CFR part 239 is reserved to establish the procedures and requirements for State compliance with RCRA section 4005(c)(1)(B).

TABLE 1

Chemical	MCL (mg/l)
Arsenic	0.05
Barium	1.0
Benzene	0.005
Cadmium	0.01
Carbon tetrachloride	0.005
Chromium (hexavalent)	0.05
2,4-Dichlorophenoxy acetic acid	0.1
1,4-Dichlorobenzene	0.075
1,2-Dichloroethane	0.005
1,1-Dichloroethylene	0.007
Endrin	0.0002
Fluoride	4
Lindane	0.004
Lead	0.05
Mercury	0.002
Methoxychlor	0.1
Nitrate	10
Selenium	0.01
Silver	0.05
Toxaphene	0.005
1,1,1-Trichloromethane	0.2
Trchloroethylene	0.005
2,4,5-Trichlorophenoxy acetic acid	0.01
Vinyl Chloride	0.002"

Will the single composite liner specified in the permit for the proposed landfill be expected to meet Subtitle D requirements of preventing exceedances of Table 1 constituents at the point of compliance for groundwater monitoring for as long as the wastes represent a threat at all sites where a landfill could be constructed? 985

What was the technical basis used to select the spacing of the monitoring wells at the point of compliance for the proposed landfill or landfill expansion? 986

Should a site-specific evaluation be made by the landfill permitting agency to determine if a minimum Subtitle D liner would be expected to be protective of groundwater resources as required by Subtitle D at the point of compliance for groundwater monitoring for as long as the wastes in the landfill will be a threat? 987

Is the staff familiar with US EPA Subtitle D Subpart E--Ground-Water Monitoring and Corrective Action §258.51 Ground-water monitoring systems which states,

> *"(a) A ground-water monitoring system must be installed that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield ground-water samples from the uppermost aquifer (as defined in §258.2) that:*
> *(2) Represent the quality of ground water passing the relevant point of compliance specified by Director of an approved State under §248.40(d) or at the waste management unit boundary in unapproved States."*

and §258.53 Ground-water sampling and analysis requirements,

> *"(c) The sampling procedures and frequency must be protective of human health and the environment."* 988

and §258.54 Detection monitoring program,

> *"(a) Detection monitoring is required at MSWLF units at all ground-water monitoring wells defined under §258.51(a)(1) and (a)(2) of this part. At a minimum, a detection monitoring program must include the monitoring for the constituents listed in appendix I to this part."*

and §258.55 Assessment monitoring program,

> *"(a) Assessment monitoring is required whenever a statistically significant increase over background has been detected for one or more of the constituents listed in the appendix I to this part or in the alternative list approved in accordance with §258.54(a)(2).*
> *(b) Within 90 days of triggering an assessment monitoring program, and annually thereafter, the owner or operator must sample and analyze the ground water for all constituents identified in appendix II to this part."?*

Do these sections of Subtitle D requirements prohibit a landfill from causing a statistically significant increase in the concentrations of constituents presented in appendices I and II of Subtitle D at the point of compliance for groundwater monitoring for a Subtitle D landfill? 989

Groundwater Monitoring

Exhibit 4 presents an example of a plan for a municipal solid waste landfill site which shows the position of monitoring wells as allowed by a California regional water quality control board. This monitoring well array is typical of that allowed by regulatory agencies permitting Subtitle D landfills throughout the US. Would this array of monitoring wells comply with Subtitle D requirements providing a sufficient number of monitoring wells which will collect samples that represent the groundwater quality passing the point of compliance? 990

Where is the point of compliance for the landfill shown in Exhibit 4? 991

What are the Subtitle D requirements with respect to the ability of the groundwater monitoring system for the proposed landfill to detect leachate-polluted groundwaters at the point of compliance? 992

What is the spacing between the monitoring wells? 993

Should a map of the site contain a scale showing the approximate distances so that reviewers of the map can determine the spacing between the monitoring wells? 994

Assume that the map is one inch equals 100 feet. Is the spacing between the monitoring wells along the downgradient edge of the waste management unit, i.e. point of compliance - hundreds of feet apart? 995

Is this typical of groundwater monitoring wells for Subtitle D landfills at the point of compliance? 996

Are there a sufficient number of monitoring wells located such that they provide assurance of earliest possible detection of leachate releases from the waste management unit? 997

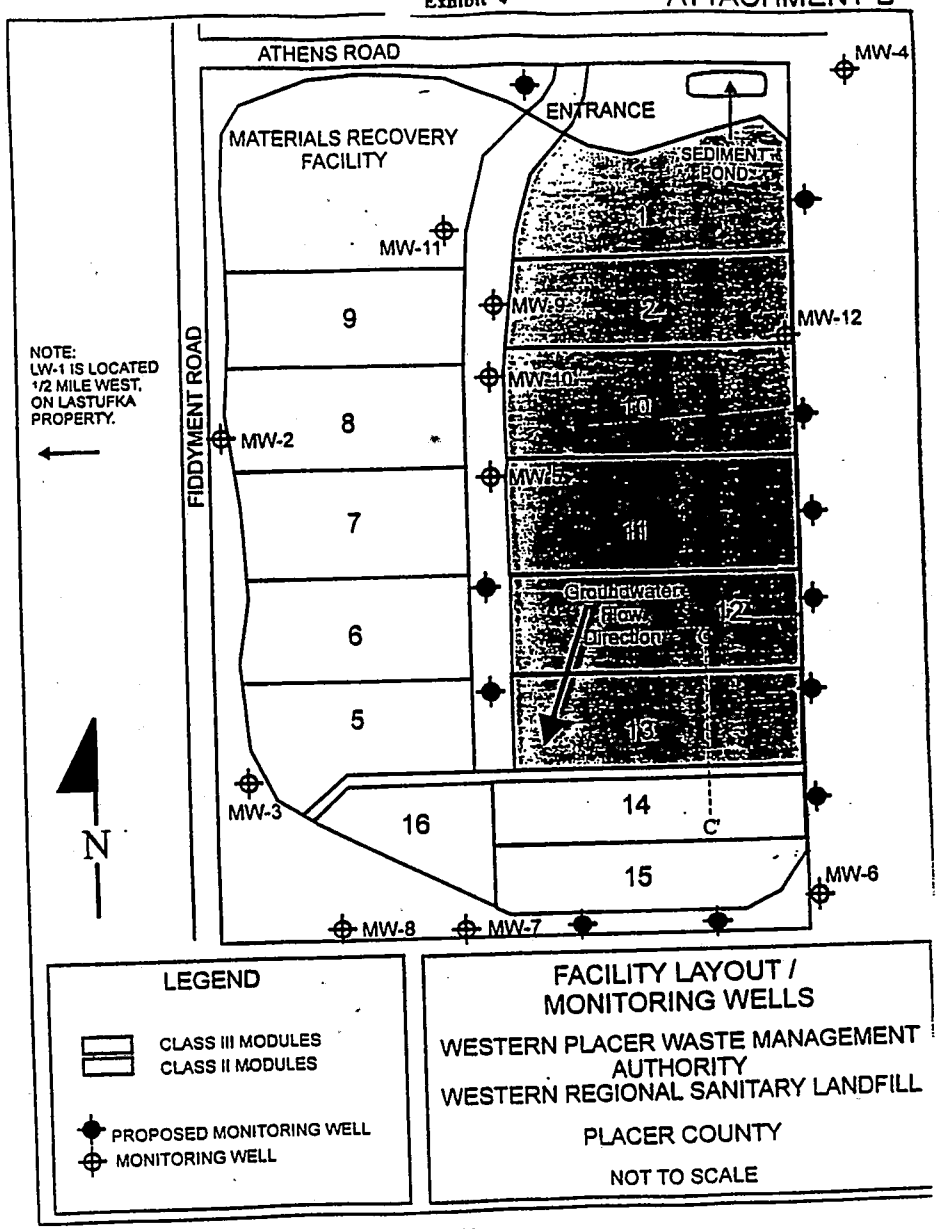
How can the staff be certain that the monitoring wells spacing and location will provide assurance of detection of leachate releases from the waste management unit and thereby provide for the assurance of earliest possible detection of releases from the waste management unit? 998

Was a site-specific evaluation conducted to determine whether the proposed monitoring well spacing and location would have a high probability of detecting landfill leachate-polluted groundwaters at the point of compliance for as long as the wastes in the landfill will be a threat? 999

If not, why not?

Exhibit 4

ATTACHMENT B



Does the staff agree that a site-specific evaluation is an appropriate requirement in order to evaluate whether the groundwater monitoring system has the potential to comply with Subtitle D requirements? 1000

If not, why not?

How was the groundwater monitoring system designed for the proposed landfill or landfill expansion? 1001

Was a site specific evaluation made to ensure that the well spacing and location would detect leachate polluted groundwaters when they first reach the point of compliance? 1002

Did the staff review the paper, "A Groundwater Protection Strategy for Lined Landfills," published by Dr. G. Fred Lee and Dr. Anne Jones-Lee, in *Environmental Science and Technology*, concerning the problems of trying to monitor groundwater pollution by leakage through plastic-sheeting lined landfills? 1003

Exhibit 5 is adapted from the Parsons and Davis paper showing an array of monitoring wells along the downgradient edge of a waste management unit which displays zones of capture of these wells, indicating that the monitoring wells zones of capture should overlap in order to prevent leachate from passing between the monitoring wells and fail to be detected by them. 1004

Do you agree with Parsons and Davis' suggested approach that the zones of capture of the monitoring wells and the well spacing should be such that there is a low probability of leachate-polluted groundwaters from passing the point of compliance without being detected?

If not, why not?

Exhibit 6 is a figure developed by Dr. John Cherry of the University of Waterloo from his 1990 paper which indicates that lined landfills produce finger plumes of leachate of a few meters width at the point of compliance for groundwater monitoring. 1005

Does the staff agree that Dr. Cherry has properly assessed this situation?

If not, why not?

What are the zones of capture of the groundwater monitoring wells that the staff has proposed for use at the proposed landfill? 1006

Exhibit 5

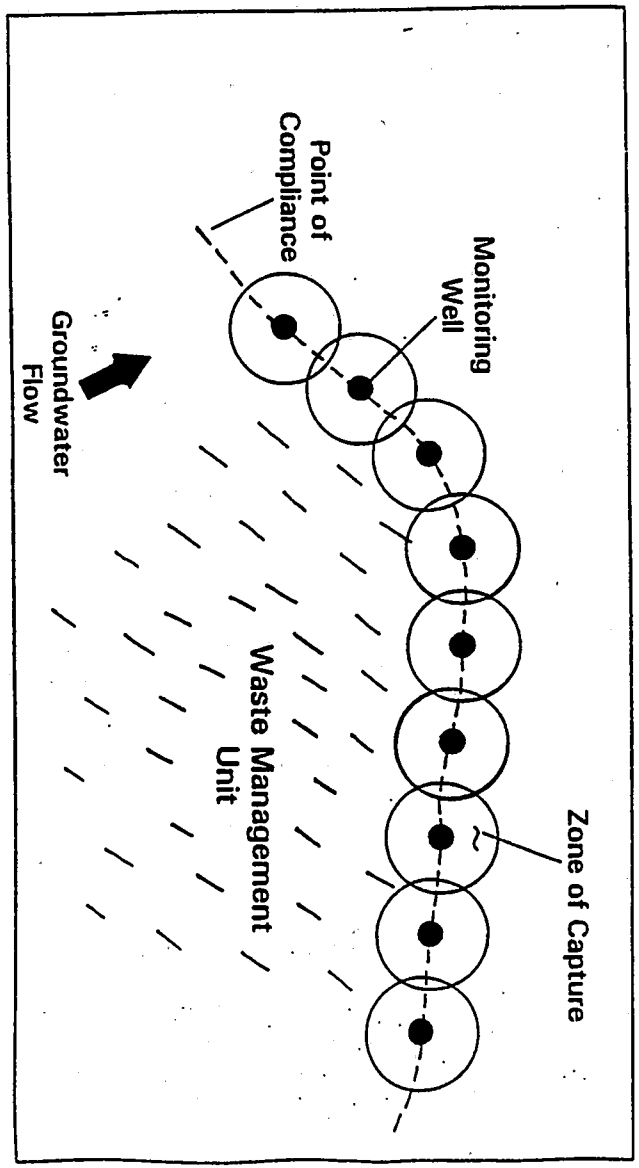


Figure 3. Zones of Capture of Standard Monitoring Wells Must Overlap to Detect Leakage from Lined Landfills (After Parsons and Davis, 1992)

Figure 2. Pattern of Landfill Leakage - Groundwater Contamination from Lined Landfills (After Cherry, 1990)

Exhibit 6

Is there a high probability that with the proposed monitoring well spacing of hundreds of feet apart and zones of capture of the monitoring wells of about one foot on each side, that leachate-polluted groundwaters that occur from leaks near the downgradient edge of the waste management unit, could pass by the point of compliance and not be detected by the monitoring well array that the staff have proposed? **1007**

Does the monitoring well array proposed by the staff for the proposed landfill provide assurance of the earliest possible detection of releases from the waste management unit? **1008**

Is there significant probability that the concentrations of the constituents listed in Table 1 (Exhibit 3) will be exceeded in the groundwaters at the point of compliance for groundwater monitoring for the proposed landfill? **1009**

If not, why not?

Should the staff/board be proactive in groundwater quality protection, or must pollution occur before the regulatory agency will act to protect groundwater resources? **1010**

Are there locations where a site-specific evaluation would show that a minimum Subtitle D landfill should not be constructed at that location because,

- the liner system will not prevent leachate from leaving the landfill and entering the groundwater system underlying the landfill for as long as the wastes represent a threat; **1011**
- the proposed groundwater monitoring system does not have a high reliability of complying with Subtitle D requirements of *a sufficient number of wells to yield ground-water samples from the uppermost aquifer that represent the quality of ground water passing the relevant point of compliance*?

Should the implementation of Subtitle D requirements of groundwater quality protection require a site-specific evaluation of the expected performance of the landfill containment system components (liner and cover) and groundwater monitoring system reliability (monitoring well spacing and zones of capture) to protect *"human health and the environment"* for as long as the wastes in the landfill will be a threat? **1012**

Could pollution-impaired use of groundwaters occur by proposed MSW landfill leachate-derived constituents that are not on US EPA Subtitle D Table 1 and appendices I and II lists? **1013**

Is the staff familiar that a large number of unregulated chemicals (unconventional pollutants) are present in municipal landfill leachate? **1014**

Could there be hazardous or otherwise deleterious chemicals in the unregulated chemicals in leachate that do not now have drinking water MCLs? **1015**

Is it appropriate to assume, as the US EPA is doing in their Subtitle D regulations, that because all drinking water MCLs are met as set forth in Table 1 that a groundwater polluted by landfill leachate is safe to consume considering the presence of unregulated hazardous or otherwise deleterious chemicals in MSW leachate? 1016

Post-Closure Care Period

1017

Does Subtitle D only limit groundwater protection to 30 years after closure of a landfill?

Are you familiar with Subtitle D, Subpart F Closure and Post-Closure Care requirements which state that,

1018

"§258.61 Post-closure care requirements.

(b) The length of the post-closure care period may be:

(2) Increased by the Director of an approved State if the Director of an approved State determines that the lengthened period is necessary to protect human health and the environment."

Will the wastes in a Subtitle D "dry tomb" landfill be a threat after the landfill has been closed for 30 years?

1019

If no, what will happen to the heavy metals, inorganic salts and persistent organics that are present in the wastes that will cause them not to be a threat?

Will they still be available to be leached from the wastes and, for some of the organics, produce landfill gas? 1020

Given that the wastes after a 30-year post-closure period will still be a threat to cause groundwater pollution through leachate generation and develop landfill gas, does the staff believe that the Board will allow the landfill owner/operator to no longer maintain and to continue to provide post-closure care required by Subtitle D at the proposed landfill? 1021

Since wastes will be a threat forever, will post-closure care be required forever? 1022

Are Subtitle D landfills significantly better than the unlined landfills with respect to their ultimate protection provided for groundwater quality? 1023

If so, how?

Is it better to postpone groundwater pollution so future generations will have to address it rather than requiring that those who generate the wastes address the problems associated with the landfill during the time that the wastes are generated? 1024

Subtitle D, Subpart D — Design Criteria states,

"§258.40 Design criteria

(a) New MSWLF units and lateral expansions shall be constructed:

(1) In accordance with a design approved by the Director of an approved State or as specified in §258.40(e) for unapproved States. The design must ensure that the concentration values listed in Table 1 of this section will not be exceeded in the uppermost aquifer at the relevant point of compliance, as specified by the Director of an approved State under paragraph (d) of this section, or

(2) With a composite liner, as defined in paragraph (b) of this section and a leachate collection system that is designed and constructed to maintain less than a 30-cm depth of leachate over the liner.

(b) For the purposes of this section, composite liner *means a system consisting of two components; the upper composite must consist of a minimum 30-mil flexible membrane liner (FML), and the lower component must consist of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/sec. FML components consisting of high density polyethylene (HDPE) shall be at least 60-mil thick. The FML component must be installed in direct and uniform contact with the compacted soil component.*

(c) When approving a design that complies with paragraph (a)(1) of this section, the Director of an approved State shall consider at least the following factors: 1025

(1) The hydrogeologic characteristics of the facility and surrounding land;

(2) The climatic factors of the area; and

(3) The volume and physical and chemical characteristics of the leachate.

(d) The relevant point of compliance specified by the Director of an approved State shall be no more than 150 meters from the waste management unit boundary and shall be located on land owned by the owner of the MSWLF unit. In determining the relevant point of compliance State Director shall consider at least the following factors:

(1) The hydrogeologic characteristics of the facility and surrounding land;

(2) The volume and physical and chemical characteristics of the leachate;

(3) The quantity, quality, and direction, of flow of ground water;

(4) The proximity and withdrawal rate of the ground-water users;

(5) The availability of alternative drinking water supplies;

(6) The existing quality of the ground water, including other sources of contamination and their cumulative impacts on the ground water, and whether the ground water is currently used or reasonably expected to be used for drinking water;

(7) Public health, safety, and welfare effects;..."

Did the staff perform the site-specific evaluations specified in the above quoted section from Subtitle D regulations as part of developing the permit for the proposed landfill?

If not, why not?

If this evaluation was conducted, what was the conclusion with respect to each of the listed items that led the staff to believe that a single composite liner of the type that the staff proposed for the landfill would prevent any of the constituents listed in Table 1 from exceeding the drinking water MCLs at the point of compliance for groundwater monitoring for as long as the wastes represent a threat? 1026

In developing the permit for the landfill, did the staff assume, without conducting the evaluation required in Subtitle D, that a minimum Subtitle D liner system, landfill cover and the proposed groundwater monitoring system would comply with the Subtitle D groundwater protection requirements of preventing pollution by Subtitle D Table 1 constituents that exceed a drinking water MCL at the point of compliance for groundwater monitoring for as long as the wastes represent a threat? 1027

Have the staff properly developed the permit for the landfill based on Subtitle D requirements for site-specific evaluations? 1028

Lysimeters

Is the purpose of the vacuum cup lysimeters that are installed under each of the landfill waste management unit cells that of providing early warning of leakage through the liner? 1029

How many lysimeters will be placed under each landfill cell? What is the total area of each landfill cell? 1030 1031

What is the zone of capture of each lysimeter, i.e. how far does a lysimeter sample into the vadose zone underlying a waste management unit? 1032

Is it possible that leaks through the liner system which will develop would not be sampled by the lysimeters that the staff have proposed in the permit for the landfill? 1033

Will the lysimeters that have been proposed provide a reliable, effective warning system for leakage through the liner? 1034

Comments by Staff

One of the two areas that the staff chose to comment on with respect to the extensive comments that were provided to them on the deficiencies in the proposed landfill was,

"1. *The ultimate failure of minimum Subtitle D liner systems will allow leachate to enter groundwater. New landfill units should be constructed with a double composite liner. Staff agree that a double composite liner will provide greater protection of groundwater than the single composite liner specified in the tentative permit. Staff have not observed that single composite liners beneath Subtitle D landfills have failed to contain wastes. There is ample* 1035

evidence that unlined landfills leak wastes to groundwater. However, the single composite liner standard, which was implemented through RCRA Subtitle D has resulted in the construction of a significant number of single composite-lined landfills. Although the time period for observing of these single composite-lined landfills is short, they are functioning well."

What is the basis for stating that the Subtitle D landfill liner systems that have been installed since 1993 are "**functioning well**"?

How does the staff know that the minimum Subtitle D liner systems that have been installed are functioning well? 1036

What conditions would have to exist to be able to determine that the Subtitle D liner systems that have been installed since 1993 are not functioning well? 1037

Did the staff review the report that was submitted in the packet of materials as back-up to the comments on the deficiencies in the proposed permit for the proposed landfill entitled, "Detection of the Failure of Landfill Liner Systems," dated April 1996 developed by Drs. Lee and Jones-Lee? 1038

Does the staff agree with the assessment presented in that report that there is little possibility that minimum Subtitle D landfills would, at this time, be demonstrating the inevitable failure of the liner system to prevent leachate from passing through them for as long as the wastes in the landfill will be a threat? 1039

Did the staff, in their comment above, provide the Board with a reliable assessment of what is known and to be expected with respect to the performance of minimum Subtitle D landfill liner systems to prevent leachate from passing through them for as long as the wastes in the landfill represent a threat that can cause groundwater pollution, as required in Subtitle D? 1040

Is the staff aware that New York, New Jersey, Pennsylvania, Michigan, Florida, Arizona, Oregon, Kentucky, Arkansas and possibly other states will not allow a minimum Subtitle D lined landfill to be constructed over vulnerable groundwaters such as those that exist under the proposed landfill site within their state? 1041

Is the staff aware that these states require at least a double composite-lined system for municipal solid waste landfills located over vulnerable groundwater? 1042

Is the staff aware that several of these states, particularly Michigan, have addressed the problems of trying to monitor landfill liner leakage that can lead to groundwater pollution by landfill leachate by requiring that a double composite liner be used where the lower composite liner is a leak detection system for the upper liner? 1043

Is the Michigan Rule 641 approach which sets forth the requirement of a double composite liner as a more reliable approach for detecting leakage through liners than the approach that the staff have adopted for the proposed landfill? 1044

Is it appropriate to assume that the hydraulic gradient underlying a landfill will be the hydraulic gradient that exists in perpetuity, i.e. for as long as the wastes in the landfill will be a threat? 1045

Is it possible that the adjacent property owner could install a production well for either domestic or agricultural water supply that would change the hydraulic gradient and, therefore, the rate of groundwater movement underlying the proposed landfill? 1046

Could a change in the hydraulic gradient lead to a greater probability that leachate generated through leakage through the minimum Subtitle D liner system would pass the point of compliance without being detected by the monitoring wells spaced hundreds of feet apart that have zones of capture of only one foot? 1047

What provisions exist that prevent adjacent property owners from utilizing the groundwaters under their property for domestic or other water supply purposes and thereby changing the hydraulic gradient and therefore the rate at which off-site pollution of groundwaters occurs that is not detected by the monitoring well system proposed by the staff? 1048

The second comment selected by the staff covering the many issues that were raised on the significant technical deficiencies in the proposed permit for the landfill was:

"2. *The minimum Subtitle D, Chapter 15 approach to closure is insufficient. A single composite barrier is required in the cover system for areas overlying compositely lined areas (module 13 and subsequent modules). This single composite barrier exceeds the minimum requirements of Subtitle D. The minimum RCRA Subtitle D requirement does not require a 1 x 10^{-5} cm/sec clay barrier layer. A four foot thick cover is required over unlined modules. This cover consists of two feet of foundation material, one foot of clay and a foot of topsoil to support vegetation. As long as the clay layer is properly maintained and repaired during the closure/post-closure period, this cover will provide protection of landfilled wastes from infiltration of significant amounts of precipitation. The landfill owner must protect the clay barrier layer from erosion, desiccation and differential settlement which can affect the integrity of the clay barrier layer in the cover.*" 1049

Did the staff review the report developed by Dr. G. Fred Lee and Dr. Jones-Lee that was submitted to the staff entitled, "Overview of Landfill Post-Closure Issues," as well as several other papers and reports included in the submitted materials which discussed the inability of a minimum Subtitle D landfill cover of the type proposed by the staff for the landfill to prevent leachate generation that will ultimately lead to groundwater pollution?

Is the desiccation cracking of clay layers in landfill covers well known in the literature? 1050

Did the staff review the materials that were submitted on the state of Wisconsin's experience with an experimental landfill cover at the Omega Hills site which was published in a US EPA report in 1990 covering landfill covers, where in a three-year period one-half inch wide desiccation cracks occurred to a depth of over three feet in the landfill cover? 1051

Does the staff contend that visual inspection of the surface topsoil layer of a landfill that the landfill operator will be able to maintain the integrity of the cover for the closed waste management units so that the designed permeability of the cover will be maintained in perpetuity, i.e. as long as the wastes represent a threat? 1052

If so, how will the landfill operator be able to learn of the desiccation cracks that will occur within the first season after the landfill cover is installed since these cracks will only occur in the low permeability layer which lies below the topsoil layer and the drainage layer? 1053

Is the statement in the permit that the landfill owner must maintain the low permeability character of the cover a superficial requirement that cannot be achieved with the approaches that are normally used for cover inspection? 1054

In the materials that were submitted to the staff was information that several companies have developed leak detection systems for landfill covers. It was suggested a leak detectible cover should be required in closing filled waste management units to prevent moisture from entering the landfill and thereby generating leachate that will lead to groundwater pollution. 1055

Does the staff feel that it is appropriate to require that this readily available technology be specified in permits for all landfill closures that take place in the state? 1056

Is it a fact that the landfill covers specified in the proposed landfill permit will not achieve Subtitle D's overall groundwater protection performance standards of preventing moisture from entering the wastes that leads to leachate generation and the impairment of groundwaters by landfill-derived constituents for as long as the wastes in the landfill will be a threat? 1057

If not, why not?

Landfill Liner Organic Solvent Permeation

Is the staff familiar with the permeation of organic chemicals through HDPE liners? 1058

What is the permeation process? 1059

Can solvents, such as those used for paint removal that can be purchased at any hardware store and that can be legally disposed of in an MSW landfill waste stream by homeowners can, when the container rusts out, pass through the wastes down to the liner and through the intact liner causing groundwater pollution? 1060

Does the staff know how much groundwater pollution above drinking water MCLs for carcinogens can occur by a half gallon of the solvents that can be purchased by homeowners and disposed of in their household waste? 1061

Would the staff be surprised to learn that this could be millions of gallons of groundwater. 1062

Is the staff aware that many of these solvents are suspected human carcinogens and are regulated as carcinogens by the US EPA? 1063

A discussion was provided, in the materials that were submitted, to reference to the work of Sakti and others at the University of Wisconsin, Madison on solvent permeation of HDPE liners where it was indicated that they found that a three-inch thick HDPE liner would only retard solvents passing through the liner, which does not contain any holes, for a period of 25 years. 1064

Does the staff have any information that would show that Sakti *et al.* as well as others' assessment of the solvent permeation situation is incorrect? 1065

What consideration was given to the permeation of organic solvents through the HDPE liner in developing permits for the proposed landfill? 1066

If none, why not?

Does Subtitle D require that the staff consider whether the proposed landfill containment system will prevent groundwater pollution by the waste constituents for as long as the wastes in the landfill will be a threat? 1067

If not, why not?

Have the staff, in developing the proposed landfill permits, properly implemented Subtitle D requirements of determining whether the proposed landfill liner cover systems will protect groundwaters from pollution by waste-derived constituents for as long as the wastes are a threat? 1068

Appropriateness of Development of Permits for MSW Landfills

Is it true that since Subtitle D was promulgated in 1991 that the staff have assumed that the minimum prescriptive design landfill liner and cover standards set forth in Subtitle D of a single composite liner would meet Subtitle D's overall groundwater protection performance standard of preventing impairment of use of groundwaters by waste-derived constituents for as long as the wastes in the landfill represent a threat? 1069

Where does it state in Subtitle D that the groundwater protection performance standard can be assumed to be achieved by constructing the minimum Subtitle D liner system at all sites where landfills could be located? 1070

Must the staff make a site-specific evaluation of each proposed landfill or landfill expansion to ensure that no impairment of the beneficial uses of surface water or groundwater beneath or adjacent to the landfill occurs throughout this post-closure period for as long as the wastes in the landfill represent a threat? 1071

Breakthrough Times for Clay Liners

Exhibit 7 is a nomograph based on a Darcy's Law calculation developed by Workman and Keeble that was discussed in the materials submitted to the staff on the technical deficiencies of the proposed permit for the landfill which shows breakthrough times for various permeabilities of clay liner systems. 1072

What is the thickness of the clay in the composite liner that is recommended for the proposed landfill? 1073

Is this clay liner specified to be two feet thick with a permeability of less than 1×10^{-7} cm/sec? 1074

Based on the nomograph presented in Exhibit 7, how long would it take leachate, once it has penetrated the plastic sheeting layer, to pass through the compacted clay layer underlying the plastic sheeting layer in the composite liner? 1075

Does this nomograph show that leachate penetration of this clay layer through holes that develop in the plastic sheeting layer could occur within about seven years? 1076

Desiccation Cracking of the Clay Layer of a Composite Liner

Is the staff familiar with the approach that is used to develop a clay liner with respect to compaction of the liner with a moisture content slightly wet of the optimum of the moisture density relationship? 1077

Does the compaction of a clay liner require the addition of moisture to the clay in order to achieve optimum compaction? 1078

Is the staff familiar with the desiccation cracking of clay layers underlying flexible membrane liners in a composite liner? 1079

Does the moisture that is used to enable optimum liner compaction leave this clay layer ,through unsaturated transport, and does the drying of this layer lead to desiccation cracks in the layer? 1080

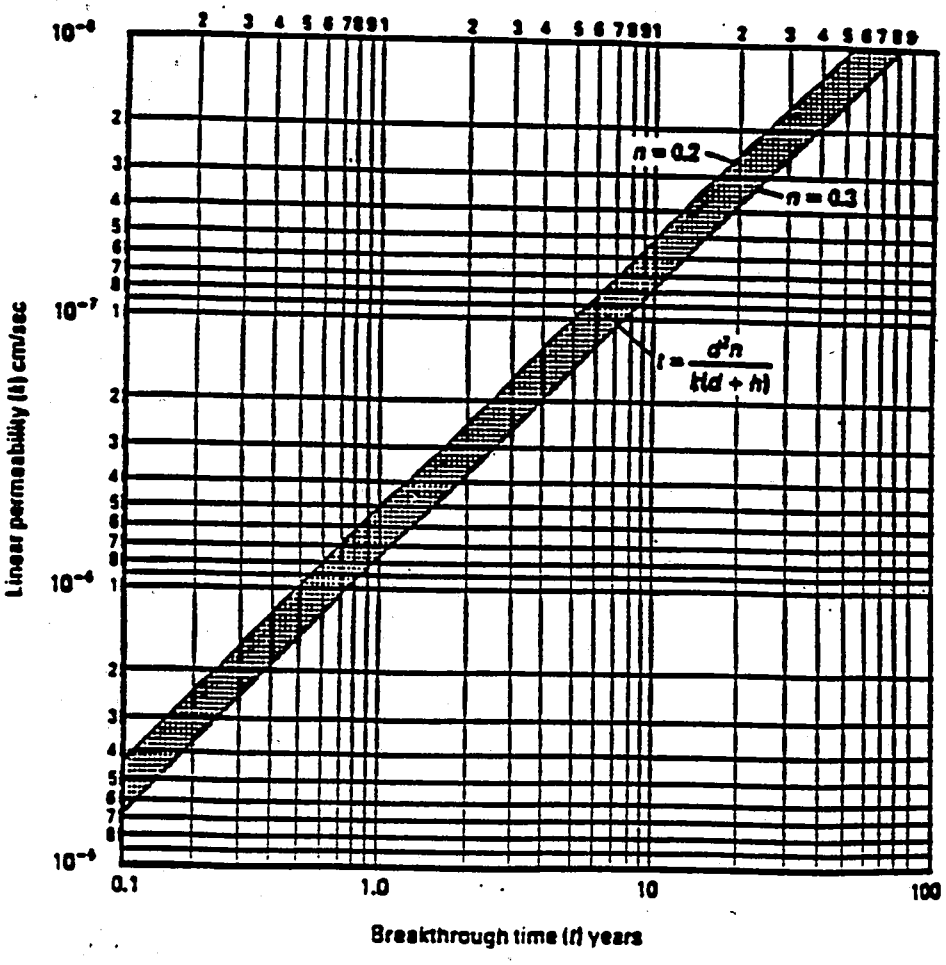
Will the desiccation cracks that occur in the clay layer underlying the flexible membrane liner provide pathways through the clay where leaks that develop in the flexible membrane liner can penetrate the clay layer in less than the predicted rate of about seven years? 1081

Exhibit 7

Calculated Breakthrough Time for a 1-m Thick Clay Liner and 0.3-m Water Head

(Workman and Keeble, 1989)

IN: *Sanitary Landfilling: Process, Technology and Environmental Impact*, Academic Press



Did the staff review this issue in the materials that were provided to them on the proposed deficiencies of the single composite liner recommended by the staff as being suitable for the proposed landfill? 1082

What provisions were taken by the staff in developing their recommended permit for the proposed landfill which includes a single composite liner, to address the desiccation cracking of the clay layer underlying the flexible membrane liner in the composite liner? 1083

Leachate Component Attenuation

Statements are made by landfill applicants, their consultants and regulatory agency staff who want to gain approval for a particular landfill that the clay layer in a composite liner and the natural geological strata represents additional barriers due to attenuation of constituents in the clay and the underlying geological strata. 1084

Is the staff familiar with the attenuation processes that occur for municipal landfill leachate components in clay layers? 1085

Is it appropriate to assume that all municipal solid waste MSW landfill leachate components that are a threat to groundwater pollution will be attenuated, i.e. prevented from transport, in passing through the underlying clay layer in a composite liner and through the natural geological strata at the landfill site? 1086

Are there components in municipal solid waste leachate that are not attenuated to any significant extent by clays or natural geological strata and thereby move at about the same rate as water, eventually leading to groundwater pollution by the waste-derived constituents? 1087

Should the staff become familiar with attenuation issues for municipal landfill leachate before they advise the Board that attenuation is an important mechanism for preventing leachate-derived constituents from polluting groundwaters under the proposed landfill? 1088

Did the staff mislead the Board in its attempt to support the permit for the proposed landfill when it stated that the leachate components that pass through the plastic sheeting liner would be attenuated and therefore would not be a threat to pollute groundwaters? 1089

Final Questions

Will the recommended permit for the proposed landfill comply with Subtitle D requirements of protecting groundwaters from impaired use for as long as the wastes in the landfill will be a threat? 1090

Does the current regulatory approach, in which it is assumed by the staff that a minimum Subtitle D landfill liner system consisting of a thin plastic sheeting layer and two feet of clay or equivalent, provide for groundwater quality protection for as long as the wastes are a threat? 1091

Is it appropriate to assume that a minimum Subtitle D composite liner will comply with Subtitle D's performance standards of protecting groundwaters from impaired use for as long as wastes represent a threat at a site where it already has been demonstrated that groundwaters are vulnerable to pollution by landfill leachate based on the pollution of groundwaters by existing waste management units located in that area? 1092

Is it appropriate to conclude that the proposed permit conditions for the landfill will protect groundwaters in the vicinity of the landfill from being polluted by landfill leachate for as long as the wastes in the landfill will be a threat? 1093

If not, why not?

Is it appropriate to conclude that the groundwater monitoring approach proposed in the permit has a low probability of detecting leachate-polluted groundwaters at the point of compliance before pollution beyond this point occurs? 1094

If not, what is the expected reliability of these monitoring systems to detect leachate polluted groundwaters when it first reaches the point of compliance? 1095

Professional Ethics Issues

Exhibit 8 is a cover page for a paper that discusses the significant professional ethics problem that exists today in landfill permitting where landfill applicant consultants and in some cases regulatory agency staff do not tell the board and public the whole truth about the ability of a landfill liner system and groundwater monitoring system for a particular landfill to protect groundwaters from impaired use for as long as the wastes in the landfill will be a threat. 1096

Do you agree that there is a significant professional ethics problem in the landfill development field today with respect to the permitting of municipal solid waste landfills?

Does the staff understand that if a consultant who normally works on behalf of landfill applicants discusses the whole truth about the inevitable failure of the landfill liner and cover systems and the inability of the groundwater monitoring system to detect this failure in leachate-polluted groundwaters they will not obtain future work from landfill applicants? 1097

Does the staff know that the American Society of Civil Engineers and the National Society for Professional Engineers have codes of ethics that require, with respect to matters of public health and safety, a civil engineer and a professional engineer to provide the public with the whole truth concerning the ability of a particular project, such as a landfill, to protect public health, groundwater resources and the environment from adverse impacts for as long as the wastes in the landfill will be a threat? 1098

FORUM

Exhibit 8

ENVIRONMENTAL ETHICS: THE WHOLE TRUTH

Do engineers working on issues concerning the impacts of chemical constituents on public health or the environment have a professional obligation to tell the whole truth? The obvious answer is yes. Unfortunately, this is often not being done today.

The field of environmental quality management has become immersed in the adversarial (legal) system for "resolving disputes" among parties with different interests—a system significantly different from the traditional engineer/scientist (E/S) approach to addressing complex environmental issues. In the adversarial system, one side presents the strongest possible technical discussion on behalf of the client; it is left to the other side to bring out the weaknesses in the technical position. While such an approach is considered appropriate in the courtroom, the problem is that it is routinely followed by E/Ss in proceedings such as appearances before regulatory boards supporting or opposing proposed projects. Engineering and other technical reports commonly do not present a disinterested discussion of technical issues and information pertinent to the protection of public health and the environment.

When the responsible, competent E/S—who is charged to tell the truth complete with caveats, qualifiers, uncertainties and unanswered questions—presents the "whole" story to the client/employer, he or she is then frequently faced with a situation in which the client or employer wants only positive project-supportive information revealed and detracting information omitted. To be useful to the client/employer, the "expert" E/S must testify or otherwise make authoritative presentation of those selected facts and information in technical reports at hearings or other review-board proceedings.

Some professionals justify doing this on the grounds that they have to "play the game." The realities of maintaining a client, securing future work, and holding and advancing one's position in a firm, along with inadequate funding to conduct quality and necessary work compel some E/Ss to exaggerate, diminish or otherwise manipulate the whole truth—despite the fact that the codes of ethics of both ASCE and the National Society of Professional Engineers emphasize the importance of full disclosure on matters of public health and safety.

One way to help neutralize the effects of the adversarial system may be to incorporate a requirement with project applications for funding independent, disinterested technical review to be presented to the regulatory agency, decision makers and public. This approach is being followed in the siting of three large landfills to serve the Greater Toronto area.

It would provide considerable impetus for project consultants and advocates to be more forthcoming with reliable information on potentially adverse project impacts if they were faced with exposure of the technical unreliability (failure to tell the whole truth) of their positions in a full peer-review public arena. Such a review could also help address "not-in-my-backyard" concerns if individuals, communities and interest groups had a mechanism for independent review and reporting of technical information they felt they could trust. To fund this peer-review process, a percentage of the cost of any proposed project with potentially significant public-health or environmental-quality implications could be made available.

While environmental impact statements (or, in California, environmental impact reports) should by law provide the vehicle for full technical disclosure of potential problems associated with the project, such documents rarely provide reliable in-depth review of complex technical issues, especially as they relate to chemical constituents in the environment. Every project applicant should be required to conduct plausible worst-case-scenario evaluations for projects involving management of chemical constituents in the environment.

Such evaluations must include consideration of the nature, transport, fate and effects of chemical constituents under plausible worst-case conditions; the ability of the project's monitoring system to detect impending public-health and environmental-quality impairment under plausible worst-case conditions; the actions that would be taken in response to such detection; the magnitude of harm to public health and environmental quality that could result from inadequate response actions to plausible worst-case conditions; the magnitude and source of funding available for corrective action required under plausible worst-case conditions for as long as the wastes and/or chemicals represent a threat; and the adequacy of the public-health and environmental-protection regulatory standards or other requirements applicable to the project, as well as potential future changes in those standards. The plausible worst-case-scenario evaluation would be provided for peer review of the project.

Adoption of this approach would provide the public, the regulatory community and officers of the courts with a much better understanding of the potential consequences of undertaking a particular project or activity. It would also be a major step in reversing the tide of unethical practices that have become common among engineers and scientists in the environmental quality-management field today.

[This Forum is condensed from a more comprehensive review of the topic, available from the authors at tel. 916/753-9630; fax 916/753-9956.]

G. Fred Lee, P.E.
Anne Jones-Lee
G. Fred Lee & Associates
El Macero, Cal.

Do you agree that Drs. Lee and Jones-Lee's suggested approach as discussed in this paper (Exhibit 8) of requiring a full, public, independent peer review of controversial technical issues concerning a proposed landfill is an appropriate approach to follow to better ensure that future generations' groundwaters will not be polluted by landfill leachate than is being followed today in the permitting of landfills? 1099

Does the staff feel that the independent peer review approach is an appropriate approach to take with respect to protecting public health, the environment and the public's interests? 1100

Do you agree that regulatory agency staff typically understand the significant problems that exist today of permitting landfills that will not protect groundwaters from pollution by landfill leachate for as long as the wastes represent a threat? 1101

Does this problem exist in your regulatory agency? 1102

Who in the agency is responsible for continuing the policy of having the staff recommend permits for landfill liners and covers and groundwater monitoring systems that, based on what is well-established in the professional literature, obviously will not be protective of groundwater resources associated with the landfill for as long as the wastes represent a threat? 1103

What needs to be done to change the current landfill permitting situation so that true groundwater quality protection can be achieved in the landfilling of municipal solid wastes at the proposed landfill? 1104

Based on our discussions of issues, is it appropriate to require that the people who deposit wastes in the landfill pay the true cost of protecting groundwaters from impaired use for as long as the wastes in the landfill will be a threat? 1105

Will the permit that is recommended by the staff for the proposed landfill provide protection of groundwater resources from impaired use for as long as the wastes represent a threat? 1106

The questions appearing at page 2 through 28 have been submitted at the suggestion of Dr. G. Fred Lee. Engineering experts such as Dr. Lee continue to conclude that landfill liners constitute a "flawed technological approach." Exh. 9 (copy of one of the articles cited in Exh. 1). (Exhibits 9 through 101 appear following page 45 of these comments and are incorporated herein by reference as though set forth in full in the text of these comments.) The EIR is deficient because it fails either to disclose the more recent literature on the issue, or to discuss its significance. Does the Planning Department agree with the conclusions expressed in the articles cited in Exhibit 1? If not, why not? 1107 1108

It has been reported that waste constituents are likely leaving landfills in the vapor phase in addition to or in place of the liquid phase. See Exh. 12 (Air/Water Pollution Report 1996). The EIR is deficient because it does not reveal this additional source of contamination. Was the Planning Department aware at the time of the release of the EIR of the information contained in the Air/Water Pollution Report article? If not, why not? Does the Planning Department agree that BFI should be required to reveal whether vapor phase is a source of landfill contamination at Sunshine Canyon? If not, why not? 1109 1110 1111

Page B5-13 of the EIR indicates that portions of the landfill will be built over the top of existing landfill. The EIR fails to disclose that as recently as 1994, according to the industry publication World Waste:

> there are still concerns about building a new landfill on top of existing solid waste. Since the MSW settles at it biodegrades and shifts under the weight of the new waste, the former landfill's instability can threaten the integrity of the new liner system. 1112
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> A piggyback landfill is not recommended for existing sites with leachate and groundwater contamination problems since it would be difficult to determine whether the source of the problem was the old or the new landfill.
>
> Even as engineers develop technology to support piggyback landfills, regulators remain cautious about approving piggyback landfills due to long term performance uncertainties.

Exh. 11. The same article also indicates that existing compaction techniques to control differential settlement are effective only to a level of about 40 feet. Was the Planning Department aware at the time the EIR was released of these concerns about the "long term performance uncertainties of a piggyback or waste-on-waste landfill, such as that resulting from the shifting of old waste under new waste? If not, why not? Was the Planning Department aware at the time the EIR was released of these concerns about the limited effectiveness of existing compaction techniques? If not, why not? The failure to disclose this information is an EIR deficiency. The City should require the applicant to disclose all relevant geological and engineering studies regarding these long term performance uncertainties. 1113 1114 1115

The U.S. Geological Survey has prepared a report (No. 95-213) which states that the mountain range in which the landfill is located is particularly vulnerable to landslides. USGS 1995 (excerpt). The EIR indicates at page 4-39 that a 1995 report prepared by the U.S. Geological Survey was consulted, but the full citation is not provided, so it is not possible based on the information provided to verify its accuracy. Other scientists predict that there will be future earthquakes in the area of the landfill that will be even larger (7.2 - 7.6) than the Northridge earthquake of 1994. See Exh. 12. Although the EIR rerveals that it is reasonable to expect a earthquake larger than the Northridge Earthquake, it is deficient because it fails to reasonably quantify the predicted size of the larger quake. 1116 1117

In April of 1997, the California Division of Mines ("DMG") and Geology stated that in assessing seismic hazards, consultants should use the latest DMG "seismic ground-motion parameter data." See Exh. 13. The EIR is deficient because it does not state whether these data were used in preparing the Sunshine Canyon EIR. Does the Planning Department agree that BFI should be required to use these data? If not, why not? Page 13 of the Static and Seismic Stabilty Assessment (11/96) states that "the Northridge Blind-Thrust event can be eliminated from further consideration" in part because its PGA of .71 g is less than the .81 g of the Santa Susana MCE. In fact, the Northridge Earthquake produced "maximum peak accelerations reaching 1 g" at the Van Norman Complex (see Exh. 14 (Bulletin of the Seismological Society of America (Bardet and Davis) 1996), and "peak acceleration near 1 g" at the Interstate 5/14 interchange (see Exh. 15 (Bulletin of the Seismological Society of America (Hutchings & Jarpe) 1996). The EIR is deficient because it does not reveal this information or discuss its significance. Was the Planning Department aware of the magnitude of the accelerations 1118 1119 1120 1121

produced by the Northridge Earthquake at these two sites, both of which are in close proximity to Sunshine Canyon? If not, why not? The EIR is deficient because it excludes from consideration relevant information about the acceleration produced by the Northridge Earthquake. We request that BFI be required to circulate a new EIR which explains why this information was not made available to the public. 1122

Page C8-8 states that aftershock activity from the Northridge Earthquake "has been concentrated to the north and northwest of the epicenter." In fact, one of the greatest concentrations of aftershocks appears to be in an area which includes Sunshine Canyon. See, for example, Exh. 14 at page S336 (Bulletin of the Seismological Society of America (Bardet & Davis) 1996). The EIR is deficient because it does not reveal this information or discuss its significance. Was the Planning Department aware of where the aftershocks were concentrated at the time the EIR was released? If not, why not? Does the Planning Department agree, after independently reviewing the evidence, that the EIR is at best inaccurate in stating that the aftershocks have been concentrated to the northwest of the epicenter? If not, why not? BFI should be required to circulate a new EIR which explains the engineering significance of the concentration of the large number of Northridge Earthquake aftershocks in an area which includes Sunshine Canyon. 1123 1124 1125 1126

During the hearings before the County Board of Supervisors regarding the expansion of this landfill, BFI attempted to downplay the numerous examples of its corporate misconduct and claimed that it had been, was, and would be a responsible corporate citizen. See Exh. 16. BFI's claim was false. In fact, numerous recent incidents have been reported which indicate that BFI's misconduct is continuing. For example, 1127

- in 1996 BFI Services was accused of violating the Clean Water Act ("CWA") based on the improper disposal of millions of gallons of mixed raw sewage. "In many instances, [BFI services] gave the [publicly owned treatment works] false samples of waste slated for disposal . . . ." Exh. 17. This misconduct defrauded municipal sewage plants of about $1.3 million." Exh. 18. As part of a guilty plea arising out of this misconduct, BFI Services paid a $3 million fine and $1.5 million in restitution for violating the CWA. See Exh. 19. 3.

- In 1995, BFI shut down and dismantled a medical waste incinerator after admitting to tampering with monitoring devices. See Exh. 20 1128
- In 1997, BFI was accused of illegally operating a construction and demolition debris transfer station in Florida. See Exh. 21. 1129
- In 1997, federal authorities raided a BFI medical waste disposal plant in Washington DC as part of an investigation into illegal dumping of biomedical waste. See Exh. 22. 1130
- In 1990, BFI abandoned plans to expand one of its landfills after admitting that it had suppressed reports showing potentially explosive methane gas in the landfill and garbage buried beyond the permitted area. Previously, BFI had boasted of "sound management practices and environmental protection." See Exhs. 23 & 24. 1131
- In 1990, Louisiana officials determined that BFI "continued to break the law" through landfill operating violations such as failing to apply proper cover material, illegally disposing of infectious medical waste, failing to keep litter from blowing off the site, and allowing contaminated liquid to seep from the landfill. The officials found that "the facility has a history of serious violations which are corrected but then reoccur . . . ." BFI eventually closed the landfill. See Exhs. 25-27. 1132
- Recent legal or administrative actions against BFI landfills have been filed based on issues such as garbage odor, dust and blowing debris, improper receipt of hazardous waste, liner failure, surface and ground water contamination, and adverse health impacts at landfills near San Antonio, Texas (see Exhs. 28 (garbage and sludge odors, dust and blowing debris, reported in 1996) & 29 (odors and mud spread by garbage trucks, reported in 1997)), Houston, Texas (see Exhs. 30 (air and water pollution, reported in 1995); Donna, Texas (see Exh. 31 (admitted violations by BFI at several landfills, reported in 1992)); Baltimore, Maryland (see Exh. 32 (ground water pollution, reported in 1994)); Reading, Pennsylvania (see Exh. 33 (citation for unpermitted discharge of leachate from lined 1133

landfill, reported in 1994)); Cleveland, Ohio (see Exhs. 34 (odor, reported in 1992) & 35 (noise and odor, reported in 1997)); San Mateo, California (see Exh. 36 (streambed destruction resulting from storm water overflow during landfill expansion, reported in 1993)); Pittsburg, California (see Exh. 37 (odors and blowing dust and trash, reported in 1993)); and in Ohio, Alabama and New York (see Exh. 38 (alleged illegal burying of sludge, reported in 1991)), Louisiana (see Exhs. 39 (1,400 violations of hazardous waste regulations, reported in 1990) & 40 (odors and noise, reported in 1989 and 1993)); Illinois (see Exh. 41 (depositing waste in excess of permit limit, reported in 1997)); and Virginia (see Exh. 42 (odors, reported in 1997)).

- In 1996, the federal government sued BFI for attempting to monopolize waste hauling competition in states such as Tennessee. BFI settled the lawsuit by agreeing to make changes in its contracting practices. See Exh. 43. 1134
- Additional examples of BFI's record of fines, suits and penalties prior to 1992 are set forth in the article enclosed as Exh. 44. 1135

Were the Planning and/or Zoning Departments aware of these allegations and incidents at the time of the release of the EIR? If not, why not? 1136 Do the Planning and/or Zoning Departments agree that by diverting material away from landfills, it would reduce or eliminate the need for the City of Los Angeles to entrust the important function of waste disposal to an entity such as BFI with such a questionable record and reputation? If not, why not? 1137 Do the Planning and/or Zoning Departments planning staff agree that as a general rule the recycling industry has a better operating record in terms of environmental health and safety than the landfilling industry? If not, why not? 1138 Do the Planning and/or Zoning Departments agree that BFI's operating record is a relevant factor in determining its suitability to conduct an important public function such as waste disposal? If not, why not? 1139

Section 4.11 of the EIR states that the expansion of the landfill will not have an adverse effect on property values. The attached article however, states that "it is reasonable to assume that unless new landfills achieve a state of operations such that the urban housing markets view them as essentially benign, one 1140

should expect that landfills will have negative price effects." See Exh. 45. The EIR also states, however, that the operator will be unable to mitigate the adverse air quality impact of operating the landfill. The EIR is defective because it fails to disclose studies which demonstrate the adverse impact of landfills on residential property values. Was the Planning Department aware of the facts and conclusions set forth in Exhibit 45 at the time the EIR was released? If not, why not? Does the Planning Department agree with the analysis and conclusions set forth in Exhibit 45? If not, why not? "It has become a common practice among major landfill operators to provide property value guarantee programs as part of the process of seeking government approval for expansion or construction of landfills." Exh. 46 (Appraisal Journal 1996 (see "Question 9")). BFI is reported to have extended or offered to extend property value guarantees with respect to several of its sites. See, for example, Exhs. 47 (Chicago Tribune 1993), 48 (Chicago Tribune 1995); 48.5 (Buffalo News 1992); 49 (Air Water Pollution Report 1995); 50 (News & Observer 1992). Property value guarantee programs offered by other landfill operators are described in Exhibits 52 (Pantagraph 1997); 53 (Chicago Tribune 1996); 54 (Post Standard 1996), 55 (Indianapolis Star 1996); 56 (Kansas City Star 1995); 57 (Leader Telegram 1993); and 58 (Tacoma News Tribune 1995). Were the Planning and/or Zoning Departments aware that it has become a common practice among major landfill operators to provide property value guarantee programs as part of the process of seeking government approval for expansion or construction of landfills? If not, why not? Do the Planning and/or Zoning Departments agree that BFI should be required to offer a property value guarantee program as a condition of obtaining a zoning change and/or a permit to operate the landfill? If not, why not? Do the Planning and/or Zoning Departments agree that if the proposed landfill will have no adverse effect on property values--as BFI claims in section 4.11--BFI will have nothing to lose by offering a guarantee program? If not, why not?

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The EIR claims that the landfill is needed to solve an "impending crisis" in landfill capacity. EIR p. I-8. In fact, the crisis does not exist, as stated in Exh. 59 (Los Angeles Times 1993) and 60 (Wall Street Journal 1996). In April of 1997--prior to the release of this EIR--the City of Los Angeles Bureau of Sanitation issued a Request for Qualifications regarding the development of "Innovative Solid Resources Management Technologies." The EIR is deficient because it does not refer to this document in the alternatives section, describe the current status of the proposal process, or provide any estimates of the

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extent to which these technologies will reduce the need for expansion of the landfill. Was the Planning Department aware of the Request for Qualifications, or of any subsequent procedures or developments within the Department of Public Works relating to the use by the City of Los Angeles of innovative solid resources management technologies? If not, why not? It has also been recently reported that "[m]any curbside recycling programs could face extinction by state and local governments anxious to fill space at cheap 'mega-landfills.'" See Exh. 61 (Solid Waste Report 1997). The EIR is deficient because it does not describe the extent to which the expansion of this landfill, with its artificially low tipping fees, will jeopardize the recycling programs implemented by the City of Los Angeles. Was the Planning Department aware at the time the EIR was released of the study referenced in Exhibit 61? If not, why not? Does the Planning Department agree with the conclusions reached in the study referenced in Exhibit 61? If not, why not? A report entitled "Approaching an Integrated Solid Waste Management System for Los Angeles County, California" (Gershman, Grickner & Bratton Sept. 13, 1996)("GBB Report") concluded that "Los Angeles County can effectively meet and exceed its AB 939 requirements without opening new landfills" by "diverting solid waste away from landfills through source reduction, recycling, and composting." See Exh. 62. The EIR is deficient because it does not disclose the existence of this report in its discussion of project alternatives. Was the Planning Department aware of the GBB report at the time that the EIR was released? If not, why not? Does the Planning Department agree with the conclusions set forth in the GBB report? If not, why not? The alternatives section of the EIR is also defective because it does not discuss the extent to which landfill capacity could be preserved by the diversion of inert wastes. Specifically, public works officials in other jurisdictions are recently reported to have predicted a diversion rate of 20 percent by disposing of inert wastes in separate landfills. See, for example, Exh. 63. Page V-18 of the GBB Report demonstrates that there is ample inert waste capacity within Los Angeles County. Was the Planning Department aware at the time the EIR was released about the potential for preserving MSW landfill capacity by mandating the diversion of inert waste? If not, why not? Does Planning and/or Zoning Staff agree that MSW landfill capacity could be preserved by mandating the diversion of construction waste? If not, why not?

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Under the California Environmental Quality Act ("CEQA"), the EIR must consider both primary and secondary consequences in determining whether the project may have a significant impact on the environment. Primary and direct consequences are those

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immediately related to the project, such as dust resulting from project construction or operations. Secondary or indirect consequences may be "several steps removed from the project in the chain of cause and effect." See CEQA Guidelines § 15064. The United States Environmental Protection Agency ("EPA") has determined that air pollutant emissions from Municipal Solid Waste landfills pose a risk to human health and the environment. Landfill emissions of Volatile Organic Compounds and Nitrous Oxide exacerbate violations of the ambient standard for ozone; the formation of ozone in the breathable atmosphere has a broad spectrum of adverse health consequences and also causes harm to plant life. Emissions of methane contribute to global warming under the greenhouse theory. Emissions of substances such as vinyl chloride and benzene pose a risk of cancer and other disease. Unlike most sources of industrial air emissions which are periodic and which can be controlled or eliminated, landfill emissions occur continuously and cannot be adjusted. Even when control devices are operating correctly, approximately 2 percent or more of collected gasses (including significant portions of the more hazardous non-methane organic compounds) pass through the control device without being destroyed. See, for example, Exh. 37 at p. 8. Does the Planning Department agree that adverse impacts on human health result from landfill operations constitute at least a secondary impact within the meaning of CEQA? If not, why not? The EIR is also deficient because by indicating at page 4-92 that "uncollected" landfill gas consists primarily of methane, it diverts attention from the fact that in absolute (as opposed to relative) terms, landfills nationwide are reported to emit approximately 255,000 metric tons of highly toxic nonmethane organic compounds each year. See Exh. 65 (San Francisco Chronicle 1991). The EIR is also deficient because it does not reveal the fact that technology exists to neutralize the odors that emanate from landfills. See Exh. 66. Was the Planning Department aware of the existence of this technology at the time the EIR was released? If not, why not? The particulate matter (PM-10) that landfills also generate has severe health consequences. The adverse affects of landfills on public health have been documented. Support for the statements made in this paragraph are found in publications such as: US EPA, "Air Emissions from Municipal Solid Waste Landfills--Background Information for Proposed Standards and Guidelines" p. 2-1 through 2-33 (1991)(Exh. 67 (excerpt)); David H. Minott, "Landfill Environmental Emissions--Regulatory Progress and Gaps" (1994)(Exh. 68); Donald L. Gill, "Landfill Gas Emissions: A Study of Two Landfills in Prince George's County, Maryland" (1995)(Exh. 64); Kay H. Jones, "Comparing Air Emissions From Landfills and WTE Plants," Solid Waste Technologies (March/April

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1994) at p. 30 (Exh. 69); D.W. Dockery and C.A. Pope III, "Acute Respiratory Effects of Particulate Air Pollution," 15 Ann.Rev.Pub.Health 107 (1994)(Exh. 70). Was the Planning Department aware of the facts set forth in the articles attached as Exhibits 64 through 70? If not, why not? Does the Planning Department agree with the conclusions expressed in the articles attached as Exhibits 64 through 70? If not, why not? The EIR is deficient because it minimizes and fails to adequately analyze these secondary environmental consequences. The EIR is also deficient because it fails to provide emissions estimates for the entire life of the landfill, and fail to disclose the extent to which the landfill flares or incinerators will generate a visible plume, or contribute to haze, or have other visibility impacts. The EIR is also deficient because the analysis of dioxin emissions is inadequate, and the mitigation analysis for NOx and CO is inadequate. As a preferable alternative to flares/incineration, the landfill could use energy recovery technology, such as reciprocating engine or gas turbine with zeolite catalysts installed to reduce NOx emissions. See Exhs. 71 & 72. Was the Planning Department aware of the existence of this technology at the time the EIR was released? If not, why not? Does the Planning Department agree that the technology described in Power Magazine is superior to landfill gas flaring/incineration? If not, why not? Does the Planning and/or Zoning Departments agree that in view of the health impacts described above, (1) any mitigation should include enforcement by the City of Los Angeles of the zoning condition regarding a health study and require BFI to fund a study, to be supervised by a major university and/or an independent agency of the federal government prior to construction, to assess the health impacts of landfills that have already been sited (including closed landfills) and other undesirable land uses on the residents of the impacted area, and (2) BFI should be required to fund ongoing health surveys in the area on a periodic basis throughout the life of the landfill and the closure period. Page 4-316 of the SEIR states that an epidemiological study would not be warranted because area residents are "concern[ed]" about "health issues." If this were a valid consideration in determining whether to conduct a health study of a facility such as a landfill, because as shown above most people who live near a landfill are legitimately concerned about health issues. But in fact, health studies have been designed and conducted regarding the health effects of municipal solid waste landfills. See, for example, Exh. 73 (Archives of Environmental Health 1995); see also Exh. 74 (NIEHS Press Release 1997 (describing health study of residents living near landfill that accepted both household and hazardous waste)). Does the Planning Department agree that people who live

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near landfills have legitimate concerns about health issues? If not, why not? Was the Planning Department aware, at the time the EIR was released, that health studies have been conducted of persons living near landfills accepting municipal solid waste? If not, why not? Does the Planning Department agree that, in view of the essential similarity of the constituents of the leachate from a municipal solid waste landfill and the leachate from a hazardous waste landfill (see Exh. 98), a health study of residents living near a municipal solid waste landfill will be as valid as a health study of persons living near a hazardous waste landfill? If not, why not? 1185 1186

The EIR also fails to consider the cumulative impact of the polluting effects of the landfill. For example, the Northeast San Fernando Valley are already burdened with a large number of undesirable land uses, including landfills. Examples of landfills and other undesirable land uses are believed to exist in the impacted area at this time, or sufficiently near to the impacted area to cause adverse health effects to the community: Bradley Landfill (East), Bradley Landfill (West), Lopez Canyon Landfill, Strathern Landfill, Valley Reclamation Landfill, CalMat Landfill, Community Recycling (aka DeGarmo St. Dump), Sheldon/Arleta Landfill (closed), Skyview Terrace Landfill (closed), Elsmere Canyon Landfill (proposed), and Chiquita Canyon Landfill. See also Exh. 75. Many of these landfills have a record of causing health problems. See "Has Landfill at Lopez Canyon Had Its Fill?", Los Angeles Times (Feb. 17, 1995) (statement of administrator of residence facility for senior citizens)(Exh. 76). Government officials are on record as stating that it was a mistake to cluster so many garbage dumps near the area to be impacted by this landfill. See "The Enemy Below L.A.", Los Angeles Daily News (statement of Regional Water Quality Control Board administrator that "with today's knowledge . . . you wouldn't have seen that many landfills in that area.")(Exh. 77). The siting of this landfill in this impacted area, near a community that is heavily populated by members of minority groups, is inconsistent with the principles of environmental justice. Were the Planning and/or Zoning Departments aware of the reported statement by the Water Quality Control Board administrator at the time the EIR was released? If not, why not? Does the Planning and/or Zoning Department agree that the Northeast San Fernando Valley has been forced the assume the burden of a disproportionate share of landfills in relation to the rest of the City of Los Angeles? If not, why not? 1187 1188 1189 1190 1191 1192

The courts are holding that the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 1193

Section 9601 ("CERCLA"), imposes liability on local governments that arrange for the disposal of municipal solid waste in landfills. Examples of such decisions are B.F. Goodrich Co. v. Murtha, 958 F.2d 1192 (2d Cir. 1992)(Exh. 78) and Transportation Leasing Co. v. State of California, 861 F.Supp. 931 (C.D.Cal. 1993)(Exh 79). The Murtha case recognizes that even if it is assumed that municipal solid waste contains a low concentration of hazardous substances (p. 1197), a municipality may be subject to CERCLA liability if "that waste contains a hazardous substance, found in <u>any amount</u>" at a landfill (p. 1206 (emphasis added)). The Transportation Leasing case held that Los Angeles County could be subject to CERCLA liability for arranging for the disposal of residential waste in a landfill later found to contain toxic substances (p. 947-48). The existence of toxic substances in municipal landfills occurs because municipal solid waste either (1) contains hazardous waste, or (2) decomposes and transforms into hazardous waste when deposited in a landfill. See, for example, Debra R. Reinhart, "A Review Of Recent Studies On The Sources Of Hazardous Compounds Emitted From Solid Waste Landfills," 11 Waste Management & Research (July 1993) at p. 257 (Exh. 80); Steven Ferrey, The Toxic Time Bomb: Municipal Liability for the Cleanup of Hazardous Waste, 57 George Washington Law Review 197, 200-10 (1988)(Exh. 81). Dr. Kirk W. Brown, of Texas A&M University has concluded that the waste streams disposed of in municipal landfills contain hazardous wastes; his methodology has been determined to be admissible in a federal court case. See Exh. 82 (excerpt). The EIR is deficient because it does not reveal or analyze the information set forth in Exhibits 75 through 82. Was the Planning Department aware of the conclusions set forth in Exhs. 75 through 82 at the time the EIR was released? If not, why not? Does the Planning Department agree with the facts and conclusions set forth in Exhibits 75 throuogh 82? If not, why not? The courts are also holding that the adverse impacts from landfill operations are a "basis for inverse condemnation." See "Expansion of Dump is a Taking By County," California Environmental Insider (July 13, 1995) at p. 9 (Exh. 83). Was the Planning Department aware of the City's exposure to liability as a result of using municipal landfills to dispose of waste? If not, why not? Instead of exposing the City (and its citizens) to economically catastrophic landfill liability, the officials of this City should be using alternative methods for the disposal of discarded materials. The economic and environmental feasibility of these alternatives has been demonstrated. See, for example, Victor Dricks, "Community Profits From Its Waste," Phoenix Gazette (Aug. 29, 1994)(Exh. 84); Richard Gilbert, "Finances of Incineration and Landfill Facilities" (1995)(Exh. 85); Southern California Edison, "Edison 1194 1195 1196 1197 1198 1199 1200 1201

Advanced Integrated Recycling (AIR) Project Description (1993)(Exh. 86). The EIR is deficient because it does not reveal or analyze the information set forth in available materials such as those included in Exhibits 83 through 86. Was the Planning Department aware of the facts and conclusions appearing in Exhibits 83 through 86? If not, why not? Does the Planning Department agree with the facts and conclusions set forth in Exhibits 83 through 86. If not, why not? se or similar articles at the time the EIR was released? If not, why not? Does Planning and/or Zoning Staff agree with the conclusions set forth in these articles? If not, why not? 1202 1203 1204 1205

The EIR does not adequately reflect that the proposed landfill is itself a "source" which must obtain an NSR permit and that the proposed landfill gas collection and flare system merely represents the air pollution control equipment proposed by the applicant to control its landfill gas emissions. This comment is based on the relevant provisions of the Clean Air Act ("CAA") and implementing EPA regulations and guidance, which the SCAQMD is responsible for implementing in Los Angeles County pursuant to CAA § 173 and the California State Implementation Plan. Specifically, as buried waste decomposes in the landfill, landfill gas will be generated and emitted to the atmosphere. Landfill gas consists of methane, carbon dioxide and various reactive organic compounds. As such, landfill gas (and each of its constituents) is an "air pollutant" as that term is defined by CAA Section 302(g), 42 U.S.C. § 7202(g)("air pollutant" is "any air pollution agent or combination of such agents, including any physical, chemical . . . substance or matter which is emitted into or otherwise enters the ambient air"). Because it will emit air pollutants, the landfill is a "stationary source" for CAA purposes. See CAA § 302(z), 42 U.S.C. § 7602(z)("stationary source" is "generally any source of an air pollutant except those emissions resulting from an internal combustion engine for transportation purposes or from a nonroad engine or nonroad vehicle . . . "); CAA § 111(a)(3), 42 U.S.C. § 7411(a)(3)("'stationary source' means any building, structure, facility, or installation which emits or may emit air pollutant"); 56 Fed.Reg. 24468, 24475 (May 30, 1991)(the "facility" is the "entire landfill," which is "the total landfill property designated for solid waste disposal . . . ."). The discussion of the applicable air quality rules should make it clear that preconstruction review of the landfill's air emissions must occur before the landfill is constructed, rather than at the time the applicant chooses to install its proposed air pollution control equipment. An attorney who advises the waste industry is reported to have stated that under the Clean Air Act: 1206 1207 1208 1209

> In building a new landfill, managers must figure out the site's potential to emit certain pollutants. "It's not what you actually emit, ... You have to calculate your worst case scenario.

See Exh. 87. The air quality section of the EIR is deficient because it is based on actual emissions, rather than the worst case scenario required under the Clean Air Act. Does Planning and/or Zoning Staff agree that BFI should have made worst case scenario calculations? If not, why not? 1210 1211

The information provided in the EIR regarding the efficiency of the landfill gas collection system is inadequate. The relevant EPA guidance on landfill gas emissions and NSR requires that an applicant assume that its gas collection system will be "designed to maximize, to the greatest extent possible, the capture of landfill gas from the landfill. See Exhs. 88 (copy of the EPA guidance memorandum); 89 (copy of article from Waste Age discussing the implications of the EPA guidance memorandum). The current benchmark for the maximum collection efficiency for gas collection systems at new landfills is 90 to 100%. A collection efficiency of over 90% was recently proposed for the Campo Landfill in San Diego County. Exh. 90 (excerpt). Further support for a 90-100% efficiency is found in a recent BFI application submitted by BFI in Pennsylvania. See Exh. 91. Was the Planning Department aware of of the possible efficiency levels of landfill gas collection systems? If not, why not? Will the Planning Department require BFI to explain why it proposed 90-100% efficiency at its Pennsylvania facility, but will not do so at Sunshine Canyon? If not, why not? A 90 to 100 percent efficiency should be required as part of the LAER determination. Various emissions calculations and ambient air quality modeling analyses will have to be adjusted to reflect this higher collection efficiency. Because the higher collection efficiency will result in increased NOx emissions, even more offsets will be required from the Priority Reserve or elsewhere, if the landfill is to be permitted. But the EIR does not adequately address whether the SCAQMD has sufficient emission reduction credits in its Priority Reserve to offset the emissions generated by the Sunshine Canyon landfill, let alone other landfill projects currently pending in the SCAQMD which will be making claims on the priority reserve in the same time frame. Does the Planning Department agree with the conclusions set forth in this paragraph? If not, why not? 1212 1213 1214 1215 1216 1217 1218 1219 1220

The estimates for fugitive dust are well below comparable projections made for the smaller Chiquita Canyon landfill. 1221

Specifically, at 10,000 tpd, Chiquita Canyon Landfill is estimated to have onsite fugitive PM 10 emissions of 638.9 pounds per day (Final EIR, Chiquita Canyon Landfill Table 4.G-8 at p. IV-85). By contrast, operations at Sunshine Canyon--where wind conditions are more severe--are assumed to produce no more than 102.5 pounds per day (Sunshine Canyon EIR Table 4.2.8). The EIR is deficient because it does not provide a full explanation for this discrepancy. Will the Planning Department require BFI to explain the reasons for this discrepancy? If not, why not? 1222 1223 1224 1225

Because the landfill is located in a non-attainment area, the amount of carbon monoxide emissions from the landfill expansion will result in a major modification to a stationary source, requiring use of Best Available Control Technology. The EIR should therefore evaluate a carbon monoxide catalyst as a control technology. It has been reported that fuel cell technology is available that would convert landfill gas into less harmful compounds, remove its odor causing components, avoid the need for flaring, and produce electricity. Exh. 91.5. The EIR is deficient because it does not reveal the existence of this control technology. Were the Planning and/or Zoning Departments aware of the existence of this technology at the time that the EIR was release? If not, why not? Will the Planning Department require BFI to explain why it has failed to consider the use of this technology? If not, why not? 1226 1227 1228 1229 1230 1231

The EIR does not contain an adequate analysis for mitigation measures for pollution sources other than vehicles. At a minimum, the EIR should analyze selective or non-selective catalyst reduction technology. In addition, a bag house should be required to reduce PM10 emissions. The EIR is also deficient because it does not adequately analyze the regulatory and health implications of the emission of benzene from the landfill. The EIR is also deficient because it fails to recognize the federal requirements for the developments of "best available control measures" to reduce the amount of fugitive dust and corresponding PM10 emissions from a variety of sources in the district. Exh. 92; 42 U.S.C. § 7513(b)(1). Does the Planning Department agree with the conclusions set forth in this paragraph? If not, why not. Specifically, does the Planning Department agree that the authorities cited above require BFI to use best available control methods to control PM10 emissions? If not, why not? 1232 1233 1234 1235 1236 1237 1238

According to Los Angeles County Traffic/Access guidelines, traffic count data should not be over 1-1/2 years old. Exh. 93 Wolfe Letter 1995. Does Planning and/or Zoning Staff agree that 1239

the traffic analysis criteria set forth in Exhibit 93 are valid? If not, why not?

The EIR states that BFI may use alternative daily cover on the landfill. Does the Planning Department agree that under current law, alternative daily cover may include green waste? If not, why not? There is evidence that the use of green organics for ADC will increase the organic fraction of landfills, increase the production of landfill gas, increase the migration of landfill gas, and promote landfill fires; for this and other reasons twenty-three states have banned green waste from landfills. Exh. 94. The City Manager of Glendale, Arizona is reported to have stated that that city wants to encourage the diversion of green waste from landfills because that will result in a reduction in landfill gas production. Exh. 95. A spokesperson for the operator of the waste collection system for Villa Park, California is reported to have stated that depositing green waste into landfills would "produc[e] methane gas, which adds to the global warming." Exh. 96; see also Exh. 97. The EIR is deficient because it does not reveal the harmful effects of using green waste as daily cover. Was the Planning Department aware at the time of the release of the EIR of the reported harmful environmental effects of using green waste as daily cover? If not, why not? Does the Planning Department agree with the points made regarding green waste in Exhibits 92 through 97? If not, why not? 1240 1241 1242 1243 1244 1245 1246 1247

The EIR is deficient because it does not reveal that, according to an article in the Journal of Environmental Health, surveys have been conducted which indicated that even where cities have programs to encourage residents to remove household hazardous waste ("HHW") from the municipal waste stream, "significant quantities of HHW are being improperly disposed of." Exh. 98 (Journal of Environmental Health 1997). Was the Planning Department aware of the existence of these surveys at the time the EIR was released? If not, why not? According to the same article, the California Air Resources Board concluded that "the overall composition of landfill gases from hazardous and non-hazardous sites appear to be similar," and that "non-hazardous landfills may contain concentrations of toxic gases equal to or exceeding those of hazardous landfills." Was the Planning Department aware of the existence of the Air Resources Board's findings at the time the EIR was released? If not, why not? Does the Planning Department agree with the Air Resource's Board's findings and conclusions with respect to this issue? If not, why not? According to the same article (Exh. 98), "[r]ecent data indicate that volatile organic compounds commonly found in 1248 1249 1250 1251 1252 1253

landfill leachate can rapidly migrate through synthetic liners . . . ." Was the Planning Department aware of the existence of this recent data at the time the EIR was released? If not, why not? Does the Planning Department agree that there is recent data showing that VOC's can migrate through synthetic liners? If not, why not? The EIR is deficient because it does not discuss the additional mitigation measures that are needed to deal with the problems discussed in this paragraph. 1254 1255 1256

Page 2-86 of the EIR states that the landfill will be "operational 16 hours per day," Monday through Saturday. Page 1-60 of the EIR states that "landfill operations shall be limited to the hours of 6:00 p.m. to 6:00 p.m.," Monday through Friday, and 7:00 a.m. to 2:00 p.m. on Saturday. A distinction should be made between landfilling operations and the acceptance of waste. At the very least, it should be made clear that waste will not be accepted at the landfill 16 hours per day. 1257 1258

The EIR states that the locations of transfer stations "ha[ve] not been identified" (p. 1-14), but also states that transfer trucks will constitute most of the traffic to the landfill site. BFI should be required to identify the transfer stations that will be used. If trucks smaller than transfer trucks will in fact constitute most of the traffic to the landfill site, the only reasonable conclusion to be drawn is that there will be more truck traffic, and BFI should be required to submit new traffic estimates based on the increased truck traffic. 1259 1260

Why was the EIR sent directly to homeowner organizations located several miles from the landfill, but not sent directly to (1) the North Valley Coalition, (2) the Community Advisory Committee for the County Portion of the Sunshine Canyon Landfill? Why did Planning Staff refuse to honor requests from representatives of the North Valley Coalition and the Community Advisory Committee for copies of the EIR? Why wasn't the EIR made available in an electronic format? Was the Planning Department aware that the time the EIR was released that environmental impact reports are now being made available electronically (see Exh. 99)? If not, why not? Does the Planning Department agree that the policy of encouraging community responses to environmental impact reports is disserved by limiting the distribution of copies of the reports, or by refusing legitimate requests for copies of the documents? If not, why not? Does the Planning Department agree that making the EIR electronically available would facilitate greater community participation in the EIR review process? If not, why not? 1261 1262 1263 1264 1265 1266

Does Planning and/or Zoning Staff agree that BFI received numerous extensions from the City of Los Angeles during the process of preparing the EIR? If not, why not? Does Planning and/or Zoning Staff agree that BFI continued to receive such extensions even after litigation relating to the expansion of the County portion of the landfill was resolved? If not, why not? If Planning and/or Zoning Staff agrees that BFI received several such extensions, why did it refuse the 90 day extension requested by Councilmember Hal Bernson, as discussed in the letter from Mary Edwards to Con Howe attached as Exhibit 100 (a response to Exhibit 100, if not already provided, is again requested). 1267 1268 1269

According to a draft letter on Planning Department letterhead dated December 20, 1995 and prepared for Ms. Shigeta's signature, and obtained through a request for public records, as of 1995 ERS staff was concerned that a data base submitted by BFI on June 19, 1995 1270

> created a false sense of urgency which avoided a careful analysis of alternatives to the Sunshine Canyon Landfill. In that, the data base was inclined to advocate for the proposed project by stating that all other alternatives had greater impacts than the proposed landfill.

Exh. 101. Please set forth in detail the facts which caused the ERS staff to conclude that BFI's database created a false sense of urgency, identify any corrections or revisions made to the data base which resulted in a conclusion that the data base no longer created a false sense of urgency, and identify all persons involved in the decision to conclude that the data base no longer created a false sense of urgency. 1271 1272 1273

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REPORT:
GEOSYNTHETIC LINER SYSTEMS FOR MUNICIPAL SOLID WASTE LANDFILLS: AN INADEQUATE TECHNOLOGY FOR PROTECTION OF GROUNDWATER QUALITY? By G. Fred Lee, and Anne Jones-Lee, 27298 E. El Macero Dr., El Macero, California 95618-1005, U.S.A.

The geosynthetic liner system technology is an engineered containment system for use in lined "dry tomb" landfills in which are placed untreated municipal solid waste (MSW). The "dry tomb" landfilling approach relies on a cover system, to in theory, keep the wastes dry and a liner system (liner and leachate collection and removal system) to collect and remove leachate. The performance of a "dry tomb" landfill depends on the functioning of the cover and of the liner system for as long as the wastes represent a threat.

Review articles on this subject, e.g. Fluet *et al.*, suggest that flexible membrane liner systems of the type being constructed today in municipal solid waste landfills will protect groundwater quality from pollution by landfill leachate. Critical examination of the Fluet *et al.* (1992) review article, however, reveals that they omitted from their discussion whether the liner system will prevent groundwater pollution for as long as the wastes represent a threat to groundwater quality.

The incorporation of liners or liner systems of any kind into landfill designs was born from the knowledge that landfills generate leachate that will pollute the groundwater with which it comes in contact. Therefore, a review of the ability of geosynthetic liner systems to prevent the pollution of groundwater for as long as the wastes represent a threat is the major essential aspect of a review of that technology. In their abstract, Fluet *et al* made observations about the common discrepancy between meeting design guidelines of regulations and the achievement of protection of groundwater quality. The paper itself, however, focused on the design components of a geosynthetic liner "system" without adequate consideration of the realities of the use of such systems in landfill applications and the manner in which such systems will eventually fail to protect groundwater quality. The review should be recognized as missing that critical component.

Presented below is a discussion of key issues that should be considered in evaluating the efficacy of a proposed landfill liner system.

Regulatory requirements

Fluet *et al.* (1992) noted in their abstract regarding regulatory requirements,

> "Regarding regulatory considerations, the paper discusses how liner systems must be selected and designed in conformance with regulatory performance standards in order to ensure long-term protection of the environment, and notes that many American state regulations for municipal waste landfills include minimum design guidelines that may be inadequate to meet the state's performance standards."

Note. This report is an expansion to G. Fred Lee's letter to the Editor published in *Waste Management & Research* 11(1), p. 90, February 1993.

The US EPA October 9, 1991 Subtitle D regulations governing municipal solid waste landfills stated with regard to performance standards,

> "The rule's standard requires that an approved State's program be capable of protecting ground water that is currently used or reasonably expected to be used for drinking water at the relevant point of compliance [i.e., ≤150 m from waste management unit boundary on land owned by the owner of the unit]."

Those regulations also stated,

> "The design must ensure that the concentration values listed in Table 1 of this section will not be exceeded in the uppermost aquifer at the relevant point of compliance . . ."

The US EPA also specified that the landfill liner and cover shall consist of a composite liner, the uppermost component of which must be a 30 mil (7.6 mm) (minimum) flexible membrane liner (FML) and the lower component of which must be at least a 2 ft (0.6 m) layer of soil compacted to achieve a hydraulic conductivity of no more than 1×10^{-7} cm sec^{-1}. If the FML is high density polyethylene, it must be at least 60 mil (15.2 mm) thick. The FML component must also be installed in direct and uniform contact with the compacted soil component.

The state of California Chapter 15 regulations governing municipal solid waste landfills require that the landfill containment system be sufficient to protect groundwater quality for as long as the wastes represent a threat. Lee *et al* (1991) have reviewed the potential threat that municipal solid wastes and their leachates represent to the use of groundwaters for domestic water supply. The following conclusions were evident

- MSW and its leachates contain a wide variety of chemical constituents in high concentrations that can readily render a groundwater and associated aquifer unsuitable for domestic water supply purposes.
- A small amount of MSW leachate can pollute very large amounts of groundwater rendering them unusable for domestic water supply purposes.
- Due to the large amounts of unidentified, unscrutinized, unregulated non-conventional pollutants in MSW leachate, any contamination of a groundwater by MSW leachate should cause the groundwater to be considered unsuitable for domestic water supply use.
- Inorganic salts, heavy metals, non-degradable organics and non degradable organic residues associated with leachate from lined "dry tomb" MSW landfills will represent a threat to groundwater quality indefinitely.
- MSW will be a threat to groundwater quality for as long as it remains buried, and hence engineered groundwater protection systems must function properly forever in order to achieve long-term protection of groundwater quality.

While the US EPA municipal landfill regulations address only a few so called "hazardous chemicals" in groundwater, the state of California requires protection of groundwater quality from all chemicals that can impair its uses. Total dissolved solids (TDS), hardness, alkalinity, chloride, sulfate, etc. present in MSW leachate can readily pollute groundwaters, impairing their use. While the US EPA regulations do not prohibit impairment from those types of pollutants, the state of California regulations do.

The authors agree with the Fluet *et al.* (1992) observation that a geosynthetic or any other type of liner system that is used for municipal solid waste landfills needs to achieve the performance standards set forth by the regulations. At one extreme, in California

that means that the geosynthetic liner system has to provide for the unequivocal protection of groundwater quality for as long as the wastes represent a threat, i.e. forever. Fluet *et al.* (1992) also noted that the minimum design standards in many states are not adequate to achieve the performance standards. California is one such state because of the manner in which the "minimum design standards" requirement is being interpreted. The Chapter 15 regulations explicitly state that the liner (or liner system) must be capable of preventing degradation of the waters of the state, have a permeability equal to or less than 1×10^{-6} cm sec^{-1}, and be of sufficient thickness to prevent vertical migration of fluid (including waste in leachate) to the waters of the state causing degradation.

While the Chapter 15 regulations state that the minimum design standards are whatever is necessary to achieve the performance standard of groundwater quality protection, regulatory agencies have allowed landfill applicants and their consultants to interpret those regulations to mean that a liner design of a 1 ft (0.3 m) layer of soil compacted to achieve a permeability of 1×10^{-6} cm sec^{-1} is the design standard for municipal landfills. It may therefore be concluded that even where the regulations make it clear that the performance standards shall be achieved, the implementation of the regulations at the regional or local level may well not provide that degree of protection envisaged.

In many places there is a current and growing importance of groundwater for domestic supply. Once polluted with municipal landfill leachate, groundwaters and associated aquifers cannot be restored to provide a reliable water supply. It is the authors' view that the performance standards must require protection from impairment of groundwater for as long as the wastes represent a threat. Since some components of the wastes may be a threat forever, by inference the geosynthetic (or other) liner system used in a landfill must be able to perform reliably "forever" as a barrier to leachate migration through it. Any landfill liner system that does not achieve that level of protection is allowing today's society to enjoy garbage disposal for cheaper-than-real cost at the expense, in some locations, of the public health, groundwater resources and economic and other welfare of future generations.

An important observation about such well-intentioned performance standards for municipal landfills is that no material or engineered component can be guaranteed to last forever. This is especially critical for components that are buried beneath hundreds of feet or meters of garbage and/or otherwise not amenable to routine and thorough inspection, repair, and replacement. The authors have seen this dilemma "addressed" in a number of different ways, each inadequate to ensure protection of groundwater resources. Technical issues of claims such as that the wastes and hazards will "degrade," that groundwater monitoring programs will provide advance warning of pollution, that liner systems provide redundancies for protection, that only cap maintenance is of significance to groundwater quality protection, and that only "small amounts" of leachate will leak through modern liner systems, have been addressed elsewhere (Lee *et al.*, 1991, 1992*a*, 1992*b*).

Geosynthetic liner system leakage

There is a myth developing that because a "liner system" contains a number of components, none of the individual components has to be fail-safe to provide protection. In discussing the theme of their paper "the difference between "liners" and "liner systems," Fluet *et al* (1992) noted,

> "In fact, since liners depend solely on their material properties to inhibit flow of fluids through them, it is impossible to construct large scale liners that do not leak. However, this does not mean that landfills must leak, because landfills constructed with liner systems consisting of one or more liner(s) and leachate collection layer(s) can be constructed with de minimis or no leakage. Liner systems are able to succeed where simple liners fail, because, whereas liners depend solely on material properties, liner systems utilize both engineering design and material properties to prevent leakage."

There is a variety of mechanisms by which failure of not only liners but also leachate collection and removal systems will inevitably occur (Lee *et al*., 1992*a*). The integrity of most such systems is governed by the integrity of a synthetic liner, itself imperfect and subject to penetration and deterioration. Clogging of the leachate collection and removal system is another mechanism becoming recognized as problematic in maintaining their performance.

In their discussion of the role of the leachate collection systems in liner system design to "prevent" groundwater pollution, Fluet *et al.* sought to develop an analogy between the design of a landfill liner system and that of a ship's hull. There is at least one very significant difference between a ship's hull design and a landfill liner design, namely that a ship's hull is accessible for and subjected to inspection, maintenance, and repair. Further, even a well-maintained ship does not have to be kept sea worthy forever. A landfill liner is buried under often hundreds of feet (or metres) of solid wastes and cannot be inspected and cannot be repaired without waste exhumation. The landfill liner must function perfectly forever if it is going to prevent groundwater pollution for as long as the wastes represent a threat.

A considerable amount of new information has been published on landfill liner leakage. That information was recently reviewed and summarized by Lee *et al.* (1992*a*). As they pointed out, for example, Bonaparte & Gross (1990) reported,

> "Based on the data in this study, an action leakage rate of 50 lphd [litres per hectare per day] is too restrictive and presents a performance standard that, if promulgated by US EPA, frequently will not be met by facilities that were constructed to present standards with rigorous third-party CQA [Construction Quality Assurance] programs. An action leakage rate of 200 lphd appears to be reasonable for landfills that have been constructed using rigorous third-party CQA programs."

Further, the US EPA (1989) stated,

> "EPA realizes that even with a good construction quality assurance plan, flexible membrane liners (FMLs) will allow some liquid transmission either through water vapor permeation of an intact FML, or through small pinholes or tears in a slightly flawed FML. Leakage rates resulting from these mechanisms can range from less than 1 to 300 gallons per acre per day (gal/acre/day) [9 to 2800 lphd]."

In January 1992, the US EPA released its regulations regarding *de minimis* or "accepted" leakage rates for hazardous waste landfills. There seems to be general agreement that a *de minimis* leakage rate of less than 20 gals/acre/day [200 lphd] would be very difficult to achieve when the liner system is new (US EPA, 1992). US EPA (1992) did not recommend a fixed *de minimis* leakage rate.

Lee *et al.* (1992*a*) pointed out that *de minimis* leakage rates should be based on protection of groundwater quality, not on what can be routinely achieved with a particular existing technology of FML's and compacted soil liner systems. They also discussed the fact that the existing liner system materials were not selected because they have a demonstrated ability to provide groundwater quality protection for as long as wastes represent a threat. Landfills are built with the least expensive materials and

systems that will allow them to be approved by the regulators. A *de minimis* leakage rate should represent a rate of leakage that will not, under any reasonable circumstance, result in groundwater pollution that can impair the uses of the groundwater for domestic or other purposes. The establishment of *de minimis* leakage rates based on the performance of geosynthetic liner systems that can be routinely achieved is technically invalid and highly inappropriate.

It is concluded that leakage of municipal landfill leachate at a rate of 20 gal/acre/day [200 lphd] may pollute millions of gallons of groundwater daily, rendering it and the associated areas of the aquifer unsuitable for domestic water supply. Therefore, the possibility exists that after a geosynthetic liner system is put into service, it may fail to protect groundwater quality from pollution by municipal landfill leachate.

Long-term performance of geosynthetic liner systems

Fluet *et al.* (1992) did not properly address the expectations for long-term performance of FMLs and compacted soil as effective liners, or of the long-term performance of "liner systems." They simply stated in this regard:

> "Geosynthetic liner systems have performed very well and should continue to provide society with a cost effective and safe means of containing waste. The foreseeable dangers lie not with the geosynthetic liner systems but with untrained designers, careless contractors, imprudent operators and unknowledgable regulators. Any of these can result in inappropriate geosynthetic liner systems and the resulting problems reflect poorly on all of us. Let us all commit to designing, installing, operating, and approving the types of geosynthetic liner systems which will reflect well on all concerned and, most importantly, will protect the environment well into the future."

First, the issue is not protection of the environment simply "well into the future." The regulatory, and indeed the groundwater quality protection, requirements are not met by the liner system's working for a while and deteriorating sufficiently to allow widespread pollution. US (federal) requirements do not explicitly specify a performance duration, but they imply that the performance duration has no time limit on it. The state of California regulations are explicit in requiring protection for as long as the wastes represent a threat. Therefore, claiming protection "well into the future" is inadequate.

The ensuing notation of the vulnerability of groundwater quality protection components of landfill systems to "untrained designers, careless contractors, imprudent operators and unknowledgable regulators" expresses a fundamental, and fatal flaw of the "dry tomb" lined landfilling approach. While systems may be able to be conceived that should in theory protect groundwater quality *ad infinitum*, they will always be subject to human error, carelessness, and neglect. If there is vulnerability to these types of human error in the development and operation of a new landfill, they can only be assumed to multiply once the landfill is closed and the landfill company is relieved of responsibility for it or society "forgets" that the area is a landfill. However, even if the design, construction and operation of landfills with geosynthetic liner systems were to be done without error or imperfection, the liner system will, based on the Second Law of Thermodynamics, eventually fail to prevent leakage of leachate to pollute groundwater. Thus, the issues of inadequate design, construction, operation, etc. associated with geosynthetic liner systems, only speak to when groundwater pollution will occur, not to whether it will occur. The less attention to perfection in design, construction, and operation, the earlier it may be expected to fail. Pollution that does not occur for 50 years is as much of concern as pollution that occurs after 5 years.

Key findings on issue of long-term protection

Based on their review of the recent literature, characteristics of municipal solid wastes and their leachates, the characteristics and research on the long term performance of FMLs and compacted soil layers, and other liner system components, Lee *et al.* (1992*a*) drew the following conclusions about the expected performance of geosynthetic liner systems.

- Geomembrane liner systems, including those with composite liners and covers, will typically leak leachate shortly after being placed in service at a rate sufficient to pollute groundwater, impairing its use, and the use of that part of the aquifer, for domestic water supply purposes.
- The leachate retention capabilities of geomembrane liner systems will deteriorate over time, leading to an increase in the rate of leachate migration through the liner and pollution of groundwater with conventional, non-conventional, and hazardous pollutants.
- Geomembrane liner systems cannot be expected to perform indefinitely – i.e. prevent groundwater pollution/for as long as the waste represents a threat to groundwater quality.
- Geosynthetic liner systems are often designed, constructed, and operated at the lowest cost possible. Once a landfill is put into service, there is no opportunity to inspect, repair, or replace system components as they deteriorate or fail. Therefore, the system components must function perfectly.
- The geomembrane liner systems of the type being used today, including those with double-composite liner systems, are a flawed technology that will not provide for groundwater quality protection from pollution by municipal landfill leachate.

Liner reviews, such as the recent work by Fluet *et al.*, should discuss the ability of geosynthetic liner systems of the type they describe to prevent unequivocally groundwater pollution for as long as the wastes represent a threat. Since it is agreed these systems cannot be relied upon to provide that level and duration of protection, they must be considered to be a flawed technological approach. Geomembrane liner systems have not performed well, nor would they be expected to provide the necessary protection of groundwater quality.

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RESEARCHERS INVESTIGATE VAPOR PHASE AS SOURCE OF LANDFILL CONTAMINATION

Investigators are uncovering evidence that may help explain situations where landfills generate small amounts of leachate or where ground water contamination does not closely parallel leachate composition. Traditional studies of contaminants migrating from landfills have focused primarily on leachate transported in the liquid phase to ground or surface waters.

Waste constituents are likely leaving the landfill in the vapor phase in addition to, or in place of, the liquid phase, according to John Ward, a senior hydrogeologist with Hydro Geo Chem Inc. of Tucson, Ariz. He says his studies of this phenomenon at landfills in Arizona and California have produced interesting results.

Ward states that many of these landfills were constructed between the early 1960s and the early 1980s and probably have achieved a steady state with their surroundings. Therefore, sampling ground water or leachate over a short timeframe yields less insight into the mechanisms of contaminant transport than the spatial distribution of the contaminants both in the liquid and vapor phases.

At some sites, soil-gas samples have been collected both within and beneath waste. The results indicate that there was virtual saturation of methane and that levels remained as high as 20 percent saturation at depth. Concentrations of volatile organic compounds in soil gas tended to increase with depth, although there were essentially no VOCs in the landfill gas. These landfills had little to no leachate, but nearby ground water exhibited chemical constituents that could be linked to the landfill.

Ward believes there may be several explanations. The simplest is that VOC leachate left the landfill and moved into nearby ground water. In addition, VOCs may be migrating in the vapor phase upward from ground water, which would make their concentrations higher at the surface of the water table than at the bottom of the fill. Field data did not support this explanation however, Ward adds.

The more likely explanation, he says, has not been studied in detail but seems more consistent with field data. The methane could drive VOCs from the landfill and into surrounding soils, according to Ward. He has seen this occur at an expansion of a landfill, where the liner cut off the methane's escape route and the additional weight appeared to squeeze the gas from the bottom fill, driving VOCs with it.

Researchers at Hydro Geo Chem have modeled the vapor- phase transport process through advection and diffusion simulations, both coupling and decoupling methane. "It's essentially modeling a soil-vapor extraction system in reverse," Ward explains. "When only diffusive transport of VOCs is modeled, it doesn't account for what is seen in the ground water or soil gas."

Model results suggest the data are consistent with long- term vapor-phase migration, both through the landfill surface to the atmosphere and through the vadose zone to the ground water, Ward says. Additional research needs to be completed before it can be applied to the investigation of landfills and their impact on ground water resources, he adds. For more information, call Ward at (800) 727-5547.

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Prospects for Larger or More Frequent Earthquakes in the Los Angeles Metropolitan Region

James F. Dolan,* Kerry Sieh, Thomas K. Rockwell, Robert S. Yeats, John Shaw, John Suppe, Gary J. Huftile, Eldon M. Gath

Far too few moderate earthquakes have occurred within the Los Angeles, California, metropolitan region during the 200-year-long historic period to account for observed strain accumulation, indicating that the historic era represents either a lull between clusters of moderate earthquakes or part of a centuries-long interseismic period between much larger (moment magnitude, M_w 7.2 to 7.6) events. Geologic slip rates and relations between moment magnitude, average coseismic slip, and rupture area show that either of these hypotheses is possible, but that the latter is the more plausible of the two. The average time between M_w 7.2 to 7.6 earthquakes from a combination of six fault systems within the metropolitan area was estimated to be about 140 years.

Californians have long anticipated the recurrence of the "Big One," a great earthquake ($M \sim 8$) emanating from a long section of the San Andreas fault (SAF), such as occurred in 1857 and 1906. Consequently, earthquake hazard assessment and preparedness in southern California has historically focused primarily on the SAF and its various strike-slip branches (Fig. 1) (*1*, *2*). In the past decade, however, several moderate earthquakes have occurred on faults beneath the Los Angeles metropolitan area. Moderate to large earthquakes (M_w 6.5 to 7.5) on these faults could potentially cause even more damage than a much larger earthquake on the more distant SAF. This was dramatically demonstrated by the 1994 M_w 6.7 Northridge earthquake, the second most expensive natural disaster in U.S. history (after Hurricane Andrew) (*3*).

The Los Angeles region is geologically complex, and almost 100 active faults have been identified in the area (*4*–*8*). Because of their size and proximity to major population centers, six major fault systems are of particular concern (*9*–*12*).

1) The Sierra Madre–Cucamonga system extends for 100 km along the northern edge of the densely populated San Fernando and San Gabriel valleys (*13*, *14*). The westernmost 19 km of the north-dipping Sierra Madre fault zone (including the San Fernando fault) ruptured during the 1971 M_w 6.7 Sylmar earthquake, which claimed 64 lives and caused $558 million in damage (1971 dollars; ~$2 billion in 1994 dollars) (*15*).

2) The Los Angeles basin fault system comprises two major blind thrust fault ramps (Elysian Park and Compton ramps) that are connected by a mid-basin flat fault segment (*7*, *16*). The Whittier fault (*17*) and the northern Newport-Inglewood fault zone (*4*, *7*) may represent partitioned strike-slip faults above the blind thrust faults. This system underlies the most densely urbanized part of the region, including downtown Los Angeles.

3) The Santa Monica Mountains fault system, which extends for 90 km from near downtown Los Angeles westward along the Malibu Coast, consists of a large blind thrust ramp and the surficial Hollywood–Santa Monica–Malibu Coast subsystem, which we interpret as a set of predominantly left-lateral strike-slip faults (*4*, *5*, *16*, *18*–*20*).

4) The Oak Ridge fault system is a major south-dipping thrust system that extends for more than 70 km from just east of Ventura to at least the eastern end of the Santa Clarita River Valley (*21*, *22*). A previously unrecognized, blind eastern extension of this system appears to have been responsible for the 17 January 1994 M_w 6.7 Northridge earthquake (*8*).

5) The San Cayetano fault, which dips moderately northward, extends for 40 km along the northern boundary of the oil-rich Ventura basin (*23*). The eastern part of this fault exhibits one of the highest slip rates in the region (7.5 to 10.4 mm year^{-1}) (*23*).

6) The Palos Verdes fault, which is best known from its onshore extent along the northeastern edge of the Palos Verdes Peninsula in the southwestern part of the Los Angeles basin, also extends as a submarine feature for more than 50 km to the south of the peninsula (*24*). Recent studies indicate that the Palos Verdes fault is slipping at a rate of approximately 3 mm year^{-1} (*25*).

The large number of damaging, moderate ($4.8 \leq M_w \leq 6.7$) earthquakes that have occurred in the Los Angeles region

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Operators use piggyback concept to meet regs. (use of piggyback landfill by solid waste managers)

Robert, Jr. Hauser

Federal mandates to close unlined landfills have inspired renewed interest in one innovative concept -- the piggyback landfill.

To site today's landfills, solid waste managers must balance regulatory requirements, public opposition and landfill capacity. The piggyback approach, which constructs a new landfill on top of one that is either closed or scheduled to be closed, can help to meet those needs. Mother configuration is to construct the new landfill adjacent to the closed landfill, using the side slope as part of the new landfill. With both methods, the piggyback landfill allows for vertical and/or horizontal expansion at an already-approved site.

The piggyback landfill's primary advantage is that municipalities can create more landfill space without a rigorous siting process. Also, the expenditure to cap a landfill can be incorporated into the liner system of the piggyback landfill and offset some closure costs. Communities also can avoid hauling expenses for moving MSW to a new, more remote site.

Piggyback landfills may sound ideal in theory, but there are still concerns about building a new landfill on top of existing solid waste. Since the MSW settles as it biodegrades and shifts under the weight of the new waste, the former landfill's instability can threaten the integrity of a new liner system.

Landfill engineers have developed techniques to curtail settlement. Deep dynamic compaction, or dropping a weight to compact the existing waste prior to new construction, reduces the magnitude of future settlement. An earth preload works in a similar manner but relies on the weight of a soil fill. However, both of these alternatives are only effective on compacting materials to a depth of approximately 40 feet, and a deeper, more active landfill may not be adequately compacted.

Injecting slurry grout, a costly but effective technique, fills the voids within a landfill and hardens to strengthen the foundation of new landfills. To improve the sub-grade and to protect the new liner system, the liner can be reinforced with geogrids, which are layers made of various plastics. This support method is helpful to prevent damage from decaying appliances and vehicles. A rusted refrigerator, for example, can cause the liner to dip and put stress on the liner containment system.

A piggyback landfill is not recommended for existing sites with leachate and groundwater contamination problems since it would be difficult to determine if the source of the problem was the old or the new landfill.

Even as engineers develop technology to support piggyback landfills, regulators remain cautious about approving piggyback landfills due to long-term performance uncertainties. As landfill engineers and regulators learn more about landfill settlement and the related issues, piggyback landfills are expected to gain more support.

Long-term monitoring of existing piggyback landfills such as the Blydenburgh landfill, Islip, N.Y., the Brookhaven landfill, Long Island, N.Y., the Oaks sanitary landfill, Montgomery County, Md., and a landfill in St. Lucie County, Fla., that is situated adjacent to a closed landfill and uses its side slope, will determine if piggyback landfills will be viable for the future.

since 1971 has given rise to the perception that this earthquake frequency is typical of the area. In reality, however, few large earthquakes have occurred on faults within the metropolitan region during the two centuries of historic record, the two largest being the M_w 6.7 Northridge and San Fernando events of 1994 and 1971, respectively [25–30].

Geodetic studies indicate a shortening rate across the Transverse Ranges in the greater metropolitan region of approximately 9.5 mm year^{-1} (31). These data suggest that far too few moderate earthquakes have occurred within the region to account for observed strain accumulation, indicating that a deficit of seismic energy release exists in metropolitan southern California (32).

In this article we use reasonable geologic slip rates for the known active faults within the metropolitan area, together with newly determined local relations between moment magnitude (M_w), average coseismic slip, and rupture area, to attempt a quantitative assessment of the potential for future destructive earthquakes from faults within the Los Angeles metropolitan region (12). We compare the rate of historical seismic moment release with longer term rates derived from geologic data to quantify the historical earthquake deficit. We then propose two end-member scenarios. In the first scenario, strain is released in numerous, moderate, Northridge-like earthquakes. In the second, strain is released in less frequent but much larger (M_w 7.2 to 7.6) earthquakes. Geological slip rates allow us to estimate repeat times for earthquakes in each of these scenarios.

Source Parameters

Moment magnitude can be empirically related to known geological parameters, such as rupture area (A) and average co-

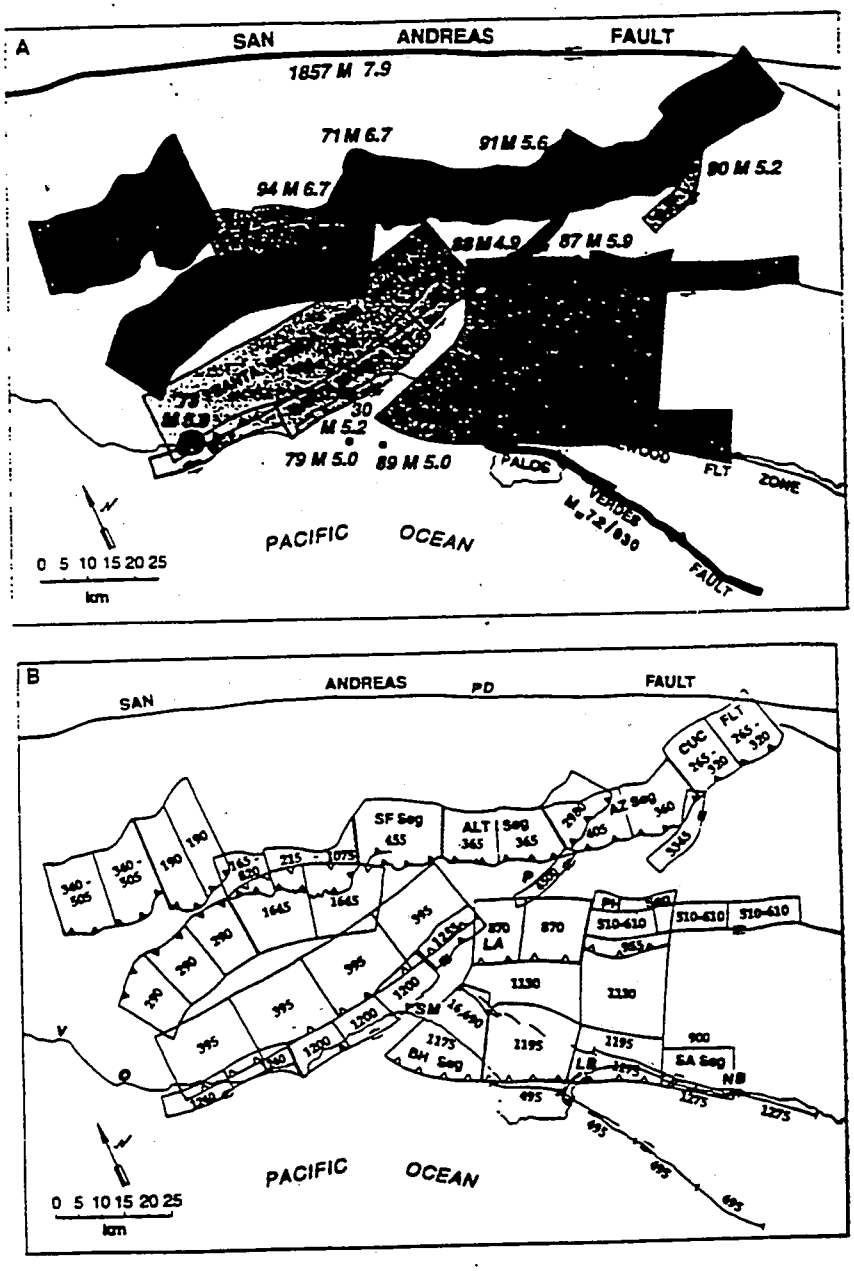


Fig. 1. (A) Historical earthquake ruptures and proposed large earthquake sources within the greater Los Angeles metropolitan area. Black areas denote surface projections of rupture planes of selected moderate historic earthquakes (6, 35–40, 65–67). Date and magnitude (M_w) of each earthquake are also shown. Historic ruptures on vertical strike-slip faults (1857 and 1933 earthquakes) are shown as heavy black lines. Polygons represent map projections of nonvertical fault planes. Thin lines denote near-vertical faults. Intermediate-width lines outline major fault systems that we consider could cause large earthquakes (M_w 7.2 to 7.6). Solid barbs denote thrust faults that break the surface; barbs point downdip. Open barbs represent the upper edge of blind thrust fault ramps; barbs point downdip. Predominantly strike-slip faults are shown by double arrows along the surficial trace of each fault. Maximum credible earthquakes and their average recurrence intervals are shown for each fault system (for example, M_w 7.4/1010 on the Sierra Madre system indicates a recurrence interval of approximately 1010 years for a M_w 7.4 earthquake rupturing the entire system). Comp FLT, Compton fault; C-SF, Clamshell-Sawpit fault; HF, Hollywood fault; MCF, Malibu Coast fault; RF, Raymond fault; SJF, San Jose fault; SSF, Santa Susana fault. (B) Map showing the 51 potential, moderate (M_w 6.5 to 6.9; average M_w 6.7) earthquake sources within the metropolitan region that we used in our moderate-earthquake scenario. The number within each earthquake source area denotes the approximate average recurrence interval (in years) for a moderate earthquake from each source region. In this scenario, for example, the source of the Northridge earthquake produces a M_w 6.7 event every 1645 years. Double lines denote geologically reasonable segment boundaries. ALT Seg, Altadena segment; AZ Seg, Azusa segment; BH Seg, Baldwin Hills segment; CUC FLT, Cucamonga fault; LA, downtown Los Angeles; LB, Long Beach; NB, Newport Beach; O, Oxnard; P, Pasadena; PD, Palmdale; PH Seg, Puente Hills segment; SA Seg, Santa Ana segment; SF Seg, San Fernando segment; SM, Santa Monica; V, Ventura.

seismic displacement over the rupture plane (D). Several compilations of parameters have been published, most of them for a worldwide earthquake data set [for example, (2, 33, 34)]; however, these relations can depend on geographic location and tectonic setting. Therefore, we have constructed new regressions of M_w versus rupture area and average coseismic slip using data from eight well-studied, off–San Andreas southern California earthquakes that have occurred since 1932 (Fig. 2 and Table 1) (35–41). We converted seismic moments (M_o) for the eight earthquakes to M_w using the equation $M_w = (\log M_o - 16.1)/1.5$ (42).

The regression (Fig. 2A) shows that for a given rupture area, M_w for a southern California earthquake will be larger than would be expected from the regressions on worldwide data. The discrepancy is larger for smaller events, ranging from about 0.3 units for $M_w = 5.0$ to about 0.1 units for $M_w = 7.5$.

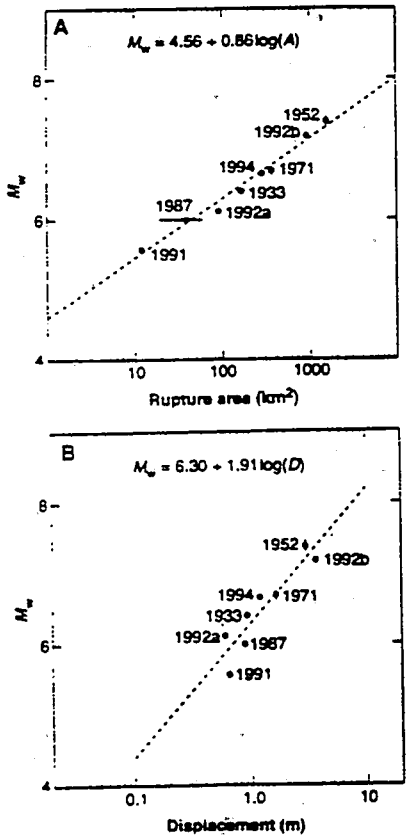


Fig. 2. New regressions for southern California earthquake parameters. (A) Rupture area (square kilometers) plotted as a function of moment magnitude (M_w) for southern California earthquakes (Table 1). Data sources as in (35–40). (B) Moment magnitude versus average slip over the rupture plane for southern California events was determined by solving the equation $M_o = \mu AD$.

From the equation above and the definition of seismic moment, $M_o = \mu AD$, where μ = shear rigidity, we can determine the relation between M_w and D (Fig. 2B) (43). The relation for southern California contrasts markedly with that of the global data (34). Displacements for small southern California earthquakes are larger than would be expected, whereas displacements for large events ($M_w > 7.4$) are smaller than expected.

Geologically Reasonable Scenarios

Recent advances in understanding the active tectonics and structure of the Los Angeles region, particularly the identification of large thrust fault systems beneath the metropolitan area, have led to a more complete understanding of potentially seismogenic faults of the region (5–7). To construct geologically realistic earthquake scenarios based on these data, we used the location, extent, and dip of seismogenic faults, together with the depth of the base of the seismogenic zone as determined from the base of deepest seismicity (44), to determine fault plane area. We then used the new regression equations for southern California earthquakes to determine the moment magnitude and average displacement of postulated earthquakes on each fault (Table 2). The recurrence interval for a particular earthquake is then the average slip estimate for each fault or fault segment divided by the geologically determined slip rate of the fault (45).

Moderate-Earthquake Scenario

One means of quantifying the historical earthquake deficit is to assume that all strain across the region is released uniformly during moderate ($M_w \sim 6.7$) earthquakes (46). For this scenario we determined geologically reasonable segment boundaries for all structures (Fig. 1B) (47). We then arbitrarily divided the segments defined by these boundaries into M_w 6.7–sized subsegments (Fig. 1B). Because subsegment size is ultimately controlled by the geologically defined segments, which are not identical in size, the resulting moderate earthquake sources range from 175 km² (M_w 6.5) to 397 km² (M_w 6.8). This process results in 51 moderate (average M_w 6.7) earthquake sources within the greater Los Angeles metropolitan area (Fig. 1B).

We converted the recurrence interval (RI) for each source into an expected earthquake frequency (f), such that $f = 1/RI$. Taking the inverse of the sum of the frequencies for all 51 sources yields an average expected repeat time for M_w 6.7 earthquakes of about 11 years, assuming that all strain across the region is accommodated in such events. Uniform release of strain in M_w 6.7 earthquakes thus requires that between 13 and 17 moderate earthquakes should have occurred during the historic period. Only two such events have been recorded (26, 27), indicating that there is a historical deficit of 11 to 15 M_w 6.7 earthquakes. Fifteen M_w 6.7 earthquakes correspond to a cumulative stored seismic moment of 2.12×10^{27} dyne cm, which is equivalent to a M_w 7.5 earthquake.

Large-Earthquake Scenario

In this scenario, we assumed that all strain across the Los Angeles region is released during large (M_w 7.2 to 7.6) earthquakes and that each of the six major fault systems described in the introduction fails in its own characteristic earthquake (48). For the four single-fault systems (Sierra Madre–Cucamonga, Oak Ridge, San Cayetano, and Palos Verdes), we used the total area of each fault to calculate a moment magnitude, which we then used to calculate the average coseismic slip for each earthquake (Table 2).

The two remaining large fault systems (Santa Monica Mountains and Los Angeles basin) involve multiple faults with varying slip rates and slip directions (49). Unlike the four single-fault systems, strain is partitioned on the Santa Monica Mountains and Los Angeles basin systems such that dip-slip

Table 1. Parameters for historical southern California earthquakes (35–40).

Earthquake	M_o	M_w	Rupture area (km²) min–max (avg)	Average slip (cm)
1933 Long Beach	5×10^{25}	6.40	150–180 (165)	84–101
1952 Kern County	1×10^{27}	7.29	1450–1625 (1540)	196–400
	1.9×10^{27}	7.45		
	2.0×10^{27}	7.47		
1971 San Fernando	1.0×10^{26}	6.60	360	87–143
	1.7×10^{26}	6.75		
1987 Whittier Narrows	1.0×10^{25}	6.00	20–60 (40)	34–142
1991 Sierra Madre	2.8×10^{24}	5.57	12	65
1992a Joshua Tree	1.9×10^{25}	6.12	90	60
1992b Landers	7.5×10^{26}	7.18	910	330–404
1994 Northridge	1.2×10^{26}	6.65	280	119

motion is accommodated along the blind thrust faults, and strike-slip motion is accommodated along the surficial strike-slip faults. Therefore, we treated these different subsystems independently and calculated sizes and recurrence intervals for earthquakes occurring on each of these individual structures. Adding the moments of these individual subevents yields the overall size of the maximum credible earthquake on each system (50).

Our calculations indicate (Fig. 1A) the following: (i) The Sierra Madre–Cucamonga system is capable of producing a M_w 7.4 earthquake approximately every 980 to 1040 years. (ii) Rupture of the Santa Monica Mountains blind thrust fault would produce a M_w 7.2 earthquake about every 740 years, whereas the Hollywood–Santa Monica–Malibu Coast fault system could independently produce a M_w 7.3 earthquake approximately every 2195 to 3290 years. If these subsystems were to rupture together, they would generate a M_w 7.5 earthquake. (iii) If only the blind thrust faults of the Los Angeles basin system were to rupture, they would produce a M_w 7.5 earthquake about every 2845 years. The Whittier fault is capable of independently producing a M_w 7.1 earthquake about every 840 to 1005 years. If the Whittier fault and the blind thrust faults were to rupture together, they could produce a M_w 7.6 earthquake. Although it is possible that the northern Newport-Inglewood (N-I) fault could rupture together with both the blind thrust faults and the Whittier fault, the extremely long recurrence interval that we calculate for the N-I fault indicates that this would be a very rare event. (iv) The Oak Ridge system is capable of generating a M_w 7.3 earthquake approximately every 1010 years. (v) Rupture of the entire San Cayetano fault would produce a M_w 7.2 earthquake every 455 to 545 years. (vi) The Palos Verdes fault could generate a M_w 7.2 earthquake approximately every 925 years.

The collective average recurrence interval for the seven large (M_w 7.2 to 7.5) earthquakes that we propose on these six systems is about 140 years (51), a return time comparable with that of $M \sim 7.8$ to 7.9 earthquakes on the San Andreas fault (52, 53). Within the Los Angeles region the historic record, which for M_w 7.2 to 7.6 earthquakes is probably complete as far back as the early 1780s (26, 27), is devoid of such large earthquakes. Thus, it has been at least 210 years since the most recent large earthquake in the Los Angeles region, a time interval that is longer than the average recurrence interval that we calculated for large earthquakes.

The two scenarios discussed above represent reasonable end-member possibilities for strain release. However, the actual means of strain release within the Los Angeles region is undoubtedly more complex, with some combination of moderate and large earthquakes (Table 2). Hough (54), for example, suggests a fractal distribution of earthquakes in which most seismic moment release is concentrated in infrequent, large events.

Table 2. Parameters for large scenario earthquakes rupturing entire fault systems and for intermediate-sized earthquakes rupturing parts of fault systems. N/D, not determined.

Fault	Rupture area (km²)	M_o (10^{26})	M_w	Average slip (m)	Slip rate (mm year^{-1})	Recurrence interval (years)	Depth (km)	Dip
Sierra Madre–Cucamonga	2220	18.0	7.4	3.94	3.8–4.0	980–1040		
Sierra Madre	1500	10.9	7.3	3.30	4.1	805		
Azusa segment	615	3.4	7.0	2.21	4.25	520	0–16	55°N
Altadena segment	490	2.6	6.9	1.99	4.0	500	0–16	55°N
San Fernando segment	400	2.0	6.8	1.82	4.0	455	0–16	50°N
Cucamonga	480	2.5	6.9	1.98	4.5–5.5	360–440	0–16	50°N
Clamshell-Sawpit	240	1.0	6.6	1.45	0.5	2890	0–16	57°NW
Oak Ridge	1370	9.7	7.3	3.17	3.1	1010		
East segment	635	3.6	7.0	2.25	1.0	2245	8–19 (E) to 0–20 (W)	45°S
West segment	730	4.3	7.0	2.39	5.0	480	0–20	55°S
Santa Monica Mountains	2655	22.8	7.5	N/D	N/D	N/D		
(blind thrust = HF-SMF-MCF)								
Santa Monica Mtns. thrust	1170	7.9	7.2	2.95	4.0	740	14.3–19.5	20°N
HF-SMF-MCF	1485	10.8	7.3	3.29	1.0–1.5	2190–3290		
Hollywood	260	1.1	6.6	1.50	1.0–1.5	1005–1505	0–17	70°N
Santa Monica	715	4.2	7.0	2.36	1.0–1.5	1575–2365	0–17	65°N
Malibu Coast	510	2.7	6.9	2.03	1.0–1.5	1355–2035	0–17	75°N
San Cayetano	1095	7.2	7.2	2.87	5.3–6.3	455–545		
East segment	470	2.4	6.9	1.96	7.5	260	0–20	40°N
West segment	625	3.5	7.0	2.23	3.6–5.4	415–620	0–20	50°N
Los Angeles basin	3110	30.7	7.6	N/D	N/D	N/D		
(blind thrusts + Whittier flt)								
Blind thrust system only	2220	21.4	7.5	3.94	1.5	2605		
Elysian Park thrust	815	5.0	7.1	2.51	1.7	1475	10.5–16	22°NE
Los Angeles segment	505	2.7	6.9	2.02	1.7	1190		
Puente Hills segment	310	1.4	6.7	1.62	1.7	955		
Mid-basin flat	610	3.4	7.0	2.20	1.4	1575	10.5	0°
Compton thrust	1105	7.3	7.2	2.88	1.4	2055	5.5–10.5	23°NE
Baldwin Hills segment	320	1.5	6.7	1.54	1.4	1180		
central segment	660	3.8	7.0	2.29	1.4	1635		
Santa Ana segment	175	0.68	6.5	1.26	1.4			
Whittier	815	5.0	7.1	2.51	2.5–3.0	840–1005	0–16	70°NE
Newport-Inglewood (north)	330	1.5	6.7	1.67	<0.1	>16,690	0–9	74°NE
Palos Verdes	1030	6.7	7.2	2.78	3.0	930	0–16	90°
Santa Susana	545	3.0	6.9	2.09	1.6–8.0	260–1310	0–16	60°N
Raymond	325	1.5	6.7	1.66	0.4	4500	0–16	80°NE
San Jose	330	1.6	6.7	1.67	0.5	3345	0–16	75°NE
Newport-Inglewood (south)	815	5.0	7.1	2.51	1.2	2095	0–16	90°

Implications for Seismic Hazards

These scenarios indicate that there is a marked deficit in moment release in the greater Los Angeles metropolitan area during the 200-year historic period; geologic fault slip rates and geodetic shortening rates show that we have had far too few earthquakes to account for strain accumulation. There are three possible explanations for this observation. (i) A significant portion of strain is released aseismically. (ii) Most of the strain is released in moderate earthquakes. (iii) Much, or most, of the strain is released in much larger earthquakes (M_w 7.2 to 7.6) with longer recurrence intervals.

There is no evidence that any significant aseismic fault creep occurs within the brittle, upper crust of the Los Angeles metropolitan region. If aseismic creep were occurring, we would expect to see abundant microseismicity on major thrust fault ramps as well as extensive disruption of built structures where they lie atop surficial faults or the traces of active folding above blind thrust faults (55). Neither phenomenon has been observed in the metropolitan area. If no significant fault creep occurs in the region, then fault slip must be accommodated during earthquakes.

If all strain release occurs during moderate, M_w 6.7 earthquakes, then the historic period must represent a lull between clusters of such earthquakes. The average 11-year recurrence interval for M_w 6.7 earthquakes on the 51 sources we have defined predicts that 17 such events should have occurred during the past 195 years, but we have experienced only two such events. Elsewhere in the world, temporal and spatial clusters of destructive earthquakes have been observed at decade-long time scales along both thrust faults (for example, Coalinga–Kettleman Hills, California, 1982–85) and strike-slip faults (for example, North Anatolian fault, Turkey, 1939–44) (56). Therefore, we cannot rule out the possibility that much of the accumulated strain in the Los Angeles metropolitan region could be released by a cluster of moderate earthquakes. Given the level of damage from the Northridge earthquake, such a sequence would certainly strain the ability of the region (and the nation) to absorb the resultant losses.

Paleoseismologic data are too sparse and incomplete to tell us when the most recent large earthquake occurred in the Los Angeles area. However, data from several faults suggest that large earthquakes may indeed have occurred in the region. For example, recurrence interval data from excavations across the Santa Monica, Hollywood, and Malibu Coast faults indicate that these faults have ruptured during Holocene time, but that the most recent surface-rupturing earthquakes occurred several thousand years ago (19, 20). Furthermore, average recurrence intervals for the Santa Monica and Malibu Coast faults determined during trench studies (19) are approximately 3000 to 5000 years, far longer than would be expected if these faults ruptured individually (Table 2). Similarly, occurrence of the most recent surface-rupturing earthquake on the Hollywood fault more than 2000 to 4000 years ago (20) indicates a much longer period than would be expected if the Hollywood fault ruptured by itself during moderate earthquakes (Table 2). These data, although not definitive, suggest that the surficial faults of the Hollywood–Santa Monica–Malibu Coast system rupture in conjunction either with each other or with other faults. The Santa Monica Mountains blind thrust fault, which may be mechanically linked to the surficial faults at depth, may well rupture with these surficial faults during large earthquakes.

Similarly, paleoseismologic data from the Whittier fault suggest that this fault has ruptured in combination with other faults in the past. These data reveal a recurrence interval of approximately 1700 years for surface-rupturing earthquakes (17), considerably longer than the repeat time of 875 to 1050 years that we calculate for a M_w 7.1 earthquake generated by rupture of only the Whittier fault (Table 2). The Whittier fault may rupture together with either the northern Elsinore fault (57) or the Elysian Park blind thrust (7).

These data indicate that events such as those proposed in our large-earthquake scenario (M_w 7.2 to 7.6) may have occurred in the Los Angeles metropolitan region in the past and may recur in the future. Similar tectonic regimes elsewhere in the world have produced thrust- and reverse-fault earthquakes of this size [for example, 1944 San Juan, Argentina, surface wave magnitude (M_s) 7.4; 1952 Kern County, California, M_w 7.4; 1964 Niigata, Japan, M_w 7.5; 1977 Caucete, Argentina, M_w 7.4; 1978 Tabas-e-Golshan, Iran, M_w 7.4; 1980 El Asnam, Algeria, M 7.3; 1988 Spitak, Armenia, M_w 6.9; and 1992 Suusamyr, Kyrgyzstan, M_w 7.4] (58).

We conclude that faults within the Los Angeles region are capable of generating earthquakes in the range of M_w 7.2 to 7.6. Documented examples of long-term earthquake clustering (52, 59) indicate that we could well be in the middle of a centuries-long quiescent period. However, it has been at least 210 years since such an event has occurred in the region, indicating that we are within the expected average recurrence time for an earthquake of this size, as determined by our model. The effects of such a large earthquake would be substantially different from the recent, moderate Northridge earthquake in several important respects. Specifically, a large earthquake would cause strong ground shaking over a much larger area and would have a much longer duration. Given the potentially devastating effects such a large earthquake would have on life and property in the region, we believe that Los Angeles must consider the potential for such an event in future planning scenarios.

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9. We define a fault system as a set of faults that are closely linked both geographically and kinematically and which therefore might plausibly rupture together in the Los Angeles region, partitioning of oblique slip into parallel strike-slip and thrust faults occurs on several of the large fault systems in metropolitan southern California. For example, at depth the steeply dipping Whittier fault probably interacts with the Puente Hills segment of the Elysian Park thrust system, and the moderately to steeply dipping Hollywood–Santa Monica–Malibu Coast fault (HF-SMF-MCF) system must interact with the Santa Monica Mountains blind thrust fault. We hypothesize that the surficial faults accommodate the strike-slip component along these two oblique-slip systems—right-lateral in the case of the Whittier fault; left-lateral in the case of the HF-SMF-MCF system—whereas the contractional component of motion along the system is accommodated by folding and movement along the blind thrust ramps.
10. Some active fault systems have been generalized. (For example, the Elysian Park thrust system in East Los Angeles is shown as a single fault rather than as an imbricate thrust stack; known east-trending faults in this system are not used. The Verdugo Hills fault system is assumed to be part of the Sierra Madre fault zone.) Furthermore, some active faults have been intentionally omitted, either because they are (i) too poorly known [for example, (60)], (ii) too small to produce moderate earthquakes by themselves [for example, (61)], or (iii) characterized by complex slip behavior [for example, (62)]. At our present level of understanding, such generalizations and omissions are appropriate. Finally, it is possible that we have not yet identified all active faults in the region. Given the uncertainties, we tried to be conservative. The overall effect of our source and slip rate characterization is to produce a probable underestimate of the rate of strain accumulation across the Los Angeles metropolitan region.
11. The southern Newport-Inglewood (N-I) fault system, as modeled in this study, is capable of producing a M_w 7.1 earthquake. However, we arbitrarily truncated the fault at the southeastern boundary of our study area. The fault system probably continues all the way to San Diego and thus may be capable of an earthquake considerably larger than M_w 7.1. Within the metropolitan region, we distinguished the northern and southern N-I fault zones on the basis of a marked northward decrease in slip rate (7) and a pronounced change in structural style (4) at the north end of the 1933 earthquake rupture zone. We hy-

pothesize that this structural transition is caused by a northward transfer of slip westward off the N-I fault zone onto northwest-trending contractional structures and, possibly, the northern part of the Palos Verdes fault.

12. We do not consider the San Andreas and San Jacinto faults in this study.
13. R. Crook *et al.*, *U.S. Geol. Surv. Prof. Pap.* **1339**, 27 (1987).
14. D. Morton and J. Matti, *ibid.*, p. 179.
15. B. Kamb *et al.*, *ibid.* 733, 41 (1971); R. Kachadoorian, *ibid.*, p. 5.
16. The Elysian Park thrust system was originally defined as a northeast- to north-dipping blind thrust fault extending from Orange County in the southeast, through downtown Los Angeles, and westward beneath the Santa Monica Mountains along the Malibu coast to Point Mugu (5). However, our geomorphologic analysis indicates that this zone of contractional deformation actually comprises two distinct thrust fault systems, an east-west–trending thrust ramp beneath the Santa Monica Mountains that we refer to as the Santa Monica Mountains thrust fault, and a west-northwest–trending system that extends from the Elysian Park Hills northwest of Los Angeles through downtown and East Los Angeles (Los Angeles segment) and southeastward beneath the Puente Hills (Puente Hills segment) (7). Specifically, the N85E-trending eastern Santa Monica Mountains, which have developed above the Santa Monica Mountains blind thrust fault, form a well-defined, distinct topographic entity that extends for more than 5 km to the east of southwest-dipping, N65W-striking Miocene-Pliocene strata [T. Dibblee, *Geologic Map of Hollywood-Burbank (South 1/2) Quadrangle DF-30* (Dibblee Geological Foundation, Santa Barbara, CA, 1991)] that have been deformed above the northwest-striking Elysian Park thrust ramp in the Elysian Park Hills. Because of their geographic association with the Elysian Park Hills, we retain the name Elysian Park thrust fault for the Los Angeles and Puente Hills segments of the blind thrust ramp.
17. T. Rockwell *et al.*, *Geol. Soc. Am. Abstr. Programs* 20, 224 (1988); E. Gath *et al.*, *Geol. Soc. Am. Abstr. Programs Cordilleran Sect.* 24, 26 (1992).
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24. J. Vedder *et al.*, *Geologic Map of Mid-Southern California Continental Margin (Map 2A), California Continental Margin Geologic Map Series (area 2 of 7, map sheet 1 of 4)*, H. Greene and M. Kennedy, Eds. (U.S. Geological Survey, Menlo Park, CA, and California Division of Mines and Geology, Sacramento, CA, 1986), 1:250,000.
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27. D. Agnew, in *Environmental Perils, San Diego Region*, P. Abbott and W. Elliott, Eds. (San Diego Association of Geology, San Diego, CA, 1991), pp. 75–82.
28. Large, historic earthquakes on the San Andreas fault (for example, 5 December 1812 and 9 January 1857) are not included in our analysis.
29. A large earthquake (M 7?) on 21 December 1812 damaged mission buildings in Santa Barbara and the western Transverse Ranges and produced a small tsunami. This event is not included in our scenario because all researchers place its position in the Santa Barbara Channel, well to the west of the western limit of our study area (26). We have also excluded the moderate earthquake of 11 July 1855 (M 6?), which damaged structures at Los Angeles and Mission San Gabriel (13 km east-northeast of Los Angeles). Although this event almost certainly occurred beneath what is now metropolitan Los Angeles, it was probably smaller than our M_w 6.7–scenario earthquakes (26).
30. Record keeping in southern California began with the establishment of Spanish missions during the late 1770s to early 1780s (26, 27). The early part of the record is of variable quality, particularly from 1832 to 1848 (27), but is certainly complete for Northridge–sized events since 1850, and is probably complete at that level since 1800 (27). The record for larger events ($M_w \geq 7.2$) is probably complete for the region since the earliest mission records (27).
31. For simplicity we divided the 155-km-wide metropolitan region into western, central, and eastern segments. We then used a weighted average of these rates to determine an average shortening rate across the region of 8.5 mm year^{-1}. In the west, geodetic data across the Ventura basin reveal extremely rapid north-south shortening of approximately 8.5 ± 1 mm year^{-1} (63). This rate does not include the Santa Monica Mountains fault system. A. Donnellan *et al.* [*J. Geophys. Res.* **98**, 21727 (1993)] reported a 1 ± 2 mm year^{-1} shortening rate between Oat Mountain along the southern edge of the Ventura basin and Castro Peak in the western Santa Monica Mountains. Although this rate does not account for all shortening across the Santa Monica Mountains system, the geographic position of Castro Peak above the upper part of the Santa Monica Mountains blind thrust ramp indicates that the rate probably includes part of the motion. Measurements from Mount Pinos just south of the San Andreas fault to Castro Peak yield an overall shortening rate across the region of 11 ± 2 mm year^{-1} (63). On the basis of these data we used an average shortening rate for the western region of 10 mm year^{-1}. The shortening rate across the central Los Angeles region is provided by geodetic measurements across the Los Angeles basin from the Jet Propulsion Laboratory (JPL) in Pasadena to the Palos Verdes Peninsula (PV). There is some debate about the shortening rate, with estimates ranging from 5 mm year^{-1} (64) to 7.9 mm year^{-1} [K. Hudnut *et al.*, *Seismol. Res. Lett.* **65**, 59 (abstr.) (1994)]. These rates probably slightly underestimate shortening within the metropolitan region because the measurements only include part of the region of elastic strain accumulation associated with the faults we used in our scenarios: JPL is located in the middle of the Sierra Madre fault zone and the PV site is adjacent to the Palos Verdes fault. An overall Transverse Ranges shortening rate of 13 ± 2 mm year^{-1} (calculated with the San Andreas fault component removed) determined from north of the San Andreas fault near Bakersfield to Santa Catalina Island south of PV (64) indicates significant shortening on faults outside the metropolitan area. For the central part of the region we used a shortening rate of 10 mm year^{-1}. In the east the only fault included in our study area is the Sierra Madre–Cucamonga system, for which we used a geologically defined slip rate of 4.5 to 5.5 mm year^{-1} on the Cucamonga fault, which dips approximately 50° (14). Converting this slip rate into a shortening rate yields 2.9 to 3.5 mm year^{-1}. The Cucamonga fault is 35 km long (14). A shortening rate of 10 mm year^{-1} for the remaining 120-km length of the area results in an overall shortening rate across the metropolitan region of approximately 8.5 mm year^{-1}.
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41. Our regression is specific to southern California and uses recent estimates of rupture area and average coseismic slip derived from modeling strong motion, teleseismic, and geodetic data. Because we attempted to model earthquakes within the Los Angeles metropolitan region, we used only earthquakes where the seismogenic crust is likely to be similar. Therefore, we did not use earthquakes from the southern San Jacinto and Salton Trough areas (for example, the 1968 Borrego Mountains, 1987 Elmore Ranch, and 1987 Superstition Hills earthquakes) because heat flow in this region is considerably higher than in the Los Angeles metropolitan area. Consequently, crustal rheology (and presumably earthquake behavior) is probably significantly different than in the Los Angeles metropolitan region, where heat flow is relatively low.
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43. Crustal shear rigidity increases markedly downward in the uppermost 5 km of the Earth's crust [see, for example, (37)], leading to different values for earthquakes that rupture to the surface versus earthquakes that rupture only the lower part of the seismogenic zone (that is, >5 km depth). We have taken this into account in using the seismic moment equation to calculate average slip per event for the eight earthquakes that we used for our southern California regressions. For earthquakes that only ruptured below 5 km depth (1987 Whittier Narrows, 1991 Sierra Madre, and 1994 Northridge), we used a value of 3.6 × 10^{11} dyne cm^{-2} whereas for the 1992 Landers earthquake, which ruptured to the surface, we used an overall rigidity of 3.0 × 10^{11} dyne cm^{-2}. For the 1933 Long Beach and 1952 Kern County earthquakes, which ruptured to within a few kilometers of the Earth's surface, we used intermediate values of 3.3 × 10^{11} dyne cm^{-2} and 3.45 × 10^{11} dyne cm^{-2}, respectively. Although one of the two faults that ruptured during the 1971 San Fernando earthquake did rupture the surface, the other fault only ruptured to within about 4 km of the surface (36). We therefore used an intermediate value of 3.3 × 10^{11} dyne cm^{-2} for this earthquake.
44. The base of recent seismicity over much of the metropolitan region is approximately 15 to 16 km (6). However, the 1994 Northridge mainshock originated at 19 km (3), and earthquakes in the northwestern part of the metropolitan area in the Ventura basin extend as deep as 20 to 24 km [A. Bryant and L. Jones, *J. Geophys. Res.* **97**, 437 (1992)], where the base of the brittle upper crust has been bowed down by rapid convergence and sediment loading (22).
45. Slip rates used in this study vary widely in quality. Extensive geologic studies constrain the slip rates for the surficial Whittier, Palos Verdes, Cucamonga, San Cayetano, western Oak Ridge faults, and the Elysian Park and Compton blind thrust faults (7, 14, 17,

21–23, 25). Slip rates on the Santa Monica Mountains thrust fault and the eastern Oak Ridge system are based on balanced section modeling assuming late Pliocene fault initiation (5, 15). Slip rates for some other faults (Sierra Madre fault and southern Newport-Inglewood fault zone) have been extrapolated along the strike from well-determined slip rates determined elsewhere on those fault systems [(14), T. Rockwell *et al.*, in *Environmental Perils, San Diego Region*, P. Abbott and W. Elliott, Eds. (San Diego Association of Geologists, San Diego, CA, 1991), pp. 37–46; S. Lindvall and T. Rockwell, in preparation]. We used the range of geological maximum and minimum slip rates for the Santa Susana fault (G. Huftile and R. Yeats, unpublished data). The Raymond fault slip rate was calculated by assuming that the known recurrence interval (4500 years) (13) records M_w 6.7 events that rupture the entire fault with 1.7 m of slip in each event (Table 2). Forty-seven meters of uplift of the 125,000 oxygen isotope stage 5e marine terrace along the Santa Monica fault (SMF; L. McGill, *U.S. Geol. Surv. Misc. Invest. Ser. Map I-1822* (1989)) indicates a dip-slip rate of approximately 0.5 mm year^{-1}. The SMF, however, exhibits a significant, if not predominant, component of strike-slip motion (J. Dolan *et al.*, *Eos* 73, 589 (abstr., 1992)). Therefore, we assumed a conservative overall slip rate of 1 to 1.5 mm year^{-1}. We extrapolated this rate to the adjacent Hollywood and Malibu Coast faults, for which slip rates are not available. Slip rates for the Clamshell-Sawpit and San Jose faults are unknown. We assumed 0.5 mm year^{-1} to be a reasonable slip rate for these faults on the basis of their geomorphic expression and the recent occurrence of moderate earthquakes on these faults (1988 and 1990 Upland and 1991 Sierra Madre) (38, 39, 65).

45. We used M_w 6.7 earthquakes as a convenient size for an average moderate earthquake because the Los Angeles area has recently experienced two such earthquakes, the 1971 San Fernando and 1994 Northridge earthquakes, which were nearly identical in size (Table 1) (36, 40). There are several additional reasons for using earthquakes of this size. The level of damage caused by these earthquakes is well understood, making M_w 6.7 a useful size for planning purposes. Furthermore, residents of the Los Angeles region know what these earthquakes felt like and will readily be able to understand such a scenario. Finally, M_w 6.7 is approximately the smallest sized earthquake that we can reasonably propose to accommodate all seismically released strain; a scenario based on smaller events (for example, M_w 6.0) would result in implausibly short repeat times.

47. The role of "geologically reasonable" segment boundaries in controlling the ultimate size of an earthquake rupture is very poorly understood, but these boundaries represent a useful starting point for our models. For surficial faults we defined segment boundaries on the basis of pronounced breaks in surficial fault traces, intersections with other active faults, and edges of historical earthquake ruptures. For blind thrust faults we used lateral ramps defined by discontinuities in overlying fold trends (9) and major along-strike changes in geomorphology above blind thrust fault ramps.

48. We cannot rule out the possibility that even larger earthquakes could occur within the metropolitan region. For example, if the Sierra Madre–Cucamonga fault system ruptured together with the Santa Susana and San Cayetano faults, they would produce a M_w 7.64 earthquake. Similarly, the Sierra Madre–Cucamonga system could conceivably rupture coseismically with the San Andreas fault in a *M* 8 earthquake. However, these scenarios require rupture of multiple large fault systems, which, though possible, we consider unlikely.

49. The variability of slip directions on different faults within these strain-partitioned systems precludes simply adding the areas of the faults to calculate the overall moment magnitude of a systemwide earthquake. Rather, we calculated the moment magnitude of subevents occurring on faults that exhibit similar slip directions. For example, we calculated moment magnitudes for two different subevents on the Santa Monica Mountains system: one on the blind thrust ramp and one on the HF-SMF-MCF strike-slip fault system. We then added these to obtain the overall moment magnitude of the systemwide earthquake (M_w 7.5). The variability in coseismic slip direction on the different faults also prevents us from calculating the overall average coseismic slip. Furthermore, because the multiple faults exhibit differing slip rates, we cannot calculate a simple overall average slip rate across the entire system. Consequently, we cannot calculate a recurrence interval for systemwide earthquakes on the Santa Monica Mountains and Los Angeles basin systems.

50. Coseismic rupture of both strike-slip and thrust faults has been observed in a number of large earthquakes worldwide (for example, 1932 Chang Ma, China, M 7.6; 1957 Gobi-Altai, Mongolia, M_s 8.0; 1967 Mogod, Mongolia, M 7.8; and 1988 Spitak, Armenia, M 6.9).

51. We used seven large earthquakes on the six sources because both the blind thrust and strike-slip subsystems of the Santa Monica Mountains system are capable of producing earthquakes of $M_w \geq 7.2$. For the Los Angeles basin system we used an earthquake that ruptures only the blind thrust faults.

52. K. Sieh *et al.*, *J. Geophys. Res.* **94**, 603 (1989).

53. L. Grant and K. Sieh, *ibid.* **99**, 6819 (1993); T. Fumal *et al.*, *Science* **84**, 2348 (1993).

54. S. Hough, *Science* **267**, 211 (1994).

55. Two lines of reasoning indicate to us that no aseismic fault creep is occurring along blind thrusts in the region. (i) Because slip on surficial faults is generally concentrated along discrete zones only a few centimeters to a few meters wide, evidence for fault creep in the form of broken roads, sidewalks, pipelines, and oil wells would be obvious, even with relatively slow slip rates. Recent research of growth strata has shown that near-surface deformation above blind thrust faults is similarly discrete, generally encompassing zones less than 10 to 20 m wide (7). Thus, as with surficial faults, fault creep along blind thrust faults would leave obvious traces in any structures built atop an active fold axial surface. No such deformation has been observed. (ii) Blind thrust ramps in the metropolitan region are not slipping aseismically. The term aseismic fault slip is somewhat of a misnomer, as the fault is not actually slipping without causing earthquakes. Rather, slip along such faults is accommodated by minute motions during many thousands of microearthquakes. Creeping faults are only aseismic with respect to moderate and large earthquakes. The creeping segment of the San Andreas fault in central California is a good example. During historic time this section of the fault has not produced any large earthquakes, but it is characterized by the occurrence of thousands of small earthquakes [D. Hill *et al.*, *U.S. Geol. Surv. Prof. Pap.* 1515, 115 (1990)]. The greater Los Angeles metropolitan area is one of the most densely instrumented regions in the world, and microearthquakes $M < 2.0$ are routinely recorded and located by the Southern California Seismographic Network. If any of the blind thrust faults were creeping aseismically, then we would expect them to be highlighted by clouds of thousands of microearthquakes. In fact, Los Angeles area blind thrust ramps are characterized by an almost total absence of microearthquakes, below even the background level in the area. This absence of microseismicity suggests to us that thrust ramps are locked and accumulating strain. Furthermore, all evidence that we have about the relation between maximum faulting depth and the base of seismicity determined from microearthquake studies indicates that earthquakes in the Los Angeles region either rupture down to the base of microseismicity or extend even deeper than the maximum depth of microseismicity. For example, before the Northridge earthquake, most researchers in the region would have predicted the expected maximum depth of earthquake rupture at the base of microseismicity, or about 15 to 16 km (44); The Northridge earthquake, however, ruptured to 20 km depth (3).

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57. T. Rockwell *et al.*, in *Neotectonics and Faulting in Southern California, Geological Society of America Guidebook and Volume*, R. Ehlig, Ed. (Cordilleran Section of the Geological Society of America, Los Angeles, CA, 1986), pp. 167–176; T. Rockwell, in *U.S. Geol. Surv. Open-File Rep. 87-673* (1987), pp. 129–135.

58. R. Smalley *et al.*, *Tectonics* **12**, 63 (1993); K. Satake and K. Abe, *J. Phys. Earth* **31**, 217 (1983); Y. Okamura *et al.*, *J. Seismol. Soc. Jpn. Second Ser.* **46**, 413 (1994); T. Kawasumi, Ed., *General Report on the Niigata Earthquake of 1964* (Tokyo Electrical Engineering College Press, Tokyo, 1973); K. Kadinsky-Cade *et al.*, *J. Geophys. Res.* **90**, 12691 (1985); M. Berberian, *Bull. Seismol. Soc. Am.* **69**, 1861 (1979); S. Hartzell and C. Mendoza, *ibid.* **81**, 305 (1991); G. King and C. Vita-Finzi, *Nature* **292**, 22 (1981); H. Philip *et al.*, *Geophys. J. Int.* **110**, 141 (1992); H. Haessler *et al.*, *ibid.* **109**, 151 (1992); G. Plafker and S. Ward, *Tectonics* **11**, 709 (1992); R. Mellors *et al.*, *Eos* **74**, 398 (abstr.) (1993).

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60. Some of the more prominent faults that have been omitted are the blind thrust fault system beneath Santa Monica Bay, source of the 1930, 1979, and 1989 earthquakes (Fig. 1A) (*6, 66*); the probable southeastern continuation of the Elysian Park blind thrust fault beneath the Santa Ana mountains (7), known east-west–trending blind thrust faults in East Los Angeles, including the fault responsible for the 1987 Whittier Narrows earthquake; and the possible northern extension of the Palos Verdes fault in Santa Monica Bay (24).

61. One of the more prominent faults that has been omitted is the Wilshire fault [C. Hummon *et al.*, *Geology* **22**, 291 (1994)].

62. One of the faults that has been omitted is the San Gabriel fault, which apparently exhibits oblique right-lateral–reverse motion in the northwest [W. Cotton *et al.*, *U.S. Geol. Surv. Final Tech. Rep.* (1988); R. Yeats *et al.*, *Am. Assoc. Pet. Geol. Bull.* **78**, 1040 (1994)], but may exhibit oblique left-lateral–reverse motion in the southeast [F. Weber, "Geologic and Geomorphic Investigation of the San Gabriel Fault Zone, Los Angeles and Ventura Counties, California," Calif. Div. Mines Geol. Annu. Tech. Rep. 1977–78 (1979)].

63. A. Donnellan *et al.*, *Nature* **366**, 333 (1993).

64. K. Feigl *et al.*, *J. Geophys. Res.* **98**, 21677 (1993).

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66. E. Hauksson and G. Saldivar, *Bull. Seismol. Soc. Am.* **76**, 1542 (1986).

67. L. Jones *et al.*, *ibid.* **80**, 474 (1990); D. Sherman and W. Ellsworth, *ibid.* **66**, 1931 (1976).

68. We thank D. Agnew, A. Donnellan, T. Heaton, S. Hough, R. Stein, D. Wald, and T. Wallace for helpful discussions. We also thank S. Hough, D. Jackson, and S. Wesnousky for thoughtful reviews. This research was supported by grants from the California Department of Transportation, the City of Los Angeles, the County of Los Angeles, NSF Cooperative Agreement EAR-89-20136, and USGS Cooperative Agreement 14-08-0001-89-A0899, all administered by the SCEC. SCEC contribution #119.

quake research. For conventional fixed-base buildings, design practice has advanced incrementally as earthquakes occur and lessons are learned. The weakness in this approach is that we have yet to learn the lessons from a very large ($M_w > 7$) earthquake directly beneath an urban area. This is particularly true for tall buildings that are vulnerable to large ground displacements, both for damage and possible collapse.

Designs of base-isolated buildings are based on site-specific ground motions that should account for near-source effects. However, the ground motions presented here are large compared to those currently used for design at sites close to major California faults, and the strongest of our ground motions require exceptional measures for the isolation system to maintain functionality of the building. The practicality of such a goal in the near-source region of a $M_w \geq 7.0$ earthquake is uncertain. Although the focus of this paper is modern buildings, an even greater hazard lies in structures built before modern codes, especially unreinforced or nominally retrofitted brick buildings and nonductile concrete buildings.

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Earthquakes in the Los Angeles Metropolitan Region: A Possible Fractal Distribution of Rupture Size

S. E. Hough

Although there is debate on the maximum size of earthquake that is possible on any of several known fault systems in the greater Los Angeles metropolitan region, it is reasonable to assume that the distribution of earthquakes will follow a fractal distribution of rupture areas. For this assumption and an overall slip-rate for the region of approximately 1 centimeter per year, roughly one magnitude 7.4 to 7.5 event is expected to occur every 245 to 325 years. A model in which the earthquake distribution is fractal predicts that, additionally, there should be approximately six events in the range of magnitude 6.6 in this same span of time, a higher rate than has occurred in the historic record.

In recent years, geologic and geodetic investigations have made possible the evaluation of the earthquake potential for the greater Los Angeles metropolitan region, an area of about 160 km by 100 km (*1*, *2*). By evaluating available geologic and geodetic data for the total region, Dolan *et al.* (*1*) argue that 0.9 to 1.2 cm/year of slip will occur over the distribution of known and unknown faults in the region.

A report by the scientists of the Southern California Earthquake Center (SCEC) has shown that the long-term geodetic deformation rate cannot be accounted for by a continuation of the historic seismic record and has proposed three alternatives: (i) that significant aseismic slip occurs; (ii) that moderate earthquakes [that is, around magnitude (M) 6] must occur significantly more frequently than they did during the historic record; or (iii) that infrequent very large events will occur (*3*).

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In general, it is difficult to determine a priori whether a given fault system will rupture all at once, as occurred during the M 7.3 Landers earthquake in 1992 (*4*), or in isolated segments, as in 1994 during the M 6.7 Northridge earthquake (*5*). In the evaluation of seismic hazard, the distribution of expected earthquakes is critical. It is reasonable to conjecture that the long-term distribution of earthquake rupture areas will be fractal. Studies have shown that the distribution of segmentation of known fault lengths is fractal (*6*) and that the well-known log-normal distribution of earthquake magnitudes is also essentially consistent with this hypothesis (*7*). Although it has been proposed that individual fault segments will not produce a fractal distribution of events (*8*), it is commonly assumed that earthquake release in a region with numerous faults will occur by events with a log-normal distribution of magnitudes, with a maximum event size imposed for each region (*9*).

Dolan *et al.* (*1*) have focused on interpretation of an earthquake budget derived from a synthesis of geologic slip rate data estimated in recent years for Los Angeles area faults. They show that the geologic and geodetic results are generally consistent and contrast two "end-member" scenarios to make up their established earthquake budget: one in which all strain is released by moderate (~*M* 6.7) events, and one in which all moment release occurs during large earthquakes (roughly M 7.2 to 7.6). In this paper, we present a hybrid model similar to that used in the SCEC studies (*8*), allowing a fractal distribution of rupture sizes. We focus on determining the expected rate of moderate and large earthquakes in the greater Los Angeles metropolitan region given the known activity over the historical period, the best available compilation of geologic data, and the most plausible model for the distribution of earthquake rupture.

We first consider the expected rate of seismic moment accrual across the Southern California region, starting with the equation for seismic moment

$$M_o = \mu A d \qquad (1)$$

where μ is the rigidity, A is the rupture area, and d is the slip. For a rectangular fault, $A = WL$, where W is the fault width and L is the fault length. If slip of 0.9 to 1.2 cm/year occurs over a region 160 km wide down to an average seismogenic depth of 17.5 km, the total moment accrual rate dM_o/dt is 7.6×10^{24} to 10.1×10^{24} dyne·cm/year, for a nominal crustal rigidity.

Dolan *et al.* (*1*) showed that recent moderate to large earthquakes located off of the San Andreas fault are well fit by the relation

$$M_w = 4.56 + 0.86\log(A) \qquad (2)$$

where A is in square kilometers and M_w is the moment magnitude, related to seismic moment (*10*) by

$$\log M_o = 1.5M_w + 16.1 \qquad (3)$$

Equation 2 can be combined with the log-normal distribution of seismicity

$$\log N_c = a - bM \qquad (4)$$

to constrain the fractal distribution of rupture areas; N_c is the cumulative number of events with magnitude above M, and a and b are constants (b is the seismic "b-value"). Using M_w as the magnitude in Eq. 4 and assuming a b-value of 1, we find

$$\log N_A = c - 0.86\log(A) \qquad (5)$$

where N_A is the cumulative number of events above area A and c is a constant.

To illustrate how a fractal distribution will fill out a given earthquake budget, we consider a discrete distribution of events. For every occurrence of an earthquake with the maximum rupture area, the coefficient of 0.86 in Eq. 5 predicts that there will be 6.2 events with 1/10 the maximum area [that is, $(10^{0.86} - 1)$], 46 events with 1/100 the area, and so forth.

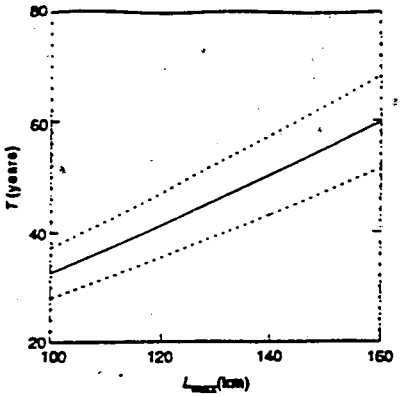


Fig. 1. Average repeat time for moderate events as a function of maximum rupture length L_{max}. Dashed lines indicate results corresponding to an overall slip rate range of 0.9 to 1.2 cm/year; solid line corresponds to the average value. The sizes of the moderate events range from *M* 6.49 for L_{max} = 100 km to *M* 6.67 for L_{max} = 160 km.

If we define $M_{w,1}$ to be the moment of the largest event expected in the region, $M_{w,2}$ to be the moment of the event with a rupture length 1/10 that of $M_{w,1}$, and so forth, the total seismic moment is

$$M_{w,total} = M_{w,1} + 6.2M_{w,2} + 46M_{w,3} + \ldots \qquad (6)$$

To evaluate the relative contributions of the terms of Eq. 6, we must determine how M_w scales with rupture area. For a model with constant stress drop and circular rupture, moment is predicted to scale as radius cubed. For earthquakes that rupture the width of the seismogenic zone, previously determined scaling relations predict that M_w depends on L^2 (*11*).

Combining Eqs. 2 and 3, we obtain a direct empirical relation between moment and area for Southern California earthquakes: $\log M_o = 1.29\log(A) + 22.94$. We thus predict that moment will decrease by a factor of about 20, corresponding to a factor of 10 decrease in rupture area. Because Eq. 2 is generally appropriate for $M_w > 6.0$ and because progressively smaller moments will decrease significantly faster with decreasing rupture size, we consider only the first two terms in Eq. 6. Estimating $M_{w,2}/M_{w,1}$ from Eqs. 2 and 3, we find

$$M_{w,total} = 1.32M_{w,1} \qquad (7)$$

That is, a fractal distribution of rupture lengths implies that most of the total moment release will have to occur in the largest events.

If we define time T_m to be the repeat time of $M_{w,1}$

$$T_m = \frac{1.32M_{w,1}}{(dM_o/dt)} \qquad (8)$$

where dM_o/dt is the moment accrual rate determined above and $M_{w,1}$ is controlled primarily by L_{max}. From Eq. 8 and a given $M_{w,1}$, we can estimate a range of T_m values corresponding to the estimated range of dM_o/dt. We can thus estimate a long-term average estimate of T_m, although it is important to note that periodicity of large events is neither implied nor required by our model.

If L_{max} is assumed to be 100 km, Eqs. 1 to 7 indicate that the maximum moment magnitude $M_{w,1}$ is 7.35, occurring on average every 174 to 231 years (the range in values reflects the overall slip rate range of 0.9 to 1.2 cm/year). The average T_m is 203 years. Unless the historic record for the region is significantly nonrepresentative of the long-term rate, this range of repeat times (and the corresponding rate of moderate-sized events, discussed below) is implausibly low. With our model, one of the few ways that T_m can increase is to allow a longer L_{max}. Assuming a value of 130 km (*12*), we obtain a maximum $M_{w,1}$ of 7.45, with T_m = 245 to 325 years and an average of 284 years.

For the assumed fractal distribution, we predict that for every occurrence of $M_{w,1}$, there will be 6.2 events with rupture areas 1/10 as big. By Eq. 2, and for L_{max} of 130 km, this corresponds to about six events with M 6.6 in the time T_m, yielding an average repeat time of 46 years. For L_{max} = 100 km, we find an average repeat time of 33 years for M 6.5 events, again somewhat implausible considering the historic record. In Fig. 1, we present the average repeat time for moderate events (M 6.5 to 6.7) as a function of L_{max}. An additional consideration, however, is that aftershock distributions are also characterized by log-normal distributions; perhaps 10 to 15% of the smaller events could thus be taken up by aftershocks of the largest events.

If L_{max} is 160 km, $M_{w,1}$ is 7.53 and the average repeat time is 372 years. The average repeat time of M_w = 6.7 events is then 60 years. This is a plausible but not our preferred model because it requires a rupture length comparable to the entire dimension of the Los Angeles region.

The analysis presented here is very simple; in reality, a continuous range of earthquake magnitudes is expected in a fractal distribution. However, our calculations illustrate the fundamental results of combining the total earthquake budget for the greater Los Angeles region with a physically plausible earthquake distribution. Most of the moment release is expected to be taken up by infrequent but extremely large events. Moderate events, with magnitudes similar to that of the recent (17 January 1994)

Northridge earthquake, are also expected, with an average repeat time of 40 to 52 years. The historic record of M 6.5 to 6.7 events in the Los Angeles Basin is still under the long-term predicted rate, even allowing for occasional large events.

Uncertainty in our results stems from three primary factors: the overall slip rate for the region, the maximum rupture size, and the effective fractal dimension implied by our choice of *b*-value and scaling coefficient in Eq. 2. (We do not consider the prima facie assumption of a fractal distribution to be at issue.) The first source of uncertainty is accounted for directly: Our results correspond to the range of slip rates determined from geologic and geodetic compilations (*1*, *2*). The second factor is also addressed: Maximum rupture lengths shorter than 100 km are discounted because of the unrealistically frequent rate of moderate events that is implied. We do not consider the third factor to be significant because of the nature of fractal distributions and earthquake scaling relations: A scaling constant of 1 instead of 0.86 (that is, a strictly self-similar distribution of rupture areas) in Eq. 2 would change Eq. 6 to $M_{o,total} = 1.45M_{o,1}$. This change would increase T_m by about 9% and increase the number of moderate events (M_w 6.6) from about six to nine.

Our calculations are independent of the known details of faulting and slip rates on individual faults in the region, as summarized by Dolan *et al.* (*1*). Their results can be compared to ours: The six multiple-fault-segment scenarios yield events with M_w 7.20 to 7.58, produced, on average, every 140 years. This value is about half of our preferred estimate but is not inconsistent with our results because 70 to 80% of the geologically determined scenario earthquakes have M_w = 7.2 to 7.3 (*14*). Also, the fractal analysis permits a fraction of the moment rate, approximately 30%, to be accounted for by moderate events.

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15. I thank S. Ward, J. Vidale, S. Wesnousky, and an anonymous reviewer for their constructive reviews; I especially thank J. Dolan and K. Sieh for many helpful discussions.

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Rapid Accretion and Early Differentiation of Mars Indicated by $^{142}Nd/^{144}Nd$ in SNC Meteorites

Charles L. Harper Jr.,* Laurence E. Nyquist, Brij Bansal, Henry Wiesmann, Chi-Yu Shih

Small differences in the ratio of neodymium-142 to neodymium-144 in early formed mantle reservoirs in planetary bodies are the result of in situ decay of the extinct radionuclide samarium-146 and can be used to constrain early planetary differentiation and therefore the time scale of planetary accretion. The martian meteorite Nakhla (~1.3 billion years old), the type sample of the nakhlite subgroup of the Shergottite-Nakhlite-Chassigny (SNC) meteorites, exhibits a 59 ± 13 parts per million excess in the ratio of neodymium-142 to neodymium-144 relative to normal neodymium. This anomaly records differentiation in the martian mantle before 4539 million years ago and implies that Mars experienced no giant impacts at any time later than 27 million years after the origin of the solar system.

Planets in the inner solar system are widely believed to have accreted from an initial swarm of planetesimals by hierarchical coagulation, which involves the merging of objects of increasing size until only a small number of large objects remain in each radial zone (*1*). According to this view, the late stages of planetary accretion are dominated by a few giant impacts. The spins of both Earth and Mars are consistent with one or more of these events during accretion (*2*). Giant impacts generate transient, mantle-wide magma oceans, and therefore the histories of the terrestrial planets are expected to have begun with an epoch of giant impacts and magma oceans. However, the durations for these accretionary epochs are unknown. Estimates from planetesimal coagulation models are generically uncertain at late times and fundamental issues remain unresolved, so isotopic age determinations are needed to constrain accretion and giant impact time scales directly.

The presence of a small but significant abundance of ^{146}Sm (which decays by α emission to ^{142}Nd with a half-life of 103 million years) in the early solar system provides a means for dating early episodes of differentiation in planetary bodies based on the preservation of isotopic signatures at depth in mantle reservoirs (*3*). The ^{146}Sm-^{142}Nd system is ideal for dating differentiation episodes in the silicate portions of planets because other large-scale cosmochemical processes such as volatile depletion or core formation do not fractionate Sm/Nd and because this system can be linked to the long-lived ^{147}Sm-^{143}Nd system. Because the initial solar system abundance of ^{146}Sm was small [$^{146}Sm/^{144}Sm$ = 0.0080 ± 0.0010 at 4566 million years ago (Ma) (*4*)] and the range of Sm/Nd fractionation in large-scale reservoirs is limited, $^{142}Nd/^{144}Nd$ shifts resulting from ^{146}Sm decay are generally expected to be less than one part in 10^4 (= 1 ε-unit). Use of the ^{146}Sm-^{142}Nd systematics therefore requires accurate determination of $^{142}Nd/^{144}Nd$ shifts at a resolution of better than 20 ppm (±0.2 ε-unit) relative to a reference standard. We report well-resolved ^{142}Nd shifts in SNC meteorites and outline their significance for the early history of Mars (*5*), which is where these meteorites are thought to have been derived (*6*).

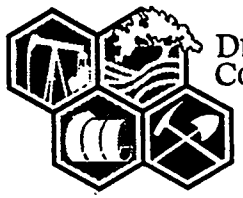
Identification of a ^{142}Nd anomaly in a

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SPECIAL PUBLICATION 117

GUIDELINES FOR EVALUATING AND MITIGATING SEISMIC HAZARDS IN CALIFORNIA

1997



DEPARTMENT OF CONSERVATION
Division of Mines and Geology

EXH. 13

THE RESOURCES AGENCY
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CHAPTER 3

OVERVIEW OF INVESTIGATIONS FOR ASSESSING SEISMIC HAZARDS

Introduction

Investigation of potential seismic hazards at a site can be performed in two steps or stages: (1) a preliminary screening investigation, and (2) a quantitative evaluation of the seismic hazard potential and its consequences. As noted below, it is possible to successfully complete the investigation by skipping one or the other stage. For example, a consultant's screening investigation may find that a previous site-specific investigation, on or adjacent to the project site, has shown that no seismic hazards exist, and that a quantitative evaluation is not necessary. Conversely, a consultant may know from experience that a project site is susceptible to a given hazard, and may opt to forego the screening investigation and start with a quantitative evaluation of the hazard.

Some lead agency reviewers recommend that for large projects the developer's consultant(s) meet with the lead agency technical reviewer prior to the start of the site investigation. This allows the consultant and technical reviewer to discuss the scope of the investigation. Topics of this discussion may include the area to be investigated for various hazards, the acceptability of investigative techniques to be used, on-site inspection requirements, or other local requirements.

Items to Consider in the Site Investigation Study

The following concepts are provided to help focus the site-investigation report:

1. Consultants are encouraged to utilize, if possible, the latest California Department of Conservation, Division of Mines and Geology (DMG) seismic ground-motion parameter data. This information is available in DMG's Seismic Hazard Evaluation Reports. The hazard zone mapping procedure for liquefaction and earthquake-induced landsliding utilizes state-of-the-art probabilistic ground-motion parameters developed jointly by the DMG and the U.S. Geological Survey, and published by the DMG (Petersen and others, 1996).

2. The fact that a site lies within a mapped zone of required investigation does not necessarily indicate that a hazard requiring mitigation is present. Instead, it indicates that regional (that is, not site-specific) information suggests that the probability of a hazard requiring mitigation is great enough to warrant a site-specific investigation. However, the

EXH. 11

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Engineering Observations on Ground Motion at the Van Norman Complex after the 1994 Northridge Earthquake

by J. P. Bardet and C. Davis

Abstract During the 1994 Northridge earthquake, the Van Norman Complex yielded an unprecedented number of recordings with high acceleration, in the close proximity of the fault rupture. These strong-motion recordings exhibited the pulses of the main event. One station recorded the largest velocity ever instrumentally recorded (177 cm/sec), resulting from a 0.86 *g* peak acceleration with a low frequency. Throughout the complex, the horizontal accelerations reached peak values ranging from 0.56 to 1.0 *g*, except for the complex center, where the peak acceleration did not exceed 0.43 *g*. The vertical acceleration reached maximum peak values comparable with those of the horizontal acceleration. The acceleration response spectra in the longitudinal and transverse directions were significantly different. Such a difference, which is not yet well documented in the field of geotechnical earthquake engineering, indicates that the amplitude and frequency content of the ground motion was directionally dependent in the Van Norman Complex.

Introduction

The Van Norman Complex (VNC) is an engineering facility that supplies a large and critical amount of water and power to the city of Los Angeles. In the past 23 years, the VNC was shaken by two moderate M_w 6.7 earthquakes. On 9 February 1971, it was struck by the San Fernando earthquake, which originated on the San Fernando Fault, 11 km northeast of the complex (USGS/SCEC, 1994). Although the ground motions in 1971 were only partially recorded (Scott, 1973), the VNC provided geotechnical engineers with one of the first well-documented cases of near-field dynamic response of two earth dams—the Upper and Lower San Fernando Dams. On 17 January 1994, the VNC was again shaken by the Northridge earthquake, which occurred on a previously unknown blind thrust fault, 11 km southwest of the complex (USGS/SCEC, 1994). Since 1971, the VNC has been instrumented with strong-motion accelerographs, in view of its numerous critical facilities close to active faults. In 1994, these instruments provided us with a unique set of strong-motion recordings with maximum peak accelerations reaching 1 *g*.

This article reports on the strong-motion recordings at the VNC after the 1994 Northridge earthquake and discusses their relevance from a geotechnical engineering point of view. This study is part of a research program that aims at understanding the ground displacements observed in the complex after the 1994 Northridge earthquake. The measured effects of these strong motions on the VNC geotechnical structures are described not in this article but in the articles of Bardet and Davis (1995a, 1995b) and Davis and Bardet (1994, 1995a, 1995b, 1995c).

The Van Norman Complex

The VNC is one of the most important sites owned and operated by the Los Angeles Department of Water and Power (LADWP). As shown in Figure 1, it is located in the northern San Fernando Valley along Interstate 5 between the 405 and 210 interchanges, approximately 11 km north of the 17 January 1994 Northridge earthquake epicenter. The VNC serves as a terminal for the First and Second Los Angeles Aqueducts. It receives, treats, stores, and distributes 80% of the annual water supply for the city of Los Angeles. Figure 2 shows the location of important geotechnical structures within the VNC, which include the Los Angeles Reservoir with the Los Angeles Dam and the North Dike, the LAA Filtration Plant, the Van Norman Bypass Reservoir, the Upper and Lower San Fernando Dams, the Backwash Reclamation ponds, several debris basins with their retaining dams, and finally, major pipelines and trunklines. The VNC also encompasses major power facilities, such as the Rinaldi Receiving Station, a critical link in maintaining an adequate power supply for the city of Los Angeles; the Sylmar Converter station; and the San Fernando Power Plant. The Jensen Filtration Plant, which is operated by the Metropolitan Water District (MWD), is located to the northwest of the VNC.

The 1994 Northridge Earthquake

The Northridge earthquake occurred at 4:31 a.m. (Pacific standard time) on 17 January 1994, with a moment magnitude of 6.7 (Trifunac *et al.*, 1994; USGS/SCEC, 1994).

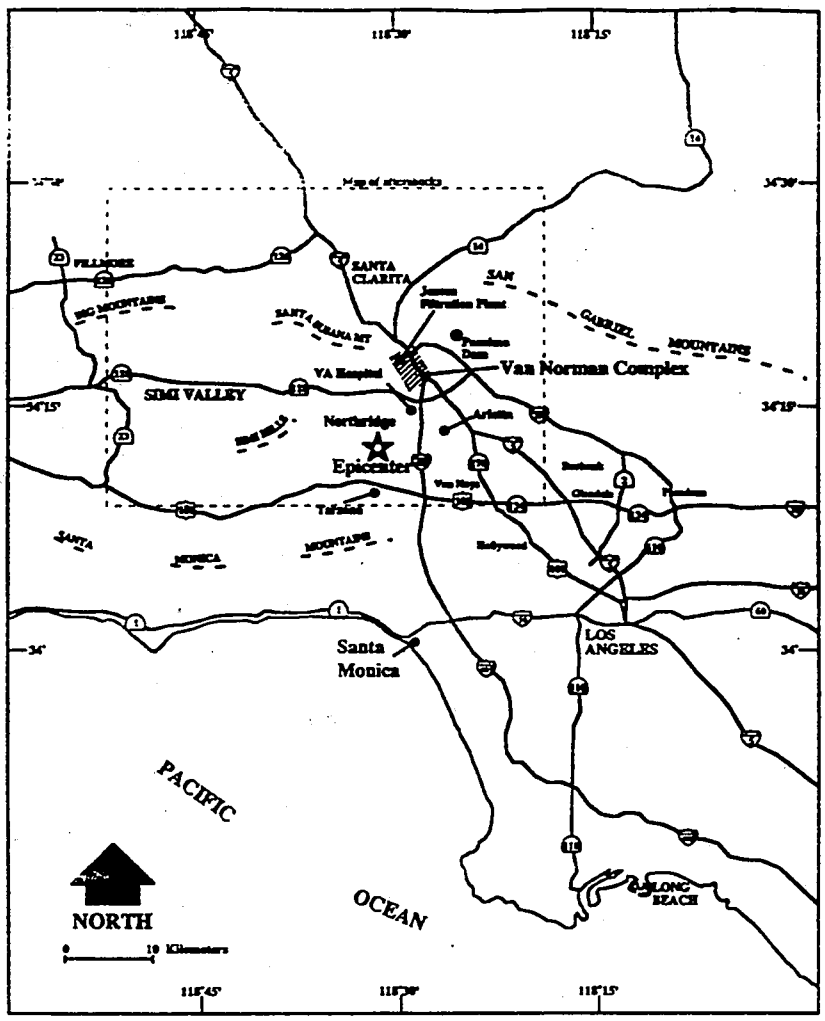


Figure 1. View of Los Angeles area and location of Van Norman Complex.

The main release of energy occurred on a previously unmapped blind thrust fault (USGS/SCEC, 1994), which strikes at approximately 70° N to 80° W and dips to the south under the San Fernando Valley at approximately 35° to 45°. The hypocenter was located at 34.211° N, 118.537° W at a depth of 18.5 km (Wald and Heaton, 1994). It took about 7 sec for the fault to rupture over a 280-km² area, which generated 6 to 10 sec of strong shaking.

Figure 3 shows a plan view of the fault plane, and the epicenters of the mainshock and aftershocks from 17 January through 29 June 1994. During the main event, two distinct subevents, with a possible third subevent, have been identified (Wald and Heaton, 1994; and USGS/SCEC, 1994). The first subevent originated at a depth of 18.5 km, began propagating to the north, then curved to the north-northeast, directly toward the VNC. The rupture during the first subevent ended at approximately a depth of 10 km, nearly underneath the VNC. The second, and longer, subevent began approximately 2 to 3 sec after initiation of the first subevent, and at about 8 km northwest, along strike, from the hypocenter. The rupture during the second event ended at approximately a depth of 7 to 8 km under the Santa Susana Mountains. These two main ruptures had comparable total slip, although the second one produced the largest maximum slip (approximately 3.9 m).

The VNC is located above the fault plane, at its northern boundary, and in line with the northerly direction of fault rupture. The VNC was also struck by many nearby aftershocks. As shown in Figure 3, the aftershocks were densely spaced beneath the VNC. Figure 4 shows the depth distribution of the aftershocks that occurred in the rectangular area along section AA′ of Figure 3, which is centered on the VNC and aligned perpendicular to the strike of the fault plane. The aftershocks occur within a narrow band delineating the 35° to 45° southern dip of the fault plane below a depth of 7 km. The large number of aftershocks beneath the VNC suggests that this area of the fault plane did not fully rupture during the initial energy release. Studies indicate that aftershocks concentrate around the area of large fault slip in regions that are stressed by the mainshock faulting (e.g., Mendoza and Hartzell, 1988). Hereafter, we only report the mainshock and omit the aftershocks.

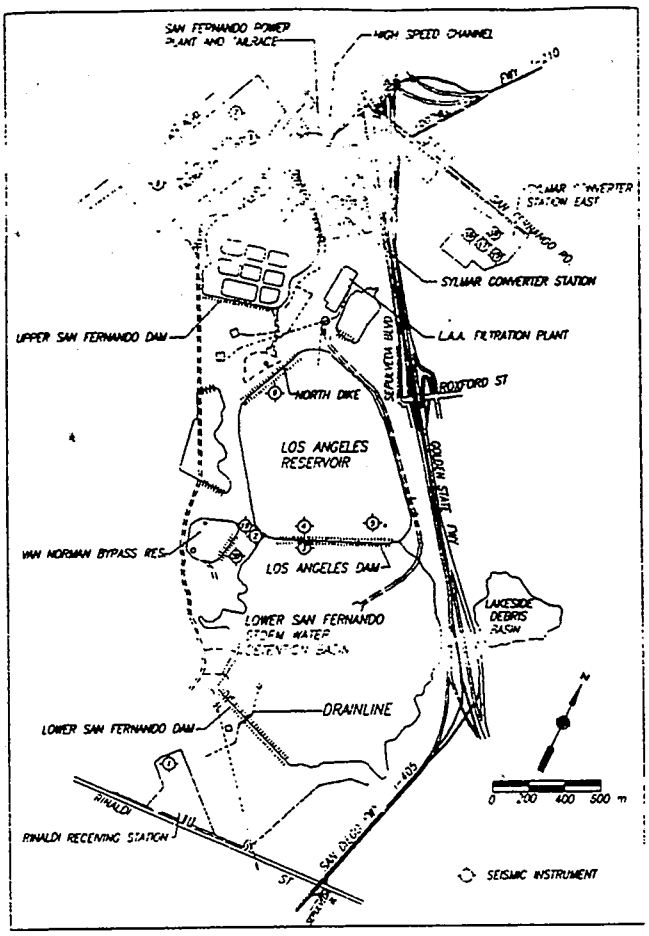


Figure 2. Van Norman Complex, its main structures and location of seismic stations.

Strong-Motion Recordings in the Van Norman Complex

Trifunac *et al.* (1994) estimated that the uncorrected peak ground accelerations reached 1 *g* in a 150-km² area just north of the epicenter and was larger than 0.5 *g* in a 450-km² area about the epicenter. Severe ground motions were also recorded in small isolated areas, 25 km to the south and southeast of the epicenter, due to local site amplification. The Tarzana Station, 6 km south of the epicenter, yielded one of the largest ground accelerations: 1.82 *g* horizontal and 1.18 *g* vertical. However, this particular recording strongly contrasts with that of LADWP, located only 2 km southeast at Encino Reservoir, which recorded 0.22 *g* horizontal and 0.15 *g* vertical.

The Northridge Earthquake produced an unprecedented number of near-source strong-motion recordings from various origins: California Division of Mines and Geology (CDMG), U.S. Geological Survey (USGS), University of Southern California (USC), LADWP (Lindvall Richter Benuska Associates, 1994), and Southern California Edison (Edison). A list of recordings, except for those of LADWP and Edison, can be found in Shakal *et al.* (1994), Porcella *et al.* (1994), and Trifunac *et al.* (1994). Table 1 lists only the recordings that were obtained by LADWP and USGS in the area covered by Figure 2. As shown in Figure 2, the VNC area has a dense array of seismic instruments with 20 recording stations. A total of 19 stations, including 17 accelerographs and 2 seismoscopes, recorded the mainshock. Station 14 failed to function during the mainshock but resumed working during the aftershocks. Of the triggered accelerographs, nine stations recorded free-field responses, five stations structural responses, and three stations embankment dam responses. As shown in Figure 2 and Table 1, free-field peak horizontal accelerations of 0.84, 1.0, and 0.90 *g* were recorded at the south, northwest, and northeast ends of the VNC, respectively. Free-field peak vertical accelerations at the same locations were recorded at 0.85, 0.52, and 0.64 *g*, respectively.

Attenuation of Peak Acceleration with Distance

Figures 5 and 6 show the attenuations of peak ground accelerations, in the VNC and other locations, with epicentral distance. The epicentral distance is defined as the distance separating the epicenter and the recording station. Different symbols are used to distinguish the recordings on alluvium and bedrock and those of the VNC. These geological distinctions were provided by Porcella *et al.* (1994), Trifunac *et al.* (1994), and Boore (1994). The stations with unknown geological conditions are listed as undefined.

The LADWP recordings are all located between 10 and 13 km from the epicenter. There are only five recordings, besides those of LADWP, that are closer to the epicenter. As shown in Figure 5, the attenuation curve of Trifunac *et al.* (1994), which is based on the attenuation relationship of Trifunac (1976), fits the maximum component of peak horizontal accelerations relatively well, although it was conceived to fit both horizontal components. However, this attenuation curve underpredicts horizontal accelerations beyond 40 km from the epicenter. As shown in Figure 6, the attenuation curve of Trifunac *et al.* (1994) also predicts the recorded peak vertical accelerations relatively well in the range 15 to 40 km but underpredicts them outside this range.

The peak accelerations of the VNC vary rapidly (over 3.5 times) over a short distance (2 km). The horizontal accelerations are 0.43 and 0.32 *g*, and the vertical values are 0.32 and 0.13 *g* at stations 2 and 3, respectively. These values contrast sharply with the horizontal values of 0.84 and 1.0 *g*, and the vertical values of 0.85 and 0.79*g* at stations 1 and 7, which are 1 km to the south and 1 km to the north of stations 2 and 3, respectively.

As shown in Figures 5 and 6, the VNC recordings are in agreement with those obtained by CDMG, USGS, and USC and are a useful complement to the existing data set of strong-motion recordings in the near-source region.

Figure 7 compares the maximum peak vertical and horizontal accelerations recorded at the VNC and other locations. As shown in Figure 7, maximum peak vertical accel-

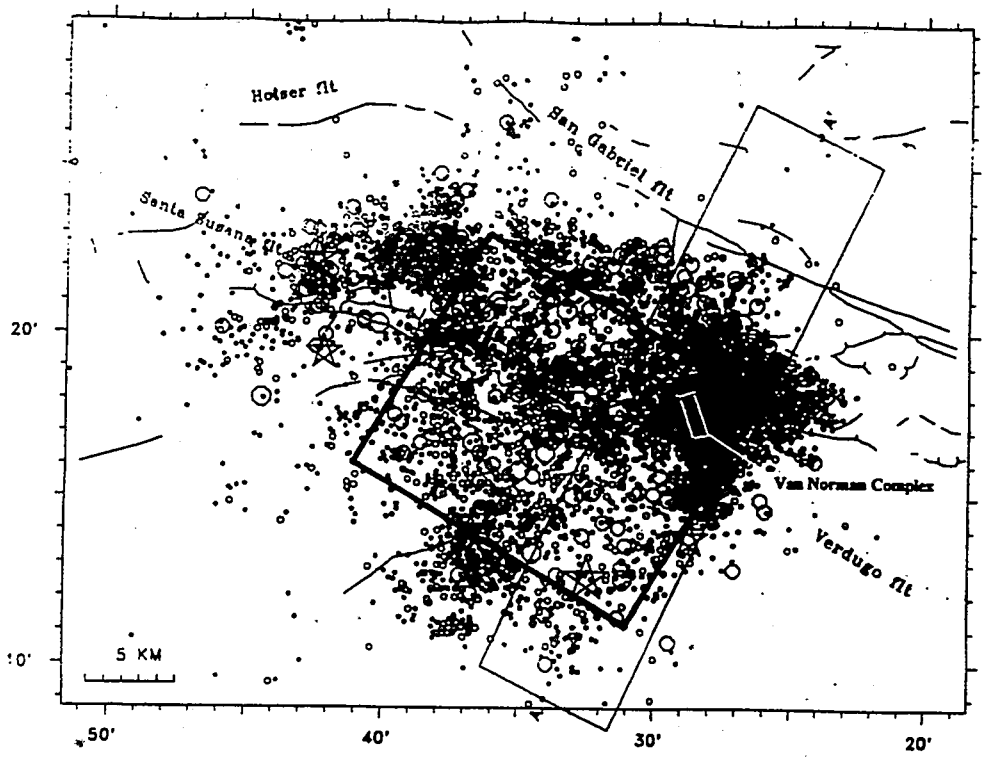


Figure 3. Map of aftershocks from 17 January to 29 June 1994 (after Haukson, 1994). (The bold line rectangle indicates dimensions of fault plane. The symbols are defined in Fig. 4.)

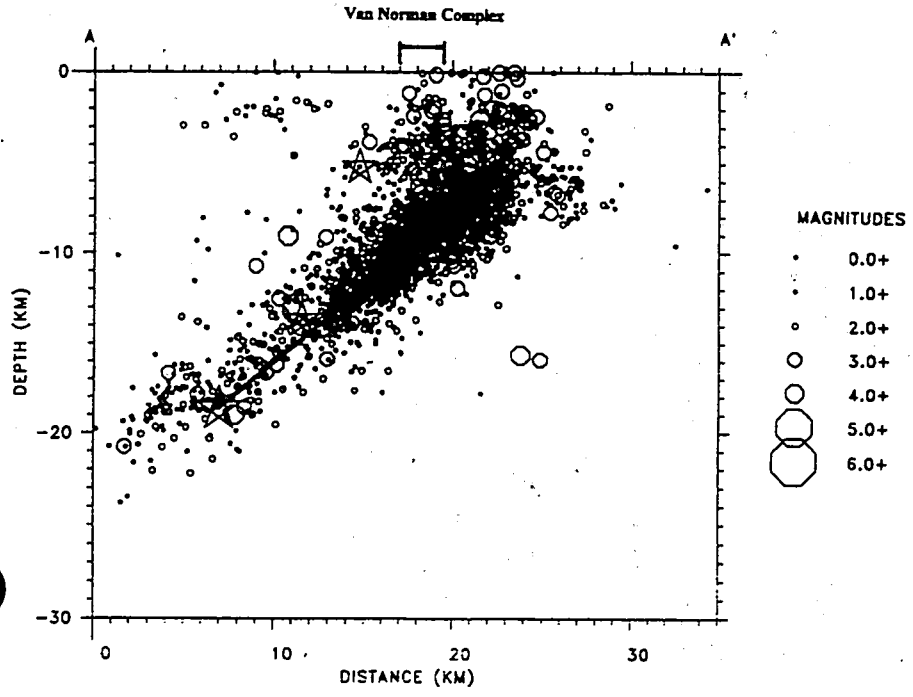


Figure 4. Aftershocks in section AA' Figure 3 (after Haukson, 1994).

Table 1

Identification and Characteristics of Strong-Motion Recordings in the Vicinity of the Van Norman Complex during the 1994 Northridge Earthquake

					Location				Maximum Peak Acceleration (g)						
		Station Name	Owner/ Agency	Geology/ Foundation	Latitude (deg)	Longitude (deg)	Epicentral distance (km)	Azimuth (deg)	Horiz. 1 (g)	Azim. (deg)	Vertical (g)	Horiz. 2 (g)	Azim (deg)	Long. (g)	Trans. (g)
	1	Rinaldi receiving station	DWP/Power	Alluvium	34.281	118.478	9	46	0.48	318	0.85	0.84	228	0.86	0.37
Los Angeles Reservoir	2	LA Dam west abutment	DWP/Water	Nonmarine dep	34.294	118.483	10	38	0.32	64	0.32	0.43	334	0.30	0.44
	3	LA Dam foundation	DWP/Water	Nonmarine dep	34.295	118.479	10	40	0.32	244	0.13	0.28	334	0.32	0.28
	4	LA Dam crest	DWP/Water	Dam fill	34.294	118.481	10	39	0.56	—	0.39	0.43	—	—	—
	5	Outlet Tower	DWP/Water	Conc. structure	34.296	118.478	10	40	1.34	—	0.29	1.18	—	—	—
	6	North Dike crest	DWP/Water	Dam fill	34.300	118.487	10	34	0.65	—	0.38	0.56	—	—	—
MWD Jensen Filtration Plant	7	Generator building	MWD/USGS	Nonmarine dep	34.313	118.498	10	25	1.00	292	0.76	0.57	22	—	—
	8	Administration building	MWD/USGS	Alluvium/Fill	34.312	118.496	10	26	0.63	292	0.40	0.40	22	—	—
	9	Reservoir roof	MWD/USGS	Conc. structure	34.309	118.499	10	25	0.84	292	0.66	0.65	22	—	—
Sylmar Converter Station	10	Valve group 7, free field	DWP/Power	Alluvium	34.311	118.490	11	30	0.61	52	0.64	0.90	142	0.64	0.65
	11	Valve group 7, ground fl	DWP/Power	Alluvium	34.311	118.490	11	30	0.60	52	0.79	0.75	142	0.67	0.55
	12	Valve group 7, roof	DWP/Power	Steel structure	34.311	118.490	11	30	1.12	—	—	—	—	—	—
	13	Valve group 1–6, basement	DWP/Power	Alluvium	34.311	118.490	11	30	0.58	322	0.53	0.37	232	0.55	0.46
Sylmar Switching Station	14	Sylmar Switching Station	DWP/Power	Alluvium	34.313	118.491	11	29	Did not record main event, but recorded aftershocks						
Sylmar Converter Station East	15	Free-field	DWP/Power	Nonmarine dep	34.312	118.481	11	34	0.83	15	0.38	0.49	285	0.90	0.36
	16	valve hall floor	DWP/Power	Nonmarine dep	34.312	118.481	11	34	0.79	15	0.43	0.45	285	0.79	0.46
	17	—	DWP/Power	Steel/Masonry	34.312	118.481	11	34	1.13		1.30	1.15			
	18	—	DWP/Power	Steel structure	34.312	118.481	11	34	1.01		1.06	0.50			
Bypass Reservoir (seismoscopes)	19	Abutment	DWP/Water	Nonmarine dep	34.294	118.483	10	38	>0.31	—	—	—	—	—	—
	20	Bypass Reservoir Dam crest	DWP/Water	Dam fill	34.292	118.484	10	38	>0.31	—	—	—	—	—	—

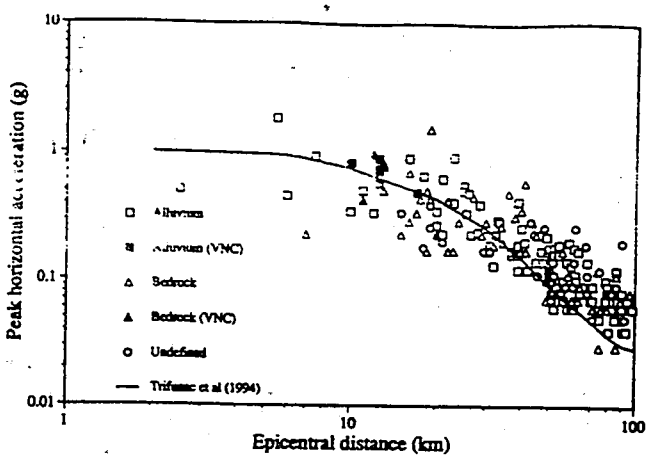


Figure 5. Attenuation of peak horizontal acceleration with epicentral distance.

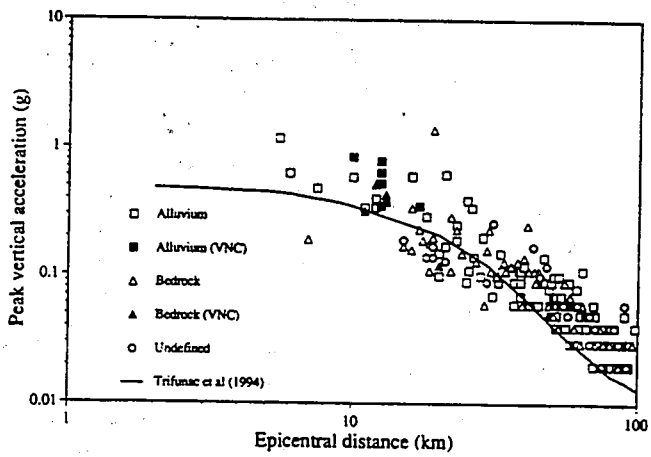


Figure 6. Attenuation of peak vertical acceleration with epicentral distance.

erations exceed 66%, and even 100%, of the maximum peak horizontal acceleration. All but one of the recordings on bedrock fall below the 100% limit. In the VNC, five records exceed the 66% limit, including two records above the 100% limit. These latter recordings are at station 1 on the southern end of the VNC and at station 11 on the northern end of the VNC.

Time Histories and Response Spectra of Strong Motion

Eight out of twenty strong-motion recordings throughout the VNC were selected. The strong-motion recordings were digitized and processed by Lindvall Richter Benuska Assoc. (1994), using standard volume 2 and 3 algorithms by Lee and Trifunac (1979). The baseline and instrument response corrections were performed using an Ormsby filter. The low- and high-frequency filter settings were in the range of 0.05 to 0.1 Hz and 25 to 27 Hz, respectively. The selected recordings are identified by numbers ranging from 1 to 20

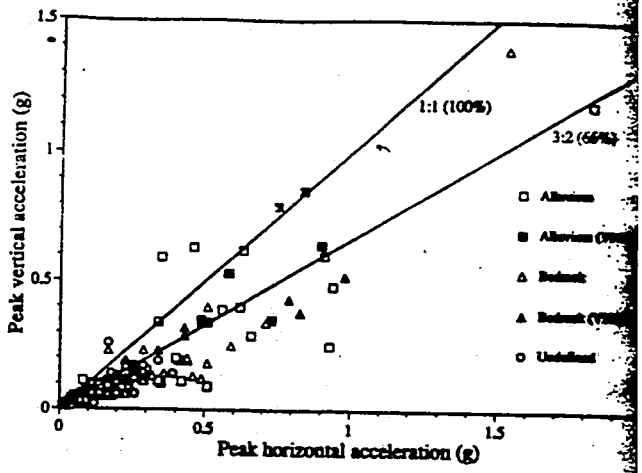


Figure 7. Relation between vertical and horizontal peak accelerations.

in Table 1. As shown in Figure 2, these recordings—located to the south, center, northwest, and northeast of the VNC—are arranged in four groups. The horizontal accelerations which were recorded in different directions depending on the instrument orientation, are projected onto the longitudinal and transverse directions. The longitudinal direction is given by the relative position of the station with respect to the epicenter. The transverse direction is perpendicular to the longitudinal direction. The longitudinal and transverse directions are almost identical for all the instruments (i.e., N33°E and S57°E), due to their close proximity to one another and their distance from the epicenter.

The frequency contents of accelerations will be represented by using normalized acceleration response spectra with 5% damping. The normalized acceleration response spectrum is the acceleration response spectrum divided by the maximum peak acceleration. These response spectra will be compared to design spectra of the NEHRP code for soil profile types 1, 2, and 3 (FEMA, 1992). The NEHRP normalized acceleration spectra increases linearly from value 1 at zero period, reaches a constant value equal to 2.5, then decreases asymptotically toward zero for long periods. As specified by NEHRP, the plateau width depends on the soil profile type. The soil types for NEHRP design spectra are similar to the UBC soil type classifications (ICBO, 1994). Soil profile type 1 (S_1) includes soil profiles "with either: (1) rock of any characteristic, either shale-like or cristalline in nature, that has a shear wave velocity greater than 2,500 feet per second or (2) stiff soil conditions where the soil depth is less than 200 feet and the soil types overlying the rock are stable deposits of sands, gravels, or stiff clays." Soil profile type 2 (S_2) characterizes "a soil profile with deep cohesionless or stiff clay conditions where the soil depth exceeds 200 feet, and the soil types overlying rocks are stable deposits of sands, gravels, or stiff clays." Soil profile type 3 (S_3) encompasses "soil profiles containing 20 to 40 feet in thickness of soft-to-medium stiff clays with or without intervening lay-

ers of sand or other cohesionless soils." Based on the shear-wave velocities and soil depths in Table 2, all the accelerograms of Table 1 are located on soil profile type 1. However, their normalized response spectra will be compared to the NEHRP spectra of soil profile types 1, 2, and 3.

Rinaldi Receiving Station (Station 1)

As shown in Figure 2, station 1 is located in the southern tip of the VNC. As shown in Figure 8, after 2.0 sec, the longitudinal acceleration record contains a large pulse with a period of 1.0 sec. This pulse generates a peak acceleration of 0.86 *g* and represents a large energy release because of its long period and large amplitude. In contrast to most strong-motion recordings during past earthquakes, this particular acceleration record displays a peak with a low frequency instead of a high frequency. After time integration and rotation, the acceleration of Figure 8 generates the largest ever instrumentally measured velocity, 177 cm/sec (Heaton *et al.*, 1995), and a differential displacement exceeding 60 cm. After 5 sec, the first pulse is followed by a second pulse of smaller amplitude but longer period, and then after 8 sec, by a third pulse of even smaller amplitude. These pulses correspond to the three successive subevents of Wald and Heaton (1994) that took place at 2-sec intervals. As shown in Figure 9, the transverse components of acceleration, velocity, and displacement are smaller than their longitudinal counterparts. The maximum transverse velocity (70 cm/sec) is obtained just before the second pulse and corresponds to the maximum amplitude of transverse differential displacement of 40 cm. As shown in Figure 10, the peak value of the vertical acceleration (0.85 *g*) is about the same as the peak longitudinal acceleration. It takes place at the end of the first pulse and generates a vertical velocity of 50 cm/sec and a maximum vertical differential displacement of 19 cm.

Cone penetration tests at the Rinaldi Receiving Station (The Earth Technology Corporation, 1994) indicate that station 1 is underlain by silty sands and sandy silts with lenses of clay and gravel. The upper 7 m have a relative density ranging from 20% to 60% and a standard penetration test (SPT) blow count $(N1)_{60}$ between 3 and 20, with values above 40 in gravel layers. These alluvial deposits from the San Fernando Creek correspond to the shallow alluvium of Table 2, with shear-wave velocity ranging from 200 to 300 m/sec. The Pico Formation bedrock is at about a depth of 10 m and has a shear-wave velocity approximately equal to 1100 m/sec. Ground cracking, but no direct surficial evidence for liquefaction (e.g., sand boils), was observed at this location, which has a water table below 10 m.

Record 1 was obtained from an instrument having slight problems with film advancement. Although the instrument triggered, the film did not advance immediately at the beginning of the strong shaking, and a few seconds of strong ground motions were lost at the beginning of the record. The film stalled after 3 sec of recording for approximately 0.05 sec. This missing 0.05-sec gap was added to the record, after matching the slopes on both sides of the stall. After this correction, the record of Figure 9 is believed to be representative of the actual ground acceleration at the Rinaldi site (Lindval Richter Benuska Associates, 1994). Record 1 is useful to analyze the significant damage to electrical equipment at the Rinaldi Receiving Station and the damage to pipes and the Lower San Fernando Dam at the southern part of the VNC.

Los Angeles Dam (Stations 2 and 3)

As shown in Figure 2, stations 2 and 3 are located at the Los Angeles Dam, at the center of the VNC. As shown in Figures 11 and 12, the two first pulses previously identified from record 1 are clearly observable in records 2 and 3 after 2.5 and 6 sec. The third pulse is also detectable after 9 sec. The second pulse has a 2.5-sec period in the transverse direction at station 2. As shown in Figures 11 through 16, records 2 and 3 are very similar. Recording 3 has a smaller peak acceleration and fewer high-frequency components than recording 2. As shown in Table 1, in contrast to other recordings, records 2 and 3 display small peak accelerations.

Stations 2 and 3 are both located on bedrock. However, station 3 is located under the earth embankment fill while station 2 is on the ground surface. After the poor performance of the Lower and Upper San Fernando Dams during the 1971 San Fernando earthquake, the alluvium was completely removed to expose the bedrock and to lay out the foundation for the Los Angeles Reservoir, which was completed in 1977. The sedimentary bedrock at these two stations consists of the Sunshine Ranch Member of the Saugus Formation (Dibblee, 1991). The Sunshine Ranch Member consists of reddish to greenish claystone, siltstone, and sandstone and interbedded pebble-cobble conglomerate. The Sunshine Ranch Member is the oldest member of the Saugus Formation and is finer-grained than the upper member of the Saugus Formation that is located north of the Los Angeles Dam. The Saugus Formation is generally poorly consolidated and poorly cemented; however, the older Sunshine Ranch Member contains some limy concretions and limestone beds. The Sunshine Ranch Member was deposited during the late Pliocene, in a nonmarine environment above the marine water line, while the near-shore Pico Formation was deposited in shallow brackish water (Saul, 1975). The Sunshine Ranch Member contacts the underlying Pico Formation in areas that were once a coast line. Unfortunately, there is no shear-wave velocity data directly measured beneath stations 2 and 3. However, the shear-wave velocity in this location may be assumed in the order of 1000 m/sec, based on the shear-wave velocities measured in the bedrock of the Upper and Lower San Fernando Dams (see Table 2), respectively, north and south of stations 2 and 3. These high shear-wave velocities were measured by DWR (1971) many years ago, which may warrant new measurements utilizing more modern techniques. The response spectra of both stations 2 and 3 in the transverse direction have peaks broader than those generally encountered for bedrock stations.

Table 2

Velocity of Shear and Compressional Waves Measured in Bedrock and Alluvium at Various Locations around the Van Norman Complex

Site	Survey Type	Fill			Upper Alluvium			Lower Alluvium			Bed Rock				Reference
		Depth (m)	V_s (m/sec)	V_p (m/sec)	Depth (m)	V_s (m/sec)	V_p (m/sec)	Depth (m)	V_s (m/sec)	V_p (m/sec)	Formation	Depth (m)	V_s (m/sec)	V_p (m/sec)	
			229	—					457–						
Lower San Fernando Dam (LSF)	Crosshole		198–	427–	—	—	—	—	549	—	—	34	1097	—	Lee *et al.*, 1975
Odissey Restaurant (LSF Dam East Abutment)	Downhole/Crosshole	15	229	549	—	—	—	—	—	—	—	—	1067–1158	1615–2042	DWR, 1971
	Seismic refraction	—	—	—	—	—	—	—	—	—	Modelo shale	10	317	—	Duke *et al.*, 1973
		—	—	—	—	—	—	—	—	—		>10	664	—	
Upper San Fernando Dam	Crosshole	12	183	—	—	122	—	—	457– 549	—	Saugus	30	1006	—	Lee *et al.*, 1975
	Downhole/Crosshole		168– 207	503	—	—	—	—	564	960–1310	Saugus	—	960–1067	1950–2286	DWR, 1971
	Seismic refraction	0–5	—	427	—	—	—	—	—	—	—	—	—	—	
		5–14	—	1036	—	—	—	—	—	—	—	—	—	—	
		>14	—	1524	—	—	—	—	—	—	—	—	—	—	
Sylmar Converter Station	Seismic refraction	—	—	—	0–4	—	305	>4	—	1661	—	—	—	—	Fallgren and Smith, 1971
Sylmar Converter Station East	Downhole	—	—	—	0–4	195	536	4–15	277	1737	Saugus	15–43	436	1585	Earth Tech., 1984
		—	—	—	—	—	—	—	—	—		2–8	335	701	
		—	—	—	—	—	—	—	—	—		8–15	335	1600	
	Seismic refraction	—	—	—	0–3	—	305	>3	—	1829		—	—	—	Fallgren and Smith, 1971
San Fernando Valley Juvenile Hall	Seismic refraction	—	—	—	9	253	—	>9	463	—	—	—	—	—	Duke *et al.*, 1973
		—	—	—	0–3, 9	—	305	>3, 6	—	701	—	—	—	—	Fallgren and Smith, 1971
		—	—	—	—	—	—	>3, 6	—	1829	—	—	—	—	
MWD Jensen Filtration Plant	Seismic refraction	0–10	260	550	0–16	260	550	—	—	—	Saugus	0–6	305	610	Converse and Davis, 1971
		—	—	—	—	—	—	—	—	—		6	472	838	
	Uphole	—	—	—	—	—	—	—	—	—		>10	—	1500	
	Downhole/Crosshole	0–12	300– 415	640– 808	3–18	213– 290	503– 640	—	—	—		6–24	366–762	640–1981	Woodward Clyde, 1989
		—	—	—	—	—	—	—	—	—	Weathered Saugus	0–21	259–335	549–701	

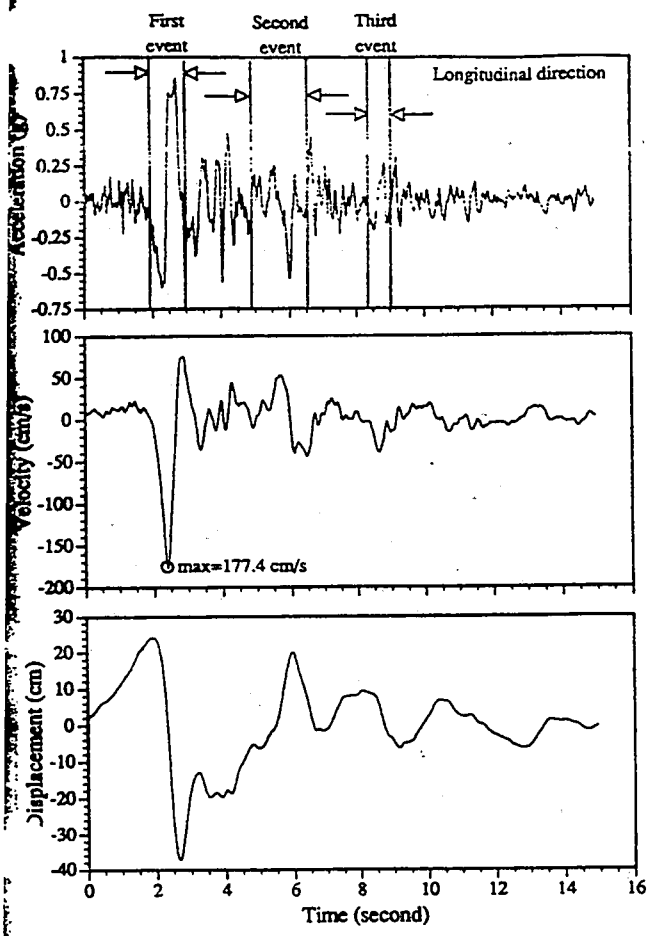


Figure 8. Time history of longitudinal component of acceleration, velocity, and displacement recorded at station 1.

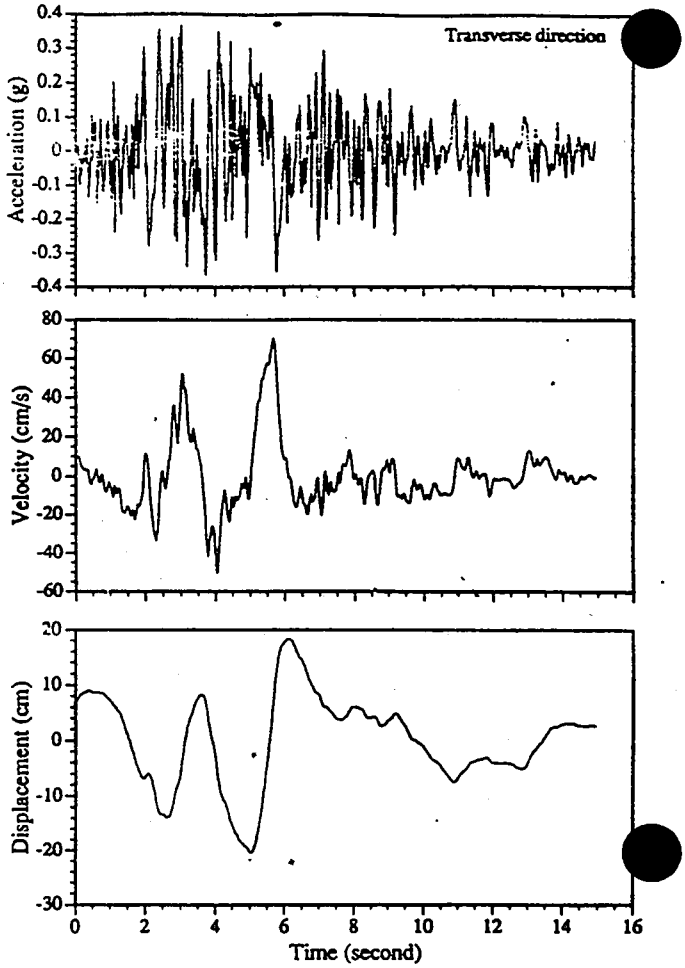


Figure 9. Time history of transverse component of acceleration, velocity, and displacement recorded at station 1.

Sylmar Converter Station (Stations 10, 11, and 13)

There are five recordings at the Sylmar Converter Stations, north of the VNC. As shown in Figure 2, stations 10, 11, and 13 are to the west of Freeway 5, whereas stations 15 and 16 are to the east of Freeway 5. All these stations are located at the same latitude as the MWD Jensen Filtration Plant.

As shown in Figures 11 and 12, the first and second pulses can be identified in records 10, 11, and 13. The first pulse is clearly noticeable after 3 sec in the longitudinal direction but barely noticeable in the transverse direction. The second pulse starts after 5 sec and has a long period of 2.5 sec. The peak accelerations range from 0.55 to 0.67 g in the longitudinal direction and from 0.46 to 0.65 g in the transverse direction. Records 10 and 11 are similar, one being located in the free field and the other on the ground floor of w-rise steel structure.

The converter station is founded over the Grapevine Creek channel, on an alluvium layer approximately 22-m thick, deposited within the Mission Hills syncline. Soil deposits have been classified as silty sand in the upper 3 to 4 m, clayey sand to clayey silt from 4 to 5 m, and silty sand to sandy silt at greater depths. As shown in Table 2, P-wave velocities of 300 m/sec were recorded in the upper 4 m and 1660 m/sec below 4 m (Fallgren and Smith, 1971). These values correspond to shear-wave velocities of about 120 to 150 m/sec and 275 m/sec, respectively, assuming that the larger P-wave velocities were measured below the water table.

The absence of high frequencies in records 10, 11, and 13 can be attributed to the nonlinear response of alluvium, especially to the liquefaction and lateral spreading of the underlying soils, which was independently observed in this region (Davis and Bardet, 1995a). Compared with recordings 10 and 11, recording 13 has no high frequencies, and its peak accelerations occurred during the first pulse, instead of the second pulse. This observation suggests that the alluvium underlying station 13 may have failed during the first pulse and could not transmit the acceleration of the second pulse.

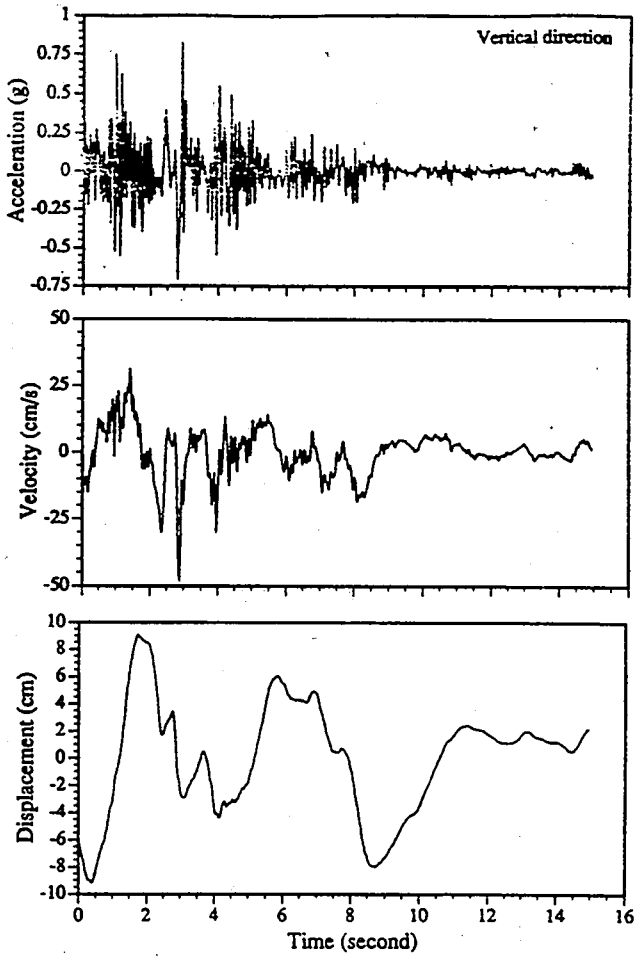


Figure 10. Time history of vertical component of acceleration, velocity, and displacement recorded at station 1.

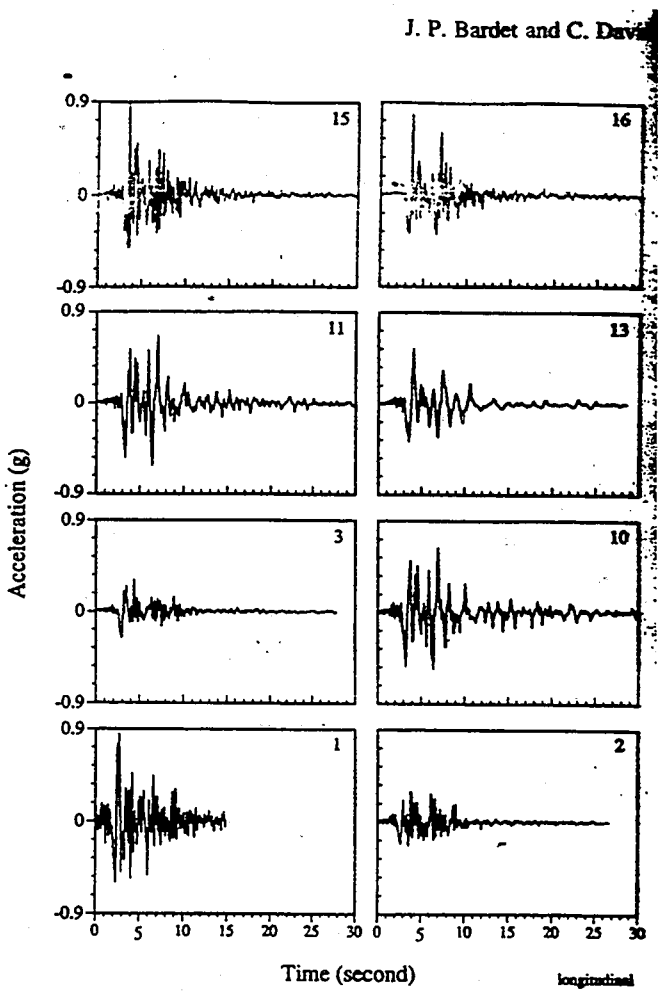


Figure 11. Time history of longitudinal acceleration recorded at eight stations in the Van Norman Complex.

Sylmar Converter Station East (Stations 15 and 16)

Stations 15 and 16 yield recordings similar to those of stations 10, 11, and 13. Station 15 is a free-field station, while station 16 is installed on a hall floor. Like records 10, 11, and 13, the longitudinal and transverse components of records 15 and 16 display the first two pulses previously described. However, these recordings have larger peak accelerations and contain much more high frequencies than those at stations 10, 11, and 13. The peak accelerations are 0.9 and 0.79 *g* in the longitudinal direction and 0.36 and 0.46 *g* in the transverse direction.

Stations 15 and 16 (i.e., stations at Sylmar Converter Station East) are underlain by a thin layer (up to 2 m) of compacted fill over Saugus Formation bedrock. The layer of fill, which is too thin to have a significant effect on site response, is omitted in Table 2. The Saugus Formation is a coarse-grained poorly consolidated and poorly cemented nonmarine sedimentary rock, consisting of light gray pebble-cobble conglomerate, sandstone, siltstone, and greenish to reddish claystone, which was deposited by streams during the early to middle Pleistocene (Saul, 1975). At this site, the Saugus Formation has engineering properties of a stiff to hard soil (The Earth Technology Corporation, 1984). In the low topographic region, the Saugus Formation behaves as highly weathered clay to clayey silt and is nearly indistinguishable from alluvium, while in the higher topographic area to the southeast, it becomes slightly calcified and firmer. As shown in Table 2, shear-wave velocities of 335 to 436 m/sec were recorded in the Saugus Formation near the recording stations.

As previously mentioned, records 15 and 16 have larger peak accelerations and higher-frequency contents than records 10, 11, and 13. This observation is in agreement with field observations. There was no obvious sign of ground failure at these locations.

Comparison of Recordings

Figure 14 shows the simultaneous variation of the East–West and North–South components of the horizontal accelerations at the eight stations previously defined. The longitudinal direction has been defined at an azimuth of 33°. In records 1, 3, 15, and 16, the peak acceleration is larger in the longitudinal direction than in the transverse direction.

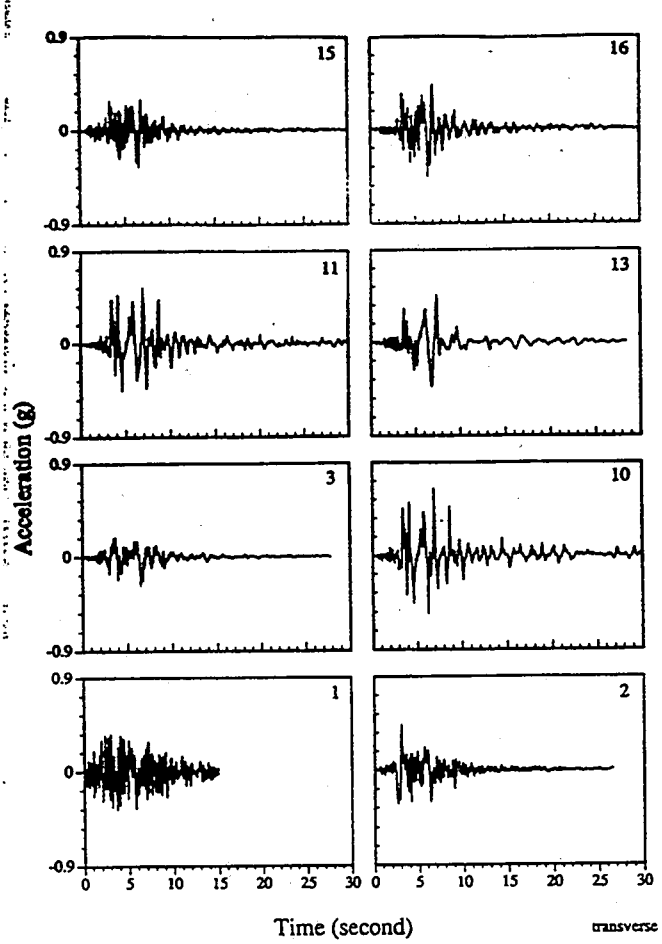


Figure 12. Time history of transverse acceleration recorded at eight stations in the Van Norman Complex.

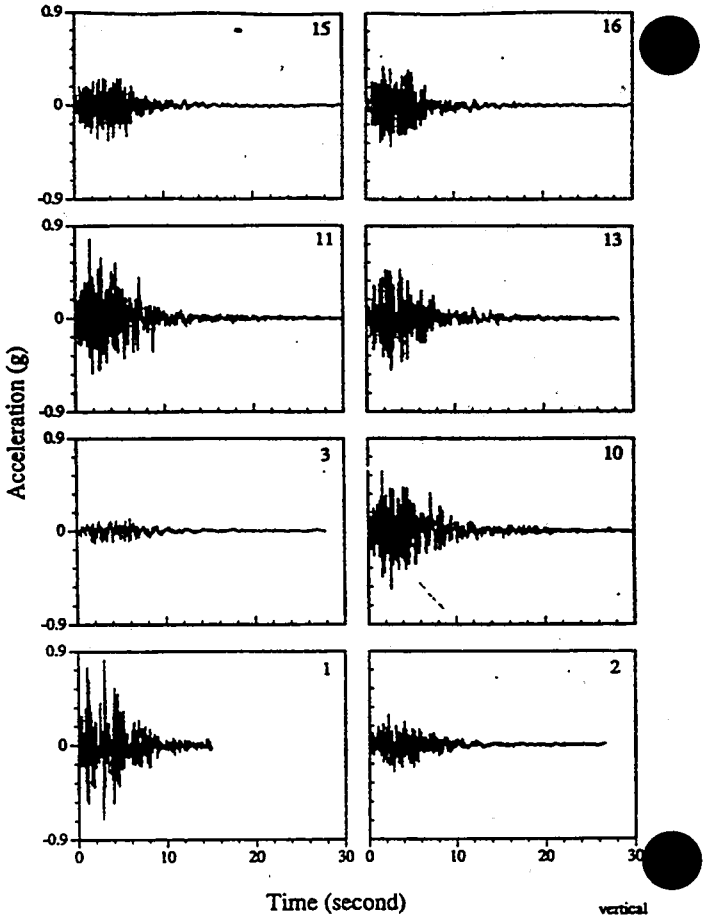


Figure 13. Time history of vertical acceleration recorded at eight stations in the Van Norman Complex.

and the maximum peak value takes place during the first pulse. However, records 2, 10, 11, and 13 display an opposite trend, having the transverse acceleration larger than the longitudinal acceleration. In all records, the accelerations had two preferential directions: longitudinal and transverse directions.

The eight recordings yield consistent information on ground shaking in the VNC. The recordings at a given location are similar, which establishes the proper functioning of the strong-motion instruments. The first and second pulses are clearly observed in all records, regardless of the site conditions. The first pulse with a large acceleration amplitude is especially visible in all the longitudinal records, whereas the second pulse with a long period appears more clearly in all the transverse records. The ground motion in the VNC had a short duration and was dominated by major pulses that radiated from the rupturing fault surface. These pulses carrying a large amount of energy underwent a limited distortion as they went through the shallow soil layers. However, the peak accelerations were lower at the center of the VNC (stations 2 and 3) than in its southern and northern parts.

Figures 15 and 16 compare the normalized spectra measured in the VNC and those used in design by NEHRP. In general, the response spectra measured in the longitudinal direction is different from and exceeds both the S_1 and S_2 design spectra, which are relevant at these locations. This discrepancy includes the filtering of short periods at stations 1, 10, 11, and 13; the spectral peak at stations 2, 3, 10, 11, and 13; and the bump at 2.5 sec in all stations, except for station 1. The filtering of high frequencies may be attributed to the nonlinear behavior of underlying soil layers that was independently observed in the field (Bardet and Davis, 1995a).

Compared with the response spectra in the longitudinal direction, the normalized response spectra in the transverse direction are significantly broader and are also poorly described by the design spectra. Compared with other stations, station 1 has a narrower and higher spectral peak in the transverse direction for low period. In contrast to other spectra, its response spectrum has the bump at 2.5 sec, but in the transverse direction instead of the longitudinal direction. However, this distinct response cannot be attributed to an error in the orientation of station 1, which was independently and carefully verified.

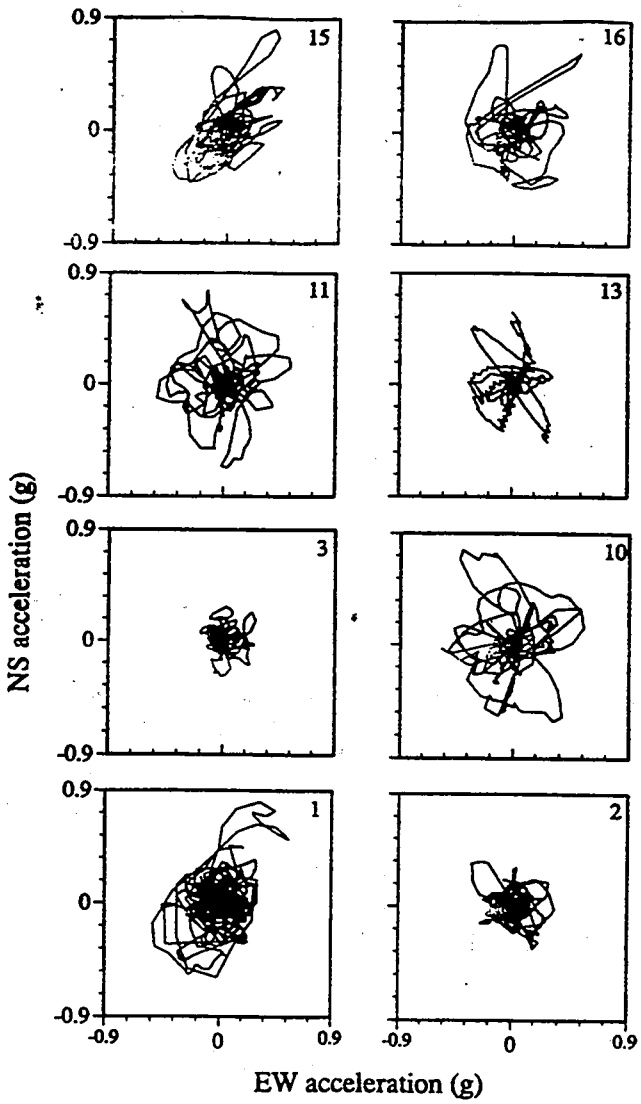


Figure 14. Variation of east–west and north–south components of accelerations at eight stations in the Van Norman Complex.

NEHRP postulates that the normalized acceleration spectra depends mainly on the soil profile type at a given site. Its design spectra were obtained by averaging a large number of measured acceleration spectra, after sorting them into typical soil profile types. However, most of these measured acceleration spectra originated from far-field measurements and not from near-field recordings, which are much more scarce. Therefore, it is not surprising that the NEHRP normalized acceleration spectra do not realistically describe the near-source spectra of the VNC.

During the spring of 1995, all VNC instruments were recalibrated by using a tilt table and were found to have properly been calibrated (Trifunac, 1995b). The orientation, location, and mounting of the instruments were also inspected. Stations 1, 2, 10, and 15 are attached to isolated concrete slabs that are firmly anchored to the ground, away from the influence of any building structures. Station 10 is, however, located over a 3- by 3-m bank of large conduits. Stations 11, 13, and 16 are bolted down to large concrete slabs in the ground floor of low-rise (one to two stories) structures. Station 3 is buried under 30 m of embankment fill. Although some instruments may have been influenced by soil–structure interaction effects, most of them are believed to have correctly measured the free-field ground motions, especially for periods longer than those typical of soil–structure interaction (i.e., about 0.5 sec). Therefore, neither error in instrument calibration nor soil–structure interaction significantly influenced the measurement of ground motion in the VNC.

As shown in Figure 15, there is a definite difference between the longitudinal and transverse spectra (i.e., wider response spectra in the transverse direction). The frequency content of the ground motion recorded at the VNC significantly depends on the direction of ground motion. Similar observations were also made by Campbell and Bozorgnia (1994) for the 1992 Landers earthquake.

The directional frequency content and contributions from permanent ground displacement in near-field strong motion have fundamental consequences in geotechnical and structural engineering. This implies that the dynamic response of structures will be influenced by their orientation relative to the ground motion and by their proximity to causative faults. The transverse ground motion in the VNC activated longer natural periods than its longitudinal component. As shown in Figure 2, the Lower and Upper San Fernando Dam structures of the VNC are almost oriented in the longitudinal and transverse direction of the ground motion, respectively, and therefore responded to ground motions having different frequency contents. The North Dike and Los Angeles Dam of the Los Angeles Reservoir were also subjected to similar effects.

In the far field where the contributions from permanent ground displacement are negligible, directional variations in the amplitudes of response spectra will depend on the radiation patterns of the source and on the properties of the propagation path (Somerville and Graves, 1993). In the near field where ground motions contain contributions from permanent displacement, the long-period part of the Fourier (Trifunac, 1993) and Response Spectra (Trifunac, 1995b) will display larger long-period amplitudes for directions of motion that coincide with the directions of permanent ground displacement.

Tectonic Displacements

During the Northridge earthquake, the fault movement did not create any observable surface rupture in the VNC but caused measurable permanent ground deformations, referred to as tectonic displacements. Tectonic displacements result from a global uplift of the valley floor and mountains in the epicentral region. They are not to be confused with the permanent settlement and lateral displacement of superficial soil

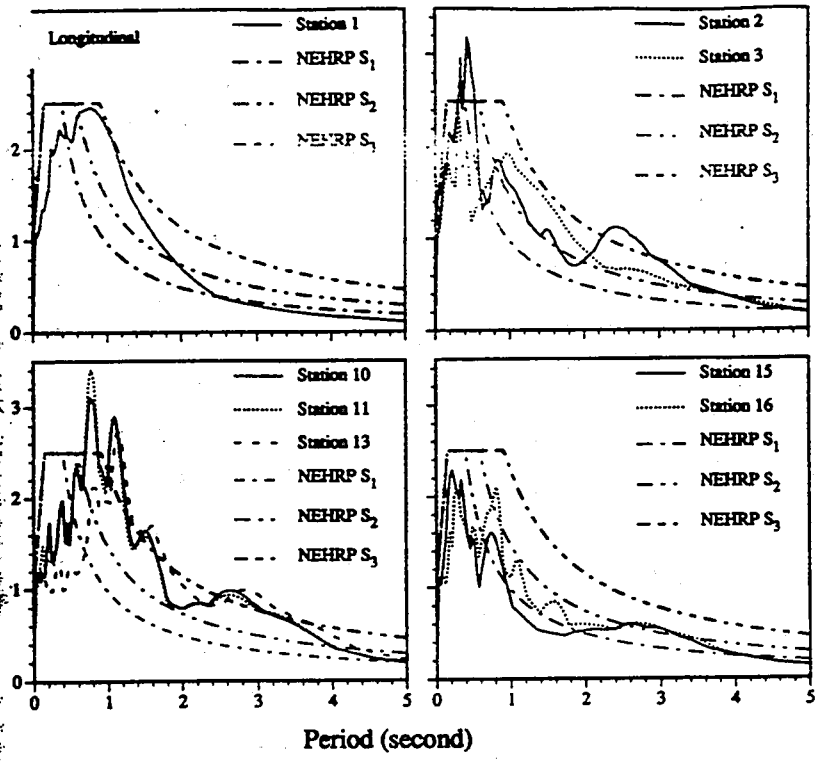


Figure 15. Response spectra of normalized longitudinal acceleration at eight stations in the Van Norman Complex.

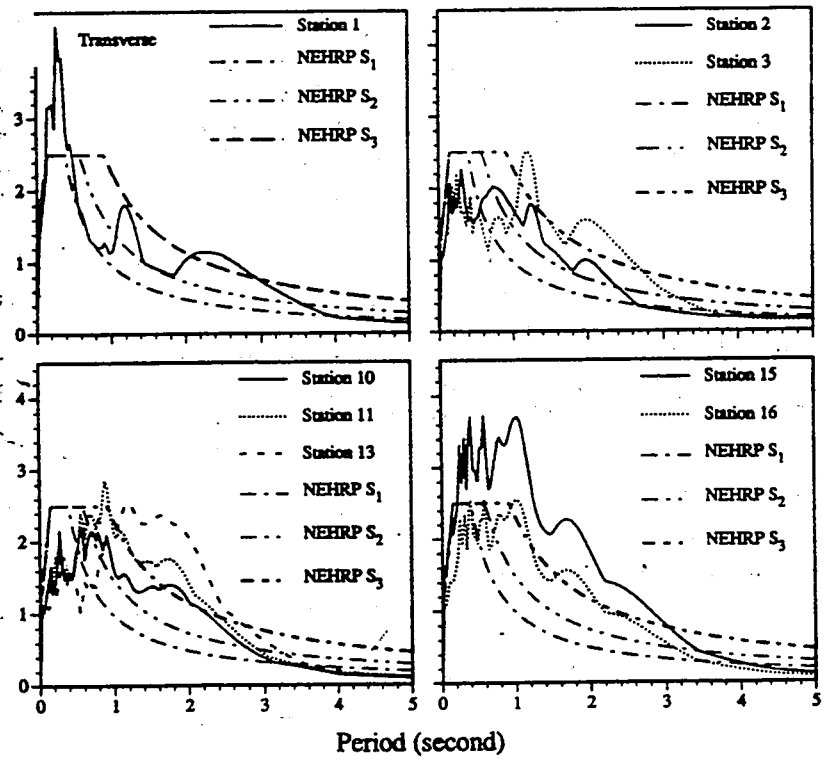


Figure 16. Response spectra of normalized transverse acceleration at eight stations in the Van Norman Complex.

lluvium layers that are induced by ground shaking. ..g the Northridge earthquake, the tectonic uplift exceeded 70 cm in the Santa Susana Mountains and was associated with a horizontal displacement of 21 cm (USGS/SCEC, 1994).

Table 3 lists the tectonic displacements that LADWP measured by using Global Positioning Systems at 19 monument stations in the vicinity of the Los Angeles Reservoir. Most of these displacements were measured on bedrock stations relative to one absolute benchmark point within the

Table 3
Tectonic Displacement at the Van Norman Complex

Number	LADWP Station ID	South Displacement (cm)	East Displacement (cm)	Vertical Uplift (cm)	Displacement Amplitude (cm)	Displacement Azimuth (deg)
1	30	1.5	16.8	29.0	16.8	95
2	210	1.2	17.7		17.7	94
3	170	6.4	20.4	17.7	21.4	107
4	40	6.1	19.5	20.1	20.4	107
5	160	6.7	19.5	20.1	20.6	109
6	150	6.1	21.3	26.8	22.2	106
7	140	7.0	21.6	23.5	22.7	108
8	20	5.2	19.2	27.7	19.9	105
9	120	3.0	21.0	18.6	21.3	98
10	50	4.9	24.1	15.2	24.6	101
11	110	2.1	23.5	25.0	23.6	95
12	100	0.9	22.3	19.8	22.3	92
13	270	2.1	20.1	20.1	20.2	96
14	10	2.1	19.2	20.1	19.3	96
15	260	1.8	19.8	20.1	19.9	95
16	250	0.9	18.9	21.3	18.9	93
17	230	3.7	21.3	22.3	21.6	100
18	240	3.0	21.3	21.9	21.6	98
19	220	0.3	16.2	26.2	16.2	91
Average		3.4	20.2	22.0	20.6	99
Minimum		0.3	16.2	15.2	16.2	91
Maximum		7.0	24.1	29.0	24.6	109

VNC and compared with the original 1977 survey. The displacement was determined by connecting the 1994 postearthquake leveling networks of the city of Los Angeles and Caltrans. Figure 17 represents the horizontal displacement by using vectors and the vertical uplift by using vertical bars. As shown in Figure 17, the vertical uplift on the VNC ranges from 15 to 29 cm, with an average value of 19 cm, and increases to the north and west. The horizontal movement in the southern direction varies from 0.3 to 7 cm, with an average of 3.4 cm, whereas the horizontal movement in the eastern direction ranges from 16 to 24 cm, with an average of 20 cm. The movements in the southern direction increase to the west, whereas those in the eastern direction decrease to the north but are of comparable amplitude on both sides of the reservoir. Compared to the Santa Susana Mountains, the VNC underwent nearly half the vertical uplift and slightly larger horizontal displacements.

Future Research

As shown in Table 3, the average azimuth of tectonic displacement vectors is 99°, which is close to the average azimuth (i.e., 123°) for the transverse direction of strong-motion recordings. The directional dependence of acceleration response spectra were probably related to the tectonic displacements in the VNC. However, these displacements contain periods longer than those measurable by the strong-motion instruments that recorded this event (Amini *et al.*, 1982). Therefore, more detailed future work must be carried out to interpret the causes for differences in the amplitudes of long-period spectra. At present, estimates of long-period response amplitudes can be estimated by approximate extrapolation of spectral amplitudes (Trifunac, 1995b), by asymptotic scaling relative to the static displacement surrounding the fault (Trifunac, 1993), and by sophisticated correction and filtering techniques (e.g., Iwan *et al.*, 1985).

The possible causes for the sudden variations in peak ground and spectral accelerations among VNC stations may be mixed and include the following: (1) radiation pattern, interference, and directivity from waves arriving from different parts of the fault (at such small distances, we cannot assume a point source approximation); (2) complicated mixing of the above effects by inhomogeneous geological media between source and stations (Novikova and Trifunac, 1994; Trifunac *et al.*, 1994); and (3) interference patterns caused by local geologic and soil inhomogeneities (Trifunac, 1990), including irregular sedimentary basins and local topography.

Based on the 1994 recordings, there is also a need for reassessing the ground motion in the VNC during the 1971 San Fernando earthquake, which was estimated indirectly by Scott (1973). In 1994, two seismoscopes recorded the ground shaking. One seismoscope was located on the crest of the Bypass Reservoir Dam, whereas the other one was situated on the abutment of the Bypass Reservoir Dam and the Los Angeles Dam, next to a strong-motion recording. These seismoscopes and strong-motion records could be useful to reevaluate the ground motion at the site during the 1971 San Fernando earthquake and to assess the validity of past analyses on the Lower San Fernando Dam (e.g., Ziemkiewicz *et al.*, 1990).

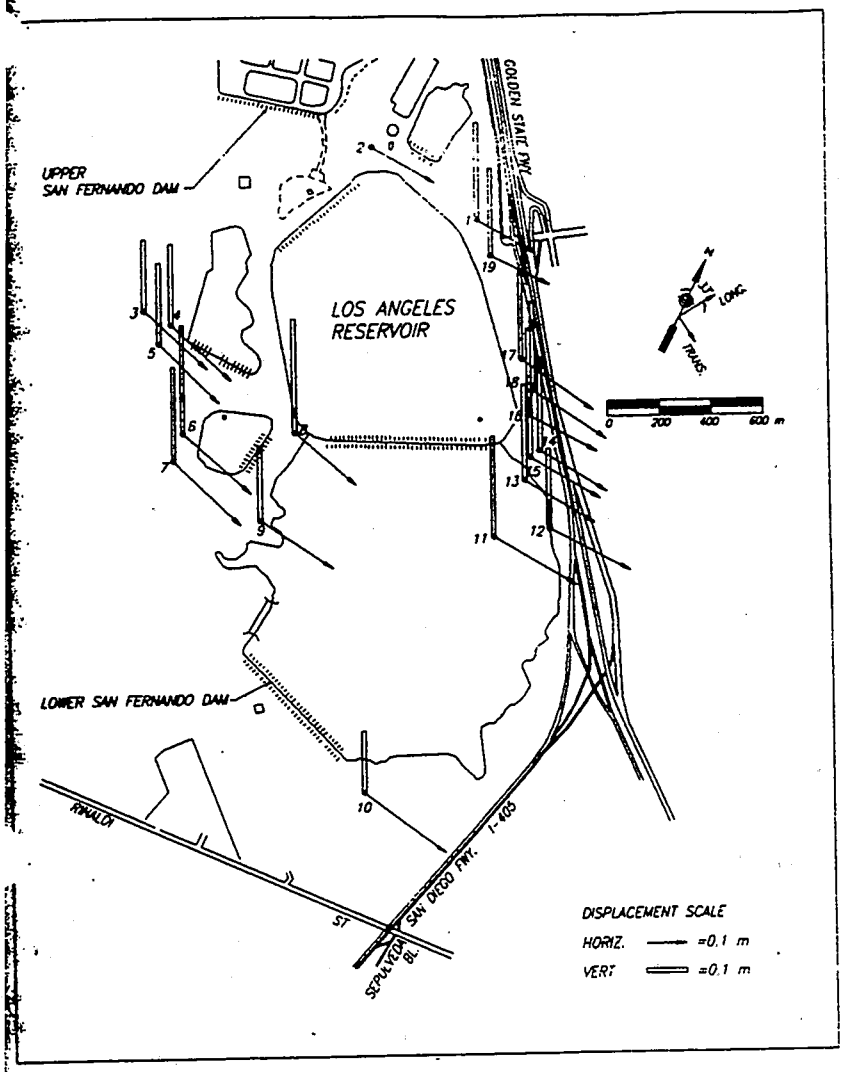


Figure 17. Horizontal and vertical tectonic movement in the Van Norman Complex.

As previously mentioned, this article reports partial results of a larger research program. At the time of this writing, only a few accelerograms have been processed, and the other recordings need to be processed as well. Future analyses will concentrate on the effects of ground motions on permanent ground deformation and will attempt to explain the ground displacements and responses of geotechnical structures in the VNC.

Conclusions

During the 1994 Northridge earthquake, the Van Norman Complex yielded an unprecedented number of recordings with high acceleration, in the close proximity of the fault. These strong-motion recordings clearly exhibited the main pulses generated by the fault that ruptured toward and beneath the complex. One station at the south of the complex produced the largest velocity ever instrumentally recorded (177 cm/sec), which resulted from a 0.86 g peak acceleration with a low frequency. Throughout the complex, the horizontal accelerations reached maximum peak values ranging from 0.56 to 1.0 g, except for the complex center where the maximum peak acceleration remained below 0.43 g. The vertical acceleration reached maximum peak values comparable with those of the horizontal acceleration. The maximum peak horizontal accelerations were also anisotropically distributed, with the largest peak values in the direction of the fault rupture. The acceleration response spectra in the longitudinal and transverse directions were significantly different. Such a difference, which has been more documented in engineering seismology (e.g., Campbell and Bozorgnia, 1994) than in geotechnical earthquake engineering, indicates that the frequency content of the ground motion in the Van Norman Complex was directionally dependent.

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Ground-Motion Variability at the Highway 14 and I-5 Interchange in the Northern San Fernando Valley

by Lawrence Hutchings and Steve Jarpe

Abstract The purpose of this article is to analyze possible causes for failure of the structures at the Highway 14 and I-5 interchange in the northern San Fernando Valley following the magnitude *M* 6.7 San Fernando earthquake on 9 February 1971 and the *M* 6.7 Northridge earthquake on 17 January 1994. This interchange consisted of a series of structures up to 600-m long; during the 1971 and 1994 earthquakes, several of these structures separated along expansion joints and collapsed.

To analyze the possible causes of failure, we recorded aftershocks at and near the interchange for 2 weeks following the 1994 earthquake. The aftershock recordings reveal a substantial relative spectral amplification (in the 1- to 10-Hz range) of a factor of 3 to 6 for sites located at the interchange (which is situated on sandstone) relative to a nearby rock (gneiss) outcrop site. Sites within the interchange area have a variation in amplification of a factor of 2 to 4 in the 1- to 10-Hz range. Also, substantial secondary arrivals were generated at two locations in the interchange area. We attribute variations in ground motion at the interchange to be due to variations in the composition of the sandstone and to topographic effects.

We computed the linear-response strong ground motion for three sites at the interchange from the 1971 and 1994 main events using aftershock recordings of the Northridge earthquake from three sites (the south and north abutments of the southbound connector of Hwy 14 to I-5 and a central location to the interchange) as empirical Green's functions. The same source events are used for all three sites for a particular synthesis so that differences between synthesized strong ground motion are due to differences in location, geology, and topography of the three sites. Source rupture models are obtained from independent studies. We estimate (1) peak acceleration to have been near 1 *g* for both earthquakes, due to the topographic and geologic conditions and the geometry of the fault rupture; (2) differential displacement across the north and south extremes of the area from the Northridge earthquake to have been about 70 cm longitudinal and 40 cm transverse to the Hwy 14 to I-5 connector; (3) differential displacement across the north and south extremes of the area from the San Fernando earthquake to have been about 25 cm longitudinal and 20 cm transverse; and (4) relative motion to be fairly incoherent for frequencies above 0.5 Hz. These observations are attributed to local geologic and topographic conditions and to wave passage effects and could have contributed to collapse of structures during these earthquakes.

Introduction

In this article, we analyze possible causes for failure of the structures at the Highway 14 and I-5 interchange in the northern San Fernando Valley following the magnitude *M* 6.7, 9 February 1971 San Fernando earthquake and the *M* 6.7, 17 January 1994 Northridge earthquake. Strong ground motion was not recorded at the interchange for either earthquake.

In 1971, at the time of the San Fernando earthquake, the interchange was under construction. Primary damage occurred to the 411-m-long south connector, which was essentially complete (Plate 1a). The gap in the photo is due to the collapse of two 53-m continuous spans that started and terminated at hinge seats (Elliott and Nagai, 1973). These two spans were supported and connected by a 2- by 3-m wide,

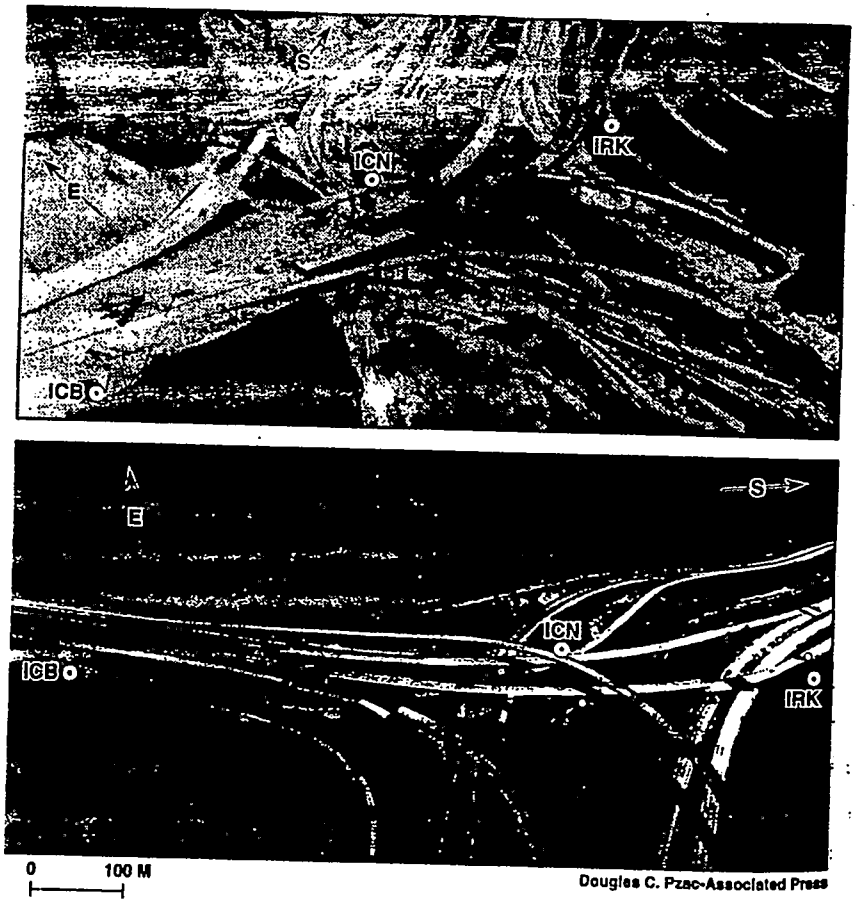


Plate 1. (a) An aerial view of the interchange following the 1971 San Fernando earthquake (from Elloitt and Nagai, 1973). The interchange was under construction. The main damage was to the south connector, which was complete at the time. The south connector is the curved structure next to station IRK and merges near station ICB. (b) An aerial view of the interchange hours after the 1994 Northridge earthquake (photo is computer enhanced near ICB). The south connector once again sustained failure. The structure that merges with the south connector near station ICB failed during this earthquake but was undamaged during the 1971 earthquake.

43-m-high column. It is theorized that the earthquake induced lateral deflection toward the outside of the curved ramp. This deflection opened up the structure, causing the northern span to fall off its 36-cm-wide hinge seat. As this span fell, it pulled down the column and the southern span (Elliott and [illegible]).

Subsequent to the 1971 failure, the interchange was completed using the original plans. New designs were prepared for the few columns that had not been completed and for those that required reconstruction. The spacing of transverse reinforcement in the new designs was reduced. Restrainers were added at expansion hinges during the final stages of construction (EERC, 1994). During the 1994 earthquake, several of those structures also separated and failed along hinge seats (Plate 1b). In particular, the south connector failed once again. Also, the north connector, which merges at ICB, failed, but it did not fail during the 1971 earthquake. Following the 1994 earthquake, the interchange was rebuilt once again. In this article, we only analyze ground motion, not the structural response to ground motion.

To analyze possible causes of failure, we recorded aftershocks at and near the interchange for 2 weeks following the 1994 earthquake. The three sites at the interchange were at the south and north abutments of the southbound connector of Hwy 14 to I-5 (600 m apart) and a central location to the interchange (300 m from either abutment). Spectral ratios of the aftershock recordings are analyzed to examine topographic and geologic effects on seismic wave propagation. We also compute linear-response strong ground motion for the three sites at the interchange from the 1971 and 1994 main events using aftershock recordings as empirical Green's functions. The same source events are used for all three sites for a particular synthesis so that differences between synthesized strong ground motion are due to differences in location, geology, and topography of the three sites. Source rupture models are obtained from independent studies, but synthesized ground motion are not validated with recorded data. No strong-motion recorders were operating at the interchange during either earthquake. Synthesized ground motion and spectral ratios reveal a significant differential ground displacement across the interchange and greater-than-expected ground motion that may have occurred from the 1971 and 1994 main events.

Recent advances in structural design require realistic input ground motion to fully test structural designs (McCallen *et al.*, 1994). Several factors affecting strong ground motion should be considered for the structural design of long-span structures. Synthesized seismograms should include the effects of (1) directivity and energy radiating from different portions of the fault resulting from finite rupture, (2) wave passage incoherency resulting from the time lag of wave propagation across the structures, (3) wave amplification resulting from local geologic and topographic conditions, and (4) high-frequency incoherency resulting from different scattering effects of the geology and topography along the structures. The approach to synthesizing strong ground motion used in this article (Hutchings, 1991, 1994) explicitly accounts for these effects on strong ground motion and provides realistic synthetic strong ground motion by using empirical Green's functions recorded at specific locations along the structure and by modeling kinematic rupture.

The Northridge and San Fernando earthquakes occurred within a complex distribution of east–west-trending thrust faults beneath the San Fernando Valley region and along the frontal thrust fault system of the Santa Susanna Mountains. Figure 1 shows the geology of the San Fernando Valley area and the epicenters and rupture areas of these recent earthquakes. The San Fernando and Northridge earthquakes had a similar geometric relationship to the Hwy 14 and I-5 interchange but a substantially different spatial relationship (Fig. 1). In both earthquakes, the interchange was very near the rupture areas, and the effects of finite rupture were significant. The San Fernando earthquake had a hypocenter to the north and ruptured updip (possibly on two faults) to the south with primarily thrust fault motion (Hanks, 1974). The Northridge earthquake hypocenter was to the south and ruptured updip to the north, also with thrust motion (Wald *et al.*, 1996). The San Fernando earthquake ruptured to the surface (Kamb *et al.*, 1971); the Northridge earthquake did not (Hudnut *et al.*, 1994; USGS Staff, 1994a, 1994b) and, therefore, is referred to as occurring on a blind thrust (SCEC, 1995).

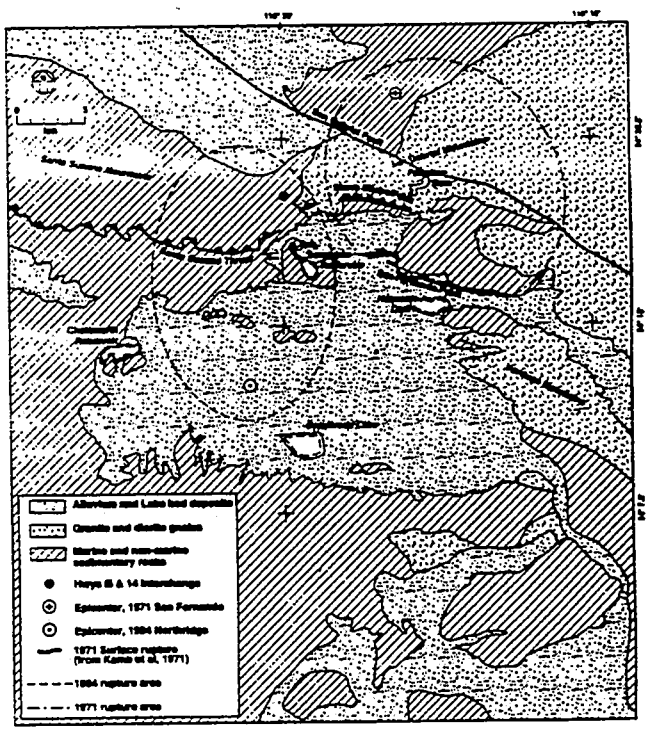


Figure 1. The geology of the San Fernando Valley area and the locations and rupture areas of the 1971 San Fernando earthquake and the 1994 Northridge earthquake. (Geology modified from Jennings and Strand, 1969.)

Instrumentation, Site Geology, and Topography

Immediately following the 1994 earthquake, Lawrence Livermore National Laboratory seismologists initiated a rapid deployment of weak- and strong-motion seismic recorders. The weak-motion recorders consisted of 16-bit fixed-gain instruments with 1-Hz free-period, high-gain Teledyne Geotech S-13 seismometers. The effective recording bandwidth (flat to velocity) was 0.2 to 50 Hz. The individual seismometer constants (free period, damping, and seismometer gain) were determined from step calibration pulses and are correct to within 5%. Table 1 lists the stati locations, ID's, geology, and period of operation.

Figure 2 shows the geology surrounding the interchan area and the location of instruments. The interchange a is composed of sandstone that extends a distance of at le 1.5 km from the interchange area. Gneiss is the closest ba ment rock outcrop at site IGN. It is hard and coherent wi some healed fractures and would be classified as a "ha rock" class A site by the Boore *et al.* (1993) classificati The sandstone within the interchange area is interbedd with layers varying in consistency and thickness from c

Table 1
Aftershock Recording Sites

ID	Operation	Latitude/ Elevation	Longitude/ Components	Geology	Description
ICN	1911 21 Jan 1931 03 Feb	34.3356 450 m	118.5060 u.n.e.	friable to semi-friable sandstone, medium grained	center of interchange
IRN	0044 20 Jan 1800 21 Jan	34.3360 450 m	118.5128 u.n.e.	coherent to semi-friable sandstone, medium grained	600 m west of interchange
IGN	0403 01 Feb 1555 02 Feb	34.3349 670 m	118.4859 u.n.e.	hard, coherent, but fractured gneiss	Tunnel Hill, 1.8 km east
ICB	1856 21 Jan 1346 31 Jan	34.3388 450 m	118.5065 u.n.e.	pebble-cobble conglomerate sandstone, soft and friable sandstone	150 m north of north abutmen
IRK	0035 22 Jan 1232 03 Feb	34.3336 450 m	118.5081 u.s.w.	coherent to semi-friable sandstone, medium grained	30 m west of south abutment

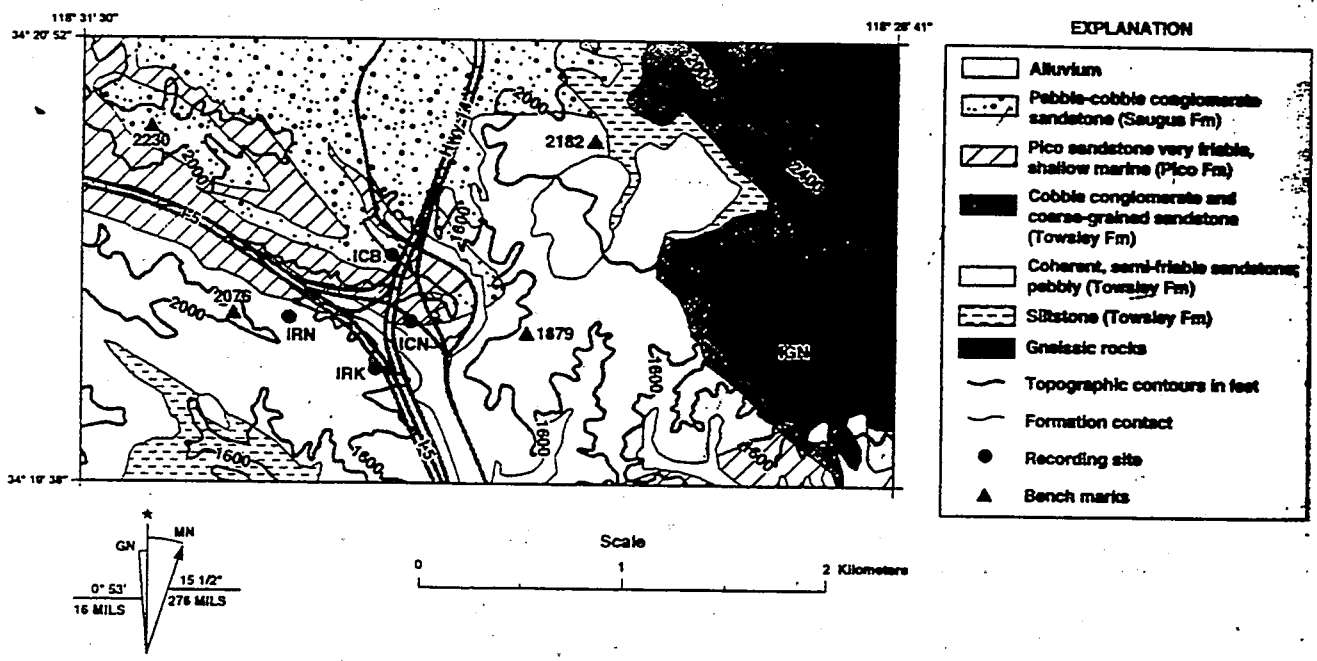


Figure 2. Geology and topography of the interchange area and the location of instruments. The interchange is situated in a topographic basin, and the geology is sandstone of varying composition. Gneiss rock outcrops at a distance of about 1.8 km and is assumed to be the basement structure for the area.

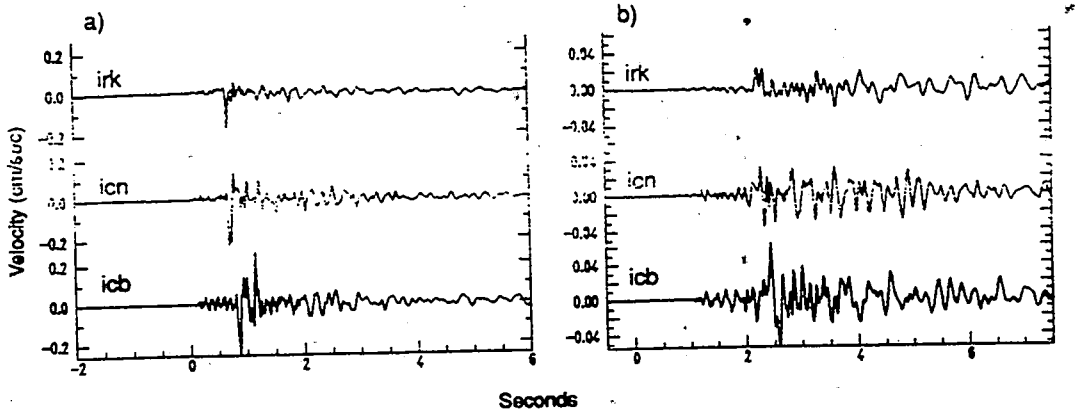


Figure 3. Seismograms at the three sites (a) from a magnitude 2.7 earthquake with hypocentral distance of 5 km and (b) from a magnitude 2.1 earthquake with hypocentral distance of 10 km.

few centimeters to 5 to 10 m. The composition of sandstone at each instrument site differs, but they all would be classified as "class B" soft-rock sites by the Boore *et al.* (1993) classification. The sandstone at the IRK and IRN sites is medium grained and coherent to semi-friable and contains significant amounts of gypsum. By contrast, the sandstone from site ICB is a weathered pebble-cobble conglomerate and contains the swelling clay, smectite, at a concentration of 10 to 20% by volume. The sandstone at the ICN site is medium grained and friable to very friable.

Laboratory measurements of shear modulus and attenuation were made at seismic frequencies and strain levels for surface samples from the instrument locations to determine if material properties contributed to site variability (Brian Bonner, Lawrence Livermore National Laboratory, personal comm., 1995). Tests were conducted with a torsional oscillator (Bonner and Wanamaker, 1991), which applies a uniaxial load of 1 to 3 MPa to simulate overburden. Results show important differences in the shear response of these rocks for shear strains of 1×10^{-6} to 5×10^{-6}, which are low enough to correspond to weak motion. Shear moduli for the IGN gneiss and the IRK and ICB sandstones are 14.5, 12.5, and 6 GPa, respectively, for frequencies between 4 and 16 Hz. Shear attenuations (Qs^{-1}) are more scattered, ranging from 0.015 to 0.03 in this frequency range. The ICB sandstone and the IGN gneiss have comparable attenuation, and IRK has the highest. The combination of low modulus and relatively low attenuation for the ICB sandstone is unexpected. However, the ratio of shear moduli for the ICB and IRK sandstones is 0.48. If this difference is representative of the rocks in the vicinity of the stations, it could account for a factor of two relative amplification of shear waves between the IRK and ICB sites.

The topography of the interchange area is unusual. It sits at the confluence of two valleys with high peaks at three points between the valleys creating a topographic basin (Fig. 2). The spatial dimensions of the basin are near the wavelengths of seismic energy (0.5 to 2.0 km) and suggest that

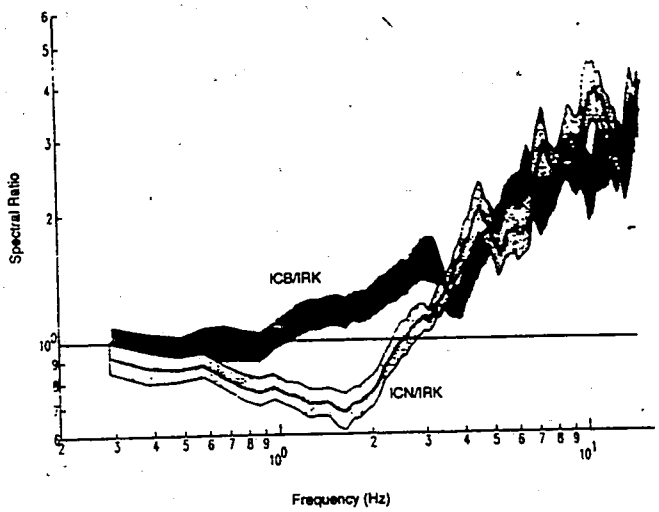


Figure 4. The spectral ratio and the 5 and 95% confidence limits for several events recorded at site ICB relative to IRK and at site ICN relative to IRK.

topography may play a significant role in amplification and incoherency of seismic wave propagation. Craig Schultz (Lawrence Livermore National Laboratory, personal comm., 1995) conducted a numerical experiment to determine whether topography in the region of the Hwy 14 and I-5 interchange contributes significantly to differential motion on the structure. He developed a simple two-dimensional topographic model of the Hwy 14 and I-5 interchange region using sinusoidal ridges with the same characteristic height, spatial wavelength, and separation as topography in the vicinity of the interchange (Schultz, 1994).

Schultz found that the peak-to-peak amplitude recorded at the free surface, given a plane incident shear wave, shows that an amplification factor of 2 can be easily achieved near the flank of the hills relative to the flatter portions of the basin and that dramatic amplification and deamplification of shear-wave energy in the 1- to 10-Hz frequency range can

occur over short distances. Schultz concludes that this simple model is most likely a lower limit on the differential motion that could occur along the Hwy 14 and I-5 interchange as a result of topography and that topography could account for at least a factor of 2 variation in amplitudes across the interchange area.

Site-Specific Site Response

Comparisons of recordings of small earthquakes ($M < 3.0$) across the interchange are used to examine the combined site geologic and topographic effect. Figure 2 shows the location of recording sites IRK, ICN, and ICB, which form a rough north–south line along the axis of the interchange. Figure 3 shows seismograms at the three sites from a magnitude 2.7 earthquake with hypocentral distance of 5 km and from a magnitude 2.1 earthquake with hypocentral distance of 10 km. These events are effectively point sources. The seismic energy has traveled along the same path from the earthquake to the interchange. The differences in the recordings are due to differences in geology and topography at the recording sites. It is apparent that there is considerable amplification in the site response at ICN and ICB as compared with that at site IRK. Also, it is apparent that relatively large secondary arrivals are being developed at the ICN and ICB as compared with those at site IRK.

Figure 4 shows the spectral ratio and the 5 and 95% confidence limits for several events, following the procedures outlined by Jarpe *et al.* (1989). The amplification at site ICB relative to IRK increases for frequencies above 1 Hz to about a factor of 3 at 10 Hz. The amplification of site ICN relative to IRK is the same as that for ICB relative to IRK, except in the 0.6- to 4.0-Hz range. These plots show that the three sites have significantly different amplification factors that range from a factor of about 2 to 4 over the 300- and 600-m separations. This is consistent with the site geology and topography effects predicted by Bonner and Schultz above. There were not enough common events to examine spectral ratios at site IRN.

Figure 5 shows seismograms from sites IGN and IRK for two events. This shows that there is a significant amplification of seismic waves and substantial secondary arrivals in the interchange area relative to the hard-rock site. Figure 6 shows spectral ratios for the two sites. There were only six events to obtain the spectral ratio, so confidence limits are poorly defined. The spectral ratios show that the IRK site amplifies seismic energy up to a factor of about 6 relative to site IGN, in the 2.0- to 10-Hz range; lower-frequency values are very unreliable. This indicates that in addition to the variation across the sandstone in the interchange area, the geology of the interchange is such that it amplifies energy by about a factor of 3 to 6 (in the 1- to 10-Hz range) relative to this hard-rock site.

Recording Site Variation

If important variations in amplification and waveforms occur over short distances, (300 to 600 m), we must consider whether they are also important over even shorter distances (50 to 100 m) (i.e., does it matter where the sensors are placed). To test this, we set up an experiment to record events at site IRK and at another site 50 m east on the abutment to the Hwy 14 connector, as well as at site ICN and at another site 100 m west, farther into the ravine. The abutment is a very massive concrete structure and is imbedded in the sandstone. It is on the same sandstone but not the same layer as IRK. The alternate site to ICN is also in the center area and on the same sandstone as ICN but on the other side of a small gully. Both alternate sites are shown in Plate 1a as small white circles without ID initials. Figure 7 shows a single component of a recording at IRK and the alternate site. The similarity of waveforms is obvious. It is interesting that the maximum peak is different by almost a factor of 2 between the two sites. The waveforms between the ICN site and the alternate site were different, but the character was the same, and the spectral amplifications relative to IRK were essentially the same. The answer to the question based on the limited data here is that variations in this area are sig-

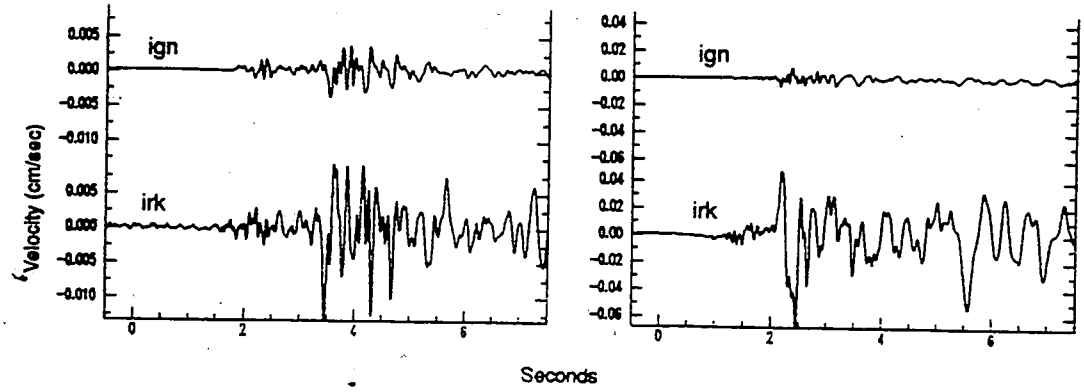


Figure 5. East component seismogram at stations IGN and IRK from two events. IGN is a hard-rock site, and IRK is a soft-rock site.

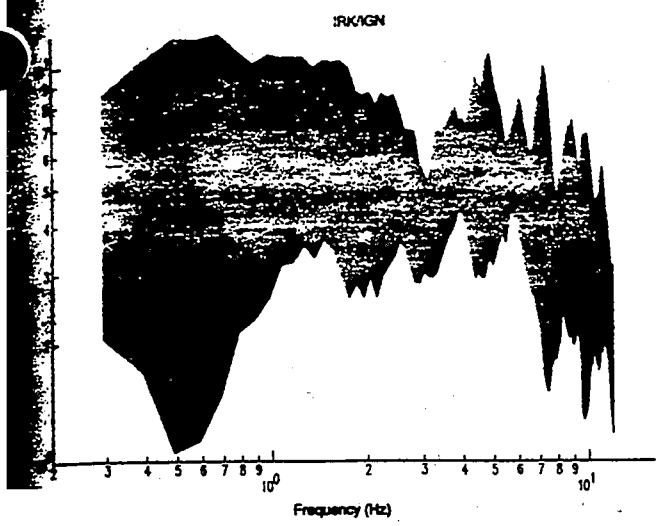


Figure 6. The spectral ratio and the 5 and 95% confidence limits for several events recorded at site IGN relative to IRK and at site ICN relative to IRK.

ificant over short distances (300 to 600 m) but not over y short distances (50 to 100 m).

Synthesized Ground Motion

We synthesized the ground motion over the frequencies 3 to 25.0 Hz using empirical Green's functions (Hutchings nd Wu, 1990; Hutchings, 1991) and combined this with a nthesis over the frequencies 0.0 to 0.3 Hz using synthetic reen's functions. Both syntheses were calculated using the ogram EMPSYN (Hutchings, 1988), which uses the reen's function summation approach (Heaton, 1982) to odel kinematic rupture models (Hutchings, 1994). Syn- tic Green's functions were calculated using the reflectiv- code (Kennett, 1983) for a one-dimensional velocity ucture obtained from Hauksson *et al.* (1995). T... syn- tic Green's functions do not include near-field terms.

The empirical Green's functions in this study are small enough that they occur as effectively impulsive point dislocation sources. This allows for an explicit solution to the representation relation with empirical Green's functions (Hutchings, 1994). Hutchings and Wu (1990) found that aftershocks of the San Fernando earthquake with moment less than about 1.5×10^{21} dyne-cm (dependent upon site geology) were effectively point sources for rock and alluvial sites. Only aftershocks of the Northridge earthquake that meet this criterion are used here as empirical Green's functions.

Syntheses are calculated at sites IRK, ICN, and ICB, where the empirical Green's functions were recorded. The site-specific empirical Green's functions include the total effect of whole path and site geology, wave amplification, and topography. Also, the same events were used to obtain empirical Green's functions for all three sites. Thus, the synthesis explicitly accounts for the effect of wave passage, wave amplification, and high-frequency incoherency.

Kinematic rupture models used here are simple characterizations of actual rupture. They rely on moment, fault geometry, hypocenter, rupture roughness, rupture velocity, healing velocity, asperities, and a Kostrov slip model. These parameters are described in Hutchings (1991, 1994). Jarpe and Kasameyer (1996) found that this simple characterization of the source, with parameters set from independent studies, described the observed strong ground motion for the Lama Prieta earthquake. Hutchings (1994) modeled observed records from the San Fernando earthquake using such simple rupture models along with parameters established from independent studies. Here, independent studies are used to establish these parameters for a rupture model of the Northridge earthquake. The rupture model M1608 from Hutchings (1994) is used for the San Fernando earthquake.

The slip distribution and geometry for both rupture models is shown in Figure 8. The model for the San Fernando earthquake has rupture on two faults as subevents: the deep rupture has moment 0.5×10^{26} dyne-cm, and the shal-

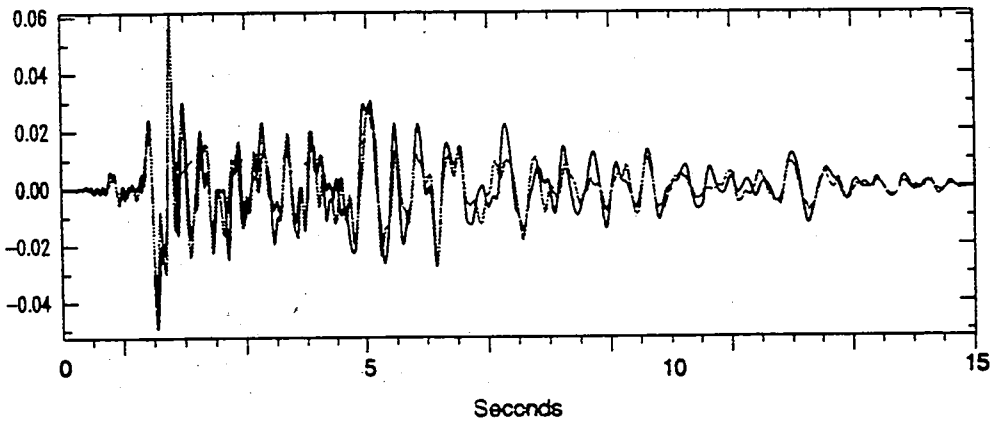


Figure 7. The east component of a recording at IRK (solid line) and the alternate site (dotted line). The alternate site is on the abutment and is shown as the open circle shown near IRK in Plate 1b.

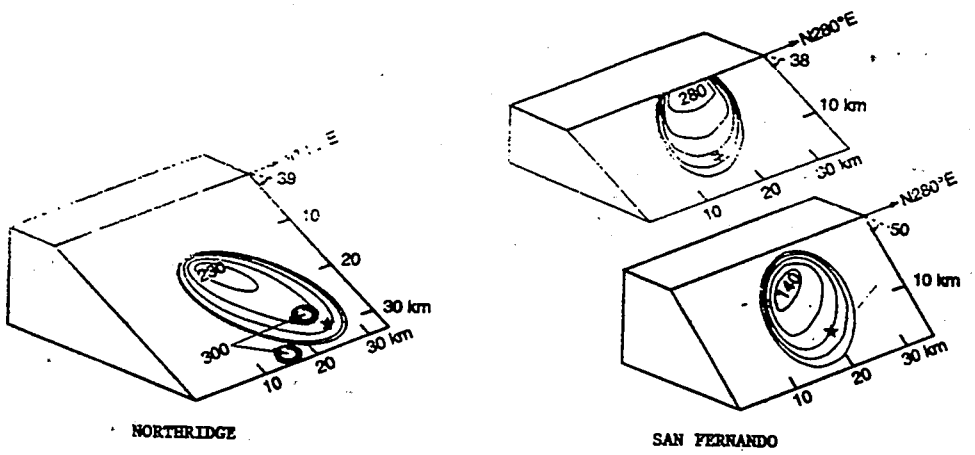


Figure 8. The slip distribution and geometry for the rupture models for the Northridge and San Fernando earthquakes. The San Fernando rupture model has rupture on two subevents. Rupture initiates on the deep rupture and then initiates on the shallow rupture 2 sec later. The stars show the initiation points.

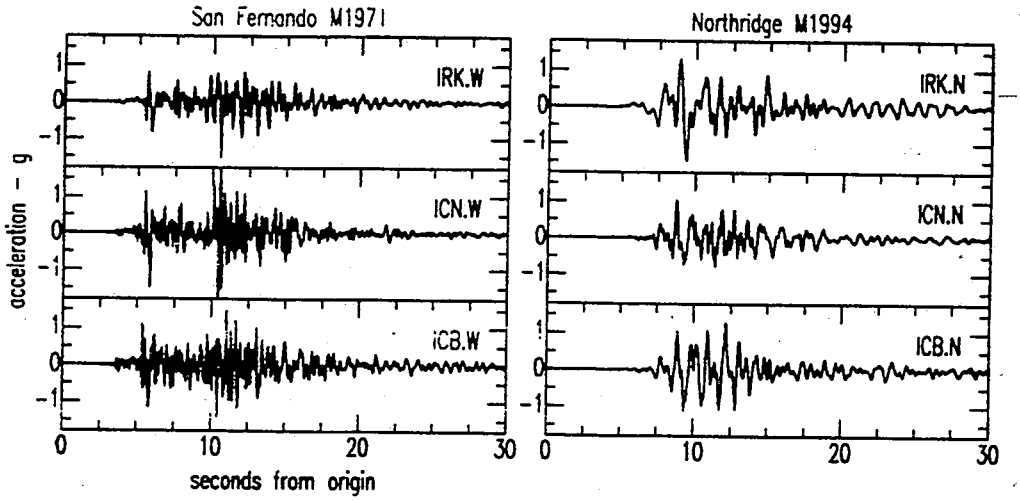


Figure 9. Synthesized acceleration at the three sites for the source models shown in Figure 7. Only the west component is shown for the 1971 earthquake and only the north component is shown for the 1994 earthquake. One excursion on the ICN.W component for the San Fernando exceeds 2 *g*.

low rupture has moment 1.0×10^{26} dyne-cm. Both have a focal mechanism solution with strike N280°W, slip vector 100, and dips of 38° N and 50° N for the shallow and deep portions of the fault surface, respectively. The solution uses the Kostrov slip rupture model with healing and 50% roughness. Nine empirical Green's functions were used for the upper rupture, and 10 were used for the lower rupture.

The source rupture model used for the Northridge earthquake used in this study (Fig. 8) is described. The hypocenter of the main event was determined by Hauksson *et al.* (1995) to be 34.2092°N, 118.5407°W 18.7 km. The moment is 1.4×10^{26} dyne-cm, obtained as an average of studies by Dreger (1994), Wald *et al.* (1995), and Song *et al.* (1995) and a slip rake of 105° from the average of these studies. The fault plane orientation is that derived by Hauksson *et al.* (1995) from aftershock distribution: N119°E, 39°S. The fault plane fits the average of the focal mechanism of the above studies. The slip distribution is a first-order approximation of the slip distribution determined by Dreger (1994) and Wald *et al.* (1995); both had similar results. The long axis of the slip contours and the major axis of the elliptical rupture area are oriented ~30°W of the updip direction and are aligned due north. The ellipse has an eccentricity of 0.8 with a major axis of 25.0 km and minor axis of 15.0 km. It approximates the area outlined by a deficit of aftershocks plotted by Hauksson *et al.* (1995) and is consistent with the area of slip determined by Dreger (1994). The stress drop modeled is 75 bars, and we used 20% roughness. Eighteen empirical Green's functions were used.

Figure 9 shows the resulting accelerograms at the three

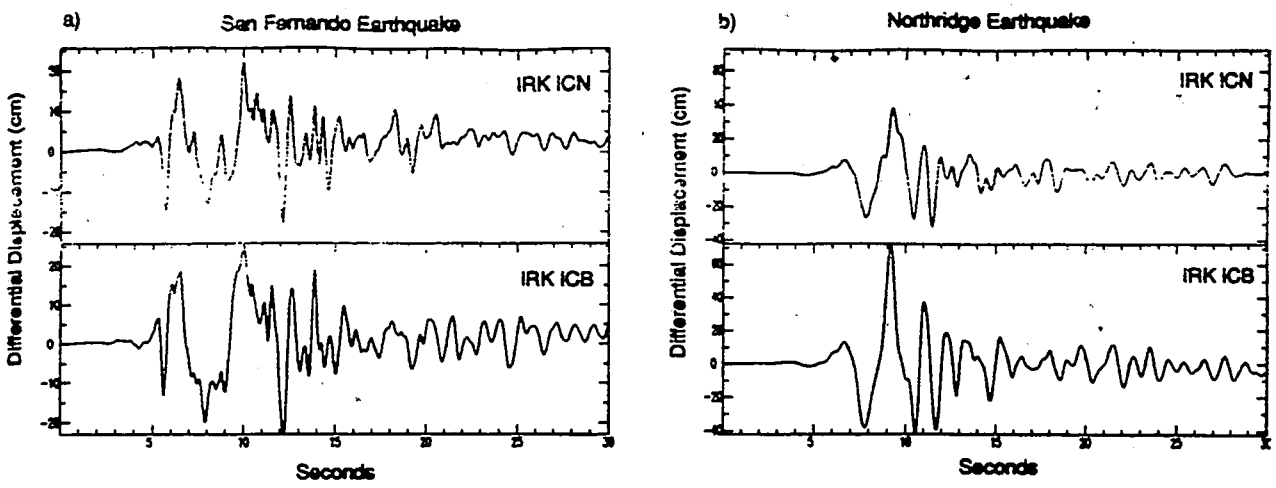


Figure 10. The relative displacement in the north–south direction between site pairs IRK and ICN (top) and IRK and ICB (bottom): (a) San Fernando earthquake and (b) Northridge earthquake.

sites from both earthquakes. It is interesting that the peak acceleration varies by a factor of almost 2 among the three sites for each earthquake. Over this short distance range, peak acceleration can vary significantly. It is assumed that this is a result of the topographic and geologic conditions and the chance occurrence of constructive and destructive interference. Also, note that more high frequencies occur at sites ICN and ICB than at site IRK. Both of these effects are entirely due to differences in site geologic response. The synthesized accelerograms for the San Fernando earthquake have higher-frequency content than those from the Northridge. This is partially a result of the San Fernando earthquake rupturing to the surface and actually rupturing closer to the interchange than did the Northridge earthquake, which ruptured only to within 6 km of the surface. Also, the rupture model used for the San Fernando earthquake has a higher percentage of roughness to rupture, which enhances the high-frequency energy.

Estimated Differential Ground Motion

The relative ground motion among the three sites along the interchange can be computed from the synthesized seismograms. Figure 10 shows the relative displacement in the north direction between site pairs for the two earthquakes. The north–south direction is longitudinal to the Hwy 14 connector that separated along expansion joints for both earthquakes. Sites IRK and ICB are at the two extremes of the interchange and show a relative displacement of up to 25 cm for the San Fernando earthquake and 70 cm for the Northridge earthquake. Site ICN is in the central area of the interchange. Differential displacements of up to 20 cm are computed for the San Fernando earthquake and up to 40 cm for the Northridge earthquake. These represent strains of up to about 10^{-3} across the interchange. The lower differential motions for the San Fernando earthquake is surprising since the interchange is closer to the high-amplitude displacements in the San Fernando rupture model. However, the two-subevent model for the San Fernando earthquake results in less long-period energy that contributes to the relative displacements.

Figure 11 shows the coherence (normalized cross-correlation) of the synthesized accelerograms as a function of frequency. Remember, synthesized seismograms used the same source events as Green's functions to limit variability resulting from different source events. Seismic energy is fairly incoherent for both earthquakes for frequencies above about 0.5 Hz. Lower-frequency calculations are unreliable due to signal-to-noise ratio.

Conclusions

We analyzed records of small earthquakes ($M < 3.0$) at three locations separated by 300 to 600 m in the interchange area and a fourth location 2 km east. The entire interchange area is situated on interbedded sandstone of varying consistencies and is surrounded by ridges of the Santa Susana and San Gabriel Mountains. The aftershock recordings reveal a substantial relative spectral amplification of up to a factor of 4 across the interchange area. Also, substantial secondary arrivals are generated at two locations in the area. We attribute these effects to variations in the composition of the sandstone and topographic variations. Also, spectral ratios for events recorded at the interchange and at a hard-rock site at a distance of 2 km show that the entire interchange area amplifies seismic waves up to about a factor of 6 relative to the reference site.

We used the aftershock recordings of small earthquakes as empirical Green's functions and synthesized strong ground motion for both the San Fernando and Northridge

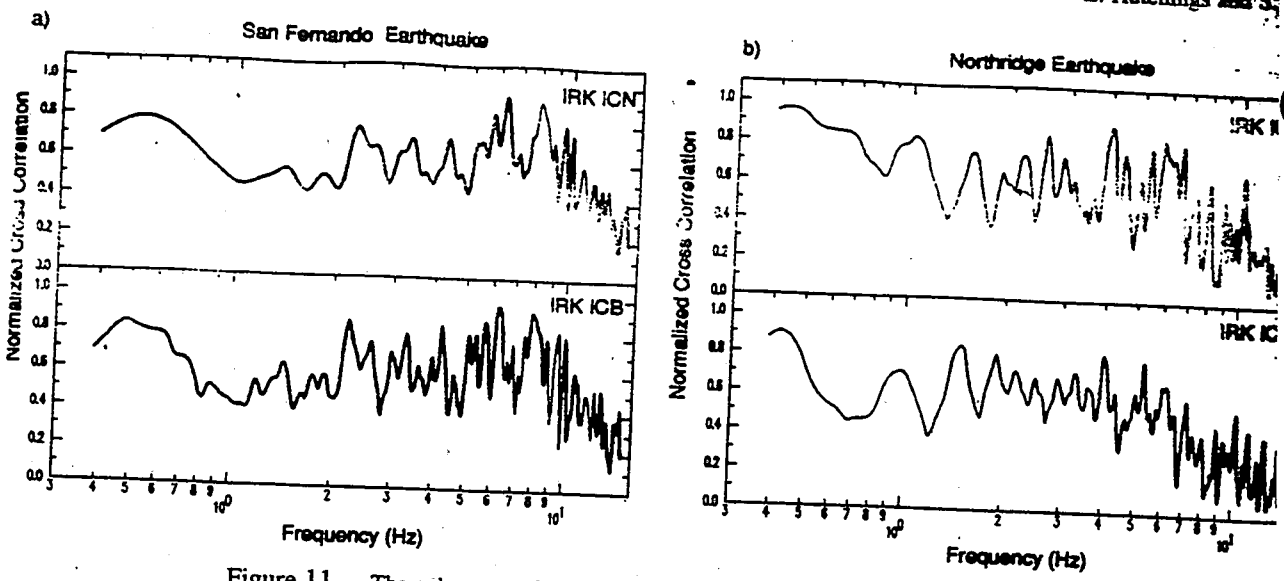


Figure 11. The coherence of the acceleration as a function frequency: (a) San Fernando earthquake and (b) Northridge earthquake.

earthquakes at three sites in the interchange area. Results presented here are based on an assumption that the geology of the interchange area remained linear in its response to the main event. We do not claim to have synthesized the exact ground motions that occurred during these earthquakes, but we do claim to have sufficiently accounted for the factors effecting strong ground motion to speculate what the effects on the structure might have been. From our synthesized ground motion, we estimate (1) peak acceleration to have been near 1 *g* for both earthquakes due to the topographic and geologic conditions and to the geometry of the fault rupture; (2) differential displacement across the north and south extremes of the area to be up to about 25 cm for the San Fernando earthquake and up to about 70 cm for the Northridge earthquake, due to wave passage effects and local geologic and topographic conditions; and (3) relative motion to be fairly incoherent for frequencies above about 0.5 Hz.

It appears that the structures were exposed to high amplitudes of shaking and significant differential motion. These effects appear to be due to the geologic and topographic conditions of the interchange area. Amplitudes are such that they could have contributed to the separation of structures along hinge seats, which resulted in failure of the structures.

Acknowledgments

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Lawrence Livermore National Laboratory
Earth Sciences Department
Geologic and Atmospheric Hazards Project
P.O. Box 808
Livermore, California 94551

Manuscript received 1 January 1995.

FIFTY-SIX

APR - 8 199

RESPONSES TO COMMENTS ON THE SUNSHINE CANYON LANDFILL EXTENSION FOR THE COUNTY OF LOS ANGELES BOARD OF SUPERVISORS

State Clearinghouse Number 89071210

Compound Plan Amendment Number 90-2-(5)
Sub-Plan Amendment Number 86-312-(5)
Conditional Use Permit and Oak Tree Permit No. 86-312-(5)

COUNTY OF LOS ANGELES
DEPARTMENT OF REGIONAL PLANNING
Hall of Records
Impact Analysis Section
320 West Temple Street
Los Angeles, California 90012

NOVEMBER 1993

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EXH.

BEFORE THE BOARD OF SUPERVISORS

COUNTY OF LOS ANGELES

EDMUND D. EDELMAN, CHAIRMAN

COPY

IN THE MATTER OF:)
)
AGENDA ITEM NO. 5)
)

PARTIAL TRANSCRIPT OF PROCEEDINGS

LOS ANGELES, CALIFORNIA

THURSDAY, OCTOBER 21, 1993

REPORTED BY:

MICHELLE HANNAH,
CSR NO. 9985

JOB NO.:
SUPZ414P

Kennedy
COURT REPORTERS, INC

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Suite [illegible]
Los Angeles, CA [illegible]
(800) 231-2682

MR. BERGHOFF: GOOD AFTERNOON MR. CHAIRMAN, MEMBERS OF THE BOARD OF SUPERVISORS. MY NAME IS ARNIE BERGHOFF. MY ADDRESS IS 444 SOUTH FLOWER STREET, LOS ANGELES 90071. I'M THE DIRECTOR OF GOVERNMENT AND COMMUNITY AFFAIRS FOR BROWNING-FERRIS INDUSTRIES HERE IN SOUTHERN CALIFORNIA.

I WOULD LIKE TO VERY BRIEFLY MAKE THE PRESENTATION ON BEHALF OF MR. RON PFEIFER WHO'S OUR REGIONAL VICE PRESIDENT FOR OUR NEWLY-FORMED WESTERN REGION. MR. PFEIFER IS OUT OF TOWN TODAY AND HAS ASKED ME TO MAKE THIS BRIEF STATEMENT FOR HIM.

I APPRECIATE THIS OPPORTUNITY TO PRESENT THIS TESTIMONY, AND AS I INDICATED, I WILL BE QUITE BRIEF IN THE INTEREST OF TIME SINCE WE ARE ALL GETTING HUNGRY AND RUNNING QUITE LATE.

I WOULD LIKE TO RESPOND TO CONCERNS RAISED BY SOME REGARDING B.F.I.'S COMMITMENT TO ENVIRONMENTAL COMPLIANCE IN THE OPERATION LANDFILLS AND TO ENSURE THAT B.F.I. IS NOT ONLY A COMPETENT OPERATOR, BUT A COMPANY THAT STRIVES TO EXCEED AND NOT JUST MEET ENVIRONMENTAL RULES. B.F.I.'S OBSESSION, IF YOU WILL, WITH COMPLIANCE NOT ONLY APPLIES TO OUR LANDFILL OPERATIONS BUT TO ALL PARTS OF OUR VARIED WASTE BUSINESSES AS WELL.

I'M NOT GOING TO ADDRESS PARTICULAR QUESTIONS ON OUR OPERATION OF THE SUNSHINE CANYON LANDFILL. MR. WESTON HERE, AS HE INDICATED, WOULD BE HAPPY TO RESPOND. WE HAVE OTHER MEMBERS OF OUR COMPANY WHO COULD RESPOND TO THOSE.

ALSO, I WOULD LIKE TO POINT OUT THE EXTENSIVE

VOLUME OF THE RECORD ON THIS PROJECT, WHICH DOCUMENTS BOTH SIDES OF OPERATING HISTORY ISSUES. IT IS CLEAR TO ME, HOWEVER, THAT ALTHOUGH DIFFERING VIEWPOINTS WERE EXPRESSED ON THESE ISSUES, WE WERE NOT PERFECT AND THAT SOME MISTAKES WERE MADE. WE OBVIOUSLY CAN'T RECTIFY PAST MISTAKES, BUT I'M HERE TODAY TO COMMIT THAT B.F.I. WILL NOT ONLY MEET THE REQUIREMENTS OF THE VOLUMINOUS CONDITIONS CONTAINED IN THE CONDITIONAL USE PERMIT, BUT WILL STRIVE TO EXCEED ALL REQUIREMENTS.

B.F.I. RECOGNIZES THAT ITS ABILITY TO SURVIVE AND SUCCEED AS A BUSINESS DEPENDS IN LARGE PART, NOT JUST ON REGULATORY COMPLIANCE, BUT AGAIN ON EXCEEDING PUBLIC EXPECTATION REGARDING HEALTH AND SAFETY AND THE ENVIRONMENT IN EVERY ASPECT OF YOUR OPERATIONS.

WE ARE FIRMLY COMMITTED TO ENVIRONMENTAL EXCELLENCE. THIS COMMITMENT STARTS RIGHT AT THE TOP WITH OUR CHAIRMAN, BILL RUCKELSHAUS, AND IS SHARED AND REINFORCED AT EVERY LEVEL OF MANAGEMENT.

LET ME TAKE JUST A VERY BRIEF MOMENT TO DESCRIBE HOW B.F.I. HAS RESPONDED TO INCREASED CONCERNS ABOUT PROTECTING AND ENHANCING OUR ENVIRONMENT IN THE UNITED STATES. THIS CONCERN COMES FROM OUR SHAREHOLDERS, OUR EMPLOYEES, THE PUBLIC AT LARGE.

IN EARLY 1989, B.F.I. ESTABLISHED AN ENVIRONMENTAL POLICY COMMITTEE TO REVIEW EXISTING ENVIRONMENTAL COMPANY POLICIES AND TO DEVELOP NEW POLICIES FOR THE COMPANY. SINCE THEN, WE HAVE EXPANDED THE ROLE OF THIS COMMITTEE, OF WHICH RON PFEIFER IS A MEMBER, TO SERVE

AS A GUIDE FOR THE COMPANY IN DESIGNING, IMPLEMENTING, COMMUNICATING AND MONITORING PROGRAMS AIMED AT ACHIEVING CONTINUAL IMPROVEMENT IN THE ENVIRONMENTAL HEALTH AND SAFETY PERFORMANCE OF OUR COMPANY.

THE COUNCIL MEETS REGULARLY, AND A REPORT IS ISSUED THAT INDICATES ANY VIOLATIONS THAT WE HAVE THAT NOT ONLY SAYS WHAT A GREAT JOB WE ARE DOING BUT ALSO POINTS OUT VIOLATIONS WE HAVE IN AREAS THAT WE NEED TO IMPROVE.

EACH OF YOU HAVE BEEN DISTRIBUTED A COPY OF OUR LATEST REPORT. I'D LIKE TO POINT OUT THAT THE REPORT IS AIMED AT OUR GOAL OF ENVIRONMENTAL EXCELLENCE TO HAVE ZERO VIOLATIONS. LET ME REPEAT THAT. THAT IS, NO VIOLATIONS AT ALL. THAT IS OUR GOAL.

THE KEY TO B.F.I.'S ENVIRONMENTAL MANAGEMENT PROGRAM IS A SERIES OF HIGHLY STRUCTURED TRAINING PROGRAMS FOR ALL EMPLOYEES FROM THE TOP ALL THE WAY DOWN TO THE GENTLEMAN WHO WORKS, OR LADY WHO WORKS AT THE LANDFILL, AND THE UNIQUE COMPENSATION PROGRAM WHICH WAS OUTLINED IN THE REPORT THAT TIES THE MAJOR PORTION OF THE MANAGER'S ANNUAL PAY TO HIS OR HER ENVIRONMENTAL PERFORMANCE.

I WOULD LIKE TO CONCLUDE MY REMARKS BY READING OUR COMPANY'S MISSION STATEMENT, WHICH HANGS IN MY OFFICE AND THE FRONT OFFICE OF EVERY B.F.I. LOCATION IN THE COUNTRY.

"OUR MISSION IS TO PROVIDE
THE HIGHEST QUALITY WASTE COLLECTION,
TRANSPORTATION, PROCESSING, DISPOSAL
AND RELATED SERVICES TO BOTH PUBLIC AND

PRIVATE CUSTOMERS WORLDWIDE. WE WILL CARRY OUT THAT MISSION EFFICIENTLY, SAFELY AND IN AN ENVIRONMENTALLY RESPONSIBLE MANNER, WITH RESPECT TO THE ROLE OF GOVERNMENT IN PROTECTING THE PUBLIC INTEREST."

AGAIN, LET ME MAKE THIS CLEAR. THIS MISSION STATEMENT IS NOT JUST A PUBLIC RELATIONS PLOY. OUR ENVIRONMENTAL HEALTH AND SAFETY REPORT IS NOT JUST A PUBLIC RELATIONS PLOY. WE TAKE THE BUSINESS OF ENVIRONMENTAL COMPLIANCE IN OUR CORPORATION VERY, VERY SERIOUSLY.

THANK YOU VERY MUCH.

MR. EDELMAN: OKAY. THANK YOU, AND NOW WE ARE GOING TO RECESS UNTIL 2:15, AND EVERYBODY WHO WANTED TO BE HEARD THIS MORNING, IF YOU WOULD LIKE TO BE HERE AT 2:15, WE WILL BE HAPPY TO HEAR THEM.

WE WILL STAND IN RECESS NOW UNTIL 2:15.

(LUNCH RECESS)

MR. EDELMAN: GOOD AFTERNOON.

OKAY. WE WILL CONTINUE THE HEARING THAT RECESSED TODAY.

MR. ANTONOVICH?

MR. ANTONOVICH: MR. CHAIRMAN, CAN WE JUST CALL ROSEMARY WOODLOCK UP FOR 60 SECONDS. SHE HAS A PROPOSAL STATEMENT TO MAKE RELATIVE TO NEGOTIATIONS ON REACHING SETTLEMENT.

MS. WOODLOCK: THANK YOU, MR. ANTONOVICH.

MR. CHAIRMAN, WE ATTEMPTED ALL DURING LUNCH

EXH. 7

Sludge
Copyright 1996 Business Publishers, Inc.

Wednesday, December 4, 1996

Vol. 21, No. 25 ISSN: 0148-4125

BFI Sub Agrees to $5M+ Settlement Of CWA Conspiracy-Disposal Case

BFI Services Group Inc., has agreed to pay a $3 million fine and $2.14 million in cleanup contributions to settle Justice Department charges that the company improperly collected, stored and disposed of raw sewage, grease and sludge in the Philadelphia area.

BFI Services, a subsidiary of Houston-based Browning Ferris Industries Inc., agreed to plead guilty to one count of violating the Clean Water Act and one count of conspiring to violate the CWA, according to the Justice Department.

POTWs To Receive $642K

The proposed settlement also requires restitution payments totaling $642,311 to four of the publicly owned treatment works affected by the alleged violations. Three of the POTWs are in Aston, Bridgeport, and Hatfield, Pa. The fourth is in New Castle, Del. Browning Ferris Industries Inc. would not face prosecution for infractions at those facilities.

DoJ alleges BFI Services illegally dumped wastes on 1,577 occasions from 1989 to 1992. Wastewater from these 4,600 waste loads allegedly contained prohibited treatment sludges and/or grease. In many instances, the company gave the POTWs false samples of waste slated for disposal, DoJ says. Other times, the firm allegedly gave POTWs unrepresentative samples containing a blend of raw sewage and other wastes to make it suitable for disposal.

DoJ also charged several past and present BFI Services employees in the case, including Robert Atkinson, the ex-president. He is charged with one count of violating the CWA and if convicted faces a maximum $100,000 fine and up to a year in jail.

EXH. IV

Waste News
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Monday, December 9, 1996

INDICTMENT PUZZLES BFI OFFICIALS

John Russell

PHILADELPHIA -- A federal grand jury has indicted a defunct unit of Browning-Ferris Industries Inc. and six employees on charges of illegally dumping more than 4,500 loads of sewage at five wastewater treatment plants.

The actions defrauded the municipal plants in Philadelphia and New Castle, Del., of about $1.3 million, said the U.S. Attorney's office in Philadelphia.

BFI officials expressed surprise with the indictment, saying they discovered the illegal activity on their own four years ago, fired those responsible, corrected the situation and reported everything to the FBI and other government agencies.

In addition, BFI paid Philadelphia $1.6 million in restitution and an unspecified amount to New Castle in 1992. BFI managed to get a new permit to use the treatment plants within two months, officials said.

"We took all the proper steps," said Philip S. Angell, BFI's assistant to the chairman. "That was 41/2 years ago. We thought everything was settled."

The grand jury returned a 23-count indictment Nov. 21 against BFI Services Group Inc. and employees Robert Atkinson, Robert Douglass, Jeffrey Turbedsky, Gary Rice, Michael Malatesta and Kevin Cornell.

The charges include violations of the Clean Water Act, conspiracy, mail fraud and aiding and abetting.

Of the employees named, only Turbedsky, a BFI accountant, remains with the firm and has maintained his innocence. BFI said it fired three others, and two had resigned.

BFI shut down the operation and reassigned employees to other duties.

The Houston-based waste company had acquired the unit in 1989 as Gary Rice & Sons, plus two other small companies that were tucked into the operation.

The unit carried out a wide range of portable waste services, including portable toilets and street sweeping.

BFI said it discovered the improper activities shortly after Rice left the operation in 1992. A new district manager took over and was told Philadelphia had rejected a load of BFI sewage at a city treatment plant.

"That set off alarm bells," BFI spokesman Peter Block said. "The new district manager sent the news up the chain of command, and we launched an investigation."

The investigation showed that unit employees had been mixing wastewater sludge and grease with raw sewage, presenting it to the wastewater plant as sewage, which is cheaper to treat than the other substances.

Hazardous Waste News
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Monday, September 1, 1997

Vol. 19, No. 34 ISSN: 0275-374X

AROUND THE STATES:

* * *

PENNSYLVANIA - The U.S. District Court in Philadelphia has fined BFI Services Group, a Browning-Ferris Industries Inc. subsidiary, $3 million and ordered it to pay $642,311 to four publicly-owned treatment facilities (POTFs) after pleading guilty to charges of illegally disposing wastewater treatment sludge. The court also directed the company to pay remedial restitution of $1.5 million to environmental programs. Contact: Lauren Mical, EPA, (202) 260-4358.

EXH. 19

12/2/95 Cin. Enquirer C03

The Cincinnati Enquirer
Copyright 1995

Saturday, December 2, 1995

Metro

Offending incinerator removed BFI admitted tampering with monitoring device

JOHN ECKBERG
The Cincinnati Enquirer

A Butler County medical waste incinerator that authorities thought operated illegally from 1993 to December 1994 is being dismantled and trucked to other facilities by owner Browning-Ferris Industries.

BFI officials admitted to Union Township officials last month that three monitoring devices were tampered with or bypassed at the plant at 9899 Charter Park Drive in West Chester.

After the admissions, the plant was closed. Operations at the plant are the subject of an investigation by the Ohio Environmental Protection Agency.

The dismantling operation that started Thursday was welcome news to township trustee Catherine Stoker, a long-time critic of the plant.

"The bottom line is they're leaving and I'm pleased," she said. "They appear to be in a great big hurry. This is a nice Christmas present for the community."

Steven H. White, vice president of governmental affairs for BFI, said parts from the plant will be used at other company facilities.

BFI owns 32 medical waste incinerators or autoclave waste sterilizers in the United States. Both systems dispose of medical waste. The company is based in Houston, Texas.

There was no ambiguity with the initiative Thursday, White said.

"It's being taken apart," White said. "We've closed the incinerator permanently. It represents a couple hundred-thousand-dollar investment."

Portions of the plant that are being removed are not connected to issues or violations reported by the company, White said.

Company officials plan to immediately remove a unit used to wash tubs that held waste material and a waste water treatment device.

"It will take several months before everything is removed that we want to remove for salvage," White said.

The company's admissions of wrongdoing followed a lawsuit filed in Butler County Common Pleas Court against BFI in May by a former operations manager, Bill Little.

He claimed in that action that poor maintenance meant the plant operated safely only two to three days a week. He also claimed the company over-billed clients. The case is pending before Judge Anthony Valen, and a trial is tentatively set for March 4, 1996.

The plant was permitted to burn up to 1,500 pounds per hour of infectious waste and has operated since September 1991. It incinerated about 900,000 pounds per month.

Devices that were bypassed include:

A lock on the incinerator door to prevent it from being opened if the temperature in the incinerator dipped below standards.

A combustion temperature recorder that keeps a continuous record of heat in the incinerator.

The continuous environmental emission monitoring device, which measures the amount of environmental pollutants that leave the plant through the stack.

Those instruments will be left on site "until we've been told by appropriate officials that they have gotten whatever information they need," White said.

Environmental activists in West Chester have long claimed that the plant was operating without regard for state pollution regulations.

Stoker said if the company plans to eventually vacate the site, she expected any left-over contamination to be removed.

11/4/95 Cin. Post 9A

The Cincinnati Post
Copyright 1995

Saturday, November 4, 1995

NEWS

Waste facility closed

Post staff report

The Ohio Environmental Protection Agency is closing down an infectious-waste incinerator in West Chester after its operator last week notified the agency of problems at the plant.

Ohio EPA Director Donald Schregardus Friday said he would keep the incinerator, which is currently shut down for routine maintenance, closed until the accuracy of its monitoring equipment has been independently verified.

Browning Ferris Industries said the company had violated Ohio environmental laws in 1993 and 1994 in its temperature-monitoring equipment and reporting. Schregardus said based on what Ohio EPA has been told, it appears the company falsified operating records.

The Ohio EPA and Ohio Attorney General's Office are investigating possible criminal violations. BFI is expected to provide a written report on the incidents next week.

The incinerator is in Union Township. BFI officials could not be reached for comment.

EXH. 21

Waste News
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Monday, February 10, 1997

FLA. OFFICIALS RAID BFI SITE: STATE AND COUNTY AGENCIES ALLEGE FACILITY ILLEGALLY HANDLED CONSTRUCTION AND DEMOLITION DEBRIS, OTHER SCRAP MATERIAL

Steve Daniels

WEST PALM BEACH, FLA. -- Browning-Ferris Industries Inc. is accused of illegally operating a construction and demolition debris transfer station at a site permitted only for yard-waste processing in the small Florida farming town of Pahokee.

Investigators with the Palm Beach County (Fla.) Sheriff's Office and the state's Department of Environmental Protection found household trash, C&D debris, used oil and other materials when they raided the operation Jan. 29, said James Pearsall, an environmental investigator with the Sheriff's Office.

Site manager Robert Edward Lee was charged with three misdemeanor violations of state environmental rules.

The company, the second largest waste firm in North America, will face similar charges, Pearsall said.

"They know what it is they're supposed to be doing," he said.

Each of the charges carries potential penalties of six months in jail and a $10,000 fine.

At the site, located next to a closed ash landfill owned by the town of Pahokee, BFI processed yard waste under contract with the town.

BFI's permit confines activity at the site to mulching landscape waste, officials said.

But BFI also was using the property to sort and transfer C&D debris and other materials, Pearsall said.

Investigators found common trash, tires, used oil, car batteries, old paint and mercury vapor light tubes during their inspection, the Sheriff"s Office official said.

All the materials were on the ground, although there is a building on site, he said.

Investigators found several cars belonging to workers parked inside, Pearsall said.

The unpermitted transfer operations had been occurring for at least the past few months, according to the investigator.

"It was a well-established operation," Pearsall said.

A BFI spokeswoman said the company had begun an internal investigation and was preparing to meet with state authorities soon.

"We will flat get to the bottom of it," she said. "Until we get to the bottom of it, we are stopping operations [in Pahokee]."

If the allegations prove true, culpable BFI personnel will be held accountable, she said.

The company has no tolerance for violating permit conditions, the spokeswoman said.

Pahokee officials were unaware that materials other than yard waste were being handled at the site, Pearsall said.

A 15-foot berm BFI constructed around the property obscured a clear view of the activities there, the investigator said.

The company is not lacking in area facilities to manage C&D debris. BFI runs a C&D operation in West Palm Beach, about 37 miles away, Pearsall said.

4/4/96 Wash. Post A13

The Washington Post
Copyright 1996

Thursday, April 4, 1996

A SECTION

Alleged Illegal Dumping Prompts FBI Raid at Plant; D.C. Facility Handles Medical Waste Disposal

Vernon Loeb; Toni Locy
Washington Post Staff Writers

Dozens of FBI agents raided a medical waste disposal plant in Northeast Washington yesterday morning and carted off boxes of documents as part of an investigation into alleged illegal dumping of biomedical waste.

The agents, wearing surgical masks and yellow protective clothing, shut down the facility, which is operated by the nationwide waste disposal firm Browning-Ferris Industries Inc. Investigators conducted a day-long search of the plant, and they ordered crews from the D.C. Water and Sewer Utility Administration to pump dye into sewer mains that carry water runoff to track its path.

Susan Lloyd, a spokeswoman for the FBI's Washington field office, described the raid as "an environmental matter" and said agents would assemble all evidence seized before determining whether arrests would be made.

Philip S. Angell, a senior official at Browning-Ferris, said last night that the company was mystified by the large-scale federal operation and that all medical waste coming into the facility -- including "pathological waste," such as body parts -- remains sealed at all times.

Angell also said that FBI agents interviewed about a dozen Browning-Ferris employees at the facility without the presence of company attorneys. "To the extent that we're upset, it's because we don't know what's going on or why," the official said.

The FBI turned the facility back over to Browning-Ferris at 5:15 p.m. and walked management officials through the plant without requiring anyone to wear protective clothing, according to Arthur J. Schultz, a spokesman for Browning-Ferris who was present. Schultz said FBI officials told the company that it was free to open the plant for business today.

The plant, at Fairview Street and New York Avenue NE, is a major transshipment point for medical waste from area hospitals and has been in operation for about four years. Angell said that all medical waste that arrives by truck -- syringes, surgical clothing and the like -- remains sealed in plastic bags and is placed in two large autoclaves that sterilize the waste by steam-heating it to 300 degrees. Once sterilized, the waste is ground up and disposed of in regular landfills, he said.

Angell said that trucks also ship sealed containers containing pathological waste -- human flesh, blood, body parts and other surgical debris -- to the plant. But those sealed containers, he said, are immediately placed on other trucks and then shipped to a special incinerator in Baltimore.

"They come into the facility in sealed containers and go out of that facility in sealed containers," Angell said. "There is no processing of body parts at that facility."

Angell said the plant passed an inspection in the fall by the federal Occupational Safety and Health Administration.

"Inspectors come into that plant all the time," Angell said.

Cheryl Byrne, an OSHA spokeswoman, said the FBI alerted the agency about the raid yesterday, as is standard procedure whenever law enforcement officials suspect a potentially dangerous situation for employees of a particular company.

"We will indeed follow up on the FBI referral to make sure the employees are not in danger," Byrne said.

D.C. Council member Harry Thomas Sr. (D-Ward 5), chairman of the council's Public Works Committee, said residents who live near the facility started calling his office as soon as the FBI arrived at the plant yesterday morning. Thomas's committee has oversight jurisdiction over all waste facilities in the District.

"About 20 cars came up there between 8:30 and 9, pulled in the place and closed it down," Thomas said.

Staff writers Marcia Davis, Howard Schneider, Cindy Skrzycki and Frank Swoboda contributed to this report.

9/12/90 Star Trib. (Minneapolis-St. Paul) 01A

Star-Tribune Newspaper of the Twin Cities Mpls.-St. Paul
Copyright 1990
Wednesday, September 12, 1990

NEWS

Eden Prairie wins battle over landfill

Laurie Blake; Staff Writer

Saying that controversy over a suppressed report has damaged its credibility, Woodlake Sanitary Service Inc. decided Tuesday to end its efforts to reopen and expand the Flying Cloud Landfill in Eden Prairie.

The city has fought the proposed expansion with attorneys, public relations experts and citizen resolve. It declared a community victory, announcing the news in its schools and filling trash cans with bottles of champagne for a City Hall celebration.

"It's a great victory for the people and a wonderful victory for the environment," said Jerri Coller, who has led the Homeward Hills neighborhood in its fight against the expansion.

"I was just so concerned that my children were going to be at risk and the children of all my friends," she said. "I felt like a mother lion. I wasn't going to let anything happen to my babies."

City Attorney Ric Rosow said, "We just feel tremendous elation that much of our struggle has been vindicated and we succeeded in preventing what could have had adverse environmental and health consequences for the citizens of Eden Prairie. When I read the notice of withdrawal I had tears in my eyes I was so happy."

The Flying Cloud Landfill has been closed since April 1988, when the Minnesota Pollution Control Agency (MPCA) learned of methane gas concentrations along its eastern boundary. Woodlake, a subsidiary of Browning Ferris Industries, sought state approval to reopen the landfill and double its size. Browning Ferris is one of the nation's largest waste-disposal firms.

Last month, however, Woodlake admitted that it had suppressed for more than 1 1/2 years reports showing potentially explosive methane gas in the landfill along its south bluff area and garbage buried beyond the area permitted by the state.

That undermined the company's argument that it could be trusted to expand the landfill safely and called into question other information it had submitted in the case.

"The damage to our credibility as a result of this controversy makes continuing impossible," Woodlake President Stephen Benton said yesterday. "We are also reluctant to continue without support for this project from Eden Prairie and the larger Twin Cities community," he said.

"There really is nothing more important to us than credibility," Benton said. "There has to be confidence in what we are doing because the issues are tremendous. Unfortunately we hurt ourselves." He said he wants the public to treat the decision to withdraw as a gesture that will help rebuild trust in the company.

It announced its decision in a letter to the state administrative law judge who was holding proceedings on the proposed expansion. The expansion would have provided Woodlake and Browning-Ferris with at least $150 million in revenues from the dump fees paid by garbage haulers. Benton said Woodlake will concentrate on closing the landfill and siphoning off the methane, which is created by decomposing garbage. "We see it as an opportunity to be as open as possible with the community about what we are doing," he said. "We will be doing everything we can to assure that there are no threats to the public health or to the environment."

Cathy Kennedy, a vice president of Mona, Meyer and McGrath, Eden Prairie's public relations consultant on the landfill issue; said the city will be extremely interested in how the closing is handled.

Residents are concerned about what was dumped there, about ground water contamination and about methane gas concentrations, she said.

Benton said that eventually the site in south central Eden Prairie will be put to another use, but that that will be years from now and that the company has not yet decided what the use will be.

In the meantime, Benton said, the company will start looking for another site that would be suitable for a landfill. "We are planning to operate here and we want to operate responsibly, but we will be actively pursuing our business," he said.

Grant Merritt, a lawyer who represented the Homeward Hills residents, said he hopes the case will help end what he called the stranglehold that Browning Ferris has on the waste disposal industry in Minnesota. Woodlake's other operations include landfills in Medina and Inver Grove Heights.

Merritt, former head of the MPCA, said he disputed the company's statement that one employee, Rollin Smith, acted alone in deciding to suppress reports about the methane gas. Smith retired as vice president of Woodlake on July 27. Had the case

continued, Merritt said, he had intended to investigate that further.

Smith has said he retired for medical reasons and denied being forced out of the company because of any suppression of reports.

Rosow, the city attorney, said Eden Prairie residents suspected all along that there was more to the landfill issue than Woodlake was admitting, and the city's lawyer had tried throughout to prove that Woodlake was not fit to expand the landfill. Fitness is a showing of whether a company can be trusted to observe all governing rules and regulations, he said.

Once it became known that at least one employee apparently had acted dishonestly in concealing a report about the methane gas, "It sealed their fate on the fitness issue," Rosow said.

Coller went to City Hall yesterday where she learned of the company's decision.

"When it finally hit home I cried. I fell apart. They gave me tissues and a chair," she said.

Although the landfill fight took time away from her family, Coller said, "I look at my children and what I've taught them and I know they know to fight for what is right and that if you fight long enough you win."

John Rafferty, solid waste division chief for the Metropolitan Council, said the loss of the Flying Cloud landfill will have little effect on the overall garbage disposal situation in the Twin Cities area.

The Twin Cities has enough landfill space to last until 1995. The options are to dig more of them, expand existing ones or take waste to sites outside the metropolitan area.

Eight sites for landfills are under consideration, four in Hennepin County , three in Anoka County and one in Washington County.

EXH. 24

11/19/88 Star Trib. (Minneapolis-St. Paul) 05AA

Star-Tribune Newspaper of the Twin Cities Mpls.-St. Paul
Copyright 1988

Saturday, November 19, 1988

NEWS

BFI can't buy a good reputation

Susan Varlamoff; Mary Anderson

It never ceases to amaze us what money can buy. A good example is the series of ads run by Browning Ferris Industries (BFI) which began with the headline, "Browning Ferris Industries in the forefront of cleaning up America." The obvious intent of these ads is to brainwash the citizens of Hennepin County into thinking that BFI is a respectable company concerned about cleaning up the environment.

As residents living next to the Flying Cloud Landfill, which is owned and run by BFI, we have had firsthand experience with BFI's alleged concern for our environment. BFI has a proven record of disregard for the very laws designed to protect our environment. Its infractions range from the sublime to the ridiculous. For example:

Illegal disposal of ice cream waste in Alabama. BFI was fined $15,000.

Price fixing in Ohio. BFI was fined $1 million.

1,700 violations in Louisiana. BFI was fined $2.5 million.

Closer to home, at the Flying Cloud Landfill, the list of infractions goes on. In the recent ads, BFI boasted of "sound management practices and environmental protection." We'd like to respond directly to this claim.

First, the Flying Cloud Landfill has been so "well managed" that it now ranks on the state superfund list. Past landfill employees report that there was little or no monitoring control of the garbage dumped in the landfill. BFI ran the facility 24 hours a day and seven days a week in violation of permit regulations. Hardly a record to be proud of.

The "sound management" practice of BFI also allowed the Flying Cloud Landfill to mysteriously double in size without authorization, once again violating permit regulations. BFI then had the audacity to apply to the government to double its already unauthorized double capacity.

Where was BFI's concern for the environment in 1985 when it knowingly withheld information concerning contamination in the landfill until it received approval for expansion from the Metropolitan Council? Does this track record exemplify a company with sound management practices and environmental protection?

Today Eden Prairie must live with the contaminated mess created by BFI. The sand and gravel pit in which BFI dumps its garbage has no barrier to prevent pollutants from quickly entering the ground water. The aquifer from which we obtain our drinking water is contaminated. This contaminated water is flowing toward the Minnesota River and the biggest urban wildlife refuge in the United States. The bluff on which the landfill is situated is unstable and is falling off in chunks. The methane gas contamination is out of control. And surrounding this polluted mess are the homes of thousands of innocent citizens.

Because of pressure from the city of Eden Prairie, concerned citizens and the Pollution Control Agency, BFI is being forced to clean up the landfill. But there is no conclusive evidence that the engineered bells and whistles BFI proposes to use for cleanup will mitigate the present contamination. A recent congressional study of 100 superfund sites questions whether we are cleaning up the mess or messing up the cleanup.

Thomas Jefferson once said that "when things get so far wrong we can rely on the people when well informed to set things right." That's what the city and citizens of Eden Prairie are doing. We certainly will not give BFI the opportunity to contaminate any more of Eden Prairie.

We have beaten BFI in the Legislature, shut down its dump and taken away at least 15 percent of its business in Eden Prairie. BFI can continue to spend millions of dollars on advertisements, public relations, lawyers and experts, but it can never buy the truth. BFI has taken big risks with the people and the environment of Eden Prairie simply to make big money. And that's unconscionable. Susan Varlamoff and Mary Anderson, Eden Prairie. Neighbors of the Flying Cloud Landfill.

3/29/89 Baton Rouge Advoc. 1B

The Baton Rouge State Times
Copyright 1989 by Capital City Press

Wednesday, March 29, 1989

NEWS

BFI faces big fine over site at N.O.

FRED KALMBACH

Browning-Ferris Industries, an international waste-disposal company with five landfills in Louisiana, faces a $400,000 fine for a string of unsanitary practices at its site near New Orleans.

State Department of Environmental Quality officials first reported violations at BFI's Crescent Acres landfill in 1986, and levied a $10,000 fine after follow-up investigations found the company continued to break the law, according to DEQ records. Subsequent investigations turned up similar problems in 1988, prompting the $400,000 penalty, according to DEQ records.

BFI buries solid municipal, commercial and medical wastes at the landfill, which primarily serves the New Orleans area. The site is operating on a temporary permit pending DEQ's decision on the number and location of landfills needed to handle solid waste statewide.

The most serious violations at Crescent Acres involved acres of garbage and other waste at the site left uncovered and open to rats, flies and birds, according to Paul Miller, head of the Department of Environmental Quality's solid waste enforcement office.

"There was a very severe situation at the site," said Miller. "The sheer area of uncovered waste and ... the history of problems there led to the high fine."

BFI spokesman Peter Block said that company officials have not decided whether to appeal the fine, but added that the problems have been corrected.

"We would like (DEQ) to have a sense of comfort that we are doing the right things now," he said. DEQ inspections conducted after the violations noted in 1988 showed that BFI was operating properly.

State law requires landfill operators to cover exposed waste with six inches of soil to contain the garbage and to protect it from scavengers and insects.

BFI has failed to properly cover landfills at other sites _ as have other waste management companies _ but not to the degree found at Crescent Acres, Miller said. After violations at other landfills, BFI quickly complied with the regulations, he noted.

Since 1986, DEQ inspectors found that besides failing to properly cover the landfill, BFI illegally disposed of infectious medical waste, failed to keep litter from blowing off the site, dumped waste in standing water, and failed to pile waste in the smallest area practical. BFI also allowed contaminated liquid to seep from the landfill and failed to properly maintain wells that monitor contamination leaking into underground water supplies, according to DEQ records.

During the 1986 inspections, state officials noted that bloody bandages, hyperdermic needles and blood bags had been mixed in with other wastes, records show.

The fine this week was stiff because "the facility has a history of serious violations which are corrected but then reoccur," the penalty notice states. "While the operators express a willingness to cooperate, the fact remains that the same serious violations occur over and over again," the notice states.

BFI owns other landfills in Monroe, Lake Charles, Ascension Parish and in Jefferson Parish, and operates the Shreveport city dump under contract. Plans to expand the landfill in Lake Charles have been thwarted by the Calcasieu Parish Police Jury, which rezoned land adjacent to the existing site to preclude dumping.

BFI is also cleaning up toxic contamination that spread from an old hazardous waste dump owned by one of its subsidiaries, CECOS International, in Calcasieu Parish. The state Attorney General's Office has sued BFI and other companies for allegedly contaminating state waters with cancer-causing chemicals.

State officials have posted signs along a half-mile stretch of Olsen Bayou in Calcasieu Parish which warn that the bottom of the waterway is contaminated with toxic waste from several dumps, including the one owned by BFI.

10/12/89 Baton Rouge Advoc. 11B

The Baton Rouge Morning Advocate
Copyright 1989 by Capital City Press

Thursday, October 12, 1989

NEWS

Protesters raise stink over landfill

AP

ARABI (AP) _ About 20 residents of this New Orleans suburb marched and waved handmade signs as garbage trucks rolled in and out of Crescent Acres, the only solid waste landfill in New Orleans.

The protesters want the state Department of Environmental Quality to turn down requests that would let the dump stay open until 1993. It currently operates with an interim permit.

"Garbage stinks," said 3-year-old Kenneth Anthony.

With a surgical mask hanging below his chin, Kenneth was cradled in his grandmother's arms outside the main entrance of the landfill Tuesday.

The dump was the site of one of two protests organized by residents who say odors from the landfill force them indoors and decrease the value of their property.

Kenneth's grandmother, Myrtle Anthony, said she took to the streets because she and others have run into a bureaucratic wall trying to rid their neighborhood of the stench.

The landfill gets about 500 tons of New Orleans trash a day and all of St. Bernard Parish's trash.

About a dozen Arabi residents also protested Tuesday outside the Police Jury Complex in Chalmette.

"They want to attack (the odor problem) politically as well as legally," said Val Exnicios, a New Orleans lawyer.

Exnicios' firm is urging many Arabi residents to join a lawsuit against Browning-Ferris Inc., landfill operators, and the New Orleans Sewerage & Water Board, which operates the nearby East Bank Sewerage Treatment Plant.

"You can't bring an odor into a courtroom and say, "Here, jury: Smell this.' What you can do is bring 200 people into court and say, "Jury _ this is damaging our property,' " he said.

About 15 residents already have joined a suit filed by two families against BFI and the S&WB. The suit charges that odors from both facilities deny residents the right to enjoy their personal property.

Both BFI and the S&WB have denied that their facilities are responsible for the smell.

5/13/93 New Orleans Times-Picayune A1

The New Orleans Times-Picayune
Copyright 1993

Thursday, May 13, 1993

NATIONAL

OWNERS END FIGHT TO REOPEN LANDFILL

KAREN TURNI St. Bernard/Plaquemines bureau

The owners of the Crescent Acres landfill threw in the towel Wednesday and dropped two appeals to continue accepting garbage.

Browning-Ferris Industries was fighting two separate rulings by the state Department of Environmental Quality, one of which forced the landfill to stop taking garbage March 31.

"We looked at all the costs involved and decided that it would be much wiser to go ahead and look for some new solutions in the New Orleans area" rather than pursue the appeals, BFI spokeswoman Karla Swacker said. "New landfill sites, recycling technologies and waste-to-energy are three viable options."

The company had wanted to continue taking garbage for a few more months to improve the contour of the 46-foot garbage heap to reduce erosion. The company appealed a ruling that prohibited that plan.

BFI also had appealed a January decision by DEQ rejecting the company's request to continue operating the landfill for six more years. That matter was scheduled to be heard by a DEQ administrative law judge this month.

"Without the support of the individual parishes, Crescent Acres was not a viable solution. We would much rather work with local government," Swacker said.

Arabi residents have long complained of odors and noise from the landfill, which straddles the New Orleans-St. Bernard border. The St. Bernard Parish Council and School Board also have supported closing the landfill.

Arabi resident John Palmer, an outspoken critic of Crescent Acres, said he was glad to hear BFI dropped the appeals, but he remained concerned about the site. "We've got a facility back there that is an old landfill and we still don't know what's underneath it. The environmental problems and the future health problems it could create are now a major concern."

DEQ Secretary Kai Midboe said BFI and DEQ are still negotiating plans for the site's closure and long-term maintenance.

"Obviously we're pleased that they have dropped their appeals," Midboe said. "We have wanted them to close in accordance with their permit and this will bring that about."

2/7/96 San Antonio Express-News

San Antonio Express-News
Copyright 1996

Wednesday, February 7, 1996

Sierra Club files complaint over BFI landfill with state

Jesse Clements Express-News Staff Writer

The Lone Star Chapter of the Sierra Club has filed a complaint with the Texas Natural Resource Conservation Commission, claiming the agency failed to issue nuisance-violation notices concerning operations at the BFI landfill on Tessman Road.

A copy of the complaint was provided to the San Antonio Express-News after an article in Sunday's Metro section laid out allegations by nearby neighbors and actions by BFI to rectify the problems.

An application by BFI is pending before the commission to raise the altitude of a section of the dump nearest the homes of residents from 710 feet above sea level to 756 feet.

Neil J. Carman, the Clean Air Program Director of the Sierra chapter, charged the commission had been apprised of numerous complaints by residents near the landfill. "But next to nothing was ever done to correct these problems," he wrote to the agency's executive director, Dan Pearson.

However, an agency spokesman, Terry Hadley, said Carman's letter of complaint, dated Jan. 25, provided no new allegations.

"In fact, BFI was cited (by TNRCC) Jan. 9 for unauthorized discharge of water into Martinez Creek," he said.

But Carman wrote:

"Even though the Tessman Road Landfill is classified as a minor source for air pollution and there has been no requirement for the TNRCC to routinely investigate such minor facilities, we have serious concerns about environmental protection for all communities despite living next to such dirty, dusty, stinky, nasty sites."

Carman castigated the state agency for allegedly failing to enforce the provisions of the Texas Clean Air Act not only at the Tessman Road dump, but also at dumps in Ferris and Fort Bend County.

He specified air contaminants such as garbage and sludge odors, dust and blowing debris.

Noting his previous employment as a state air pollution inspector, Carman called on TNRCC to develop a list of all landfills poorly sited near residential areas and then give more attention to improving air quality.

"Tracking of such landfills needs major improvement statewide," his letter concluded.

Hadley said his agency was currently reviewing a number of videotapes taken and provided by neighbors who were complaining of the dump's conditions.

"But what we are seeing is dust and blowing debris confined to the landfill itself - not on others' property," he said.

Hadley said the commission has addressed all the complaints over the past few years.

Asked if BFI had been fined for the citation, Hadley said the purpose of such citations is to bring violators into compliance, rather than as a punitive measure.

"There will be no future penalties (as a result of the citation)," he added.

But Joe Irizarry, divisional sales manager for BFI, disputed that TNRCC even issued a citation.

He said the agency had simply warned the company that it should notify TNRCC anytime anything was pumped into the creek.

"What this was," Irizarry said, "was accumulated rainwater that was not even on the landfill premises. TNRCC said to notify them in advance next time in case complaints were made."

He said BFI welcomes the many visits of regulators or people with complaints.

"We certainly don't mind additional scrutiny," he added.

A public hearing on the expansion permit will be scheduled by the commission during the last two weeks in March, a spokesman said last week.

10/15/97 San Antonio Express-News 01S

San Antonio Express-News
Copyright 1997

Wednesday, October 15, 1997

Sun - Southside

Buyout blues Martinez mulls future

Joseph Barrios
Express-News Staff Writer

Sundays in Martinez have always been the favorite for Mike Jaksik.

The 72-year old remembers how families would go to church, then meet afterward for coffee at the general store at the corner of Farm Roads 1516 and 1346.

Nowadays, Sundays offer Jaksik relief from the giant dump trucks that six days per week haul trash into the landfill near his property, and from the flocks of buzzards that fly over his house to feed off carrion.

"This used to be a real quiet community. We didn't have much traffic," said Jaksik, a lifelong Martinez resident. "At 5 o'clock every morning, when those trucks round the corner, they give it the throttle. That wakes me up every damn morning."

Residents in the tiny Southeast Bexar County community have been fighting the Browning-Ferris Industries landfill since 1981, when plans to build it first surfaced.

With the announcement last month that about a dozen homeowners along Farm Road 1516 plan to settle a lawsuit against BFI and sell their houses, remaining residents doubt Martinez has a future. Longtime residents remember when Martinez was a close-knit community, surrounded by rolling hills dotted with trees and farm land. Area farmers grew cotton or corn. Most people shopped at the general store.

"My children are fifth-generation raised on this land," said W.L. Shodrok, whose great grandfather bought several acres of land in the 1890s, southeast of the main intersection. "My family has been in Martinez for a long time. It was a really wonderful place to be,"

Shodrok, who grew up just south of the intersection of Farm Roads 1516 and 1346, said the landfill's dominance over Martinez "spread like cancer" as BFI purchased land next to homeowners.

"They couldn't sell the land to anybody but BFI. Then the landfill would spread out," Shodrok said. "Now they're buying those homes down on 1516. Pretty soon, no more Martinez."

Shodrok and Jaksik pointed to what they said are the most common complaints about the dump - nauseating fumes travelling for miles into people's homes, and garbage trucks spreading mud on the road.

Aside from the purchase of homes along Farm Road 1516, BFI is negotiating with a dozen or so other residents to get them to agree to the dump's expansion and stop thier public protests, said Donna Kolar, BFI general counsel.

Kolar said she does not believe the buyout will bring about the end of Martinez.

"I don't see why the community would disappear. People like the community," Kolar said.

But David Johnson, a history professor at the University of Texas at San Antonio, said residents have legitimate reasons to worry about their community disappearing.

"It's a common occurence: the conflict between a small community's history and a larger community now impinging on that community's lifestyle," Johnson said. "Here, it sounds like San Antonio is the larger community."

Bob Schneider, 74, owns 26 acres of land in Martinez. He refused an $8,000 settlement offer from BFI.

"I lived on this land before they ever started the dump," Schneider said. "It's a nice quiet community. There's very little crime, if any.

"I don't blame them for moving with that dump being across the street with all the buzzards and rodents," Schneider said of the homeowners along 1516.

Schneider believes BFI is only concerned with getting the land they want, not with residents' well- being.

"I guess they figure we're going to die pretty soon and they don't have to worry about us," Schneider said.

Meanwhile, Jaksik said he is trying to negotiate with BFI and get a "fair" payment for the devaluation of his land.

Jaksik said that until he moves away or dies, he will continue to enjoy Sunday mornings, when no garbage trucks roll into the landfill to dump their hauls.

"Sunday morning is a day of peace," Jaksik said. "It's just a

5/2/95 Hous. Chron. 20

Houston Chronicle
Copyright 1995

Tuesday, May 2, 1995

A NEWS

Group digs in to fight landfill/Legal efforts aimed at closing BFI waste site at Sinton

BILL DAWSON, Houston Chronicle Environment Writer Staff

A citizens' group at Sinton, near Corpus Christi, has launched a multi-part legal attack to shut down a landfill run by Houston-based Browning-Ferris Industries.

The landfill, originally designed for municipal solid waste, now has been authorized by the state to receive nonhazardous industrial waste, as well as municipal waste.

A group called Victims of Toxic Exposure, saying it represents most homeowners near the landfill, contends the facility has been improperly receiving hazardous waste.

The organization also is alleging a number of health problems stems from the landfill's operation.

""The chemicals coming from the landfill choke us and make us very sick,'' member Elsia Muniz said in an statement released by the group.

The organization has filed three legal documents in its campaign against the landfill, Austin attorney Rick Lowerre said.

They are a lawsuit in state court in Austin to close the facility, a notice of intent to sue BFI in federal court, and a petition asking the Texas Natural Resource Conservation Commission to revoke the company's state permit for the landfill.

BFI spokesman Peter Block said the landfill has been operated ""within permit requirements, other regulations and all applicable restrictions."

Among other allegations, the citizens' group charges the landfill contaminated groundwater, but Block said company officials are confident that claim is not accurate.

The air pollution incident that Muniz mentioned was confirmed, however, by Linda Fernandez, a spokeswoman for the state environmental commission.

A notice of violation was placed in BFI's file in January for ""nuisance conditions'' that occurred at the landfill when fumes were produced by Exxon refinery wastes received at the Sinton facility.

The wastes in question did not qualify as ""hazardous,'' and BFI has agreed to reroute future deliveries to avoid air pollution problems, Fernandez said, adding that the Natural Resource Conservation Commission has no evidence that the landfill has received waste that legally qualifies as ""hazardous."

Apart from the allegations pertaining specifically to the BFI facility, Lowerre said the citizens want the commission to reassess policies under which it allows municipal waste landfills to receive industrial waste so citizens will be notified and given a chance to comment.

2/2/92 Hous. Chron. 1

Houston Chronicle
Copyright 1992

Sunday, February 2, 1992

STATE

South Texas residents join to fight BFI/Waste firm argues landfill will be safe

JAMES PINKERTON
Staff

DONNA -- A crude, hand-lettered sign declares ""El Agua es Vida."

The Spanish words -- ""Water is Life'' -- are the battle cry of thousands of Rio Grande Valley residents opposing a proposed Browning-Ferris Industries Inc. landfill.

They fear the dump could contaminate the drinking water piped to 12,300 households.

BFI's proposed landfill would be 1,320 feet from the reservoir that holds the residents' only water supply.

Since obtaining a permit in 1988, efforts by the Houston-based corporation to develop the landfill have been challenged in court; company lawyers have responded with personal lawsuits against Valley elected officials who have blocked the project.

BFI, with annual revenues of $3.2 billion, operates 100 landfills in the United States and eight other countries.

Company officials insist the landfill design is safe, and that opposition inevitably follows a landfill -- no matter where the location.

And the Valley location, they argue, meets all of BFI's groundwater and land use criteria.

Opposition comes from the cities of Alamo, Donna and Weslaco, the Donna school district, the Hidalgo County Farm Bureau, the Sierra Club, McAllen Mayor Othal Brand, the Audubon Society, a group of small business owners and 3,500 residents who have signed a petition.

""It's mostly that there are so many unknowns, you don't know what the potential is,'' says Lori Castaneda, a member of Citizens Against Landfill Location. ""You've seen so many landfills where there have been problems we just don't know what could happen."

Castaneda, husband Fidel and their five children live on five acres her husband's family bought 35 years ago in the Valley's Winter Garden area. Her mother-in-law lives in a house on the same property.

They don't relish the sight of a 44-foot-tall landfill rising on land across the highway from their home.

But they are more concerned about possible contamination of their drinking water because the 135-acre landfill tract is only a quarter-mile from the reservoir that supplies water to more than 55,000 residents.

Bill Crier, a spokesman for Gov. Ann Richards, said the governor is aware of the dispute.

""The governor has, in fact, agreed with the people and shares their concerns,'' he said. ""She has assured them if it is approved by the court system -- which of course she has no control over -- she will make sure the thing is built properly so the water is absolutely safe.

""This was approved 18 months ago by the Health Department before she was elected so there's not much she can do about it."

The concerns of area residents are understandable.

The North Alamo Water Supply Corp. stores and treats drinking water in a 35-acre reservoir and treatment complex, supplying a large part of Hidalgo and Willacy counties, in addition to Port Mansfield.

""We're worried about it polluting the water supply, either from blowing debris, from birds, from underground water or a broken water line on the property,'' says Milton Kersten, the manager of the non-profit water company.

Kersten said the principal water line from the plant -- made of 10-foot sections of concrete pipe with rubber gaskets -- runs along the east and north side of the BFI tract.

The water company recently obtained financing to double its water output -- from 4 million to 8 million gallons a day -- in anticipation of delivering water to 37 substandard ""colonias'' in the Valley.

""We have a 16-inch line on the east side of the property with 100 pounds pressure and it could blow out or get hit when they are digging and wash a hole in their landfill,'' says Kersten. ""Or we could get infiltration from the landfill.

""And we've been told there are certain chemical materials in

the landfill that could dissolve the rubber gaskets in our waterlines."

Dr. Roger Boren, who runs a chemical testing laboratory across the highway from the proposed landfill, envisions his neatly landscaped business festooned with plastic bags and other windborne trash from the landfill.

But he, like his neighbors, worries more about the less visible danger of toxic materials seeping into the groundwater or invading water pipes.

""The landfill permit states specifically that the landfill will accept empty pesticide, herbicide, fungicide and rodenticide containers, infectious and pathological wastes, dead animals and slaughterhouse wastes and septic tank and portable toilet wastes," says Boren.

Boren and other opponents have challenged BFI's assertion they can successfully plant grass in six inches of dirt on the top and sides of the landfill to prevent erosion. And they say the garbage in the landfill will attract thousands of grackles that could set up housekeeping in nearby citrus groves.

Citrus farmer Jimmy E. Steidinger, one of the principal opponents to the landfill and a founder of the water company, wonders why BFI doesn't put a landfill in non-productive land on the eastern end of Hidalgo County.

""There's a lot of land out there, with caliche pits, that won't even grow weeds that they could use if we needed one,'' says Steidinger. ""That they (BFI) would take some of the best productive land we have makes me think they don't have any respect for our land, and as a farmer that makes me mad."

Mary Jane Valentine, the BFI project manager, says the flow of groundwater is away from the Alamo water supply reservoir.

""We don't see how the landfill can contaminate that reservoir,'' says Valentine. ""And if anything should leak, our monitoring would detect it at our property line and we could do cleanup if necessary."

The landfill will be constructed with a bottom lining of clay three feet deep, and depending on new federal regulations, an additional synthetic liner may be required, Valentine said. Health Department officials have said it would take 29 years for liquids to seep through the layer of clay lining the bottom and sides of the landfill.

Still, Valentine said the landfill will not be welcome anywhere it is located.

""No matter where we go, everyone is going to be mad. If we were going to move away from Dr. Boren and Jimmy Steidinger and go 50 miles away to Starr County, those people would be mad,'' says Valentine. ""I mean, nobody wants a landfill. Nobody wants it no matter where you put it."

But farmer Steidinger and Boren, the chemical researcher, say the Texas Department of Health rubber-stamped BFI's application and ignored many facts developed by experts the citizens's group brought to public hearings.

And correspondence between the Health Department and concerned citizens indicates that state officials want BFI to operate a facility, which would become Hidalgo County's fourth operating landfill.

For example, on May 28, 1991, Health Department official T.A. Outlaw Jr. wrote a reply to a protest letter sent to Gov. Richards by one Donna resident.

""Facilities in the county range from perhaps the worst landfill in the state, city of Donna (which has been referred to the attorney general), to composting, to landfills of adequate capacity,'' wrote Outlaw, an engineer who is chief of the Bureau of Solid Waste Management.

""A well-designed, properly operated landfill is needed in your county."

However, in an 1989 letter to Steidinger's wife, Health Department official Hector H. Mendieta wrote that ""need is not one of the criteria that we evaluate in determining the suitability of a site for a landfill."

Mendieta, director of the Division of Solid Waste Management, made a number of errors in his five-page letter, according to Steidinger and Boren.

""The prevailing winds in that area are from the southeast, blowing toward the northwest. Since the treatment plant is located south-southwest of the landfill site, any windblown material escaping the site will be blown away from the water plant," Mendieta wrote.

Steidinger said data from the Texas A&M extension service office in Weslaco, within a few miles of the site, indicate the wind blew from the north 106 days in 1990.

Mendieta wrote that ""BFI, in our opinion, (and as reflected in the Department's files), has a commendable "track record' in operating their existing sites."

The health official added: ""It was also our opinion that the site could and would be properly operated by professionals who have been in this business for many years and whose sole endeavor is the safe and proper handling and disposal of solid waste."

Steidinger counters this flattering assessment with records his group obtained from the Health Department outlining repeated violations at four BFI landfills in Harris County, as well as landfills in Bexar, Travis and Galveston counties.

The Health Department inspections noted contamination seeping from landfills into bayous and drainage ditches, illegal dumping, uncovered hospital waste and numerous cases of erosion of the landfill sites.

BFI's record in operating hazardous waste dumps in a number of states is much worse.

In March 1990, the Environmental Protection Agency announced that BFI and a subsidiary agreed to pay $1.55 million in fines to settle 1,400 violations of federal law found at a hazardous waste disposal site in Calcasieu Parish, La.

In August 1988, BFI and its subsidiary paid a $2.5 million civil penalty for similar violations at a hazardous waste facility in Livingston, La.

A BFI official said that the company purchased the Calcasieu Parish site from another company and was unaware of previous contamination at the time of purchase.

Valentine, the BFI project manager, says all that is in the past since the company has sold its hazardous waste division.

""That's why we got out of the hazardous waste business, we realized we couldn't do it,'' says Valentine. ""Yes, we were fined, but fined not for pollution violations or for harming the environment."

Roger Meacham of the Dallas EPA office, however, said the Louisiana penalties were assessed for ""actual pollution, groundwater contamination."

Valentine defended BFI's record on landfills that do not accept hazardous wastes, such as the one proposed near Donna.

""I can't deny it, we've had violations. We've not had any serious violations and we haven't paid any fines. If they follow the correspondence (with state officials), they find the violations were taken care of immediately,'' she said.

Earlier this month, lawyers hired by the citizens group went

to Austin to argue their case before the 3rd Court of Appeals after losing in district court.

The protesters filed suit because the Health Department instructed BFI to change the design of the landfill because of the shallow water table beneath the property. BFI contended it was six feet beneath the surface, but soil experts said it was shallower.

The protesters say their rights of due process were violated because the Health Department has not conducted public hearings or released information on the changes BFI made to the landfill design.

While the controversy winds through the courts, the citizens of the area continue to fight.

Most of the families who live near the landfill site have children who ride buses to school on the main road, FM 943, and many are concerned that a fleet of 40 garbage trucks might dangerously congest the heavily traveled roadway.

Many of the residents are middle-class Mexican-Americans who have struggled to buy property and build decent homes for their families.

""You can see everything is pretty here, it's clean. The homes are pretty,'" says Modesta Guarado, vice-president of the citizens' group CALL.

""But when they build it, it doesn't matter how tall the fence is, it will be terrible. It will be a crime."

9/23/94 Balt. Sun 3B

The Baltimore Sun
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Friday, September 23, 1994

METRO

Property owner sues BFI, claiming contamination from landfill

Andrea F. Siegel
Sun Staff Writer

The nation's second-largest waste handler was sued for $100 million this week in federal court by a man who says its Solley Road landfill has contaminated his adjacent land with hazardous waste so badly that he cannot develop it.

John C. Blumenthal, whose Blumenthal Power Co. Inc. owns 145 acres between the closed landfill and Marley Creek, has proposed building a 738-home subdivision on the site. But cancer-causing chemicals from the landfill, owned by Browning Ferris Industries, have turned up in test wells on his property.

Contaminated ground water has been moving west toward Marley Creek at about 100 feet a year, according to the federal Environmental Protection Agency. A second plume was detected this year.

BFI spokesman Peter Blocker said company officials were not surprised by the suit but could not comment because they had not seen it.

The suit, filed Wednesday in U.S. District Court in Baltimore, claims that BFI violated a 1991 agreement not to allow hazardous contaminants to seep into Mr. Blumenthal's property.

It seeks $20 million in compensatory damages, $20 million in special and incidental damages, and $60 million in punitive damages.

Despite the allegations, BFI's stock prices should remain stable, said Marc Sulam, an analyst with Kidder Peabody & Co. in New York. The firm "has one of the strongest balance sheets among all of the environmental service companies in this country," he said.

BFI closed at 29 1/4, down 1/8, on the New York Stock Exchange yesterday.

Mr. Blumenthal said yesterday he met with BFI officials on July 6, before test wells installed on his land turned up trichloroethylene, benzene and other hazardous chemicals. The sides could not reach an agreement.

Now he cannot obtain financing for his development. "My financier does not feel it is a risk worth taking knowing there is a level of contamination on the site," he said.

"If you can't get financing, you have a worthless piece of property," explained Thomas Guckenburg, a North County real estate broker.

BFI purchased the Solley Road landfill in 1973 and began operating it as a licensed, hazardous-waste landfill in 1977. It was closed in 1982. Two years later, the Maryland Department of the Environment said hazardous waste was seeping into the ground water.

Now, environmental protections are failing. BFI is seeking federal permission to reseal the trash hills. It built a network of pipes and aerators last year to clean the underground water and return it to the ground, but shut that down in March because it was blocking the aquifer.

The company, which is is hauling the water off-site temporarily, has asked the state for permission to dump the cleaned water into an intermittent stream that empties into Marley Creek, but community leaders and government officials fear that would set back their efforts to clean up the creek.

3/16/94 Reading (Pa.) Times & Eagle B3

Reading Eagle, Reading Times
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Wednesday, March 16, 1994

NEWS

State cites BFI for damaged liner

A DER waste specialist says a tear in the material lining a cell allowed leachate seepage. BFI disputes the charges and asks for a meeting with the agency.

The state Department of Environmental Resources has cited Browning-Ferris Industries Inc. for an incident in late February when a liner at its landfill in New Morgan was damaged.

DER solid waste specialist Tim Leon Guerrero said the firm was cited Monday for failing to immediately notify state officials of the rip, and for illegally discharging leachate from the landfill, which opened in January.

Leon Guerrero said he was unaware what fines the company could face for the alleged violations. BFI officials, meanwhile, denied the charges, and said they plan to schedule a meeting with DER regarding the charges.

The incident occurred Feb. 24 when a Berks County Prison inmate, breaking up ice accumulations in an unused cell while working at the landfill under a work-release program, punctured a temporary liner that covers an embankment between an active cell and an inactive one.

BFI spokesman Carl W. Brown Jr. reiterated Tuesday previous company claims that tests conducted after the tear showed no leachate leaked from the active cell into the unused one, or into a nearby sediment basin and a tributary of the Conestoga Creek.

The only liquid found with traces of waste in it, he said, was in the active cell.

Brown also said the company properly notified regulatory officials about the tear. He said the company's permit requires the state to be told of such incidents within 24 hours after they occur, and that was done.

Leon Guerrero said DER does not dispute the test results. ""We're pretty much agreed with what the landfill is saying," he said. ""Our contention is, however, that the material did originate from the active cell, therefore it was leachate, and it was therefore an unpermitted discharge."

Leon Guerrero also said DER was to be notified immediately in the event of an emergency. That includes, he said, a spill threatening public health and safety, public welfare or the environment and personal injury.

1/2/92 Plain Dealer (Clev.)

The Plain Dealer Cleveland, OH
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Thursday, January 2, 1992

Portage officials fight landfill's bid to stay open

NORMAN PARISH; PLAIN DEALER REPORTER

RAVENNA

Portage County officials and some angry residents are gearing up to battle an Atwater Township landfill's appeal to continue operating after it was denied a state permit last year.

Ohio Environmental Protection Agency officials denied Willowcreek Landfill, owned by Browning-Ferris Industries Inc., a permit because the landfill was too close to private wells, streams and ground water.

But the landfill continues to operate while it appeals the EPA's decision, and that has outraged county officials and some residents.

A hearing on the appeal is scheduled for Jan. 13 in Columbus. County officials said they would have a lawyer at the meeting to fight the appeal.

John Watkins, group leader of the EPA's Northeast District in Twinsburg, said landfill and EPA officials were discussing whether the operation could move to two other areas of BFI's more than 200-acre site, where it wouldn't violate EPA rules.

Atwater resident Joan Ellsworth is planning a meeting of her own because she doesn't like the landfill's fumes and says it poses environmental problems. She has scheduled a meeting to discuss the issue with residents Jan. 8 at Waterloo Elementary School in Atwater.

"The landfill should just close," said Ellsworth, president of Residents Against Garbage Environment, a group opposed to the landfill. Ellsworth, who lives near the landfill, owns a golf course nearby.

"The odor is terrible," she said. "It smells like dead bodies over there. It almost knocks you out. You are just gasping for air. We are fighting this tooth and nail. Our property values have dropped. The stench is so bad you can't sit outside. The smell is just atrocious over there. The roads even stink. If you live next to the landfill, you have to live like a second-class citizen."

Landfill officials could not be reached for comment.

Charles Ramer, coordinator of the Portage County Solid Waste District, also criticized the landfill.

"It is not an appropriate site for a landfill and cannot realistically be brought into compliance," Ramer said.

If BFI wins the appeal or reaches a settlement, the solid-waste district's options on how and where to dispose of its waste could be narrowed, because of a law that says districts must use all available facilities to the maximum possible extent. That would mean using the BFI landfill.

The district has a 20-year plan for managing trash, which includes using some landfill fees to form an economic-development grant-and-loan fund for companies that use recyclable materials.

4/30/97 Plain Dealer (Clev.) 1B

The Plain Dealer Cleveland, OH
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Wednesday, April 30, 1997

METRO

THEY'RE DOWN ON THE DUMP EXPANSION OF LANDFILL DRAWS PROTEST

MOLLY KAVANAUGH PLAIN DEALER REPORTER

Homeowners on Butternut Ridge Rd. like to joke about their "dumpfront property," across the street from "Mount Trashmore."

But what is happening in their neighborhood is no laughing matter, they say.

Browning-Ferris Industries wants to expand its landfill off Butternut Ridge Rd. by 102 acres. The current landfill is 190 acres and will reach capacity in six to eight years.

"We really thought we were done with the fight when this one filled up," said Pat Justin, who lives west of the landfill on Butternut Ridge Rd.

In the early 1980s, BFI came to the township seeking approval for its current landfill. Justin and her husband, Rick, and others objected, but consoled themselves with a BFI-township contract that they thought prevented future landfills.

They apparently were wrong and now plan to fight the proposed one.

"We're not going to shut up," said Lynn Suleski, who lives on Ohio 511 near the front of the landfill. Among the group's complaints are noise and odor.

Tomorrow, the group will attend a trustees' hearing on BFI's expansion request. The zoning commission has already given its approval.

Trustee Richard Williams said trustees could vote on the matter as early as tomorrow, depending on what is said at the hearing.

Williams was not a trustee during the last go-around, and he was against the landfill. But times have changed, he said.

"Landfills are 100 percent better managed than they were 15 years ago," he said.

The current landfill's slope also will increase, to 90 feet from 30 feet, but the trustees have no control over that, Williams said. The Ohio Environmental Protection Agency regulates landfills, and BFI was given approval for the higher slope a year ago.

In exchange for letting BFI build a new landfill, the township would get a one-mile landscaped berm with mature trees along Butternut Ridge Rd., which would help camouflage the slope, Williams said.

David Matthews, district vice president of BFI, said New Russia Township residents also will continue to get free garbage and recycling pickup.

"I'd rather pay to have it picked up," said Sue Gerhardinger, who also lives on Butternut Ridge Rd.

BFI owns 1,400 acres spread over New Russia and Carlisle townships. About 240 acres is being used, and there are no proposals for additional landfills beyond the proposed one, Matthews said.

10/20/93 Times (San Mateo Cal.)

Times
Copyright Times 1993

Wednesday, October 20, 1993

Settlement in BFI case considered
By Marshall Wilson

San Mateo, CA, US --

HALF MOON BAY--Water-pollution officials were to consider a proposal today that requires Browning Ferris Industries to pay $900,000 to restore coastal streams filled with mud when construction dams burst last year.

The Oct. 29 spill was the worst case of sediment pollution in Bay Area history, investigators for the state Regional Water Quality Control Board said.

The board was to meet in Oakland today to consider a proposed settlement tentatively agreed to by BFI, the state Fish and Game Department and the water board's staff. The state Attorney General's Office negotiated the agreement on behalf of the public agencies.

The agreement calls for BFI to pay $900,000 to the Pilarcitos Creek Restoration Fund. The money would be used to restore habitat along the watershed inundated when a wall of water gushed down Corinda Los Trancos and Pilarcitos creeks when the dams burst during the first heavy rains of the season.

In addition, BFI would pay $100,000 to the state Water Pollution Cleanup and Abatement Account, a fund that pays the cleanup costs of spills. BFI would also reimburse the state agencies charged with investigating the spill up to $75,000.

Approval of the agreement would end any criminal or civil proceedings against BFI.

In agreeing to the settlement, BFI denies any wrongdoing. The denial of liability means the agreement could not be used against the company in any other legal action brought against it by other parties.

The Oct. 29 spill occurred when storm water overflowed earthen dams, causing the dams to fail. The dams were being used to contain water during expansion work at the company's Ox Mountain Landfill, San Mateo County's largest dump.

Investigators said the flood left the streambeds buried under a thick layer of mud and killed steelhead trout and other fish.

The agreement calls for BFI to pay half the $900,000 within 30 days. The balance would be paid 10 days after BFI begins use of the expanded landfill area or by June 1, whichever comes first.

Fish and Game biologist Ken Aasen said an advisory committee of community leaders and wildlife experts will be established to determine how to spend the $900,000.

Possible projects include planting native vegetation along the streams, removing sediment from the creeks and creating pools.

11/30/93 S.F. Chron. C3

The San Francisco Chronicle
Copyright 1993

Tuesday, November 30, 1993

NEWS

Class-Action Suit at Pittsburg Dump / Homeowners concerned with health problems, lower property values

Erin Hallissy, Chronicle East Bay Bureau

. A group of homeowners living near the Keller Canyon Landfill in Pittsburg filed a class-action lawsuit yesterday, saying that the dump is lowering their property values and causing health problems by allowing dust and trash to blow over their homes.

The suit, filed in Contra Costa County Superior Court, argues that Browning-Ferris Industries, which owns the dump, could be using safer methods to cover trash each day than piling on dirt that blows away when the wind picks up.

Tom Bruen, an attorney for Browning-Ferris Industries, said yesterday that the plaintiffs' attorneys are "misinformed" about their allegations of health problems and diminished property value.

"There's simply no evidence to support the plaintiffs' allegation that any property damage or personal injury has been caused by the landfill," Bruen said.

The Hillsdale subdivision of 1,200 homes is less than 200 yards from the dump's boundaries and in the direct path of winds that blow "dust, litter, toxic substances and odors," the suit claims.

About 7,800 other homes in the surrounding area of Bay Point and Pittsburg are also affected by operations at Keller Canyon and should be included in the class-action suit, attorneys for the plaintiffs said.

The lawsuit is the latest round in a series of fights over Keller Canyon, which opened in May 1992. To receive permits from county and state agencies, Keller Canyon had to fend off legal challenges in court and escalating complaints about high garbage rates at the "state-of-the-art" landfill.

The suit says that a large earthen berm that has been built as a buffer between Keller Canyon and the nearby homes is an eyesore that illustrates their daily problems with the dump.

"The earthen wall of the garbage dump towers over the community as a constant reminder of the invasion of plaintiffs' neighborhood and the permanent impairment of the quality of their lives," the suit says.

Residents say that excavation and dirt-moving at the site, which is supposed to continue for more than 30 years, also causes constant problems. Each day, six inches of dirt is placed over the new trash -- an area that can be as large as three acres, the suit says.

"The constant and recurring process of moving dirt and spreading it over the trash results in unreasonable amounts of unhealthful dust," which is carried onto neighboring homes and causes recurring respiratory problems and visual irritation and injuries, according to the suit.

"This is making these homes unfit for their residential purposes and is also causing personal injuries," said Michael Ram, one of the plaintiffs' attorneys.

The suit suggests that instead of using dirt to cover trash, the company could use a man-made landfill cover called "Aqua-Shed," which sticks to waste like flypaper and is impermeable to gases and rainwater.

Browning-Ferris attorney Bruen noted that a U.S. District Court judge dismissed a federal class-action suit by the same plaintiffs earlier this year, saying that it was not "ripe" because some of the issues should have first been heard in a state court.

3/19/91 Ariz. Republic/Phoenix Gazette A3

The Arizona Republic
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Tuesday, March 19, 1991

FRONT

GM, landfills may be fined $35 million in PCB disposal EPA says sludge with high levels of toxicant buried

The Associated Press

General Motors Corp. and two landfill operators face fines of $35 million or more for burying sludge allegedly containing high levels of cancer-causing PCBs in Ohio, Alabama and New York state, the government said Monday.

The Environmental Protection Agency said the sludge should have been incinerated.

A General Motors forge in Massena, N.Y., near the Canadian border about 75 miles southwest of Montreal, generated about 30,000 tons of the sludge, the EPA said. The agency said CWM Chemical Services Inc. and Cecos International Inc. buried it in landfills in the three states.

General Motors and CWM officials disputed the EPA's conclusion that the dumping was illegal. Browning-Ferris Industries, Cecos' parent company, had no immediate comment.

The EPA's complaint proposed fining General Motors $14.1 million for generating the waste. Cecos and CWM would be fined $14.1 million and $7 million, respectively, for the portion that was dumped in New York state.

Melissa Jaeger, an EPA spokeswoman, said EPA regional offices with jurisdiction over the Ohio and Alabama landfills may decide to assess additional fines for the dumping in those states.

Jaeger said all of the fines are negotiable if the companies offer to change their behavior.

The EPA said the sludge, dumped from February 1984 to October 1987, contained more than 500 parts per million of polychlorinated biphenyls, or PCBs, chemicals once widely used as industrial coolants but banned for most U.S. uses since 1979.

General Motors is allowed to use up to 50 parts per million of PCBs in hydraulic fluid at its forge, and waste containing higher concentrations of PCBs may be disposed of legally. But the waste must be incinerated if the concentration is higher than 500 parts per million, the EPA said.

Although General Motors' hydraulic fluid and sludge contained more than 500 parts per million of PCBs, the company mixed it with sand and limestone and shipped it off to be buried in landfills, the EPA charges.

General Motors has some "technical disagreements over sampling and analysis issues" with the EPA, and is drafting a formal response to the complaint, said Ben Ippolito, a spokesman for the company's central foundry division in Saginaw, Mich. He declined to be more specific.

Jaeger said a Cecos landfill in Niagara Falls, N.Y., received 16,360 tons of the waste, and 10,000 tons were buried in a CWM landfill north of Niagara Falls. The Cecos landfill is being shut down, leaving the CWM facility as the only licensed hazardous-waste dump in New York state.

Of the rest of the sludge, 3,000 tons went to a CWM landfill in Emelle, Ala., and about 500 tons were buried in a now-closed Cecos landfill in Williamsburg, Ohio, she said.

CWM General Manager John J. Stanulonis said the company plans to contest the allegations.

"It is our belief that we did take the material and that we did properly dispose of it in accordance with our permits and procedures," he said.

3/9/90 Wall St. J. C13

The Wall Street Journal
Copyright (c) 1990, Dow Jones & Co., Inc.

Friday, March 9, 1990

EPA Says Two Units Of Browning-Ferris Fined $1.55 Million

DALLAS -- A regional office of the Environmental Protection Agency said two Louisiana-based units of Browning-Ferris Industries agreed to pay $1.55 million to settle allegations that the companies violated hazardous waste-disposal regulations.

The latest settlement marks the second time in two years that the waste disposal concern has paid fines to settle alleged violations at its Louisiana facilities.

The EPA said the most recent fine resulted from allegations that Browning-Ferris failed to properly maintain hazardous waste disposal pits, conduct inspections, train personnel and keep records. The agency said it had found 1,400 violations at a facility operated by two units, Browning-Ferris Industries Chemical Services Inc., and CECOS International Inc. That facility is in Calcasieu Parish in southwestern Louisiana.

The allegations arose from inspections the EPA made of the facility in December 1985 and January 1986. Browning-Ferris will make equal payments to the federal government and Louisiana.

Browning-Ferris spokesman Peter G. Block said the violations at the Calcasieu facility "at no time posed a health hazard." However, EPA spokesman Roger Meacham said, "The potential threat is there. That is why we want to see that the requirements of the federal regulations are followed to the letter."

Mr. Block said Browning-Ferris had been taking steps to correct the problems even before the company signed a consent decree to settle the case Tuesday.

EXH. ___

2/5/88 Baton Rouge Advoc. 3B

The Baton Rouge State Times
Copyright 1988 by Capital City Press

Friday, February 5, 1988

NEWS

Ascension Police Jury condemns BFI expansion plan * * * DEQ will be asked to revoke landfill permit

Tim Talley
RIVER PARISHES BUREAU

DONALDSONVILLE _ A proposal by Browning-Ferris Industries Inc. to expand the service area of its solid-waste landfill near Sorrento was condemned Thursday night by the Ascension Parish Police Jury and local environmentalists.

Following lengthy discussion on the subject, the police jury adopted a resolution against BFI's plan to haul wastes to the non-hazardous Colonial Landfill from within a 200-mile radius and requested a public hearing on the proposal.

Jurors also asked the Louisiana Department of Environmental Quality to revoke BFI's permit to operate the landfill and issue another one restricting BFI's use of the dump to wastes generated in the parish.

BFI's state permit allows it to haul in wastes from neighboring parishes in addition to waste products from Ascension.

The state is accepting public comments on BFI's request to modify its DEQ permit and allow wastes to be trucked in from a distance of 200 miles. The 200-mile radius would include most of Louisiana and parts of Texas, Mississippi and Alabama.

Jurors, residents and representatives of parish environmental groups said they object to the proposal. The additional wastes will exacerbate the parish's chronic pollution-control problems, they said.

"We don't want to be the dumping ground for Louisiana," said Juror Marvin Braud of Gonzales.

"I am personally opposed to taking care of somebody else's waste," said Theresa Robert of the environmental organization Save Ourselves, Inc.

"We have enough problems," said Charlene Melancon of Sorrento. Melancon lives adjacent to the Cleve Reber abandoned hazardous-waste dump near Sorrento and said that dump began as a solid-waste facility.

"We are really opening ourselves up to something that we won't have any control over," said Ruby Cointment of SOS. "I think it boggles the mind."

"There are sins of the past all around us, and we don't want to create any more," said Tom Nicholson, district manager of the Colonial Landfill.

"We're not a hazardous-waste landfill," he said. Colonial is a non-hazardous industrial-waste facility and is not permitted to accept hazardous wastes, Nicholson said.

The type of substances disposed at the landfill are public information, and Nicholson invited jurors and environmentalists to visit and site and learn more about BFI's proposal.

Residents complained about odors from the site and dumping late at night. Jury Vice President Johnny Ramirez said the after-hours activities are inconvenient to local residents.

Nicholson said off-hours dumping is done only when customer request and is reported to DEQ, which has the authority to have an inspector on hand during the operation.

Juror Joseph U. Pierre suggested the parish ask for increased monitoring of BFI's activities to prevent odors and other problems.

Jurors expressed concern that the dump will fill up when wastes trucked in from other areas and parish residents will have to pay more to have their wastes trucked to landfills in other areas.

Nicholson said only about half of Colonial's 300 acres are being utilized. He said more wastes can be hauled into the landfill and it still will last until after the year 2000.

On another matter, the police jury adopted a resolution requiring a two-thirds vote to remove the jury president, secretary-treasurer and parish manager. The Louisiana Legislature must concur with the resolution before it becomes law.

Officials previously could be replaced by a simple majority of the 11-member jury. A majority vote will remain all that's required to appoint them.

Juror Shafter Kling said the change will instill more public confidence in the jury and its top officials.

Juror Charles Parent indicated that proposed changes to parish government contained in a home-rule charter motivated the jury's action.

8/5/97 Chi. Trib. 5

Chicago Tribune
Copyright 1997

Tuesday, August 5, 1997

METRO DU PAGE

VIOLATIONS AT LANDFILL SPUR ACTION

An area waste hauler has been charged with permit violations in conjunction with the operation of Mallard Lake Landfill, near Hanover Park, the DuPage County state's attorney's office said Monday.

The civil complaint alleges that Browning-Ferris Industries of Illinois Inc., and its subsidiary, E&E Hauling Inc., deposited waste in areas of the landfill in amounts that exceeded the operating permit specifications allowed by the Illinois Environmental Protection Agency.

According to DuPage County State's Atty. Joe Birkett, the parties have agreed to a consent order to address the issues raised in the complaint. The consent order, scheduled to be filed soon, is intended to resolve and conclude the matter, Birkett said.

Under the terms of the agreement, to compensate for overfilled areas, BFI and E&E Hauling will not fill certain remaining areas of the landfill to capacity.

E&E Hauling also will reimburse the county for expenses incurred during the investigation of landfill irregularities, officials said.

EXH. 1

11/5/97 Richmond Times-Dispatch B7

Richmond Times-Dispatch
Copyright 1997

Wednesday, November 5, 1997

AREA/STATE

GROUP SAYS LANDFILL GASES MADE THEM ILL

Tom Campbell Times-Dispatch Staff Writer

Bad-smelling gas from the Caroline County landfill give people who live nearby symptoms including nausea, vomiting, headaches, watery eyes and breathing difficulties, witnesses have testified in federal court.

Just how sick they get and whether the sickness is "a substantial endangerment to health" is the legal issue a coalition of 55 county residents placed before U.S. District Judge Robert E. Payne yesterday at the close of two days of testimony.

The residents -- the Caroline County Landfill Closure Group -- sued the county and Browning-Ferris Industries, alleging that the landfill was making them sick and posed a health threat.

BFI was made a party because, about two years ago, it began dumping construction waste in the Caroline landfill, including drywall scrap containing gypsum, which the residents allege brought on emissions of hydrogen sulfide and similar gases.

"I woke up one morning and couldn't breathe," said Darrel Webb, whose house is about 300 yards downhill from the landfill. "It was smelling really bad and I just couldn't get my breath."

By the time he got to a hospital, symptoms had subsided and no diagnosis was made, Webb said. He said the sulfur smells continued and at times his two children could not go outside. Webb said his head frequently ached.

BFI lawyers and witnesses dispute the residents' claims that toxic gases from the landfill make them sick. One doctor testified that Webb's headaches were derived from sinus problems and are not related to hydrogen sulfide exposure.

Marcia French testified in February that the smell became so bad it woke her up in the middle of the night. Her house is about 200 yards from the landfill section where BFI dumped.

"The odor in our bedroom was really extremely bad," French said. "It was a sewer odor."

Sleepy and thinking the smell was from inside the house, she opened an outside door, expecting to take a deep breath of fresh night air.

Instead, the air outside was much worse, French testified. She had just enough time to run into the bathroom before she vomited. Nausea and a severe headache lasted into the following day, she said.

"I was just very, very ill," French said.

Webb and other residents sought help from the small county government, which made repeated attempts to solve the problems, and eventually from the state and federal governments.

Webb said the group decided last year to pool resources and hire an environmental lawyer, David S. Bailey, as fix after fix proved to be ineffective and they still were living with the smells.

"We thought, the county has had a year to fix this -- OK, what do we have to do to get it fixed ourselves?" Webb said.

Currently the gas-producing section of the landfill has been closed and wells have been installed to burn off the gas. Episodes of bad odors at his house now occur only about twice a month, Webb said, but residents want the problem resolved completely.

Originally, the federal lawsuit included damage claims linked to state statutes, but the judge refused to hear them. Based on those claims, the residents filed a similar $30 million lawsuit in Richmond Circuit Court that still is pending.

Yesterday Payne said he wants written arguments from both sides to help him decide what "substantial endangerment to health" means in this case.

He set a Feb. 13 hearing date for oral arguments and will decide the issue after that. But he urged both sides to work toward an out-of-court settlement before then.

"I would think creative lawyers ought to be able to work that out," the judge said.

2/16/96 Com. Appeal (Mem. TN) A1

The Commercial Appeal Memphis, TN
Copyright 1996

Friday, February 16, 1996

News

BFI sued here on monopoly charges

Charles Conner The Commercial Appeal

The federal government sued Browning-Ferris Industries and its Tennessee subsidiary Thursday for unlawfully thwarting waste-hauling competition in the Memphis area.

In court documents, the U.S. Justice Department said Browning-Ferris Industries of Tennessee Inc. controlled more than 60 percent of the Dumpster business in the Memphis area and dominated the small container segment for more than a decade.

The Justice Department said the company intentionally used restrictive contracts to inhibit competition and enhance its power over commercial customers, such as restaurants, apartment complexes, retailers, office buildings and industrial parks.

Such contracts were long-term and renewed automatically. "Many of these contracts contain terms . . . make it more difficult and costly for customers to switch to a competitor," the government said. "As a result, there is a dangerous probability that Defendants will achieve monopoly power in the relevant markets."

BFI and BFI Tennessee agreed to settle the lawsuit with the Justice Department Thursday.

In court documents, the companies agreed to make changes in their contracting practices in the Memphis area. The tentative settlement must still be approved by a federal judge in Washington.

Such changes should mean greater competition and result in lower prices, government officials and Memphis area economists said Thursday.

"The potential for competition is at least being enhanced by such a settlement," said Thomas O. Depperschmidt, professor of economics at University of Memphis, whose areas of expertise include antitrust economics and government regulation of business.

The key, he said, is the number of companies that might move in to try to win that business.

Dr. David Ciscel, another UM economics professor, agreed. "Prices are likely to fall over the next two to three years as other firms see the opportunity for selling less expensive refuse hauling services."

The Justice Department took action Thursday against BFI for its practices in Memphis and Dubuque, Iowa. The government also took action against Waste Management Inc. for thwarting competition in Savannah, Ga., and central Louisiana.

The markets that the Justice Department tackles are evaluated on a market-by-market basis, said Anne K. Bingaman, assistant attorney general for antitrust with the U.S. Department of Justice in Washington.

"What we found was a three-year, rollover contract that had the affect of keeping out new entrants and maintaining higher prices," Bingaman said in an interview.

Brett Frazier, vice president of investor relations with BFI in Houston, said the Justice Department has spent two years to change one class of service in two relatively small markets, Memphis and Dubuque.

That, Frazier characterized, has been an "inefficient use of (Justice) time."

Meanwhile, said Frazier, BFI has been struggling for more than 2 years to enter the "noncompetitive, $1.5 billion New York City market. It's noncompetitive because it's run by the Mob and the Justice Department has done nothing there."

The Justice Department defined BFI's Memphis area market as Shelby and Fayette counties; Crittenden County, Ark.; and DeSoto, Marshall, Tate and Tunica County, Miss.

It said BFI generated revenues of more than $40.9 million in its 1994 fiscal year from operations in Tennessee, Arkansas and Mississippi.

Under terms of the settlement, BFI and BFI Tennessee Inc. agreed to limit initial customer contract terms to no more than two years and renewal terms of one year. The companies agreed not to require its customers to give more than 30 days notice before termination.

In addition, the settlement agreement also prohibits BFI from entering into any contract that "is not easily readable and is not labeled, in large letters, CONTRACT FOR SOLID WASTE SERVICES."

BFI's Memphis district manager was out of the office Thursday and not available for comment.

The company employs about 400 workers in the area and operates two large landfills in Shelby County. Included is a 959-acre site

southwest of Millington and another landfill on Malone Road, just south of Holmes in the southern portion of the county.

Neither BFI or Waste Management acknowledged any wrongdoing in the settlement their lawyers negotiated with the Justice Department.

The companies also agreed that contracts wouldn't require customers to give them exclusive rights to all solid waste and recyclables.

The settlement with Waste Management, now known as WMX Technologies, was filed in a Savannah federal court.

The agreement with BFI was filed in a Washington federal court. Both must be approved by a judge.

The agreement wasn't the first time the Justice Department raised questions about the waste hauling industry.

Federal investigators in Memphis began looking into the garbage hauling practices of BFI back in 1986.

And in December 1994, BFI negotiated an agreement with the Justice Department, pledging to end restrictive Dumpster contracts in Maryland and Florida as one condition for U.S. antitrust clearance for its acquisition of rival Attwoods PLC.

BFI posted revenues of more than $4 billion during 1994. And their shares rose 25 cents to $29.62 1/2 in trading Thursday at the New York Stock Exchange.

WMX generated revenues of $5.8 billion last year. Its shares were unchanged at 28.62 1/2 in NYSE trading.

EXH. ___

7/27/92 Lancaster New Era - Lancaster PA A1

Lancaster New Era Lancaster, PA
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Monday, July 27, 1992

NEWS

BFI, the waste disposal company, has long record of fines, suits, penalties

Andrea S. Brown

Although it has abandoned plans to build an East Hempfield Township facility to process medical waste, Browning Ferris Industries continues to be active in other projects in Pennsylvania. One nearby project involves its plans for a 154-acre landfill in Berks County, near Morgantown. This article, based mainly on court documents, shows that Browning Ferris has been successful in getting approval for numerous projects across the country despite a record that raises questions about the company and its management.

When Browning-Ferris Industries dropped plans for a medical waste treatment plant here last month, Lancaster County escaped a close encounter with a conglomerate with a nationwide record of environmental mishaps and pollution offenses.

Beyond that, BFI has been accused of having criminal connections and of threatening its opponents. It has been convicted of anti-competitive practices that have jacked the prices of waste disposal to exorbitant levels in some communities.

All these charges are denied by BFI. In glowing letters of recommendation the company filed with the state Department of Environmental Resources, BFI is described by officials from areas where the firm operates landfills as "a good neighbor," a "first-class operation," a company "always concerned with the protection of the environment."

In its 1990 annual report, BFI says its medical waste subsidiary's very existence is "a direct response to community concern for its health and the environment."

Spokesman Peter Block says the firm "has compiled an excellent safety record over the years. It's been continuous improvement."

But opponents vehemently disagree, and BFI's own record contradicts what Block says.

"They're convicted felons. They have a history of convictions for price fixing, predatory pricing, and dumping toxic waste in the drinking water supply," says Brian Lipsett, of the watchdog group Citizens Clearinghouse for Hazardous Waste.

The Wall Street Journal says the company's image is considered "less than trustworthy" by many.

A group of BFI's own shareholders accuses the firm's board of directors of "long-standing and egregious misconduct, waste, mismanagement and other wrongdoing" in a lawsuit filed in federal court.

The shareholders' charges include bid rigging, ties to organized crime, an alleged bribe of a Texas state senator, insider trading and environmental recklessness.

Instead of disciplining the individuals responsible for such practices, the company has actually rewarded and promoted some of them, the shareholders allege.

Which image is the accurate one?

The community-minded, environmentally concerned good neighbor?

Or the price-fixing, polluting corporation that breaks rules as a way of life?

Active in Penna.

In Pennsylvania, environmental officials seem to have decided in BFI's favor.

The company has filed a huge binder representing its environmental history for the past ten years with the state Department of Environmental Resources.

Before granting a permit, DER agents at regional offices, like the one overseeing the application for the infectious waste autoclave that BFI planned here, must review that Compliance History and decide if it is acceptable.

The office in charge of the aborted Lancaster County project had not yet looked at BFI's Compliance History when the company backed out, according to Robert Binvin, who was responsible for the review.

But the DER office in Conshohocken, which recently granted BFI a permit for a Berks County landfill where more than 5,000 tons of waste will be dumped each day, apparently decided that that same history passed muster.

"It's kind of difficult to say how bad a Compliance History has to be to affect the application," said Binvin. "One thing is that if the applicant is currently in violation of some

environmental regulation, we would not be able to issue the permit."

But a long record of environmental mishaps need not stop a company from getting approval to open new operations in Pennsylania, Binvin said, provided the problems have been corrected and all fines and penalties have been paid.

As for BFI, said Binvin, "They are probably considered to be in compliance right now."

But what about a history of serious violations involving non-environmental issues _ issues like bid-rigging, in which BFI has been proven to have been involved?

Binvin said that if the state attorney general's office is currently investigating the company, that would hold up an application, but if not, such violations are not part of DER's decision about whether or not to grant a permit.

In February, BFI signed a seven-year contract with the city of Philadelphia to dispose of 70 percent of its municipal solid waste. The company estimated the value of the contract at $210 million.

The company also operates several landfills around the state.

BFI's Alan P. Magan, project manager for what would have been BFi's autoclave here, says that in all the years BFI has been applying to DER for permits for various waste disposal businesses, the state agency has never expressed any concern about the company's history of environmental violations and litigation.

"We've been getting permits right along," he says. "There's not been a problem."

Civil suits, penalties

Much of the evidence on BFI's environmental record comes from the company itself.

In the 10-year, company-compiled history in DER's files, BFI lists scores of incidents in which BFI and its subsidiaries were cited, fined, indicted or convicted on charges of violating state and federal environmental regulations. (In this article, any reference to BFI includes its subsidiaries.)

It also records millions of dollars BFI has paid to settle civil suits _ often without admitting guilt _ related to how it handled waste, including dangerous chemicals.

In all, BFI admitted a record of 270 civil penalties, administrative orders, permit or license suspensions and

revocations, and bond forfeiture acts; 10 misdemeanor or felony convictions and pleas; 24 court decrees or settlement orders, and one pending court case.

More than a dozen listings involve medical waste, which is what BFI wanted to process in Lancaster County. The charges include operating without a permit, transporting the waste in trucks not properly identified as carrying infectious items, and secretly mixing infectious waste with other waste dumped in a landfill.

Some of the more noteworthy examples:

* BFI paid a $200,000 civil penalty after the Louisiana Department of Environmental Quality charged the firm with, among other things, failure to comply with infectious waste handling procedures at Crescent Acres Landfill near New Orleans.

Later, BFI settled for another $280,000 after receiving a separate notice regarding similar problems at Crescent Acres.

* After the Ohio Environmental Protection Agency alleged that a Cleveland infectious waste incinerator failed emissions tests and was operating without a permit, BFI Medical Waste Systems Inc. paid a $28,000 civil penalty. As part of the agreement, BFI closed the facility after it completed construction of a new one in Warren, Ohio.

* A BFI subsidiary, Bio-Medical Services Corp., allegedly started construction at its infectious waste incinerator in Lake City, Ga., before being granted an amended permit. It was slapped with a $25,000 civil penalty.

* Another $25,000 civil penalty resulted from a notice of violation at a BFI subsidiary's medical waste incinerator in Valley Cottage, N.Y., where the New York Department of Environmental Conservation said unmarked and improperly marked trucks _ as well as some not listed on the company's permit _ were transporting infectious waste.

* And at a medical waste autoclave in San Diego, Calif., the company was charged with emitting air contaminants "of such intensity as to create a nuisance." It settled for a $300 fine and a promise to correct the situation.

But medical waste is a relatively new field for the company. In the areas BFI has been involved in longer _ hazardous and solid waste _ the list of charges and violations is more extensive.

The violations listed in BFI's Compliance History include charges by state and federal environmental agencies that the company or its subsidiaries poisoned drinking water, followed unsound testing procedures, and failed to determine what kinds of

waste were going into BFI landfills.

Asbestos, PCBs, cyanide, hydrochloric acid and mercury are among the substances alleged to have been mishandled.

The list is far too long to print in full, but here are a few of the more serious items from BFI's Compliance History:

* At a Williamsburg, Ohio, landfill, BFI pumped 27,000 gallons of toxic waste into the area's drinking water supply, according to the Ohio Attorney General. The BFI subsidiary, CECOS International, pleaded guilty to one violation and was fined $25,000 and court costs. A former CECOS employee was convicted of two misdemeanor and eight felony counts and is now appealing.

In a civil suit about the Williamsburg operation, BFI agreed to a $3.5 million settlement on April 5, 1990, the same day it announced it was selling its hazardous waste business and shutting down the Ohio landfill.

* BFI paid a $200,000 civil penalty for supplying oil contaminated with nitrobenzene (a suspected carcinogen) and cyanide for use on roads in eastern Texas.

The company spent more than a million dollars — the shareholders say $3.5 million — cleaning up roads and establishing a health monitoring system and veterinary referral program.

The government's star witness was a former BFI chemist who blew the whistle and told a Texas newspaper he was fired for it.

* A Livingston, La., landfill cost BFI $2.15 million in a civil penalty after the federal government and the state said they found 2,800 violations there.

* Also in Louisiana, the Willow Springs hazardous waste landfill was the site of 1,400 violations, according to the Environmental Protection Agency. The BFI subsidiary that ran the landfill was subject to a $1.55 million civil penalty.

As of July 1991, when the Compliance History was filed, the federal government was seeking substantially more payments — tens of thousands of dollars a day for each day the violations existed.

BFI says it is fighting the penalties, which it believes are "grossly excessive." The company does "not believe that there exists or have existed any substantive environmental problems at the site," it says in its DER filing.

* BFI was fined $350,000 for violations at its Niagara Falls hazardous waste landfill and denied a permit to expand, forcing it to close. While shutting it down, BFI incurred a $75,000 civil

penalty for allegedly failing to follow procedures aimed at making the closure safe.

* In their lawsuit, shareholders mention one serious instance that does not appear on BFI's Compliance History. They say that the EPA "preliminarily assessed" the waste hauler $14.2 million in March 1991 for illegally dumping PCB-contaminated wastes it received from General Motors.

GM diluted the waste contaminated with the deadly chemical, the shareholders allege, and then solidified it and shipped it to a BFI landfill.

"BFI accepted the PCB-contaminated waste without challenge or inquiry to GM officials, and was therefore fined as an active participant in circumventing the nation's environmental laws," say the shareholders.

BFI is vigorously contesting the charges. Spokesman Block said the $14.2 million figure only represents the maximum the EPA is seeking.

"We weren't assessed a damn thing," he said, adding that what a waste generator does before the waste gets to a landfill "is not our responsibility."

The company responds

What does BFI say about all these violations and fines?

Company spokesman Block says BFI "is a decentralized company in the extreme" but that "the reporting relationship is very close."

"We've placed a lot of emphasis on training managers and then disciplining" those who haven't done their job right, adds Alan P. Magan.

But the shareholders tell a different story in their lawsuit.

Investors Melvin Ronald Cardonick, Michael Koretsky and Sally M. Yeager first filed what they hope will become a class action on behalf of all BFI shareholders last October in Philadelphia federal court.

The case, against the company and various current and former members of its board of directors, has since been transferred to Galveston, Texas, near BFI's Houston headquarters.

BFI has filed technical, legal objections to the suit, seeking to have it thrown out before it goes further. So far, the company hasn't formally challenged the substance of the shareholders'

allegations, however, and both sides are awaiting a ruling from a federal judge about whether the case should go to trial.

The shareholders' allegations are explosive.

At one point in the suit, they say, BFI's leaders "have not only refused to take disciplinary action against the BFI employees ... responsible for the misconduct, waste, and mismanagement complained of herein, but have actually promoted these employees to higher positions within BFI (including election to the Board of Directors) or have paid hundreds of thousands of dollars in 'hush' money to former BFI officials under the guise of 'consultant fees,' all in apparent appreciation of their efforts to not cooperate with the investigating authorities nor implicate their BFI superiors ...."

Far from having an "obsession with compliance" as the company claims in its 1990 annual report, the shareholders say BFI has had a "criminally cavalier attitude" toward the handling of hazardous waste.

To that, Block replies, "You can say anything you want in a lawsuit."

While the shareholders charge "a massive cover-up" has occurred, Block says the company has always been open and forthright about its past problems and that it is working hard to prevent environmental accidents in the future.

Shareholders angry

But the problems BFI has experienced go beyond its ecological record and into the heart of the way the company does business.

BFI's board of directors has "fostered a corporate culture that involves and/or condones criminal and other wrongdoing, waste, and mismanagement at the highest levels of the company," the shareholders claim, citing a disturbing chain of litigation.

Block calls that "nonsense."

But the shareholders in their suit say the company or its officers have engaged in insider trading, consorted with members of the Mafia, and won business through "anticompetitive practices ... reminiscent of those used by robber barons."

If BFI was not able to buy out smaller companies that were competing with it, it undercut their prices, forcing them into bankruptcy in a practice "BFI insiders refer to as 'The Blitz,' " the shareholders allege.

Once BFI had monopolized the market, they allege, it would

raise its prices, "gouging customers at will."

Where Waste Management was the competitor, the two companies sometimes entered into a conspiracy, prosecutors have shown. For instance, in 1980 BFI was indicted for conspiring with other firms including Waste Management "to fix prices and divide, allocate or otherwise apportion customers in the Atlanta area, between 1974 and 1979."

"After BFI and its manager pled (no contest) in connection with the scheme," say the shareholders, "BFI was fined $350,000 and its manager sentenced to one year in prison."

The convicted manager was "subsequently rehired" by BFI after his release from prison, the shareholders state.

BFI also pleaded guilty to price fixing with Waste Management in Toledo, Ohio, in 1987. As a result, the company paid $1 million in fines to the U.S. government and settled with the state for $350,000.

And then there was the Burlington, Vt., trash hauler who said BFI tried to drive him out of business. "Squish him like a bug," a BFI executive instructed company employees, according to testimony in federal court.

In 1989, the Supreme Court upheld a jury's award of $6 million to that trash hauler, Joseph Kelly, and his Kelco Disposal company.

And in a 1981 civil antitrust suit, a BFI competitor alleged that the firm "secretly paid Texas state Sen. Jack Ogg for his assistance in defeating" a landfill application.

Immediately before Ogg was scheduled to testify, BFI settled the case for a reported $5.2 million.

The shareholders allege that the settlement was actually in excess of $20 million and that several of the firm's board members who are still on the board "sought to conceal the full amount from the SEC (Securities and Exchange Commission) and from the investing public generally" by buying the competitor at an inflated price.

What happened to the vice president the shareholders say was responsible for the alleged bribe?

"BFI took no legal or disciplinary action against him," they say. "Rather, ... he was rewarded for his efforts and promoted to chief marketing officer and vice chairman of BFI's board of directors, where he still sits."

BFI spokesman Block freely admits that the company's antitrust record is less than sterling. But he says it is all in the distant

past. The Toledo and Atlanta cases, he points out, involve events that happened in the '70s and early '80s.

"Each of them involved a lot of corporate anguish. Each of them brought about changes in corporate policy," he says. "I will not say that it cannot recur, but I will say that we have taken more forceful steps and provided more comprehensive training."

But the company has found itself in court again more recently on allegations of price-fixing and bid-rigging in its containerized waste business from 1978 to 1987.

In November 1990, BFI agreed to a $30.5 million settlement of a class-action suit filed by customers who accused the company of a nationwide conspiracy with Waste Management Inc., the only waste hauler larger than BFI.

Waste Management agreed to pay $19.5 million to end the litigation, but both companies deny the allegations.

The BFI shareholders further allege a "spate of insider trading by BFI officials."

The shareholders say that R. John Stanton Jr., the company's chief financial officer, and Howard S. Hoover Jr., BFI's general counsel, are targets of an investigation by the Securities and Exchange Commission for insider trading.

Both men have since left the company, following an internal investigation of the charges. The two deny the allegations, says Block, "but they did resign."

The shareholders allege that Stanton sold half his BFI holding three weeks before Sept. 3 when "BFI shocked the investment community by announcing that profits for the 1991 third and fourth quarter would be 15 to 25 percent below those of the same period last year."

The firm's common stock price plummeted 15 percent on the day of the announcement and another 5 percent the day the disclosure was reported in the nation's financial newspapers. So Stanton's timely move saved him $426,600.

Hoover sold half of his 30,000 shares 11 days prior to the announcement, say the shareholders. Had he waited, he would have received nearly $100,000 less.

The shareholders further allege that "BFI was not above submerging itself in the underworld of organized crime" _ a charge the company vigorously denies.

It is a charge that has been repeated for several years. "When

it first began to surface in a serious way," says Block, "we, using the Freedom of Information Act, got 300 pages of reports from the FBI." Many allegations have been made, he said, but every FBI report concludes that there is no proof of such ties.

A 1934 indictment focused on Johnny Pinto, then a vice president of BFI's New Jersey operations.

It charged that Pinto and others "engaged in a 'property rights' system to allocate customers, rigged bids to give the appearance of competition, and used predatory pricing tactics, threats, and even physical force to secure the agreement of other haulers to join and remain in the price-fixing conspiracy," according to the shareholders.

The indictment also alleged that Pinto bribed public officials. He pleaded guilty, according to the lawsuit, and paid $50,000.

Also on BFI's payroll was Ernest Palmieri, "identified in Justice Department reports and Congressional testimony as a leader in the Genovese crime family," the shareholders claim.

According to a publication of the Citizens Clearinghouse for Hazardous Waste, "Harold Kaufman, a former mobster who turned 'state's evidence' ... under the Federal Witness Protection Program" testified before the New York State Assembly in 1984 about BFI.

" 'I don't know anything about BFI in Houston,' " he said, " ' ... but if they play footsies with these guys (known mob figures), knowing full well what is going on, I think they know as much as I do, I think they are cooperating with organized crime.' "

Block says the shareholder's charges are motivated by nothing other than their displeasure with stock prices: "When stock moves either up or down, ... it does bring out this kind of lawsuit."

When asked about the sheer volume of violations listed in the company-compiled "track record" _ the 10-year Compliance History on file at DER _ Magan says:

"Those are violations around the world. That's why it's so long. We don't think our record is unusual ... (considering) we operate 100 landfills, a lot of trucks, transfer stations."

And, like Block, he points out that BFI bought into some of the problems it has had when it purchased landfills from other operators. Also, he admits BFI has had some managers "who haven't done what they are supposed to do."

Block says that situation has been remedied through better training, an emphasis on safety, and the use of an internal audit team that looks for deviations from environmental rules. Plus, he says, managers' bonuses are now tied more closely to compliance with environmental regulations than to profits.

"We have a lot of policies in effect that have teeth in them, and we have a lot of people enforcing those policies," Block adds. "We have tried to create a check-and-balance system."

As for the environment, says Block, "We're pretty particular. The head of this company was twice the head of the EPA, so he has a very high level of concern about not only the environment but about regulations and regulators.

"He has assured that if we weren't paying attention before, we are paying attention now. We were paying attention before, but he has sharpened our focus."

EXH. ___

Price Effects of Landfills on House Values

Arthur C. Nelson, John Genereux, and Michelle Genereux

ABSTRACT. *There is debate on the extent to which landfills impact on nearby single-family homes. This article applies an empirical model to estimate the price effects of one Minnesota landfill on the value of 708 nearby homes during the 1980s. Empirical results indicate that the landfill adversely affected home values in the range of 12 percent at the landfill boundary and 6 percent at about one mile. Beyond about 2–2.5 miles adverse effects are negligible. The findings have important implications for the siting of new landfills near residential areas and in areas within the path of future development.*

I. INTRODUCTION

The effects of certain land uses on residential property values has long been of interest in the public policy arena. Generally speaking, where neighboring or nearby land uses are such that they impose negative price effects on residential property value, nuisance claims are made and sometimes awards are given through the courts or other means. Forms of nuisance can include noise, flies and other insects, hours of operation, traffic, odors, debris located both on the nuisance property and drifting off the property, and appearance. The possibility that some land uses will have negative price effects on residential property drives the land use planning process to physically separate those land uses by such measures as distance, setbacks, and buffering. Sometimes some land uses that are perceived to have negative price effects are banned from the community altogether. In the real estate market people are willing to pay higher prices for sites that are not affected by nuisances than for sites affected by nuisances (Crecine, Davis, and Jackson 1967).

Landfills are commonly considered a form of nuisance. They are places of activity involving trucking, dumping, filling, sorting, spraying, operation of heavy equipment, and noise. In their search for sites for housing, families tend to equate landfill proximity with diminished environmental quality or quality of life. Given a choice between two sites offered for the same price and identical in every respect except that one is closer to a landfill, home buyers will choose the site that is farther away. Only when the closer site is offered for less money will families consider the closer site a suitable alternative. At some lower market price of the closer site, home buyers will become indifferent in choosing between that site and a higher priced one farther away from the landfill.

Literature indicates that environmental features can increase land and house value if they are viewed as attractive or desirable, or they can reduce values if they are viewed as nuisances or undesirable. Ambient noise levels increased by point-sources can reduce nearby urban residential property values (Li and Brown 1980). Air quality reductions associated with point source emissions can reduce nearby residential property value (Ridker and Henning 1967). Urban residential development can reduce nearby agricultural land value (Nelson 1986).

The effect of landfills on residential property values is a subject of debate. Some literature indicates negative effects while other literature indicates positive effects.

Using a sample size of 182 single-family

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homes near five landfills near Fort Wayne, Indiana. Havlicek (1985) found that a house located one mile closer to a landfill than a similar house would be valued about $3,640 less. House price rose about 5 percent per mile away from the landfill.

Adler et al. (1982) studied the price effects of proximity to a hazardous waste site in Pleasant Plains, New Jersey. That operation contaminated local water supplies, a condition which became evident after 1974. Their study evaluated house sales before 1974 (before contamination was known) and after 1974 (when contamination became evident). For homes within 1.5 miles of the landfill, there was no significant change in sales prices before or after 1974, indicating that the landfill impacted prices equally. Between 1.5 miles and 2.25 miles there was about a 10 percent difference in price change between homes sold before and after 1974. For sales after 1974, distance from the landfill was a significant predictor of price effects out to 2.25 miles from the landfill. The mean price effect was found to be $2,700 per mile.[1]

Gamble et al. (1982) evaluated the effects of the large Boyertown Landfill on nearby home values in Montgomery County, Pennsylvania, during the period 1977–79. They limited their investigation to a one mile radius around the landfill, theorizing that home prices farther away would not be substantially affected. While showing that the landfill had a negative effect on property values, the results were not statistically significant perhaps for a variety of reasons.[2] First, they did not include a large enough area away from the landfill to adequately measure variation in house prices that could be attributable to landfill proximity. Second, their sample size was only 137.[3] Third, most cases were grouped near the outer edge of the one mile zone, which means there was only limited variation in the distance variable for this limited set of homes.

In a study done for Browning Ferris, Industries, one of the nation's largest operators of landfills, Research Planning Consultants, Inc. (1983) evaluated price and development effects of landfills on residential properties at four sites located in Houston, Texas, Baltimore, Maryland, Minneapolis, Minnesota, and Atlanta, Georgia. They did not find that landfills imposed negative price effects and, indeed, in some situations they found that landfills actually increased property values and were associated with greater residential development. However, they did not clarify at what stage of the life of the landfills the study was conducted. Near the latter stages of life of a landfill, after property values have already dropped, prices may rise because of future expectations of the positive benefits from closed and covered landfills.

Pettit and Johnson (1987) indicate that where a landfill is located in remote areas, the extension of infrastructure to accommodate the landfill actually attracts residential development towards it. Cartee (1989) concludes that there is little empirical evidence to suggest that landfills impose negative price effects, although he also admonishes that many studies including his own are limited because of a dearth of sales data.

There is, thus, debate on the extent to which landfills impact on nearby single-family homes. This article contributes to that debate. It develops and applies an empirical model to estimate the price effects of one landfill located in Minnesota on the value of more than 700 single-family homes, located within two miles of that landfill, sold during the 1980s. It is the most comprehensive study reported to date on price effects of landfill distance on single-family homes.

II. METHODOLOGY AND APPLICATION

As in any model estimating the price effects on single-family homes of distance to

[1] For sales after 1974, there was no statistical association between value of homes sold inside versus outside of the contamination zone.

[2] Interestingly, the price effect indicated a reduction in value of about $4,200 per mile, or about 5 percent. This is roughly comparable to the effect noted above.

an object causing nuisance or benefit, the model used in this analysis isolates the influence of landfill distance on house price after controlling for attributes of the house, lot, location, and other features:

$$V_i(t) = a_0(t) + \sum_{j=1}^{n} b_j(t)X_{ij}(t) + b_k LF_i = e_i \quad [1]$$

where:

$V_i(t)$ = value of house i at time t;
$X_{ij}(t)$ = contribution of individual attributes to value at time t;
LF_i = distance of the house i from the landfill; and
e_i = error term.

If landfill proximity influences house value negatively, the first-order relationship of house price with respect to distance from landfill is:

$$dLF_i/dV_i(t) > 0 \quad [2]$$

which means that house price rises with respect to distance away from the landfill.

The model is applied to analysis of the single-family house sales price effects of a landfill located in Ramsey, Minnesota. The Anoka Regional Landfill in Ramsey has been accepting solid waste since 1967. It has a permit to allow operations into the 1990s. It receives up to and sometimes more than 500 tons of waste per day. Minnesota state officials have allowed operations to continue and expand. While the area around the landfill was open country when operations commenced, development now comes near the boundary of the landfill.

The Ramsey landfill was selected for a variety of reasons. First, it is set amidst a suburbanizing landscape near a major urban area, Minneapolis–St. Paul. Second, the terrain is relatively flat and lightly wooded. Third, the landfill is operating under substantial regulatory constraints principally aimed at minimizing adverse effects on nearby property value (Genereux 1989). Fourth, the landfill has been operating since 1967 and will continue into the 1990s. The study period for this analysis extends from 1979 through 1989. Fifth, the landfill affects a reasonably homogeneous housing market. This affords reasonable estimation of purely distance effects on house prices where houses are roughly similar across the entire study area.

Data for the analysis come from the Anoka County Property Assessor, the Anoka County Board of Realtor's Multiple Listing Service (MLS), city and county plat maps, city and county highway maps, and site investigations (primarily to assess tree cover on house sites that may block landfill views).

The analysis proceeded in two phases. In the first, the price effect of landfill proximity was estimated by one-half mile increments of concentric zones. This was done to determine at what distance landfill price effects were statistically insignificant. This distance was found to be somewhere between 2.0 and 2.5 miles. The second phase, which is reported here, uses actual distance from the landfill center out two miles. The empirical model developed for this analysis is:

$$\begin{aligned} PRICE_i = a_0 &+ b_1 AGE + b_2 BDRMS \\ &+ b_3 BTHRMS + b_4 DI\text{-}694 \\ &+ b_5 FF + b_6 FIREPL \\ &+ b_7 SMALLLOT + b_8 SALEYR \\ &+ b_9 STYLE20 + b_{10} STYLE50 \\ &+ b_{11} TREES + b_{12} DFILL + w \end{aligned}$$

where

$PRICE_i$ = sales price of house i as reported in the MLS records;
AGE = age of the house in years as indicated in the MLS records;
$BDRMS$ = number of bedrooms as indicated in the MLS records;
$BTHRMS$ = number of bathrooms as indicated in the MLS records;
$DI\text{-}694$ = distance of the center

property i to the nearest interchange with Interstate 694 to the nearest one-twentieth of a mile as measured from city and county maps;

FF = the square feet of the house foundation as measured by the exterior walls (in effect living square feet on the first floor) as indicated in the MLS records;

$FIREPL$ = number of fireplaces (not woodstoves) as indicated in the MLS records;

$SMALLLOT$ = whether the parcel is less than one acre, which is also a proxy for presence of public water and sewer, as indicated in the MLS records (1 if yes, 0 if no), where the lot sizes range between less than one-half acre to less than two acres (larger acreage lots are not evaluated to maintain reasonable homogeneity);

$SALEYR$ = year of transaction as indicated in the MLS records;

$STYLE20$ = whether the house was of two full floors as indicated in the MLS records (1 if yes, 0 if no);

$STYLE50$ = whether the house was of three or more full floors as indicated in the MLS records (1 if yes, 0 if no);

$TREES$ = categorical tree cover where 0 is no cover, 1 is very few, mostly young trees, 2 is several but mostly young trees, 3 is coverage of property by usually immature trees, and 4 is nearly complete tree canopy with mature trees, as determined from windshield surveys (admittedly more subjective than we would have liked);

$DFILL$ = distance of the center of property i to the center of the landfill to the nearest one-twentieth of a mile as measured from city and county maps;

w = stochastic disturbance.

Of principal interest is whether $b_{12} > 0$, which would indicate that the mean property value rises with respect to distance from the landfill. The null hypothesis is that there is no significant association between house price and landfill proximity, all other factors considered.

Ordinary least squares regression is used. It is applied to all 708 sales of houses observed from 1979 through 1989 between 0.35 and 1.95 miles of the center of the landfill. Regression results are reported in Table 1. The descriptive statistics are reported in Table 2. The matrix of correlation coefficients (Pearson correlations) are reported in Table 3. The adjusted coefficient of determination (R^2) is 0.573 and the F-ratio is 80.188 ($p > 0.000$).

The sign on the landfill distance variable is in the expected direction, and the coefficient is significant beyond the 0.01 level of the one-tailed t-test. The magnitude clearly shows that mean house value rises the farther away from the landfill it is, all other factors considered. In particular, house value rises by nearly $5,000 for each mile it is located away from the landfill. On a percentage basis, house value rises by about 6.2 percent per mile from the landfill.

III. IMPLICATIONS

The empirical results indicate that the landfill adversely affects single-family house values in the Ramsey, Minnesota area to a distance of about two miles. Beyond about two miles, there is little if any adverse price effect. This has certain implications for the siting of new landfills. The results also indicated that landfill proximity is associated with a reduction in house value of perhaps more than 12 percent

TABLE 1

RAMSEY, MINNESOTA, HOUSE SALE ANALYSIS: LINEAR REGRESSION RESULTS WITH RESPECT TO LANDFILL DISTANCE

Dependent Variable: *PRICE*

Variable	Coefficient	Standard Error	Standard Coefficient	Tolerance	t	2-tail Prob.
CONSTANT	−166194.466	20003.448	0.000		−8.308	0.000
AGE	−204.745	92.066	−0.061	0.7896960	−2.224	0.013
BDRMS	−2499.788	707.367	−0.107	0.6594665	−3.534	0.000
BTHRMS	14239.881	1025.489	0.428	0.6347619	13.886	0.000
DFILL	4896.297	1160.251	0.115	0.8145561	4.220	0.000
DI-694	−635.387	325.504	−0.056	0.7429921	−1.952	0.026
FF	41.314	3.057	0.398	0.6970723	13.514	0.000
FIREPL	2290.754	909.205	0.074	0.7051258	2.520	0.006
SMALLLOT	807.899	1066.072	0.021	0.7932588	0.758	0.225
SALEYR	2121.608	210.664	0.263	0.8823538	10.071	0.000
STYLE20	4186.224	1028.881	0.113	0.7848099	4.069	0.000
STYLE50	3620.194	2198.845	0.043	0.8792989	1.646	0.050
TREES	340.109	473.184	0.020	0.7425526	0.719	0.237

Analysis of Variance

Source	Sum-of-Squares	DF	Mean-Square	*F*-Ratio	*P*
Regression	.139784E+12	12	.116487E+11	80.188	0.000
Residual	.100960E+12	695	.145266E+09		

N	708
Multiple *R*	0.762
Squared Multiple *R*	0.581
Adjusted Squared Multiple *R*	0.573
Standard Error of Estimate	12052.639

TABLE 2

RAMSEY, MINNESOTA, HOUSE SALES ANALYSIS: DESCRIPTIVE STATISTICS (Total Observations: 708)

	PRICE	*AGE*	*BDRMS*	*BTHRMS*	*DFILL*
N of Cases	708	708	708	708	708
Minimum	36000.000	0.100	1.000	1.000	0.350
Maximum	187400.000	49.000	9.000	4.000	1.950
Mean	74318.294	6.315	2.768	1.371	1.430
Standard Deviation	18453.037	5.540	0.789	0.555	0.433

	DI-694	*FF*	*FIREPL*	*SALEYR*	*SMALLLOT*
N of Cases	708	708	708	708	708
Minimum	6.000	704.000	0.000	80.000	0.000
Maximum	16.000	2358.000	2.000	89.000	1.000
Mean	13.705	1088.064	0.410	85.542	0.650
Standard Deviation	1.616	177.595	0.594	2.291	0.477

	STYLE20	*STYLE50*	*TREES*
N of Cases	708	708	708
Minimum	0.000	0.000	0.000
Maximum	1.000	1.000	4.000
Mean	0.555	0.051	1.458
Standard Deviation	0.497	0.220	1.112

TABLE 3

RAMSEY, MINNESOTA, HOUSE SALE ANALYSIS: PEARSON CORRELATION MATRIX
(Number of Observations: 708)

	PRICE	AGE	BDRMS	BTHRMS	DFILL
PRICE	1.000				
AGE	−0.078	1.000			
BDRMS	0.127	0.171	1.000		
BTHRMS	0.566	0.025	0.429	1.000	
DFILL	0.217	−0.194	−0.046	0.037	1.000
DI-694	−0.229	0.171	0.170	−0.047	−0.389
FF	0.511	0.094	0.324	0.395	−0.001
FIREPL	0.302	0.194	0.371	0.372	0.059
SALEYR	0.225	−0.079	−0.253	−0.107	0.114
SMALLLOT	−0.010	−0.327	−0.082	−0.067	0.165
STYLE20	0.134	−0.042	−0.183	0.109	0.073
STYLE50	0.110	−0.056	0.068	0.114	0.040
TREES	0.249	0.278	0.229	0.296	0.040
	DI-694	FF	FIREPL	SALEYR	SMALLLOT
DI-694	1.000				
FF	−0.025	1.000			
FIREPL	−0.009	0.369	1.000		
SALEYR	−0.167	−0.110	−0.163	1.000	
SMALLLOT	−0.257	−0.138	−0.062	−0.034	1.000
STYLE20	−0.139	−0.215	0.010	0.115	0.087
STYLE50	−0.109	0.148	0.046	−0.080	−0.005
TREES	0.006	0.293	0.337	0.022	−0.260
	STYLE20	STYLE50	TREES		
STYLE20	1.000				
STYLE50	−0.259	1.000			
TREES	−0.015	−0.026	1.000		

the landfill boundary and about 6 percent at a distance of about one mile from the landfill boundary.

The analysis is consistent with theoretical expectations and is consistent with many previous empirical studies. Two interesting and important implications emerge. First, this paper demonstrates that at perhaps less than 2.5 miles from the center of a landfill, residential property value will likely be adversely affected. Beyond this distance those effects may not be observed. This has implications for landfill siting around the nation since it confirms reports of other researchers.

Second, within at least two miles, the price effects of landfill proximity on middle income, relatively homogeneous housing markets are such that house value rises about 6 percent per mile from the landfill to about two miles. Work reported here combined with other studies seems to demonstrate this reasonably constant relationship. This reduction in house value is not trivial. A $100,000 home built within one mile of the proposed landfill the day before landfill operations commence would lose $6,000 the day after.

The price effects of landfills on single-family house values estimated from the case studies presented here are common to many other landfills as shown in the literature review. In some instances, landfill operators have realized that nearby property values will suffer because of landfill proximity. For example, Genereux (1989) observed that managers of the Flying Cloud Sanitary Landfill in Eden Prairie, Minnesota, the Anoka Regional Sanitary Landfill in Ramsey, Minnesota, and the Mid-

Landfill near Franklin, Wisconsin, have all purchased land and homes surrounding those facilities in order to avoid, contain, or resolve disputes with private landowners. Browning Ferris Industries included a *compensation in advance* proposal in a 1990 application for a permit to expand capacity at the Flying Cloud Landfill in Eden Prairie, Minnesota.

Caution is made that the analysis does not specifically address the price effects of the latest landfills built and operated pursuant to the most modern standards. Nonetheless, it seems from the analysis reasonable to assume that unless new landfills achieve a state of operations such that the urban housing markets view them as essentially benign, one should expect that landfills will have negative price effects.

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Stigma, environmental risk and property value: 10 critical inquiries.

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Over the past two decades, real estate appraisers have gained considerable experience in valuing property affected by environmental risk. In fact, many in the appraisal community are now so comfortable analyzing those impacts on property markets and market values that some now specialize in environmental risk analysis. The increased comfort level of both the marketplace and appraisers with this type of analysis is, in part, a result of improved techniques for environmental assessment, wider availability of data about the numbers, types and locations of properties likely to be affected by environmental risks, better information about health risks posed by some environmental conditions,and enhancements in removal/remediation techniques. The simple passage of time has also helped. It has allowed real estate owners, developers, lenders, buyers, sellers, and appraisers to become familiar with processes for the appropriate analysis of the potential impact of environmental risks on property.

The Appraisal Institute and its predecessor organizations have been instrumental in this process as well. For example, since 1985, The Appraisal Journal has published at least 70 articles dealing with environmental topics.(1) In addition, the Appraisal Institute launched a new publication called Environmental Watch in 1988. This newsletter concentrated on environmental issues pertinent to appraisers.(2) In 1989, the American Institute of Real Estate Appraisers adopted Guide Note 8 which dealt with "The Consideration of Hazardous Substances in the Appraisal Process." That note was adopted in 1991 in its entirety by the Appraisal Institute. In 1992, the Appraisal Institute Board of Directors appointed a special Appraisers' Environmental Responsibility Task Force that subsequently promulgated a voluntary Property Observation Checklist, which appraisers may use when inspecting property likely to be affected by environmental risks. In 1993 the Appraisal Institute published a video titled Hidden Factors: Environmental Risks and the Real Estate Appraiser, that gives special attention to the environmental site assessment process. In 1994, the Appraisal Institute introduced a new seminar titled "Environmental Risk and the Real Estate Appraisal Process," which has been taught in many locations across the country. The essence of many of the articles published in The Appraisal Journal and Environmental Watch, and the information in the Hidden Risks video, and the seminar course can be distilled to 10 critical inquiries that every real estate appraiser should bear in mind in assignments involving contaminated properties.

STIGMA AND ENVIRONMENTAL RISK: WHAT ARE THEY?

The concept of environmental risk as applied to real estate is broad and covers a range of substances, events and land use activities. We may typically think of environmental risk as emanating from such things as groundwater contamination or soil contamination by hazardous substances. But it can be generated in many other ways as well, for example, by air pollution or movement of airborne contaminants on the wind, by pollution of lakes or streams, by contamination of drinking water distribution systems, or even by noise such as might emanate from a busy expressway or an airport. An event, such as a marine oil spill or a railroad derailment involving tank cars carrying chemicals, may create temporary environmental risks until cleanup is completed. Also, certain types of land uses, such as power plants, electrical transmission lines, landfills, waste incinerators, chemical or radioactive material storage facilities, may be perceived in some locations as creating environmental risk for adjacent or nearby real estate.

In analyzing environmental risk, however, real estate appraisers must carefully bear in mind the following points. Not every use of a hazardous substance results in contamination. Not every use of a hazardous substance that does result in contamination necessarily creates an environmental risk. And not every use of a hazardous substance that results in contamination and results in environmental impact and environmental risk necessarily results in a real estate market impact.(3)

The Appraisal Institute emphasizes that environmental risk should be evaluated in the context of a system. The substance itself may be a big part of the risk, but the amount of real estate impact, if any, depends on many other systemic factors such as how the substance is controlled, how it is spread, how many people are potentially affected by the risk, and the degree to which people may be affected.(4)

Stigma, as it applies to real estate affected by environmental risk, is generally defined as "an adverse public perception about a property that is intangible or not directly quantifiable."(5) It is an additional impact on value, over and above the cost of cleanup or remediation. Stigma can occur on sites that once contained contaminants and have been cleaned up, on sites undergoing cleanup, or on sites that were never contaminated but neighbor a property that contains or once contained contaminants.

In many appraisal assignments, the costs of cleanup or remediation are known or have been reasonably quantified by technical environmental assessment specialists. The appraiser's

principal task may be to provide an opinion of the additional impact, if any, arising from the "stigma" associated with the site in the marketplace before, during, or after the cleanup process.

QUESTION 1: WHAT TYPE OF RISK OR CONTAMINATION IS PRESENT?

Not every contaminant or hazardous substance creates the same level of health risk. And not every contaminant creates the same level of risk of impact on property values or markets. Therefore, for the appraiser to do his or her job effectively, the character of the contaminant and its technical environmental impacts. and potential health impacts should be understood.

What types of information about the substance should the appraiser obtain in order to understand the real estate impact risks? They can be summarized as follows: the most likely locations, typical transport media, typical transport mechanisms, types of environmental impact and potential health effects, and accepted remediation techniques.

An appraiser needs to know about the typical or most common sources of the substance or risk. Are they widespread or localized? Are the locations well known and carefully documented, or of uncertain extent? How does the substance get into the environment? Does it get into soil, air, groundwater, surface water? Does it get into the food chain? Does it result from natural processes, such as with radon emissions? Or does it get into the environment only as a result of human processes, such as with PCBs?

How does it move through the environment? For example, is it transported by erosion, water, air currents, human or animal activities? The speed at which it moves and the distance it can travel can be affected by such factors as topography, soil type, geology, hydrology, or even wind and air patterns. How do such factors as temperature and humidity affect its movement and presence?

What are the known or suspected impacts on human health? Is the substance a known carcinogen or only suspected of contributing to cancer? How conclusive is the scientific evidence about the link between the substance and health impacts? At what stage is the research on the health effects? These are all things an appraiser may need to know something about because they may be at the core of the real estate marketplace reaction to owning property containing or affected by proximity to the substance or risk.

Knowledge of the appropriate remediation techniques is also crucial to the appraiser's inquiries. Some substances and risks can be easily controlled or remediated, while others cannot. Remediation techniques may include physical removal, on-site treatment, or encapsulation. On-site treatment techniques may vary depending on the nature of the substance, the degree of

contamination, or the media in which the substance is located, such as in groundwater or soil. Appropriate remediation techniques may vary from one substance or risk to another. For example, physical removal of some substances, like PCBs, may be the only appropriate technique while on-site encapsulation is appropriate for others like urea-formaldehyde insulation or some types of asbestos.

QUESTION 2: HOW DO THE FIVE CRITICAL CYCLES AFFECT PERCEPTIONS OF THE RISK?

Every appraiser experienced with evaluating environmental risks soon notices discernible stages in the market concern about environmental impacts of any particular substance. To understand how this works, consider the history of the concern about asbestos as a hazardous substance. Asbestos was widely used in the construction industry in the 1950s and 1960s. Use grew substantially in the early 1970s as well until studies began to conclusively document that asbestos fibers could get into the lungs and cause asbestosis, a potentially fatal condition. Between 1972 and 1975, the Environmental Protection Agency (EPA) issued a series of regulations about the use of asbestos, in many cases banning its use in construction.

Newspapers in the early 1970s had extensive coverage of the asbestos health risks,(6) causing near panic in some sectors of the real estate marketplace. Many properties containing asbestos were stigmatized, becoming unmarketable virtually overnight when many major lenders and financial institutions adopted policies against lending on any property containing asbestos, and some prospective tenants adopted policies against leasing in buildings containing asbestos.(7) By the early 1990s, however, the situation was completely changed. Buildings in which asbestos had been removed, and even buildings with asbestos in place, were routinely bought and sold in the marketplace, and most lenders and tenants were quite comfortable in evaluating the risks.

What happened in the intervening 20 years that so dramatically changed the situation? The marketplace simply got more comfortable in evaluating the risks associated with ownership of a building containing or once containing asbestos. This naturally occurred as a result of the normal evolution of five critical cycles that affect the market for properties affected by environmental risk: the health risk cycle, the remediation cycle, the public relations (media) cycle, the regulatory cycle, and the lending cycle. All of these five cycles are interrelated. In fact, they may more properly be considered as part of one larger systemic cycle that repeats itself over and over again with each new substance or environmental risk that gets attention in the real estate marketplace. To evaluate the impact of environmental risk on real estate, the appraiser needs to understand each component and how the five cycles fit into a larger pattern.

The Health Risk Cycle

The health risk cycle typically begins with the publication of a groundbreaking study linking some common substance in the environment with a health effect. This initial study typically finds some correlation between the substance and a serious disease or condition, often an increased incidence of cancer in persons exposed to the substance. Appearance of the first study typically begets additional studies showing the same effects or focuses attention on other earlier studies showing the same results.

Soon, however, a scientific dialogue emerges, as additional studies critically evaluate the results of the initial studies, poke holes in the methodology, or refine the analysis to better clarify the situations in which health impacts may or may not be likely. This is typically accompanied by better measurement and understanding of the concentrations necessary to create health risks, better data about the locations of sources of the substance, and information on simple ways to limit exposure to the contaminant.

With most of the significant environmental risks that have initially been considered to have widespread impacts on the real estate marketplace in recent years - consider asbestos, PCBs, radon, and electromagnetic fields, for example - the result has been the same: As more scientific information becomes available, general alarm and concern in the real estate community abates and becomes more narrowly focused on a smaller pool of properties than first suspected.

The Remediation Cycle

Once the potential health risk posed by a substance becomes a factor in the real estate marketplace, the real estate community immediately begins to seek information about techniques to remediate or lessen the risk. One reason why a marketplace may shut down, as it did in the wake of early concerns about asbestos in commercial buildings, is due to lack of information about types and costs of remediation techniques. As time passes, however, if the market gets more information about remediation, the stigma typically decreases.

Attention given to developing remediation techniques is often directly proportional to the perceived magnitude of the health risks and the number of properties potentially affected by the environmental risk. Remediation techniques are proposed, evaluated, and tested. Results of the tests are publicized, leading to further refinements. A remediation "industry" may actually develop to apply appropriate techniques to the problem properties. Initially, remediation costs may be high, but as more research is done, and more competitors for remediation business enter the marketplace, the cost of remediation is driven down. Eventually, the real estate marketplace becomes more comfortable with its ability to estimate

remediation costs for particular types of environmental risks in a variety of settings. Over time, that often means a decrease in the component of stigma caused by uncertainty about remediation techniques and costs.

The Public Relations (Media) Cycle

The old conundrum about falling trees, noise, and human ears applies to the publication of articles about the health effects of substances commonly found in the environment. If it is published only in the scientific or technical literature, and gets no mention in the popular press or at least in professional real estate publications, the substance may have little effect on real estate markets.

Consider the recent concern about the impact of electromagnetic fields emitted by power lines on property values. The first U.S. epidemiological study showing a possible relationship between power lines and some forms of cancer was published in 1979.(8) It was not until a decade later that this study received serious attention. This was the result of an article published in The New Yorker magazine by an author whose book, published a year later, put the issue before the general public for the first time.(9)

The popular media treatment of environmental risks typically runs in three phases. In the first phase of the cycle, there is extensive newspaper and electronic media reporting of studies asserting some adverse health effect associated with a substance, building material, or land use previously perceived by the public as being of no environmental concern. This first phase of the cycle also typically involves allegations that the substance, material, or land use creates a widespread risk of serious magnitude, and includes interviews with concerned citizens and environmental groups emphasizing possible dangers from exposure. As the first phase continues, government authorities promise investigation and response, and promise new regulations, if necessary, to lessen the risk.

The second phase of the cycle typically begins with the publication of information on ways of avoiding, remediating, ameliorating, or limiting exposure to the potential problem, publication of additional studies indicating that the health effects are not as conclusive or as serious as first reported, or at least not likely to be as widespread or occur as frequently as first suspected.

In the second phase also, the media begin to report on technologies and techniques for control, cleanup, remediation, or avoidance of the risk. As this information becomes more widely available, the costs associated with the techniques become better understood and more easily quantifiable. Information also becomes

available about the situations in which the risks are likely to be high and those in which exposure or proximity to the risk is limited. Much of the information resulting from this second phase comes as a result of the government process of investigating the existence and seriousness of the risk and determining if there is any need for new regulation of the causes.

In the third phase of the cycle, the market has completely digested the information and makes more informed decisions about the level of risk, if any, and the costs of avoiding or ameliorating it. In this third phase, initial perceptions about potential impacts may be greatly diminished. When the potential impacts relate to property values, the concerns of the marketplace about the number and type of properties potentially affected may also be greatly reduced. And with respect to some types of risks, the market may no longer perceive any adverse impact on property values.

The Regulatory Cycle

There is also a cycle in the way regulators and lawmakers respond to public concerns about possible environmental risks. It typically follows the same pattern as the three phases of the media cycle. In the first phase, lawmakers and regulators respond with cries of concern and alarm, and promises to investigate and "do something" about the problem, if there is one. In the second phase, they launch investigations of the problem, and perhaps hold public hearings to determine its seriousness and garner different points of view. Regulators publish technical studies and propose new regulations or improved laws to control the problem. In the third phase, the new laws are put into practice and then monitored to determine if they are having the intended effect, or whether the laws themselves are creating unforeseen problems and need to be adjusted.

If the laws enacted are very strict, they may have unintended consequences. That is exactly what has happened as a result of some of the Superfund program and the state programs modeled on it. In some older industrial areas, so-called "brown-fields," so many properties have contamination problems that qualify or potentially qualify for federal or state Superfund programs, that the real estate market, in some cases, has virtually evaporated. In other markets, it simply creates further impetus for suburban rather than inner-city development. Federal and state regulators are now trying to modify and streamline regulations in order to eliminate some of these regulatory impediments to sale and redevelopment, now reversing past trends for ever-tighter environmental regulations.

The Lending Cycle

The lending community has also gone through a cycle in the way it has reacted to environmental risk, and now has institutionalized

and regularized its procedures for dealing with those risks. In the early 1980s, lenders were so nervous about environmental risk and the real estate marketplace that even the hint of a contamination problem might cause entire categories of properties to be unmortgageable.

That attitude has changed dramatically. Lenders have become more comfortable in evaluating environmental risks. Some of this is the result of the institutionalization of the environmental site assessment process as part of customary mortgage lending practice. Some of it is the result of changes in laws and regulations that clarify when mortgage lenders are, and are not, responsible for cleanup costs. Some of it results from the Federal Deposit Insurance Corporation (FDIC) guidelines issued in February 1993, outlining the steps that member banks should take to implement a proper program for analysis of environmental risk.(10) One of the recommendations of the FDIC is that every institution should appoint a designated senior officer to be responsible for environmental program implementation. Some of it is the simple result of lenders gaining more knowledge about comparative risks created by various environmental conditions.

QUESTION 3: HAS THERE BEEN AN ENVIRONMENTAL SITE ASSESSMENT?

Thanks to the cycle that has occurred in the lending community, a new industry in environmental site assessment has developed since 1986. Most major lenders now routinely insist on some kind of environmental analysis on commercial properties before making a loan, and the standard Uniform Residential Appraisal Report (URAR) form specifically requires an appraiser to comment on "adverse environmental conditions (such as, but not limited to, hazardous wastes, toxic substances, etc.) present in the improvements, on the site, or in the immediate vicinity of the subject property."(11)

The purpose of the analysis is to gather as much information as possible about existing or potential environmental conditions that might affect value and the security of the mortgage loan. Site assessments are undertaken in stages, typically known as Phase I, Phase II, and Phase III site assessments. Phase I assessments usually consist of four areas of research and inquiry: (1) interviews with current owners/operators and inspection of owner or operator documents and records; (2) search of the chain of title for any evidence that past owners, operators, or tenants undertook activities that might have resulted in discharges of contamination; (3) inquiry to government agencies for information about past discharges or storage of potential contaminants on site or nearby; and (4) actual onsite inspection.

If the Phase I work results in some evidence of possible surface or subsurface contamination or past or present violations of environmental laws and regulations, a Phase II assessment may be

undertaken. The purpose of this second phase is to confirm the presence or absence of contamination, and document the types, amounts and locations, and possible rates of migration through soil or groundwater. Soil testing and even groundwater testing may be undertaken during the Phase II investigation. Following completion of the Phase II assessment, there may be a Phase III assessment that further analyzes the site and better defines the amount, location, and control or cleanup techniques and costs.

The information gathered in the environmental site assessment process can be very significant to the potential mortgage lender, the real estate marketplace, and therefore the appraiser in estimating value. The site assessment process pinpoints the location and amount of any contaminants, and, if it proceeds into a Phase II or Phase III assessment, the appropriate control or remediation techniques and their costs. The availability of accurate information about the levels of contamination and the costs and duration of control or cleanup can cut down dramatically on the risk associated with ownership of property affected by environmental risk.

QUESTION 4: IS IT A DESIGNATED FEDERAL OR STATE SUPERFUND SITE?

The federal program known as "Superfund" was established by the Comprehensive Environmental Response, Compensation and Liability Act of 1980, known better by its acronym, CERCLA.(12) The principal focus of the program is to identify abandoned and inactive hazardous waste sites and stimulate their cleanup. The Super-fund itself is the pot of money appropriated by Congress to clean up specifically designated sites.

As of the end of 1994, just over 38,000 sites all over the country had been brought into the program. However, only about 1,300 of these sites are actual Superfund sites with cleanup programs in process. These 1,300 properties are on the National Priority List (NPL), and have been selected from the larger group of sites based on a scoring system that evaluates many factors, including relative toxicity of substances on site, location, size of the population at risk, potential for groundwater contamination or drinking water contamination, and potential threat to air quality. The larger database from which NPL sites is drawn is called the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS). Qualifying sites can be brought to the attention of the EPA in many ways, including as a result of actual government monitoring of reported releases of hazardous substances at the site, citizen complaints, or government investigations.(13)

Inclusion of a property in either the CERCLIS or NPL lists can often have significant consequences for the value of the property and even the value of adjacent properties.(14) The principal reason

is that the EPA can undertake a remedial cleanup plan and hold current or past owners or operators of NPL sites liable for reimbursement of those cleanup costs.(15) A current or past owner or operator can be liable whether or not it had any involvement in the handling, disposal, or treatment of the hazardous substance on the site.(16) And because cleanup responsibility is "joint and several," each current or former owner or operator can be held liable for the entire costs of cleanup. That means the owner or operator with the deepest pockets is often the one pursued hardest, even when that entity made no contribution to the problem.

Those factors by themselves might be enough to create significant market stigma for many Superfund sites. But there is another reason also. Lenders are extremely reluctant to make a loan on a site that is or potentially could be part of the Superfund program because as the law is currently being applied by the courts, in some circumstances a lender can be declared to be an owner or operator - and therefore a party potentially responsible for cleanup - even in the absence of a foreclosure action.(17)

One way a buyer or prospective operator of a site included in the CERCLA program can avoid liability for cleanup costs is to meet the legal definition of an "innocent landowner."(18) That exception is available when an owner did not know at the time of purchase, or had no reason to know, that hazardous substances were on the property. The proof is evidence that before the purchase the buyer made all reasonable inquiries consistent with good commercial or customary practice, thus, the impetus for Phase I and Phase II environmental assessments.

At least 35 states(19) have adopted their own programs modeled on the federal Superfund concept. Some states may have their own equivalent of the CERCLIS list, the scoring system, and the NPL list of properties with the highest priority for cleanup.(20) Also, many of these properties may not otherwise qualify for the federal Superfund program. State listing too may create responsibilities for cleanup, with the same kind of joint and several "no fault" liability.(21)

All of this means, however, that an appraiser should carefully evaluate the potential for a property to be part of the Superfund program. Information about existing properties on the CERCLIS or NPL lists can be obtained from regional offices of the EPA. It may even provide maps. State environmental protection agencies can also provide information on either federal or state equivalent listings.

But the regulatory environment is changing quickly. Early in 1995, the EPA removed about 25,000 sites from CERCLIS. These were generally sites that had been investigated by the EPA and found no longer to be of federal interest either because they were found to contain no or little contamination or were being cleaned up under state programs. The intention was to remove some of the stigma that

accompanies inclusion in CERCLIS, and encourage more sale and redevelopment of brownfields, which are typically in the Northeast and Midwest. And Congress has before it a number of legislative initiatives that would clarify and limit the responsibility of lenders for cleanup, help identify portions of contaminated sites that do not require cleanup, and match the appropriate remediation technique to "reasonably expected future land uses at sites."(22) All of these pending changes may, in the future, reduce the amount of stigma associated with Superfund site listing.

QUESTION 5: IS THERE AN APPROVED OR COMPLETED REMEDIATION PLAN?

There are many different types of control and cleanup techniques and methods. In fact, there are many different definitions of the word "remediation." It can have a technical, legal term that can carefully differentiate some types of control or cleanup activities from others, for example, by differentiating a "remedial action" from a "removal action."(23)

Under Superfund and its state-level surrogates, a federal or state environmental protection agency typically undertakes a remedial investigation and feasibility study to determine type of contamination, extent, possible cleanup technologies and options, and likely costs. The same kind of investigation is undertaken in some other types of environmental programs, for example, under state programs requiring removal of underground storage tanks.(24) A common element in these types of programs is that a federal, state or local agency with environmental responsibility eventually approves a plan for action to lessen the risk of a release of a contaminant or assure cleanup to an appropriate standard.

The approval of such a plan, therefore, can eliminate some of the environmental risk associated with owning a contaminated site. The basis of the action plan is a site investigation. The testing and monitoring provides data about the nature and extent of the problem that allows selection of the appropriate technology for cleanup and a quantification of the cost. But most importantly, approval of the plan by a government agency often defines the legal cleanup responsibility of parties involved with the property and the cleanup attainment standard that must be met. All of that narrows risk.

As part of this inquiry the appraiser should ask the following questions:

* Is there an approved remediation plan?

* Who has approved it and how?

* How certain is the remediation approval?

* Is there any risk of additional remediation being ordered

after completion?

* What is the approved remediation technique?

* How long will the remediation process take?

* What will be the level of cleanup after remediation?

* Does the remediation require ongoing monitoring? If so, for how long, and who pays for monitoring costs?

* What will the remediation cost?

* Who will pay the cost of remediation?

Is there a federal or state program to reimburse for remediation costs?

QUESTION 6: HOW DOES THE CONTAMINATION AFFECT CURRENT USE?

Some uses may be more affected by contamination or environmental risk than others. For example, a use that sits above a contaminated aquifer and needs unpolluted groundwater for on-site drinking water may be more affected than a use on the same site that does not need to use the groundwater.

So the appraiser has to undertake a highest and best use analysis, taking into account the presence of the environmental risk. A careful analysis should be undertaken to determine if the current use has, in any way, been affected by the risk. If it has not been affected, and the current use is the highest and best use and is likely to continue indefinitely, then many times there may be little or no stigma from the contamination or risk.

Sometimes, for example, in litigation, the appraiser may be asked to consider the highest and best use of the property both before and after considering the environmental risk. In some situations, the current use may not be the highest and best use of the property when the value of the property is considered free and clear of the contamination. However, an analysis of the past operations of the current use may indicate that it can continue indefinitely even with the contamination in place. If so, there may be some continuing use of the property after considering the contamination, and that use may indeed be the highest and best use.

QUESTION 7: HOW DOES THE CONTAMINATION AFFECT SURROUNDING USES?

This inquiry may be important in two contexts. First, the appraiser may be valuing property adjacent to a source of potential contamination or risk, for example, property next to a landfill or adjacent to overhead transmission lines or a service station with

a leaking underground storage tank. Second, the appraiser may be valuing the property that is itself the source of potential contamination or risk, but trying to determine the implications of actual or possible off-site migration or transmission on the value of the source property.

In either context, perceptions in the marketplace may be as important as the reality of whether the contamination or substance is actually physically affecting surrounding property. But the appraiser must take care to determine real market impacts on adjacent property from mere allegations of market impact. The appraiser's job is to investigate the market for evidence that indicates an impact on value, and if so, how far the off-site impact extends.

The starting point for the inquiry is usually the factual basis of any off-site migration or physical effects. What do the technical assessments and off-site testing show about the actual location and intensity of off-site impacts? Does the extent of the off-site migration vary, depending on such factors as soil conditions, slopes, wind patterns, etc.? How have local governments with land use and zoning authority responded? Have they imposed, or are they likely to impose in the future, development moratoria, limitations on use, special hearing requirements, or other land use regulations around the source of the risk?

Many types of uses, such as sanitary landfills, power plants, transmission lines, airports, expressways, and hazardous waste sites have been studied in a variety of settings to determine their off-site impacts, if any.(25) The appraiser may be able to use these other case studies as evidence of the actual or potential impact of similar uses in other settings. Care must be taken, however, to make adjustments as appropriate when considering case studies from other locations or based on past events or different contamination or risk situations.

Actual or potential impact on surrounding uses may affect the value of the source property. The risk of owning the property that is the source of the contamination may be increased if there is the possibility of impact on surrounding properties as well.

QUESTION 8: ARE THERE GOVERNMENT PROGRAMS TO OFFSET RISKS?

Many states have been assisting the private sector in cleaning up contaminated properties. Other states have been trying to limit the exposure of property owners to damage claims as a way of encouraging the redevelopment of older industrial areas. These programs, when effective, can go a long way to offsetting the risk associated with owning some types of properties affected by environmental risk.

For some types of environmental cleanup, there is special

state funding available to reimburse cleanup expenditures. This is most frequently available for the removal of leaking underground storage tanks and the remediation of soil or groundwater contamination problems that may have resulted. Often "Petrofund" programs, they are typically paid for by a special tax on gasoline sales,(26) and may go far to offsetting the impact of environmental risk on the value of the properties that qualify for the program.(27)

In some states, regulatory agencies will issue various "letters" to relieve property owners of their anxiety regarding environmental risk on their properties. Among the types of letters are the "no action" letters, which are intended to assure future buyers that once a plan for cleanup has been approved, no further cleanup actions will be required. "No association" or "good neighbor" letters state that if an owner did not cause the original contamination and has voluntarily undertaken approved testing and cleanup on the property, there is no liability for further cleanup.(28)

The EPA has a number of programs in the works to "help remove the barriers to property transfer and revitalization"(29) of contaminated sites in the CERCLIS and NPL programs. These are the so-called brownfield initiatives, designed to encourage the reuse of older contaminated, manufacturing sites in major urban areas. As a result of one of the initiatives, the EPA has promised to develop "guidance" to "reassure lenders and prospective purchasers of the safety of their investments, and to thereby encourage the cleanup and redevelopment of contaminated properties."(30) As these brown field initiatives develop, the perceptions of risk associated with actual or potential Superfund listing may be significantly reduced for some properties.

QUESTION 9: ARE THERE GUARANTEE OR INSURANCE PROGRAMS FOR BUYERS?

With some types of environmental risks, it has become quite common for property owners to provide an indemnity to purchasers and even neighbors against liability for future cleanup costs and other potential impacts of the contamination. This has become quite common, for example, when major oil companies sell service station/convenience store sites. It also has become common practice among major landfill operators to provide property value guarantee programs as part of the process of seeking government approval for expansion or construction of landfills.(31)

Such a guarantee program can offset some or all of the stigma risk associated with owning a previously contaminated property, or owning a property adjacent to a source of environmental risk. There are some critical questions that the appraiser should ask about the guarantee or indemnity, including the following:

* What does the guarantee cover? Are all cleanup costs, including testing, monitoring and consultants fees covered? Are only future cleanup costs covered, or are other types of impacts such as potential stigma impact on value also covered?

* How long does the guarantee run?

* Does it extend to third parties, such as future owners and tenants?

* What is the credit rating of the company providing the guarantee? Is it a large national concern with significant assets?

* Is the guarantee structured to survive merger, sale, or acquisition of the company?

* What is the track record of the guarantor? Do they stand behind their promises? Do they cooperate when claims are made for indemnification on environmental risk guarantees?

Availability of environmental insurance should also be explored by the appraiser. True "environmental impairment liability" policies are available to provide site-specific coverage for some types of land uses that may create environmental risks, for example, landfills, hazardous waste storage and treatment facilities, and manufacturing sites where potential pollutants are used in or produced as a by-product of the manufacturing process.(32) These policies generally provide third-party, bodily injury and property damage coverage for loss, along with cleanup costs and legal expenses generated by pollution accidents.(33) Policy premiums can be expensive - $200,000 per year for simple third-person property damage and bodily injury coverage to $2.0 million or more for facilities that produce or store vast quantities of potential pollutants. As new insurers enter the marketplace, premium costs are expected to decrease substantially.(34) An appraiser's job is to observe the marketplace's response to the availability of such insurance programs. If the marketplace begins to consider it a standard operating expense item for certain types of property, then an appraiser may have to make an adjustment to operating expenses or to market value to reflect the costs. That may, in turn, affect the appropriate capitalization or discount rate on income-producing property.

QUESTION 10: HOW GOOD ARE THE "COMPARABLE" SALES?

As the appraisal profession becomes more comfortable with valuation of properties affected by environmental risk, it is developing a better database of sales transactions and market studies involving property affected by environmental risk. This sales information is typically collected by appraisers in one of four ways:

* From inquiries to appraisers who specialize in valuation of properties affected by environmental risk

* As a result of a notice in the Appraisal Institute's newsletter, Appraiser News,(35) requesting sales or other market data involving a particular risk

* From independent research into contaminated property sales, beginning with data about properties included in various federal or state lists of contaminated properties

Even the best sales information about properties affected by environmental risk obtained from a reliable source may not fit the standard definition of a comparable sale. The appraisal profession typically thinks of a comparable as property similar in many respects to the property being appraised. Often, the best the appraiser may be able to do when evaluating stigma impact of environmental risk is to find sales of other property affected by a different type or intensity of contaminant, in a different location, and for a different use. Is that a comparable? Probably not in the strict definition of the term. Nevertheless, it may be quite helpful in arriving at an opinion on the impact of stigma on value. It should properly be considered as a case study rather than a comparable sale.

When collecting sales information from other appraisers about stigma-affected properties, it is more important than ever to verify the accuracy of the information. Valuation of property affected by environmental risk is such a new area of appraisal practice that the thoroughness of data collection practices vary considerably from one appraiser to another.

As part of the evaluation of the comparable sale or case study, the appraiser may have to compare and contrast that sale with the property being appraised on many points that might affect the appraiser's conclusion regarding the amount of stigma, including the following factors:

* Type of environmental risk, contamination or event creating potential for stigma, including comparison on such points as toxicity, persistence, amount or physical extent of contamination (for example, on-site or off-site migration)

* Regulatory framework affecting the risk or substance

* Physical characteristics of the site

* Amount and quality of the testing, assessment, and monitoring (meaning the extent and reasonable accuracy of the data)

* Type and level of cleanup

* Date of sale, especially considering the importance of the five cycles

* Location

* Media coverage

* Conditions of the sale, including availability of an indemnity or insurance program

* Use of the property

* Motivations of buyers and sellers

* Lenders' attitudes

CONCLUSION

It is not enough for an appraiser today simply to conclude that if a property is contaminated, there is no market for it. That may still be true for some types of properties, but the number of such totally stigmatized properties is relatively small. It is also not good enough for the appraiser to expect that he or she will always be able to assume away the presence of the contamination and appraise the property as if unaffected by environmental risk. While there may still be times when such an approach is absolutely the right thing to do, more and more users of appraisal services want answers to tough questions about the actual impact, if any, of specific types of environmental risk on property values, and will go to another vendor of appraisal services if their usual appraiser rejects the assignment.

But in valuing property affected by environmental risk, appraisers have to be ever alert to the nuances of the marketplace. Our job, as always, is to look to the marketplace to see how it actually prices property and determines value. As the marketplace adjusts to risks and prices the real estate product to reflect changing perceptions, so too must old appraisal theory give way to new professional practice techniques that incorporate those changes in the marketplace.

That is especially true today in the rapidly changing practice area involving contaminated properties and other forms of real estate affected by environmental risk. The appraiser's job is to ask the right questions and then listen to the market as it reveals its reasons for acting the way it does. Only if the appraiser does that can he or she gain enough understanding of the market to apply that knowledge to other appraisal situations correctly.

1. See, for example, Danny J. Martin, "The New URAR and Environmental Hazards," The Appraisal Journal (January 1995): 47-52; Peter J. Patchin, "Contaminated Properties and the Sales

Comparison Approach," The Appraisal Journal (July 1994): 402-409; Robert Simons, "How Clean Is Clean?" The Appraisal Journal (July 1994): 424-438; and Albert R. Wilson, "The Environmental Opinion: Basis for an Impaired Value Opinion," The Appraisal Journal (July 1994): 410-423.

2. Appraisal Institute, Environmental Watch (Chicago: Appraisal Institute). Publication of this newsletter was terminated in 1995 because of the increased availability of information on environmental issues from other sources.

3. Appraisal Institute, Environmental Risk and the Real Estate Appraisal Process, Seminar Workbook, Chap. 1 (Chicago: Appraisal Institute, 1994), 21.

4. Ibid. See also Hidden Factors: Environmental Risk Evaluation and the Real Estate Appraiser, video, Appraisal Institute, Chicago, 1992.

5. Environmental Risk and the Real Estate Appraisal Process, 128.

6. See, for example, "Perilous Particle: Tiny Asbestos Fibers Pose a Health Threat to Workers," The Wall Street Journal (June 8, 1972): col. 1, 1.

7. See, for example, Janis L. Kirkland, "What's Current in Asbestos Regulation," University of Richmond Law Review, v. 23 (Spring 1989): 375-402, citing Adams and Baker, "Sale or Lease of Asbestos-Contaminated Buildings: Legal and Marketplace Issues," 4 National Asbestos Council Journal (1986): 50, 53.

8. See N. Wertheimer and E. Leeper, "Electrical Wiring Configurations and Childhood Cancer," American Journal of Epidemiology, v. 109, no. 3 (March 1979): 273-284.

9. See Paul Brodeur, "Annals of Radiation: The Hazards of Electromagnetic Fields," The New Yorker (June 12, 1989): 51-88; (June 19, 1989): 47-73; and (June 26,1989): 39-68, later published as Currents of Death: Power Lines, Computer Terminals and the Attempt to Cover Up Their Threat to Your Health (New York City: Simon and Shuster, 1989). See also Gary Taubes, "Fields of Fear," The Atlantic Monthly (November 1994): 94, for a discussion of the sequence of publications and public inquiry into the issue.

10. See Environmental Watch, v. 6, no. 1 (Spring 1993): 1, for a discussion of these FDIC guidelines.

11. Federal National Mortgage Association (Fannie Mae), Uniform Residential Appraisal Report Form 1004 (Washington, D.C.: Fannie Mae, 1993), 1. For additional commentary on this requirement, see Danny J. Martin, 'The New URAR and Environmental Hazards," The

Appraisal Journal (January 1995): 47-52.

12. 42 U.S.C., sec. 9601 et seq.

13. 42 U.S.C., sec. 9603(a) and (c), 9604(b), 9659(a).

14. According to EPA administrator Carol M. Browner, "The mere fact that these sites have remained in CERCLIS has caused potential developers to shy away from them and many lending and real estate investment communities have denied loans for businesses in or near CERCLIS sites as a matter of policy." Statement of Carol M. Browner, Administrator, U.S. Environmental Protection Agency before the Commerce, Trade, and Hazardous Materials Subcommittee, Committee on Commerce, U.S. House of Representatives, March 16, 1995.

15. EPA's policy is not to seek cleanup costs from residential property owners unless those owners caused the contamination. See Policy Towards Owners of Residential Property at Superfund Sites, OSWER Directive No. 9834.6, July 3, 1991.

16. Most courts have found an exception for state government. See, for example, United States v. Dart Indus., Inc., 847 F.2d 144 (4th Cir. 1988).

17. When CERCLA was first adopted, lenders thought they were exempted from the strict liability rule for cleanup. However, a series of court cases, culminating in United States v. Fleet Factors Corp., 724 F.Supp. 955 (S.D. Ga. 1988), 901 F.2d 1550, reh'g denied, en banc, 911 F.2d 742 (11th Cir. 1990), held that in some limited circumstances, a mortgage lender could be held to be an "operator" and therefore potentially liable for cleanup costs. In the wake of the Fleet Factors decision, the U.S. EPA, at the urging of the lending community, adopted a regulation that specifically exempted lenders from strict liability for cleanup. However, that regulation was eventually struck down by the courts on the basis that it exceeded the agency's rulemaking authority.

18.42 U.S.C., sec. 9607(b)(3).

19. The following states either do not have their own Superfund legislation, or have more limited legislation: Alabama; Connecticut (state only has authority to act under CERCLA and has no independent state provision); Washington, D.C.; Georgia; Nebraska; Nevada (very limited CERCLA-like provisions); Ohio (state has no independent liability provisions); Rhode Island (no clear liability standards of its own); South Dakota; West Virginia (no liability provision of its own); Wisconsin (limited CERCLA-like provisions); and Wyoming.

20. See, for example, Wisconsin Stat. Ann., sec, 144.442(4), and Utah Code Ann., sec. 19-6-311.

21. See, for example, New Jersey Stat. Ann., sec. 58.10-23.11g(c); Or. Rev. Stat., sec. 466.567 and 466.640; and Pennsylvania Stat. Ann., sec. 60320.702.

22. See, generally, the testimony of Carol Browner, supra.

23."Remedial action" has been defined, in part, as follows: "Those actions consistent with permanent remedy taken instead of, or in addition to, removal action in the event of a release or threatened release of a hazardous substance into the environment, to prevent or minimize the release of hazardous substances so that they do not migrate to cause substantial danger to present or future public health or welfare or the environment."
"Removal action" has been defined as follows: "Short-term immediate actions taken to address releases of hazardous substances that require expedited response." See Thomas F. P. Sullivan, ed., Environmental Regulatory Glossary, 6th ed. (Rockville, Maryland: Government Institutes, Inc., 1093): 469-471.

24. See, for example, Florida Stat. Ann. Ch. 376-3071(5).

25. For a good summary of many of these studies and articles, see Environmental Risk and the Real Estate Appraisal Process, Addenda N and O.

26. See generally, Nebraska Rev. Stat., sec. 81-15 and Wisconsin Stat. Ann., sec. 101.43.

27. In some states, there may be limits on the amount of money that can be allocated to any one particular site. For example, in Arkansas the fund will reimburse an owner, after he has expended $25,000, up to the maximum amount of $1.0 million per occurrence. Arkansas Code Ann., sec. 8-7-907(a). In other states, such as Illinois, while there may be a "Petrofund" program on the books, funding is so limited that the program is ineffective, and property owners in effect pay their own cleanup costs.

28. For a discussion of one of the recent programs, in Minnesota, see "Minnesota's Superfund Shield," Planning (June 1995): 22-23.

29. See the testimony of Carol M. Browner, supra.

30. Ibid. Administrator Browner's testimony indicated that some of the focus will be on "soil screening guidance" to help identify appropriate portions of contaminated properties that do not need remediation, as well as on modifying remediation standards to fit the most likely land use that a property will be devoted to in the future.

31. See, for example, discussion of such programs in "Report of the Subcommitee on Land Use and Solid Waste," The Urban Lawyer,

v. 23, no. 4 (Fall 1991): 773-784.

32. See, generally, Evelyn Hall, "EIL Is Poised for Growth," Best's Review - Property & Casualty (April 1995): 40-43.

33. Ibid. Usually, coverage only applies to pollution that is accidental and sudden and which takes place onsite. For an additional premium, some insurers will include first-party, offsite cleanup or coverage for non-sudden and gradual pollution.

34. Ibid., 42-43.

35. The publication of Appraiser News was terminated after its December 1995 issue and its contents have been merged with Valuation Insights & Perspectives, a quarterly magazine, which debuted in February 1996.

Richard Roddewig, MAI, is president of Clarion Associates, Inc., in Chicago and Denver. He co-developed the Appraisal Institute's seminar, "Environmental Risk and the Real Estate Appraisal Process," and has taught the seminar nationwide. He is adjunct lecturer of real estate valuation in the Department of Finance at DePaul University, Chicago.

EXH. 47

Chicago Tribune
Copyright 1993

Friday, May 21, 1993

LAKE

Dump owner to guarantee home values

LeAnn Spencer.

The prospect of an expanding landfill next to your dream home would seem about as inviting as having a boorish neighbor throwing trash in your carefully tended back yard.

But what if the landfill owner promised to guarantee the value of your house? What if he also promised to cork the noxious odors that perfume the neighborhood, provide an attractive prairie landscape and recreational trails, and donate hundreds of thousands of dollars to an open-space preservation fund?

The developer of a one-of-kind residential community near Grayslake announced just such an agreement Thursday with the owners of the adjacent Countryside landfill.

If one can imagine such a thing as a model landfill, this appears to be it-and the operator says it may be at the cutting edge of a national trend in the aesthetics of garbage dumps.

Landfills once were in outlying, undeveloped farmland and consisted of little more than ugly, artifically molded hills dotted with flaring torches that burned off the gas produced by rotting garbage.

But as more and more residential development springs up in once-empty countryside, landfill owners must placate nervous homeowners by going beyond safely burying decades-old garbage, according to industry experts.

Prairie Crossing, a unique development with 317 homes being planned for 670 acres, is on the east side of the Countryside landfill. The community is the dream and brainchild of George Ranney Jr., an open-space preservationist and president of Prairie Holdings Corp., the development company building Prairie Crossing.

Countryside's owners, Dallas-based USA Waste Services Inc. will spend $4.5 million on improvements over the next two years to develop the good will of its neighbors at Prairie Crossing.

About 80 of the 200 acres at the landfill are being used for waste disposal. The company hopes to persuade county leaders in a year or two to give it permission to expand and wants the backing of nearby residents, who could block any expansion.

"This is a unique opportunity to build a model landfill next to a model community," said Donald Moorehead, president and chief executive officer of USA Waste, which owns and operates waste-disposal haulers and landfills throughout the nation.

Prairie Crossing is bounded by Casey Road, U.S. Highway 45 and Illinois Highways 137 and 120.

Under the agreement, USA Waste will guarantee that the original 317 home purchasers will be able to resell their homes for at least the prices they paid, plus an allowance for inflation. The homes will be priced from $180,000 to $350,000. This is the first property-value guarantee offered by USA Waste.

In addition, USA Waste will install recovery systems to reduce the amount of methane gas that fouls the air and immediately give $250,000 to an open-space preservation foundation set up by Ranney.

Landscaping to be completed by November includes native plantings of prairie flowers and grasses, as well as trees, to create an oak savanna, much like the woodlands that once comprised much of the Midwest.

While not endorsing any expansion of the landfill, Ranney said "we think they deserve a chance" to prove themselves.

The development will include single-family homes nestled in a wooded community with equestrian and pedestrian trails, a community farm, and an organic vegetable market.

The plans for the community were announced in the fall and received accolades from pro-development county leaders, open-space planners and environmentalists.

The agreement gives Prairie Holdings oversight and enforcement powers of the landfill agreement if USA Waste does not meet its end of the bargain.

Such "incentive packages" are becoming more common as landfill operators try to persuade communities to grant approval for expansions or new landfills, said Dan Shomon, spokesman for the Illinois Environmental Protection Agency. The IEPA regulates landfills and does not endorse or discourage such agreements, he said.

Waste Management Inc. of Oak Brook is offering equity protection to homeowners adjacent to its newest landfill, which is being planned for Morrison in Whiteside County. Other property-value guarantees are in place at Waste Management landfills in Kansas, Wisconsin and Indiana.

Residents are starting to realize that landfills are part of

the infrastructure, said Will Flower, spokesman for Waste Management, but they are nervous about living next to one.

Landfill operators, he said, are more in tune with the needs of residents and are offering guarantees to them in the form of property-value protection, as well as the development of recreational uses for closed and capped landfills.

Browning-Ferris Industries Inc. offers property-value protection to homeowners of nearby landfills in Illinois and Wisconsin, said spokesman Jim Ambroso.

In addition, the company is working on an annexation agreement with Zion that would include incentives for the community. Browning-Ferris owns a landfill near Zion that it wants to expand. If it doesn't get permission, the landfill must close this fall.

In Grayslake, the agreement between USA Waste and Prairie Holdings prohibits USA Waste from building an incinerator at Countryside, accepting hazardous waste, and accepting waste by rail.

The Liberty Prairie Foundation will help fund projects for the Liberty Prairie Reserve, a 975-acre conservation area being managed by Libertyville Township and the Lake County Forest Preserve District. cOntributitions will start in 1995 and are expected to amount to about $300,000 a year.

EXH. ___

2/7/95 Chi. Trib. 4

Chicago Tribune
Copyright 1995

Tuesday, February 7, 1995

METRO LAKE

ZION LANDFILL THINKS BIGGER ONCE AGAIN

LeAnn Spencer, Tribune Staff Writer.

Five years ago when it was feared that a Zion landfill was about to grow, neighbors gathered more than 8,000 signatures on a petition and strong-armed county officials to designate the land for a forest preserve.

But the so-called Stateline Preserve was never to be born. A shortage of funds brought on by the property-tax cap meant that only the most ecologically significant land could be purchased and protected from development by the Lake County Forest Preserve District.

And when district officials abandoned plans for the preserve in the fall of 1992, the way was paved for Houston-based Browning-Ferris Industries Inc. to use the land for burying more garbage.

Hearings on the company's expansion plans begin Tuesday before a pollution control board appointed by Zion. The hearings are expected to last several weeks. Browning-Ferris wants to use another 105 acres for a municipal sanitary landfill; now, garbage is buried on 130 acres of the 250-acre site.

If approved by the city, and then by state and federal regulators, the expansion would add up to 20 years of life to the dump, which can take no more garbage without permission. The whole process could takes several months, or longer, to be completed.

Browning-Ferris officials have worked hard to woo support this time for their plans. They spent months last year meeting with neighbors, and promised to guarantee property values and share landfill receipts with communities.

Nonetheless, environmentalists remain wary. They fear that chemicals might leak into the area's water supply. Residents living near the landfill rely on well water.

"Ground water is an Illinois state resource," said Earl Johnson, executive director of Illinois Citizen Action, a government watchdog and environmental organization. "Any toxic materials that get into an aquifer can destroy it. We want the maximum protection built into the landfill.

"All landfills, no matter how well they are built, sooner or later will leak," said Johnson, who wants backup systems installed at the landfill.

Officials for Browning-Ferris said this week that the landfill design goes beyond state and federal requirements, which vary from site to site.

"This system is designed not to leak," said company spokesman Jim Ambroso, who added that plans call for two plastic liners, as well as a densely compacted clay layer.

"It's way beyond the required liner systems under state and federal guidelines. We have good-quality clays there to begin with, and the added layers of plastic are additional safeguards to help protect surrounding ground water."

The company's plans call for expanding the landfill on 75 acres of unused land. The rest of the expansion would include "piggybacking" garbage on another 30 acres already used, Ambroso said. Overall height would rise to about 95 feet in a gentle slope and be landscaped with trees and shrubs.

The Zion landfill, which is at Green Bay Road and 9th Street, is a linchpin in the county's solid waste disposal plans, officials say, especially in light of a new Wisconsin law that effectively keeps Illinois garbage from going to dumps across the state line.

The landfill has the support of 36 municipalities and the county, which, as members of the Solid Waste Agency of Lake County, last year contracted for up to 30 percent of the space in the expanded landfill.

The solid-waste agency has a similar agreement with Dallas-based USA Waste Services Inc., owners of Countryside Landfill near Grayslake.

The landfill also has an agreement with Zion that includes a one-time cash payment to the city of $100,000, as well as a portion of landfill receipts, which city officials have estimated could average roughly $500,000 a year.

4/23/92 Buff. News

Buffalo News
Copyright 1992

Thursday, April 23, 1992

LOCAL

LANDFILL SESSION IN BLISS PICKETED EAGLE GROUP TIES PROTEST TO OBSERVANCE OF EARTH DAY

By BILL PRICE - Wyoming Corespondent

About 20 adults and children, representing Concerned Citizens of Eagle, Wednesday evening picketed outside St. Joseph's Church Hall to show their opposition to the possibility of Browning-Ferris Industries constructing a landfill in the Town of Eagle.

Connie Larson, a member of the citizens group, said the picketing was timed to coincide with the observance of Earth Day. Mrs. Larson said the group is doing its part in protecting the environment by opposing any BFI landfill in Eagle.

The pickets chose the church hall because BFI officials were holding an information open house inside. BFI officials have repeatedly told Eagle residents that whether or not a landfill is constructed would be up to the majority of town residents.

Mrs. Larson said she believes that even if the BFI landfill is "state of the art," it would create an environmental hazard.

The issue has divided residents of the town, and this week half- and full-page ads in area shoppers have fanned the flames of disagreement between the two camps.

In one ad, paid for by BFI and signed by 80 Eagle residents, voters are being encouraged to support a straw vote scheduled for Friday on whether or not BFI should locate a landfill in the town.

The American Arbitration Association will oversee Friday's straw vote. The polls will be open from noon to 9 p.m. in Bliss Recreation Hall. All full-time town residents are eligible to vote.

Mrs. Larson said she is not sure if she will participate, calling the vote unfair to property owners who do not use the Town of Eagle as their permanent address.

The Eagle Town Board at 8 p.m. today will reconvene a public hearing on a local law that gives the Town Board power to issue permits for the construction of landfills. Now, no such law is on the books and in theory, any firm could come into the area and build one.

The hearing will be conducted in the Bliss Recreation Hall on East Main Street.

Last week the board attempted to hold a public hearing on the issue, but a technicality forced it to be postponed.

BFI has offered to pay the town $1 million to $2 million a year for each year the landfill is in operation. The amount i negotiable and would be based on the size of the facility.

The project is expected to create 25 to 50 jobs, and promises to give job training and preference to Eagle reside

The firm also promises a $500,000 to $1 million annual p to the town for a locally controlled economic trust fund. BF the fund could total $30 million over 20 years and could for economic development on other projects beneficial to t

The firm also promises a property value protection guarantee no loss of real estate value and $25 mill million in local construction spending.

BFI has also offered free trash disposal f residents.

The Town Board will vote on the local law public hearing.

Air Water Pollution Report
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Monday, July 17, 1995

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CSAB STUDY: ENVIRONMENTAL INEQUITY STEMS FROM ECONOMICS, NOT RACISM

Environmental inequity has more to do with economics than racism, according to a report issued by the Center for the Study of American Business (CSAB) at Washington University. The conclusion was reached in Environmental Inequity: Economic Causes, Economic Solutions by Thomas Lambert and Christopher Boerner, who analyzed census information relating to 167 industrial facilities and waste sites in the St. Louis area.

A major finding includes the tendency of minorities to move near polluting facilities instead of polluting facilities moving near them. When an industrial facility or waste site moves to a neighborhood, higher-income people and whites usually move out. This makes property seem less desirable and therefore less valuable. The report found that the lower prices attract poorer, typically nonwhite residents. Around these facilities, concentrations of minorities usually increased at a disproportionate rate, family incomes fell and housing values rose at a slower rate, said the report.

The findings are significant for environmental justice policy because regulating where polluting and waste facilities may locate are only temporary solutions that are unlikely to end long-term environmental inequity, according to Boerner and Lambert.

They propose that industry offer various compensation options to people living near undesirable facilities so that the surrounding property is not devalued. The schemes may include direct payments to affected landowners and "host fees" or community general fund contributions; grants to improve local health-care delivery and education; and providing parks and other recreational projects.

The report cites Browning Ferris Industries (BFI) as a company that guarantees property values near its sites, compensating residents whose property values fall when a BFI plant moves in. For a copy of the report, Policy Study 125, call (314) 935-5630.

EXH. ___

2/5/92 News & Observer (Raleigh NC) A1

The News & Observer Raleigh, NC
Copyright 1992

Wednesday, February 5, 1992

NEWS

Sampson gives nod to landfill Many protest plan; final vote Feb. 17

MARTHA QUILLIN

CLINTON -- In the high-tech trash business, regional landfills are the wave of the future -- but some Sampson County residents don't want to be on the cutting edge.

When county commissioners held a public meeting Monday night to discuss a proposed landfill where trash would be brought from up to 60 miles away, 500 people crowded into the Clinton-Sampson Agri-Civic Center to hear about it. More than 60 of them took three-minute turns at the lectern either to encourage the county to go ahead with the project, or beg them to reconsider.

Supporters say a privately run, regional landfill will solve Sampson's solid waste problems for years into the future while raising millions of dollars for the rural county's coffers. Opponents say it will make the county a dumping ground for Eastern North Carolina and threaten groundwater supplies.

After concluding the public hearing, county commissioners discussed the proposal in closed session for about an hour, then voted unanimously to give it preliminary approval. A final vote is scheduled Feb. 17.

If the landfill is approved by the county and state, it would be built on 500 acres adjacent to the existing landfill a few miles west of Clinton.

The meeting opened with county Health Director Kenneth Jones showing a promotional film about Browning-Ferris Industries, the Texas company that would build and operate the facility, and a news program that profiled a landfill in a small town outside Detroit. That facility, town officials said in the program, had generated millions of dollars that were used to upgrade town services, and had become a tourist attraction in itself.

The film showed people skiing on top of a snow-covered, trash-filled mountain, and golfing on top of a carefully landscaped garbage heap. In the BFI promotional film, race cars zoomed around the Charlotte Motor Speedway outside Concord -- the infield of which is a former trash dump.

But some residents were not convinced that the landfill -- which could receive non-hazardous waste from some 30 counties -- would be a good neighbor. They were concerned about BFI's environmental record in other states, and about possible long-term hazards of the dump.

"We don't get enough snow to ski, we work too hard to play golf and we can't afford race cars," Bernice Cooper of Roseboro told commissioners. She asked them to pursue recycling efforts and to build a landfill that would serve Sampson County alone.

Bob Wheeler, also of Roseboro, agreed. "I'm not opposed to a landfill," he said. "I'm opposed to a regional landfill. I do not want everybody else's trash in my backyard."

But Dexter Matthews, chief of the solid waste section of the state Department of Environment, Health and Natural Resources, said Tuesday that because of the high cost of building landfills under new state and federal regulations, regional facilities are being discussed by more than half a dozen clusters of counties from the coast to the mountains.

Some, he said, would be operated by commercial outfits like BFI. Others would pool county resources for construction and operation.

Before 1972, when the state initiated regulations on sanitary landfills, there were as many as 450 open dumps in towns and cities across the state where trash was poured into piles and set afire. Since then, the state has required that trash be put in central facilities and buried each day with 6 inches of dirt to reduce health hazards.

As those landfills reach capacity -- as the existing one in Sampson County is expected to do by late 1993 -- new ones must be built, conforming to the latest regulations. These "high-tech" landfills, designed to prevent groundwater contamination, must be lined with a clay or plastic barrier and equipped with collection systems to catch liquid residue.

Such landfills cost in the neighborhood of $240,000 to $300,000 an acre to build, putting them out of reach for counties like Sampson unless residents agree to considerable increases in garbage collection fees -- up to $200 a year per household, Jones said.

Over the 20-year contract being negotiated with BFI in Sampson, Jones said, the county's share of tipping fees at the landfill could be as much as $50 million, with county residents enjoying free trash collection and the closest residents getting price guarantees on their homes and property. If the county has to build and run its own high-tech landfill, Jones said, it could cost residents $50 million over 20 years.

To people like Bruce McLamb of Clinton, it is a simple choice. Speaking at the hearing in favor of the landfill, he said, "If we're going to do it, let's at least make money off it."

EXH. 7

2/28/96 Buff. News B5

Buffalo News
Copyright 1996

Wednesday, February 28, 1996

LOCAL

BOARD MAPS NEW STEP TO BLOCK LANDFILL

The Albion Town Board will take another step toward blocking an 80-acre landfill adjacent to the Erie Canal when it holds a public hearing March 11 to consider revising its zoning ordinance.

Meanwhile, Waste Management of New York took a counter measure Tuesday as it announced that it will guarantee appraised values on land which abuts the Towpath Environmental & Recycling Center east of Transit Road once the landfill begins operating.

The company will reimburse the price difference for any landowner who sells property for less than its appraised value within eight years of the start-up of the landfill, Waste Management spokes person Cindy Jessup explained.

Waste Management Inc. is leasing the 80 acres of idle land from John and Irene Smith, the bankrupt operators of a former landfill on Transit Road. The $105 million project is proposed for a site on Densmore Road, about 1,000 feet south of the Erie Canal.

Because of a new anti-landfill majority on the Albion Town Board since Jan. 1, however, the opening of the landfill has been thrown into doubt.

The March 11 hearing will be the third step taken since January by the new board to prevent "our town from becoming a dump," said Supervisor Edward R. "Ted" Scharping, a longtime Orleans County realtor who took office at the beginning of the year.

Landfill development in Albion was halted early in January when the new Town Board lineup returned Waste Management's permit application as incomplete and then declared a 120-day moratorium on any new landfill applications.

The original plan was for Waste Management Inc. to dump 500,000 tons of solid waste a year that "would come from anywhere and everywhere including Canada," Scharping said.

"A big question for us is whether enough residents of Albion (population 6,500) will stand up to threats of a lawsuit," Scharping said. "We have retained Daniel A. Spitzer of the Hodgson, Russ firm of Buffalo."

"None of the three proposals had any teeth to them," said Legislator Edward Ryan, D-Syracuse, the minority leader. "All they accomplish is giving Warner something to talk about during next year's political campaign."

9/17/97 Pantagraph (Bloomington Ill.) A7

The Pantagraph Bloomington, IL
Copyright 1997

Wednesday, September 17, 1997

NEWS

Livingston Co. sales tax may save property tax

TONY PARKER

PONTIAC - Approval of a proposed sales tax increase Nov. 4 would not only help pay for centralized emergency service dispatch, but also result in a property tax savings, the Livingston County Board decided Tuesday.

The board unanimously adopted a resolution to use any surplus revenue generated by the quarter-cent sales tax increase to abate that much from the county's General Fund levy.

Based on the most current numbers available, the sales tax hike would generate $692,000 annually, with about $400,000 earmarked to pay for the dispatch service in conjunction with enhanced 911.

The remaining $292,000 would be abated from the General Fund levy. For the owner of a $60,000 home, the savings would be about $14.30 per year.

Money from the increase must be used for public safety purposes, but Finance Committee Chairman Carl Borngasser said the money will be placed in the Sheriff's Department budget that is part of the General Fund. The resulting savings would be passed on to taxpayers through an abatement in the county's General Fund levy, he said.

Other options presented by Borngasser include using $100,000 of the money for a juvenile detention agreement with Salem Children's Home in rural Flanagan or using the extra money to help the struggling General Fund.

The referendum was requested by 911 officials because of financial difficulty in the centralized dispatch program, which has a $60,000 annual deficit. The revenue would replace $305,299 in annual fees now collected from emergency service agencies, including $106,249 now paid by the county from its General Fund.

In other business

The board:

- Amended the host-county agreement with American Disposal to reflect landfill operation changes the company agreed to implement in response to neighbors' concerns about blowing debris and other issues.

The changes require the company to: monitor wells within 1,500 feet of Livingston Landfill on a quarterly basis and randomly sample one home's well every three months within a one-mile radius of the facility; extend property-value guarantees from a quarter-mile to one-mile radius; and curtail landfill operations when sustained wind speeds reach 30 mph, down 5 mph from the original contract.

- Authorized Livingston Manor Administrator Sue Anne Myers and Livingston County engineer David Winters to enter binding contracts of up to $10,000 with consent only from County Board committees.

Previously approval was needed by the entire 28-member board, but officials said that often meant waiting several weeks for a necessary supply or piece of equipment.

- Learned deputy coroners Sue Mennenga, Rita Mills, David Murphy, Richard Ores, Julie Runyon and Danny Watson have completed the state's 40-hour basic coroner training course.

- Reappointed Elmer Ifft to a three-year term on the Belle Prairie Drainage District board of trustees; Steven Haag to a three-year term on the Northeast Sullivan Mona Drainage District board of trustees; and Merle Jehle to a one-year term on the Northeast Sullivan Mona Drainage District board of trustees.

Chicago Tribune
Copyright 1996

Wednesday, December 4, 1996

METRO LAKE

GRAYSLAKE PROJECT SELLS ENVIRONMENT-FRIENDLY LIFESTYLE NATURE RIGHT AT HOME IN SUBDIVISION

LeAnn Spencer, Tribune Staff Writer.

In the nearly five years since the seeds for the Prairie Crossing subdivision were planted in the rolling landscape of north-central Lake County, more than 75 homesteads have taken root in this Rockwellian portrait of Midwestern utopia.

There's a village green with gazebo, a community-sponsored organic garden and food co-op, pathways lined with hedgerows and fruit trees, a petting farm, a children's garden, horse stables and even a restored historical barn and farmhouse.

The goal, designers of the Grayslake project say, was to foster a sense of community akin to the days of yesteryear, with 19th Century-style homes clustered on smaller lots and surrounded by generous helpings of open space.

"We were drawn by what they were doing, and ecologically, they are doing wonderful things," said Mark Loughmiller, 38, who with his wife, Kelly, was one of the first to make a deposit on a house at Prairie Crossing.

"When I looked at other developments in Lake County . . . I bought into the idea that (Prairie Crossing) was certainly a worthy experiment to become involved with," said Loughmiller, the county's recycling coordinator.

Across the Chicago area, other subdivisions promise neighborliness and even conservation, but few have been able to create the kind of lifestyle package found at Prairie Crossing.

With its bucolic pastures, verdant wetlands and inviting ponds, Prairie Crossing has won acclaim as a "conservation community" by national environmental groups such as the respected Nature Conservancy and the Conservation Fund.

It is a design concept few had heard about when the project was announced in 1992, but today, the idea is considered by some builders and land planners as an antidote to sterile and unappealing suburban sprawl that isolates people from each other.

This is important, experts say, because development is spreading deeper into the collar counties, far from traditional town centers. Many people who live in subdivisions feel out of touch.

"The community concept is a big draw. People are far from town, and they want to feel a sense of community and like they are at home," said Roy Krughoff, an Aurora home builder and president of the Northern Illinois Home Builders Association.

Another factor, Krughoff noted, is that one subdivision often looks like the next, and people want something unique.

"If you blindfolded someone and put them in the middle of many subdivisions and took off the blindfold, they could name 50 different locations that they might be at--and they would be correct," he said.

Other places that promote a strong sense of community, Krughoff said, include Stonebridge in Aurora and Mill Creek in Geneva. Both include appealing neighborhood centers with recreation areas and some small commercial stores.

Another development often cited for its emphasis on native landscaping is the Reserve at the Merit Club in Libertyville.

In the case of Prairie Crossing, those who buy homes also purchase a back-to-nature lifestyle that includes potluck suppers and Sunday afternoon concerts. The deal includes a long list of covenants governing house color and design as well as guidelines for ecologically safe landscaping.

The subdivision even has its own environmental manager who coordinates the care of the 463 acres of open space and advises homeowners on natural landscaping.

"We (biologists) know how to restore native landscapes on 1 acre and up," said Michael Sands, environmental team leader.

The challenge was making that work on lots smaller than a half-acre in a subdivision that is surrounded largely by native landscapes.

"Homeowners told us that they wanted to do things differently," said Sands, whose recommendations included less lawn turf and more drought-tolerant prairie plants.

"One of our goals," Sands said, "is to turn the average home buyer into an environmental advocate."

That can be done, he said, by teaching neighborhood conservation. As a result, many yards include tall native grasses and wildflowers that meld into untamed open spaces. Some owners even have creatively incorporated vegetable gardens as the

centerpiece of their "landscaping."

For homeowner and ecological consultant Karin Wisiol, life at Prairie Crossing resulted in a new venture after she and other homeowners started looking for help in designing natural-looking yards.

She has founded the northeastern Illinois chapter of the Wild Ones-Natural Landscapes, a national organization that promotes the use of prairie plants in home landscaping.

"An ordinary development wouldn't have drawn me, and we liked the idea of living in a community philosophically created to be ecological sound," said Wisiol, who with her husband, Klaus, a retired Commonwealth Edison executive, is planting a prairie garden in her yard.

Prairie Crossing was the dream of the late Gaylord Donnelley, a Lake County philanthropist and businessman, and his wife, Dorothy. They bought several hundred acres in the area after a controversial high-density residential development for the property was rejected by county officials in 1972.

Instead of the proposed 2,200 homes, Prairie Crossing will have 317 houses on 700 acres. More than half of the property has been left in common open space owned by the homeowners association, including a network of trails that will connect to nearby forest preserves and the adjacent 2,500-acre Liberty Prairie Conservancy.

Prairie Crossing was created by Donnelley's nephew George Ranney Jr., a Lake County businessman, and his wife, Victoria Post Ranney. They are the president and vice president, respectively, of Prairie Holdings Corp.

Their idea was to carry out Donnelley's vision of a community in harmony with the environment, economically sound but environmentally sensitive as well.

In the nearly two years since the first model house opened, about 75 dwellings have been built and sold, mostly to white-collar professionals. That's about an average sales rate for new suburban development, according to industry observers. Base prices range from $195,000 to $410,000.

Frank Martin, project manager for the Chicago-based Shaw Co., which is building the houses that were designed by well-known Chicago architects, likes Prairie Crossing so much that he moved his family there from Chicago.

"We're not just building a subdivision. We're truly building a community here, and that is what is exciting," said Martin, who commutes to his Chicago office via the recently opened Metra North Central rail line.

Even an adjacent landfill hasn't seemed to bother many people, said the developers. That may be due in large part to an agreement Ranney made with the owners of Countryside Landfill.

Under terms of that contract, the landfill operators guarantee property values in the subdivision. The landfill also promised to put in several million dollars of landscaping improvements and odor controls beyond what is required by state and federal agencies.

9/12/96 Syracuse Newspapers 10

The Post-Standard Syracuse, NY
Copyright 1996

Thursday, September 12, 1996

Neighbors West

LANDFILL NEIGHBORS GET SOME CONSIDERATION THE LAWMAKERS AIM TO GUARANTEE THE VALUE OF SOME PROPERTIES IN VAN BUREN.

PATRICK LAKAMP The Post-Standard

He couldn't stop Onondaga County legislators from deciding to open an ash landfill in his district, but Legislator Robert Warner presses on so Van Buren residents can live with the decision.

Warner - who brought three proposals to the county legislature's September session last week - scored a split decision.

Lawmakers passed one of his measures and rejected a second, and he pulled a third proposal shortly before it was to be considered.

Lawmakers approved, by a 23-1 vote, a proposal asking the Onondaga County Resource Recovery Agency to "make every effort" to establish a property stabilization plan.

Such a program would guarantee the market value of properties near the landfill off Brickyard Road.

If homeowners can't sell their houses at a decided-upon value, the homeowners would be paid the difference.

Residents who live near the next county dump deserve a plan to help make up for the noise, the smell and the impact on property values, Warner said.

Lawmakers defeated a second proposal, 7-17, to ask the trash agency to "protect the interests of the town of Van Buren" if the site is sold to a private company.

At the last minute, Warner pulled a proposal asking the trash agency to compensate the town for lost property taxes.

Last month, the county authorized the agency to spend $1.2 million to buy a remaining 364 acres from property owners for the landfill. The site, about one square mile, eventually will be used to bury ash from the county's trash incinerator.

Warner's proposals would not have required OCRRA to do anything, but would simply ask the agency to consider the ideas.

EXH. ___

8/7/96 Indianapolis Star B02

The Indianapolis Star
Copyright 1996

Wednesday, August 7, 1996

METRO

Council expects to appoint new chief on Aug. 19 Town panel has interviewed four candidates but wants more time before making its selection.

LINDA KARN; CORRESPONDENT

DANVILLE, Ind. - The Danville Town Council announced Monday night that it expects to name a new police chief Aug. 19.

The council interviewed four candidates during an executive session prior to the regular meeting, but decided more time was needed before making the selection.

William Cope, who submitted his resignation July 1, will continue to oversee the department until a new chief is hired.

In other business, Larry Wright, executive director of Twin Bridges Recycling and Disposal Facility, told council members that about 60 letters have been submitted to homeowners who qualify for Waste Management's property value guaranteed program. The program is a means to protect property values of homeowners surrounding the landfill.

As part of the negotiations for the landfill's February 1994 annexation into the town, the council asked Waste Management to guarantee property values to homes surrounding the landfill along Cartersburg Road to County Road 150 East and County Road 200 South.

Wright said Waste Management expanded the guarantee area to include homes not only surrounding the landfill, but also near the proposed Hendricks County Reliever Airport along County Road 200 East.

Wright said there is no mandatory obligation to sell homes to Waste Management, but added that the offer is good as long as Waste Management operates the landfill. Wright said he believes the firm will be operating the site for another 30 years.

Wright said about 30 owners have returned verbal or written responses. He said Waste Management has hired Certified Appraiser Howard Thomas to conduct appraisals. He said homeowners can hire their own appraisers at Waste Management's expense.

He emphasized that Waste Management actually does not have a firm plan of what to do with the properties once they are acquired. Wright speculates that Waste Management will rent the properties.

The program includes an option for the owners to lease the property until they can decide where they want to reloc Wright said the company has no desire to demolish any of the ho

He said he hopes all the properties could be utilized and to the council the area will not be designated as a Habitat f Humanity subdivision. He said those homes do not fit into Habitat'. criteria.

However, he did warn that the guarantee is not transferable to future homeowners because they know the landfill exists.

When the Town of Danville agreed to Waste Management's annexation and rezoning request, the property was rezoned to "plan development district extraordinary" so the landfill's disposal area could be expanded from 119 acres to utilize an additional 135 acres.

Because of the annexation, Waste Management received town utilities with the intention to release the leachate, or rainwater runoff, into the sewer system and the town's waste water treatment plant.

The town has not begun accepting leachate into the treatment plant.

5/24/95 Kan. City Star A1

The Kansas City Star
Copyright 1995

Wednesday, May 24, 1995

NATIONAL/WORLD

Landfill gets state approval Sugar Creek site eases space crunch; opponents fear it will ruin acqifer.

MIKE RICE; BRIAN BURNES
Staff Writers

The Missouri Department of Natural Resources has approved a 208-acre landfill in Sugar Creek despite more than three years of protests from residents who don't want it near the area's main water source.

The state agency on Monday approved a solid waste management permit for the Courtney Ridge Recycling and Disposal Facility on the Missouri River bluffs near Missouri 291 and Courtney Road.

The permit will allow Waste Management Inc. to open the landfill next year after its nearby Rumble Landfill reaches capacity. Construction should start this summer, said Kevin O'Brien, the company's division president who will oversee the new facility.

Proponents said the new landfill could help solve the metropolitan area's dwindling landfill capacity. It is expectedto

house trash for 20 years from much of Kansas City, eastern Jackson County and Clay County.

But opponents are concerned about polluting an aquifer south of the Missouri River.

The nearby Courtney Bend aquifer and well fields are the main water source for Independence, which also sells water wholesale to other utilities in Jackson and Lafayette counties. Nearly 250,000 customers tap that water source.

''The DNR has betrayed us by permitting the landfill," said a leading opponent, Mary Ann Wilson of Independence. ''It is endangering our water supply."

Lee Moore, a retired real estate broker, said the fresh water from the Courtney Bend aquifer has drawn thousands of residents to eastern Jackson County.

''I'm so furious, I could bite a nail," said Moore of Independence. ''Can you imagine trying to clean a head of lettuce with bottled water?"

But Courtney Ridge officials and Sugar Creek leaders contend that the facility will be safe. The permit contains more than 30 stipulations, such as a special synthetic liner to help prevent leaks, a ''catch" system for methane gas and restrictions on hazardous wastes.

Department of Natural Resources officials noted that they inspect sanitary landfills four times a year to ensure they are in accordance with state guidelines.

''We've always felt that this will be one of the most regulated landfills in the state," said Bob Buckley, Sugar Creek assistant city attorney.

But Independence Water Department Director Randy Vest said he remained concerned about blasting in the mostly industrial area and monitoring the landfill after it closes. ''The risk is still there," he said.

Opponents have written letters to the state, hired engineers to prove the facility will leak and introduced legislation.

But in May 1993, the Sugar Creek Board of Aldermen approved the special-use permit after the stipulations were added. The city held five previous public hearings.

Opponents continued communicating with the state and were optimistic earlier this year when the Department of Natural Resources extended its review of Waste Management's application.

That delay gave two area legislators, Sen. Ronnie DePasco and Rep. Dennis Bonner, more time to push legislation that would have banned construction of all landfills near water sources.

But DePasco said Tuesday that rural legislators, dependent on revenue generated by landfills, helped kill both proposals. Although DePasco revised his bill several times, ''(rural legislators) said I would be killing all landfills because they all sit atop aquifers."

Approval of the landfill is a boon for Sugar Creek, which lost a significant corporate neighbor in 1982 when the Amoco Oil Co. refinery closed.

Buckley said the city would receive 10 percent of Waste Management's gross receipts from the Courtney Ridge facility each year for the life of the facility. A report two years ago estimated that the new landfill could generate $43 million for the city through the year 2015.

Sugar Creek Mayor Charles Dumsky, who championed efforts to have the landfill permit approved, was unavailable for comment

Tuesday.

To placate some Sugar Creek residents, Waste Management has offered a program guaranteeing the replacement value of their homes. If homeowners within a designated district cannot sell their properties for an agreed-upon appraised value, Waste Management will make up the difference.

About two dozen other property owners have taken advantage of the program, O'Brien said.

The Courtney Ridge approval is the second big victory for area landfill proponents this spring. Last month, the Kansas City Board of Zoning Adjustment approved a 39-month extension of the Southeast Sanitary Landfill at 8301 Indiana Ave. That facility had been scheduled to close by Jan. 1, 1996.

Defeating both landfill proposals would have left the Johnson County Landfill and the Forest View Recycling and Disposal Facility in Kansas City, Kan., as the area's two main trash disposal sites.

Nick Artz, a principal for Franklin Associates, a Prairie Village solid-waste management firm, has said the Courtney Ridge facility and the Southeast Sanitary Landfill extension would improve the area's landfill capacity, especially on the Missouri side.

But Courtney Ridge opponents said the Sugar Creek facility could be unnecessary if a solid waste transfer station is built in Independence. The City Council will decide next month whether to issue the special-use permit, which also needs state approval.

Up to 240 tons of trash a day would be shipped from the station to the Show Me Regional Landfill in Warrensburg. Because the station would be an indoor facility, trash haulers would sustain less wear and tear on their trucks, said Jim Sharpless, a consultant for the station's operator, Allied Waste Industries.

''We don't think this will affect us," Sharpless said. ''It's still to the trash haulers' advantage to come to us."

EXH. 5

9/20/93 Leader-Telegram (Eau Claire Wis.) (Pg. Unavail. Online)

Leader-Telegram
Copyright Leader-Telegram 1993

Monday, September 20, 1993

Rusk County landfill slated for late 1994

By Tim J Sheehan

Eau Claire, WI, US --

If all goes according to plan, a new state-of-the-art landfill could open in Rusk County in late 1994.

But it won't be owned by the local company formed nearly two years ago to design and build the facility.

Waste Management of Wisconsin, the state's largest solid waste handling firm, has bought Rusk County Landfill Inc. and the site in the town of Stubbs outside Weyerhaeuser, which recently won approval from the state Department of Natural Resources. Waste Management of Wisconsin is a division of one of the country's largest waste- handling firms, Waste Management of North America.

In 1991 William Rands and a northern Wisconsin developer, Jack Ardoyno, formed Rusk County Landfill Inc. to build and operate the proposed landfill. Rands, president of Rands Trucking and Disposal in Ladysmith, said in a release on the sale that he is confident in Waste Management's environmental record.

"I believe Waste Management's environmental expertise is greater than any other company's in Wisconsin," Rands said.

DNR officials who administer the long, complicated landfill sitting process confirmed Rand's assessment of Waste Management's history in the state.

"We see the facilities they run in the state as being run well," Paul Huebner, site evaluation unit leader, said.

Waste Management also operates waste transfer stations, recycling programs and a trucking division.

The Rusk County project, if given the final go-ahead by the DNR, would be the company's seventh state landfill and the first in the northern part of the state.

Lynn Morgan, manager of government affairs for the Menomonee Falls-based company, said the firm is looking for expansion sites in areas of the state it does not serve.

"We are always looking to expand our areas of service," Morgan said. "The opportunity came up in Rusk County for us to offer our services up there."

Morgan said the site, about a mile north of U.S. 8 east of Weyerhaeuser, is a good site with good planning for the establishment of the landfill. In late July the project cleared a major hurdle after the DNR issued a favorable ruling on the project.

Called a feasibility determination, the ruling found there was sufficient need in the area proposed to be served to justify the project. The determination also found the facility as proposed was environmentally feasible, provided the developers followed specified guidelines.

Hydrogeologist Timothy Kessenich of the DNR's Bureau of Solid and Hazardous Waste Management said three hurdles remain.

The developers now must file a plan of operation with the DNR. Once the DNR receives the detailed plan spelling out the technical aspects of the landfill and how it will be run, the department has 90 days to seek refinements of the plan or reject it.

When the first phase of construction is completed, the site is reviewed again before a license application is considered, Kessenich said. Morgan said the site's new owners will file a plan of operation with the DNR this fall.

"If we are successful, we could begin construction in the spring and be on line in late 1994," Morgan said.

Kessenich agreed that with that timeline, assuming all the steps in the licensing procedure stay on track.

One additional hurdle Waste Management will have to clear that wasn't a problem with the former local developers of the Rusk County landfill is a state statute requiring companies seeking a landfill license to comply with all regulations at all other sites the firm operates or owns.

Morgan said Waste Management does not expect the statutory hurdle to be large.

"We don't anticipate any problems with that," Morgan said.

When Rands, who was president of Rusk County Landfill, unveiled plans for the landfill, some area residents objected to the proposal.

The town of Stubbs had filed for a contested-case hearing with the DNR on the project before reaching an agreement with the local developers.

Morgan said Waste Management will honor the signed agreement with the town of Stubbs. Under that agreement Waste Management agrees to pay the town about $300,000 over the 14-year anticipated life of the landfill; blacktop the town road leading to the site; provide the town with free waste disposal; and guarantee property values of neighboring landowners.

EXH. ___

The News Tribune Tacoma, WA
Copyright 1995

Thursday, October 12, 1995

Local/State

LANDFILL FIRMS VOW TO PROTECT PROPERTY VALUES 1 MILE FROM DUMP

Rob Tucker / The News Tribune

Local garbage companies have increased their commitment to buy out disgruntled property owners near a proposed East Pierce County dump.

The companies, joined together as Land Recovery Inc., will expand their "property value protection zone" to a 1-mile area surrounding the 320-acre landfill site, according to spokesman Dan Syrdal.

Property value protection means that LRI will buy land or subsidize the selling price if an owner within the zone is unable to sell at fair market value after attempting to do so for six months, he said.

The old zone boundary was one-half mile. The expansion area includes several hundred property owners south of Graham near the site at 304th Street East and Meridian Avenue East.

LRI made the decision after reviewing the testimony of Fred Lee, a California expert hired by people living close to the proposed landfill site 5 miles south of Graham. Those people oppose the landfill.

The company also reviewed community testimony during hearings at Graham last month, where several people expressed fears about declining property values near the landfill site, he said.

"Lee said 1 mile should be sufficient" to lessen adverse landfill consequences, Syrdal said.

In addition, LRI will expand the property value protection program to any land where drinking water is made unhealthful by the proposed landfill, he said.

Some landfill opponents didn't think much of the new development.

"Do I have a lot of faith in this? No," said State Sen. Marilyn Rasmussen, (D-Eatonville).

The proposed landfill is in her district.

"I don't think they can afford it," added Wendy Hall, the paid staffer for Rural Citizens Against Urban Sprawl, which opposes the landfill.

"We're not a typical rural neighborhood," she said. The area includes a Weyerhaeuser family and many others with higher-value houses and land. And it contains many horse ranchers, some of whom breed Arabians, she said.

A landfill failure would bankrupt LRI, she predicted. "This is not a Fortune 500 company," she said.

The $60 million landfill would be built over a drinking water aquifer used by thousands of south Pierce County residents.

The South Muck Creek flows nearby and floods substantially at times, blocking Meridian Avenue East, Hall showed with a video at the landfill hearings.

Testimony by others revealed that an earthquake in 1949 dried up deep wells and a lake near the landfill site. The quake also disrupted the soils on the landfill site, she said.

LRI believes that it won't be spending much money.

There won't be any adverse impact on property values or drinking water wells near the planned dump, Syrdal said.

But LRI knows that the landfill proposal and its safeguards aren't credible with nearby property owners, he said.

"We are dealing with a perception problem," he said. "But if they are right, they are protected. Otherwise, there's no cost to us."

The LRI move came after the county ended land-use permit hearings for the landfill earlier this week.

The hearings lasted 16 days and included community and expert testimony on the adequacy of the landfill's environmental impact study and whether a land-use permit should be granted.

The final decision on the permit won't come until Jan. 1, hearing examiner Steve Causseaux said.

People who have an opinion on the proposed landfill near Graham can still give it - in writing.

County hearing examiner Steve Causseaux will allow written testimony on the issues through Oct. 24.

People who want to write should send their letters to: Pierce County Hearing Examiner, P.O. Box 5767, Tacoma, WA 98405.

EXH. ___

Recycling Burying Profits of Dump Operators

■ Trash: Fears of a landfill shortage for L.A. County vanish as recycling and plans for new facilities combine to drive down disposal fees.

BY JONATHAN GAW
TIMES STAFF WRITER

On the northeast edge of the San Fernando Valley, like a hole in the ground that makes the rest look downright [illegible]

[illegible] the 20 million cubic yards of air space [illegible] allow 30 of the massive areas give or take a couple [illegible] Greg Loughnane and his staff busy for the next 30 years.

Driving [illegible] Ford Explorer along the rim of the Bradley Landfill and Recycling Center, he looks to feel down where garbage trucks and bulldozers [illegible] a mountain [illegible] of Los Angeles' trash like so many ants scurrying around a [illegible]

The [illegible] has had from [illegible] Loughnane, who is president [illegible] and recycling center that takes [illegible] tons of garbage a [illegible]

For such companies as Waste Management Inc., the nation's largest solid waste company, and the owners of the Bradley [illegible], the [illegible] is a [illegible] of money. But the [illegible] is growing more [illegible] years ago, when the landfill industry reeked of the [illegible]

Increasingly scarce dump space in Los Angeles would seem to lead to riches for those in the business. But the weak economy, increased regulation and recycling and the onset of landfill alternatives—such as hauling garbage out to the hinterlands—are working to turn once-fat profit margins for the capital-intensive business. While no one [illegible] state and industry officials were trumpeting the onset of a dump crisis in Los Angeles, the county may actually face a landfill surplus in the not-too-distant future, driving down the tipping fees that landfills charge to take a ton of garbage.

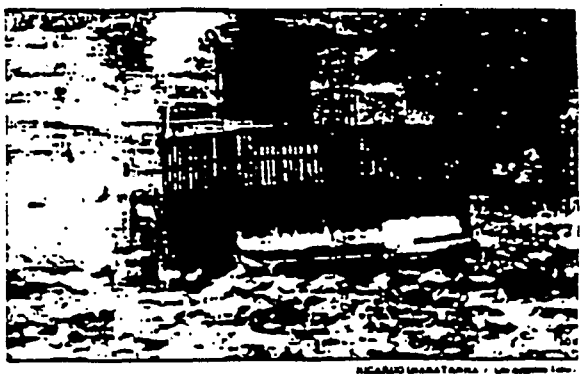
That's bad news for owners and operators of private dumps, which take in more than half of the county's 40,000 tons of trash a day. They range in size from the family-run Palmdale Disposal Co. to multinational corporations such as Waste Management, which, along with running 100 [illegible] in the United States and Canada, has interests in every aspect of business, including trash-hauling, recycling, hazardous waste and trash-to-energy plants.

"It doesn't work as well as it used to," said Tad Watson, a spokesman for Laidlaw Waste Management, Inc., which operates the Chiquita Canyon Landfill in the Santa Clarita Valley. Profits from landfills have [illegible] since [illegible] summer, environmental regulations add to landfill [illegible] cost.



Greg Loughnane, president of Bradley Landfill and Recycling Center in Sun Valley. The dump takes in 7,000 tons of trash daily.





Trash is crushed and compacted by heavy equipment at the Palmdale Disposal Co.

Paul Arelin, who 35 years ago founded Palmdale Disposal with his two brothers and an REO Speedwagon county truck, said it's hard to raise your prices as fast as they make up the new [illegible]

In Los Angeles County, the average tipping fee is $21 [illegible] a state survey showed. But among private facilities the fee is higher, with Bradley charging $33.5[illegible] a ton, while dumps in outlying areas such as Palmdale Disposal and Chiquita Canyon charge $30 and between $25 and $30 a ton, respectively.

But at the same time, both public and private dumps now must pay for high-tech liners, extensive recovery systems for the toxic methane gas given off by rotting garbage and trust funds to cover the costs of closing a landfill once its full. Federal laws also make dump owners pay for any cleanup that may be required for 30 years after the landfill closes.

"Twenty years ago, you or I could just dig a hole in the ground and put garbage in," Watson said. "But now it's become a real scientific industry."

Waste Management, for example, has spent $35 million over the last five years on new liners and gas recovery systems at the Bradley site. It purchased the site for $6 million in 1986.

For his relatively small operation, taking in 700 tons a day from the Antelope Valley, Arelin said he has set aside $2 million in a trust fund for post-closure cleanup costs.

Analysts see another long-term shift in the industry that will cut into profits: required volume because of recycling and reuse of materials. "We think landfill volumes are going to be under pressure for a number of years," said Mark Bain, an analyst at New York-based Boston Securities Corp.

Please see LANDFILLS, 10

(Print-out of this article on following pages)

5 of 11 Complete Record
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Recycling Burying Profits of Dump Operators
Trash: Fears of a landfill shortage for L.A. County vanish as recycling and plans for new facilities combine to drive down per-ton load fees.
Los Angeles Times (LT - TUESDAY July 20, 1993
By: JONATHAN GAW; TIMES STAFF WRITER
Edition: Valley Edition Section: Business Page: 15
Word Count: 1,324

On the northeast edge of the San Fernando Valley lies a hole in the ground that makes the Rose Bowl look downright Lilliputian.

Filling the 22 million cubic yards of air space, equal to about 20 of the Pasadena arenas, give or take a couple, will keep Greg Loughnane and his staff busy for the next 10 years.

Driving his sky-blue Ford Explorer along the rim of the Bradley Landfill and Recycling Center, he looks 70 feet down where garbage trucks and bulldozers maneuver a multi-ton mound of Los Angeles trash like so many ants scurrying around a beetle carcass.

"The smell isn't that bad from up here," said Loughnane, who is president of the landfill and recycling center that takes in 7,000 tons of garbage a day.

For such companies as Waste Management Inc., the nation's largest solid waste company and the owner of the Bradley facility, the smell is still that of money, but the scent is growing more faint than in years past when the landfill industry reeked of the stuff.

Increasingly scarce dump space in Los Angeles would seem to lead to riches for those in the business, but the weak economy, increased regulation and recycling, and the onset of landfill alternatives--such as hauling garbage out to the hinterlands--are working to trim once-fat profit margins for the capital-intensive business. While not long ago state and industry officials were trumpeting the onset of a "dump crisis" in Los Angeles, the county may actually face a landfill surplus in the not-too-distant future, driving down the tipping fees that landfills charge to take a ton of garbage.

That's bad news for owners and operators of private dumps, which take in more than half of the county's 40,000 tons of trash a day. They range in size from the family-run Palmdale Disposal Co. to multinational corporations such as Waste Management, which, along with running 133 landfills in the United States and Canada, has interests in every aspect of disposal, including trash hauling, recycling, hazardous waste and trash-to-energy plants.

"It doesn't work as well as it used to," said Tag Watson, a spokesman for Laidlaw Waste Management, Inc., which operates the Chiquita Canyon Landfill in the Santa Clarita Valley. Profits from landfills have "diminished quite significantly" in the last five years, Watson said, because stringent environmental regulations add to landfill costs.

Phil Arklin, who 23 years ago founded Palmdale Disposal with his two brothers and an REO Speedwagon utility truck, said "it's hard to raise your prices as fast as they make up the new laws."

In Los Angeles County, the average tipping fee is $21.42 a ton, a state survey showed. But among private facilities, the fee is higher, with Bradley charging $33.80 a ton, while dumps in outlying areas, such as Palmdale Disposal and Chiquita Canyon, charge $30 and between $25 and $20 a ton, respectively.

But at the same time, both public and private dumps now must pay for high-tech liners, extensive recovery systems for the toxic methane gas given off by rotting garbage and trust funds to cover the cost of closing a landfill once its full. Federal laws also make dump owners pay for any cleanup that may be required for 30 years after the landfill closes.

"Twenty years ago, you or I could just dig a hole in the ground and put garbage in it," Watson said. "But now it's become a real scientific industry."

Waste Management, for example, has spent $35 million over the last five years on new liners and gas recovery systems at the Bradley site. It purchased the site for $60 million in 1986.

For his relatively small operation, taking in 700 tons a day from the Antelope Valley, Arklin said he has set aside $2 million in a trust fund for post-closure cleanup costs.

Analysts see another long-term shift in the industry that will cut into profits: reduced volume because of recycling and reuse of materials. "We think landfill volumes are going to be under pressure for a number of years," said Mari Bari, an analyst at New York-based Mabon Securities Corp.

Forty-three states, including California, have laws requiring cities to reduce the amount of trash going to landfills, Bari said. Many communities, such as Santa Clarita, use incentives to encourage residents and businesses to recycle and reduce waste, reducing landfill volumes by 25% to 30%.

In California, environmental regulations and heightened public distrust of landfills make trying to get permits to build a dump expensive, time consuming and uncertain.

Earlier this month, Waste Management abandoned plans to build a 6,500-acre dump at the mouth of the Ojai Valley in Ventura County after spending eight years and $13 million trying to win a permit. Torrance-based BKK Corp. has had plans to construct a landfill in Elsmere Canyon, near Santa Clarita, for nearly seven years, and still has not gotten so far as having an environmental impact report.

"This has always been a capital intensive business, and the impact of regulation has been to make it even more so," said Douglas Augenthaler, an analyst at New York investment firm Oppenheimer & Co. "There's no guarantee you can get the permits, and very few people can take that kind of risk."

Make no mistake, landfills can still turn trash into gold. "It's a license to steal, isn't it?" quipped one analyst.

Most companies don't break out financial results from their landfill operations. But Houston-based Browning-Ferris Inc., which owns the Sunshine Canyon landfill in Sylmar, received 23% of its $3.3 billion in total revenue in its fiscal year that ended Sept. 30 from the disposal and transfer of municipal waste. Waste Management, in Oak Brook, Ill., received half of its $8.6 billion in revenues last year from its solid waste operations.

Despite the difficulty in getting permits, some analysts and industry officials said, soon there may be a glut of dump space in Los Angeles County, particularly in the San Fernando Valley area.

The Sunshine Canyon landfill in Sylmar, owned by the country's second-largest

solid waste company Browning-Ferris, has a permit to reopen, but its expansion is tied up in litigation. Just to the north near Santa Clarita, an environmental impact report is due in the fall for BKK's proposed 190 million-ton landfill in Elsmere Canyon. Meanwhile, Laidlaw's Chiquita Canyon Landfill near Castaic has capacity left for up to 60 more years.

"I find it hard to argue that Chiquita plus Elsmere plus Sunshine wouldn't be too much for one area," said Alan Purves, market and strategic development manager for Laidlaw.

Throw into the mix three separate rail-haul proposals being developed to carry trash to remote sites in inland California and other states, where pits that dwarf any Los Angeles landfill are ready to take in the county's daily load of trash. "Everyone is trying to build these rail-haul projects, and if every one of these got built, they won't have enough garbage to make it worth their while," analyst Augenthaler said.

But Waste Management, whose Bradley Landfill will be full early in the next decade, said it plans to take trash by train out to lonely Amboy, in San Bernardino County. The dump crunch may not come now or 10 years from now, said Waste Management officials, but it will come.

"No one can predict where the garbage is going to go," Loughnane said, standing at the Bradley dump, which Waste Management plans to turn into a transfer site under its rail-haul proposal. "There are only so many potential landfills and only so many possibilities, and probably not all of them are going to get permitted or expanded, and I expect some of it will be taken out by rail."

Rail haul, most agree, will cost more than current landfills and may temporarily give owners of the last surviving landfills the chance to charge a premium. But it won't last long, observers say, and rail haul and recycling will keep a rein on price increases.

Caption:

Photo: Greg Loughnane, president of Bradley Landfill and Recycling Center in Sun Valley. The dump takes in 7,000 tons of trash daily.
JOEL P. LUGAVERE / Los Angeles Times
Photo: Trash is crushed and compacted by heavy equipment at the Palmdale Disposal Co.
RICARDO DeARATANHA / Los Angeles Times
Photo: At 50 tons a day, the recycling center at the Bradley Landfill breaks even at best. Waste Management wants to process about 200 tons a day.
JOEL P. LUGAVERE / Los Angeles Times
Photo: COLOR, (COVER) A bulldozer moves dirt over a day's worth of trash at Palmdale Disposal Co. dump site in Palmdale.
RICARDO DeARATANHA / Los Angeles Times
Photo: About 800 trucks a day unload cargo at the Bradley dump. Profit margins at private landfills are shrinking.

Descriptors: RECYCLING; DUMPS--LOS ANGELES COUNTY; WASTE MANAGEMENT INDUSTRY--LOS ANGELES COUNTY; BRADLEY LANDFILL AND RECYCLING CENTER; WASTE MANAGEMENT INC

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EXH. 60

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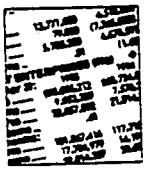
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advice

San Diego County to Unload Trash Unit

Move Reflects Sharp Rivalry From Orange County

By Jeff Bailey
Staff Reporter of The Wall Street Journal

SANTA ANA, Calif. – Orange County's trash-disposal agency is learning to run itself like a private-sector business, pushing operating costs down and competing aggressively for new customers. The efforts of the county's Integrated Waste Management Department are producing millions of dollars a year in additional revenue to help pay off huge debts left over from the county's 1994 bankruptcy.

The results aren't so gratifying, however, just to the south in San Diego County. Its government is literally being pushed out of the waste business by the bargain-basement pricing Orange County is using to dominate the Southern California trash-disposal market.

So, in an unprecedented move for a major U.S. municipality, San Diego County last month put its big garbage dumps and other disposal assets up for sale, hoping to cut its losses. And it acknowledged that it can't compete with its neighbor to the north. Orange County "convinced me that this is an open market," says Lawrence B. Prior III, San Diego County's chief administrative officer. "I don't want to be in it."

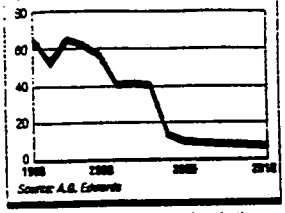
Hurt by a Dump-Capacity Glut

The proposed sale is one of the largest municipal privatization efforts to occur in the U.S., and is being closely watched. The waste-disposal business – hit by dump-capacity gluts in many regions – has grown more competitive. And many municipalities have seen their investments in dumps and trash incinerators threatened. Those investments were made largely on the faulty assumptions that disposal capacity would be scarce, and dumping fees high. To some, privatization is looking more attractive.

San Diego County hopes to raise more than $100 million from the sale, being managed by J.P. Morgan & Co., New York. Some of the nation's largest waste-handling companies are expected to bid on the dumps. Waste Management Inc. and Browning-Ferris Industries Inc. both confirmed that they submitted bids.

Plenty of Room

Projected excess dump capacity serving Southern California, in thousands of tons per day



Source: A.G. Edwards

But Orange County, which is importing thousands of tons of trash a day to its vast dumps, some from San Diego County, has thoroughly depressed disposal prices in the already glutted Southern California market. The value of San Diego County's dumps is therefore probably far reduced from a few years ago.

Trash as a Commodity

The unexpected disposal glut makes trash, of all things, a sought-after commodity. "Orange County is after our trash," a headline in the San Diego Union-Tribune warned earlier this year.

Usually a backwater of local government, financial crises in Orange and San Diego counties pushed sanitation front-and-center. After its bankruptcy filing, brought on by bond-trading losses, Orange County found it had little besides its huge canyon dumps to generate extra revenue. It mulled selling the dumps, and talked optimistically of getting $300 million or more, but decided to keep them.

Like many governments unaccustomed to competition, Orange County initially assumed that increasing revenue was as easy as raising prices: it boosted its dump fee from $23 a ton to $35 in May 1995. The government got a quick lesson in the impact that price has on demand for a service, as 19% of the county's trash fled to cheaper dumps elsewhere.

Clearly, $35 a ton wasn't going to attract trash from outside the county, which was needed to help pay creditors. Dumps serving Southern California have combined excess capacity of about 67,000 tons a day, or enough extra permitted space to handle all of New York City's trash more than twice over. And some dumps charge less than $20 a ton.

Price War at the Dumps

Orange County, learning the private-sector game, reversed course and dramatically lowered prices to $18 a ton to attract trash from other counties. And it offered all its own cities long-term disposal at $22 a ton. With those two moves, the county quickly dominated the Southern California market. That allows the waste department to pass $15 million a year to the county to retire debt.

Those prices also trashed the market. Riverside County, charging $38.50 a ton at its dumps, was forced to slash prices to as low as $23 to hang onto tonnage. Dumps in Arizona that had been attracting Southern California waste saw much of that business disappear.

More broadly, of course, a price war among dumps benefits many. Haulers, municipalities and consumers who pay to dump enjoy lower prices. But dump owners suffer. Among them, San Diego County was most vulnerable, already suffering from a disasterous trash decision.

San Diego County built and opened in 1994 a $134 million trash-sorting plant. But taking in trash already heavily sorted by recycling-happy residents, the plant essentially had little or no purpose, though it cost $27 million a year. To pay for it, the county raised fees at all of its dumps to $55 a ton. Predictably, haulers and some entire cities bolted the county system, taking their trash elsewhere, and revenue fell.

Paying Off Trash Bonds

Trash brought to San Diego County dumps, also reduced by recycling and recession, plunged to 1.0 million tons in fiscal 1996 from 1.7 million tons in 1992. At $38 a ton, today's price, that's $26.8 million less in revenue.

To stem the losses, the county closed the trash-sorting plant in 1995, and last year paid off the bonds that were sold to finance the plant. To do that, the county dipped into the general fund, borrowed cash reserves held for a variety of operations, and took out what amounts to a second mortgage on a portfolio of county property. No stone went unturned. "We were down to lint," says assistant controller William J. Kelly, who scraped together the financing.

Bill Horn, chairman of the county's Board of Supervisors, says, "We have done our damnedest to keep the County of San Diego out of bankruptcy."

The trash-sorting plant debacle and the botched pricing moves that followed hardly inspire confidence in the county's ability to manage waste operations in a competitive environment. By selling the dumps, said investment bankers at J.P. Morgan, the county could "return to [its] core competency."

Meanwhile, the city of San Diego has watched all this with increasing interest. It issues a key permit for the county's most valuable dump, Sycamore Landfill, which sits inside the city.

The city has told potential bidders for the county dumps that it wants ownership of Sycamore to pass free-of-charge to the city in about 20 years, when its dump will be full, and that it doesn't want Sycamore's capacity used too rapidly.

The conditions, of course, make Sycamore less attractive to bidders. The city, says Alan Dash, a J.P. Morgan vice president working for the county, is "working with private bidders to devalue the assets." City officials won't comment.

Says Gaye Saroka, a local official of Waste Management, the nation's No. 1 trash company: "Trash got Orange County out of trouble. In San Diego County, it got them into trouble."

BUSINESS BRIEFS

Exchanges Stop Trading Baesa After News of Negative Net Worth

By Nikhil Deogun
Staff Reporter of The Wall Street Journal

Baesa Aires Embotelladora SA, a financially imperiled PepsiCo Inc. bottler in Latin America known as Baesa, said the Buenos Aires stock exchange has suspended trading of the company's stock after fiscal second-quarter results showed a negative net worth under Argentine accounting principles of $18.7 million.

The New York Stock Exchange also halted trading in Baesa's American depositary shares. Baesa, based in Buenos Aires, said it expects to meet with both exchanges to discuss the situation.

On Friday, debt-laden Baesa posted a loss of $29.1 million, or 40 cents a share, on sales of $182.8 million for the quarter ended March 31. For the year-earlier quarter, Baesa posted a loss of $26.4 million, or 36 cents a share, on sales of $206.8 million.

Last month, Baesa said a standstill agreement with creditors lapsed, leaving the company in default on about $505 million in debt. The bottling company has been discussing a restructuring plan with creditors, which include units of Citicorp's Citibank, BankBoston Corp. and Germany's Bayerische Vereinsbank. Although Baesa's operating performance has improved recently, it isn't generating anywhere near enough cash to service its $765 million in total debt.

In its earnings report, Baesa said it is "critical" that the company reach an agreement with creditors. If no agreement is reached before next January's shareholders meeting, Baesa said its board will have to consider several options, including filing for "insolvency."

"This either means they are going to use this as a posturing tool with creditors or they really may be under pressure from Argentine [regulators] to file for insolvency," said Maria Marron, an analyst for ING Barings in New York.

PepsiCo, based in Purchase, N.Y., owns 24% of Baesa and took voting control last May when the bottler was overwhelmed by losses stemming from a rapid expansion into Brazil. PepsiCo last year wrote down its investment in Baesa to a "prudent level."

Baesa's ADRs fell 15%, or 25 cents, to $1.375 apiece in New York Stock Exchange composite trading Friday.

Baesa attributed poor second-quarter results to debt, and other restructuring expenses of $18.6 million. The expenses comprised an $8.5 million write-down of a Costa Rica investment and $2.1 million in other restructuring charges.

FLAGSTAR COS.

Widened Loss Is Posted For Fiscal First Quarter

Flagstar Cos., reflecting mixed performance in its various restaurant chains, posted a widened loss of $51.7 million, or $1.38 a share, for its fiscal first quarter ended April 2. In the year-earlier quarter, the Spartanburg, S.C., company had a loss of $27.3 million, or 73 cents a share. The restaurant concern, which is shouldering $2.2 billion in debt, filed a registration statement with the Securities and Exchange Commission in March covering a restructuring, and said it expects to record a charge in the second quarter. Revenue rose 3.5% to $1.04 billion from $1.01 billion.

TRONICS MARKETS.

For the three months ended March 31, the Barrington, N.J., company, which publishes hand-held electronic books, said net was $311,000, or four cents a share, compared with $1.5 million, or 19 cents a share, a year earlier. Revenue fell 16% to $17.4 million from $20.7 million. Franklin shares fell 62.5 cents, or 5.9%, to $10 in the New York Stock Exchange trading Friday. For the fiscal year, net fell 38% to $6.7 million, or 82 cents a share, from $10.4 million, or $1.25 a share. Revenue fell 12% to $88.7 million from $100.8 million.

PANDEMIC CORP.

Capacity Will Be Boosted

Walden Residential Agrees on Acquisition Of Drever Partners

By a Wall Street Journal Staff Reporter

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SLANTS & TRENDS:AN ENDANGERED SPECIES?

AN ENDANGERED SPECIES? - Many curbside recycling programs could face extinction by state and local governments anxious to fill space at cheap "mega-landfills," a new survey of state recycling managers has found.

Dozens of local governments have been forced to scale back recycling programs and increase taxes because they had depended on tip fees at their landfill facilities, according to the survey, published in State Recycling Law Update Year- End Edition. The survey also found that such economic incentives as "carrot and stick" tip fee surcharges and volume-based fees for trash seem to work best in encouraging landfill diversion; that many states are beginning to realize the need to address commercial, construction and demolition waste; and that there is widespread support among state recycling managers for phasing our subsidies for virgin materials. Contact Michele Raymond, Raymond Communications Inc., (301) 345-4237.

EXH. 5

Approaching an Integrated Solid Waste Management System for Los Angeles County, California



PREPARED BY:

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EXH. ___

APPROACHING AN INTEGRATED SOLID WASTE MANAGEMENT SYSTEM
FOR LOS ANGELES COUNTY, CALIFORNIA

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APPROACHING AN INTEGRATED SOLID WASTE MANAGEMENT SYSTEM FOR LOS ANGELES COUNTY, CALIFORNIA

EXECUTIVE SUMMARY

Throughout the nation there is growing controversy regarding the best approach for managing the millions of tons of waste generated by residents, businesses, and industries in large urban areas.

Pressures from both the public and private sectors have been successful in focusing attention on recycling and other alternative methods for managing of solid waste. As a result, a number of new statutes throughout the nation have been enacted to minimize reliance on landfills. California adopted Assembly Bill 939 (AB 939), the California Integrated Waste Management Act, in 1989. This act mandated that by 1995, 25% of the waste stream in each of California's counties had to be diverted from landfills. Furthermore, the act required that this diversion rate be increased to 50% by the year 2000. Diversion is defined as the process of diverting solid waste away from landfills through source reduction, recycling, and composting.

One year prior to enactment of AB 939, Los Angeles County developed a Solid Waste Management Action Plan (1988) which explicitly called for 50 years of in-county landfill capacity and minimized diversion potential. Six new in-county landfills were proposed in this Action Plan. In spite of the new legislative mandate to increase diversion of waste from landfills, as well as rapidly advancing technology which enabled the capacity of existing landfills to be expanded, Los Angeles County persisted in emphasizing landfills as the primary means of solid waste disposal.

Clearly an independent analysis of Los Angeles County's public policy on solid waste disposal was needed. This report provides another perspective to a "landfills first" policy, based upon carefully studied data projected in alternative "scenarios" by the authors. The Board of Supervisors could consider this document in their decision making process to comply with AB 939, as well as to preserve urban land for alternative uses.

These scenarios describe how Los Angeles County can implement strategies to increase regional interest. The goal is to divert more than 50% of the County's trash away from urban land and add years to the final life of the existing landfills in the County.

WHAT ARE THE OBJECTIVES OF THIS REPORT?

1. To offer alternatives to the Board of Supervisors and the public for urban landfills.
2. To provide suggestions for extending the life of existing landfills.
3. To foster a policy consistent with AB 939 to divert solid waste away from landfills.

This report paints a different picture of the future of solid waste disposal by making the following points:

- The document presents a strategic approach for addressing short and long term solid waste disposal requirements. The key to implementing the approach involves selecting the appropriate combination of alternative scenarios.
- By selecting a series of proven low risk alternatives (such as shown in Scenarios 1-5) for immediate implementation, the County's short term 15 year "time to crisis" is alleviated.
- Adoption and implementation of additional policy alternatives as recommended in the report enables the County to develop waste disposal policy well beyond the AB 939 planning period.

WHY DOES THE COUNTY DRAW DIFFERENT CONCLUSIONS FROM THE SAME DATA?

To illustrate the potential impact of creating a new diversion policy in Los Angeles County, the authors of this report developed a computer model which allocated the waste generated in the County among diversion and alternate disposal options. Prior to developing a model, the report presents a comprehensive review of two County sponsored documents; the 1996 Siting Element and the 1995 Draft Environmental Impact Report/Draft Environmental

Impact Statement (DEIR/DEIS) for Elsmere Canyon. The County has relied upon these two documents to sustain their current landfill policy.

A review of the County's reports reveal that they exaggerated the projection of waste generation and the need for additional landfill capacity. When critically analyzed, there is a clear discrepancy between the two documents regarding the amount of waste generated per day.

The Siting Element projects waste generation per day for 1997 to be some 4,200 tons more than the DEIR/DEIS document. The County has employed the higher estimate presented in the Siting Element document, thus accelerating their claim that additional new landfill capacity is required or the "time to crisis" is imminent. The computer model projects the quantity of waste disposed of in landfills located in Los Angeles County beginning in 1996 and running through 2044. The model evaluates waste disposal through the use of a series of waste management strategy scenarios. Each scenario develops a series of diversion alternatives aimed at increasing the life of in-county landfills.

SCENARIOS

The following summarizes the seven computer generated scenarios found in this report. Each scenario provides waste management strategies aimed at diversion such as recycling and composting, which will ultimately increase the life of existing in-county landfills. These scenarios can operate independent of one another, but in the analysis Scenarios 1-5 have been combined to have a cumulative impact. The impacts of the scenarios are shown graphically in Figure E-1.

SCENARIO 1—HISTORIC RATES

The County's solid waste strategy found in its Siting Element, the Base Case, calls for a minimum diversion of 50% as required by AB 939 and disposing the remaining waste in landfills.

Scenario	Waste Diversion and Disposal Policies	Projected Landfill Shortfall Date (Cumulative)	Years Added to Landfill Capacity
Base-Case	LA County Public Works' latest baseline for waste generation, rate of landfill use, and recycling (50% only from 2000), found in the Siting Element.	1999	N/A
1	The County's latest base-case with the historic use (daily disposal) rate of landfills, not the theoretical maximum rate.	2001	2
2	Include a net waste export of waste to Orange County landfills (which began January 1996) of 3,500 tons per day in 1997; rising to 6,000 in 2001 through 2026.	2007	6
3	Increase recycling of inert materials like construction and demolition debris (C&D), and divert remainder to the proper inert materials landfills, and away from Class III landfills from 1996.	2009	2
4	Incorporate the impact of LA City for 70% waste diversion (recycling, composting) by 2020 for the County Unincorporated areas as well as LA City.	2010	1
5	Use space-saving chemical/foam cover instead of dirt as the cover added daily to landfills, on all LA County landfills from 1997.	2014	4
	In addition to Scenario 5, one or both of the following:		
6A	Intensive diversion and recycling: adopt and implement the 70% waste diversion rate by 2020 for all of LA County and its 88 cities (residential, commercial, industrial).	2016	2
6B	Intensive diversion and recycling: add a ban on recyclable materials -- wood, corrugated paper and yard waste -- from landfills starting in 1998.	2019	5

	Effect of Additional Policies:	Years Added to Scenario 5
7	Assume no increased waste diversion, but expand five of the existing landfills to around half the level proposed by the County; no new landfills.	6
--	Use the conservative waste generation growth projections based on accurate, LA County specific data.	3

Figure E-1. Summary of Policy Options to Increase Diversion and Provide Adequate Disposal Capacity for Los Angeles County

Contrary to the County Siting Element figures which overestimates by using Daily Permitted Capacity numbers, this scenario utilizes more realistic figures based on a landfill's historic usage. This recalculation delays the supposed Daily Disposal Capacity Shortfall or "time to crisis" until the year 2001, two years past the County's original estimate (2 years).

SCENARIO 2–EXPORT ADDITION

The County's Siting Element does not account for existing export of L.A. County waste to Orange County. This scenario accounts for this export at a rate of 2,000 Tons Per Day (TPD) based on existing contracts in 1996 and 3,500 TPD starting in 1997. Exports are raised to 6,000 TPD in the years 2001 through 2044. Thus, this scenario extends the time to crisis from 2001 to 2007 (6 years).

SCENARIO 3–INERT MATERIAL AND BIOSOLIDS BAN

This scenario would ban inert materials and biosolids (sludge) in Class III landfills. It is assumed that the inert ban would be 80% effective and the sludge ban 100% effective since the material is controlled by the County. If implemented, this scenario extends the time to crisis to the year 2009 (2 years).

SCENARIO 4–DIVERSION GOAL BY 70 PERCENT

This scenario calls for the County to join with the City of Los Angeles and adopt a goal of 70% diversion in all unincorporated County areas by the year 2020. The result would be an extension of Daily Disposal Shortfall (time to crisis) to 2010 (1 year).

SCENARIO 5–CHEMICAL/FOAM COVER

This scenario replaces the use of dirt to cover waste deposited daily in L.A. County landfills with a chemical or foam cover. The report assumes a daily foam or chemical cover is initiated in 1997. The saving capacity is 22%, allowing space for 22% more waste at each

landfill. Implementation of this technology will delay the Daily Disposal Shortfall until the year 2014 (4 years).

SCENARIO 6–INTENSIVE RECYCLING AND DIVERSION

Two different model scenarios were conducted, both of which are mutually exclusive to the other.

6a. Total County 70% Diversion. Assumes all cities and the unincorporated areas of Los Angeles County achieve 70% diversion by 2020. Starting in 2001, the impact would increase diversion by one percent per year, extending the shortfall to the year 2016 (2 years).

6b. Recyclable Material Ban. Assumes a ban of corrugated wood and yard waste in Class III landfills beginning in 1996. The ban would be 70% effective and postpones the Daily Disposal Shortfall until 2019 (5 years).

SCENARIO 7–LANDFILL EXPANSION

This scenario was added not to propose landfill expansion but to put in proper context for policy makers the comparative results achieved by focusing on a reduce/recycle/compost strategy. Implementing Scenarios 1-6 is relatively low cost and politically risk-free compared to the cost of landfill expansion. It also illustrates that 24 years of capacity can be realized by these methods. Further ample time is realized for emerging alternatives such as rail haul to take effect and further alleviate the pressure for landfilling of waste within the County. This strategy must be enacted in conjunction with Scenarios 1-5 to postpone the Daily Disposal Shortfall until 2023 (9 years).

HOW CAN LOS ANGELES COUNTY CREATE AN ALTERNATIVE WASTE DISPOSAL POLICY?

In this report a number of different alternatives to extend existing landfill capacity are examined. Clearly, if the County adopts these alternative strategies there is no need to develop

new landfills anytime in the near future. In order to implement these alternatives Los Angeles County will have to shift its waste management strategy and place more emphasis on recycling and diversion *as required by law*. Further, the County should realize that its self-imposed requirement of 30 years in-county disposal capacity may have a serious legal flaw. The courts have recently ruled in-county disposal unconstitutional.

The first step is for the County to develop a new policy which outlines the process of diverting solid waste away from landfills through source reduction, recycling and composting. Once the policy is adopted, the County will become responsible for implementing and ensuring the process of diversion. Specifically, the County should:

- Develop a diversion strategy;
- Adopt billing and accounting methods for solid waste that fully account for all cost items;
- Set new diversion goals for the County's unincorporated areas, and to monitor and report on the achievement of these goals;
- Coordinate and facilitate diversion programs with the County's 88 municipalities;
- Provide incentives between the public and private sectors to increase the participation in County-wide diversion programs; and,
- Function as a role model to the cities by developing a model recycling program for all County facilities, as well as implementing a County-wide "reduce-recycle" advertising campaign.
- Review legality of flow control ordinances or other restrictions on waste flow in the County.
- Develop detailed costs for implementation of the new policy.[1]

[1]Detailed cost analysis of diversion options was beyond the scope of this study.

CONCLUSION

It is the conclusion of this report that Los Angeles County can effectively meet and exceed AB 939 requirements without opening new landfills. Indeed, by leading its 88 municipalities and the unincorporated areas into the 21st century, Los Angeles County can be the facilitator to implement an effective regional diversion-oriented solid waste disposal policy. However, the County must act now.

I. INTRODUCTION AND PURPOSE

The impetus for the development of this document arises from sincere concerns about the potential environmental, aesthetic, and social consequences of Los Angeles County's policy of developing in-county landfills for solid waste management. The County's promotion of the new Blind, Elsmere Mission/Rustic-Sullivan and Towsley Canyon landfills provides examples of this. The authors and many individuals and groups in the County feel strongly that there are better ways of managing the rubbish of our society than vast storage piles that must be engineered, managed, and monitored for 80 to 100 years, and, in the process, destroying pristine canyons with their wildlife, waterfalls, and opportunity for open space recreation in an increasingly urbanized area. The alternative vision is a diversion-based policy that applies the full array of modern solid waste management technologies that together can reduce, reuse, and recycle as much of the solid waste generated by the residents and businesses in the County and the 88 cities as possible, and transform or safely dispose of the remainder.

Approaching an Integrated Solid Waste Management Plan for Los Angeles County was prepared by Gershman, Brickner & Bratton, Inc. (GBB), a national consulting firm that specializes exclusively in solid waste management. GBB's professional staff consists of engineers, planners, economists, environmental scientists, market analysts, and recycling and community relations specialists. GBB was assisted in this effort by a distinguished team of individuals who provided unique perspectives on Los Angeles County issues. They are:

- Joan Edwards, of J. Edwards & Associates, former Director of the Integrated Solid Waste Management Office for the City of Los Angeles Board of Public Works.
- Eugene Tseng of E. Tseng & Associates, a nationally-recognized environmental engineer and member of the California bar who has provided technical services to the State of California as well as technical oversight for the City of Los Angeles' AB 939 Solid Waste Generation Study. Eugene Tseng is also an Adjunct Professor at the UCLA Anderson Graduate School of Management.
- J. Eugene Grigsby, III and Leobardo F. Estrada of UCLA. Eugene Grigsby is president of The Planning Group in Los Angeles. He is also a professor at UCLA's Graduate School of Public Policy and Social Research, where Leo Estrada is an associate professor. Dr. Grigsby and Dr. Estrada provided essential population and demographics data for Los Angeles County.

It is not intended that this document serve as a detailed Integrated Solid Waste Management Plan for the County of Los Angeles – the County Plan (presently in preparation) that pulls together all the Source Reduction and Recycling Elements (SRREs) developed by the County and the incorporated municipalities is intended by California's AB 939 law to be a very specific, implementable Integrated Plan. The components needed for such an implementable plan that are not available in this document are:

- Verifiable quantification and characterization of waste actually generated in Los Angeles County (including materials presently diverted, both reported and estimates of unreported): As discussed in later chapters of this document, the County's projections of waste generation are inconsistent, and based on dubious assumptions.
- Determination of leadership and the roles of the public and private sectors: The County's present posture is that it has limited influence over future development of solid waste management. However, the County is responsible under AB 939 for developing the overall County Plan, and this requires commitment and leadership.
- Reorganization of the County's management structure to accommodate reduction and recycling as an integral part of the County's activities: This is not solely a responsibility of the incorporated municipalities and the private sector.
- The essential public input to the development of a Plan: While this document is an exhaustive review of current trends and techniques, it has not been through the extensive public review, public hearing, and comment process that is necessary for a community to claim a Plan as its own.
- Develop detailed costs for implementation: The changes in policy recommended will change the costs of solid waste management in the County. The cost increases and savings will need to be determined by the County and the Cities.

Instead, this document is meant to inspire a profound change in the County's *status quo* approach to solid waste management exemplified by the County's support for the proposed Elsmere Landfill. The County's historic policy emphasizing landfill capacity must adapt to present reality, which places pollution prevention and diversion first. In the following chapters, this document lays out the complex parameters defining solid waste management from now

through the turn of the Century, reviews alternative technologies and management structures, and recommends actions for implementation by the County and the 88 cities.

This report incorporates the dramatic changes experienced in the field of waste reduction/recycling in recent years. Since the SRREs were prepared in the early 1990s, technologies have improved, new markets have developed, existing markets have expanded, and the overall economics of waste diversion are increasingly positive. The County believes that addition of huge new landfill capacity in the County promises to maintain competition for disposal, and thus will keep disposal costs down. However, cheap disposal is only one factor to consider in developing an integrated solid waste management program, including source reduction, recycling, collection, transfer, and composting. Landfills have hidden potential costs if cleanup actions are necessary. On the other hand, diversion has no such future costs and provides the current benefits of local jobs and raw materials for new or existing industries.

Finally, this document is not a pie-in-the-sky fantasy of an ideal world. GBB is well aware of the limitations of current practices. Some waste will remain that must be managed by traditional disposal methods (i.e., landfilling). However, that is not a reason to rely on landfills as the primary approach to solid waste management. The alternative technologies and management structures outlined here are all practical, tested approaches presently in use by local governments across the nation, and real-life examples and a Case Study provided. Not one of the recommended approaches is new or revolutionary nor does any single component represent a "magic bullet" for solid waste management. Together, however, these recommendations represent a dramatic shift in vision, offering the County of Los Angeles, the 88 cities, and their inhabitants the opportunity to chart the future of integrated solid waste management and environmental preservation.

II. HISTORY OF SOLID WASTE PLANNING IN LOS ANGELES COUNTY

Los Angeles County is the most populous local jurisdiction in the United States. The population in 1995 was 9.3 million people of diverse cultural, social and economic backgrounds. This population has been growing rapidly in the last decade, with the growth rate doubling from the previous decade's annual growth rate of half of one percent to the current decade's growth rate of over one percent per year. The County covers an area of approximately 4,100 square miles and is comprised of 88 cities and a large unincorporated area. Economic activity is as diverse as the population and includes manufacturing (aerospace, electronics and automobiles), entertainment, oil and food processing industries. The Port of Los Angeles is one of the busiest ports in the country and serves as the major connection between the U. S. and Japan and the other Pacific Rim countries.

The size and diversity of Los Angeles make solid waste management planning a large and complex undertaking. Each of the 88 cities and the County play a role in the collection of the solid waste generated in the County. These roles range from permitting of private collectors to operating large collection operations. In addition, there are in excess of 250 private firms that collect solid waste in the County.

After World War II, solid waste management was mainly an individual and community problem. Many residents burned their waste in their backyards. The waste that was not burned was taken to community or private dumps, some of which practiced open burning as well. Beginning in the early 1950's, the Sanitation Districts of Los Angeles County (Sanitation Districts) initiated planning for solid waste. In the late 50's, the Sanitation Districts working jointly with the County, sited and developed five landfills and a transfer station to improve the quality of solid waste disposal and end open burning. These facilities were implemented under a series of joint powers agreements and funded by the County and the individual Sanitation Districts. Planning and policy formulation was done jointly. In the mid-1960's, the County and the Sanitation Districts established a joint trust fund and adopted the policy of setting rates at the landfill operations with the intent of both paying for operations and developing a surplus with which to expand existing facilities and acquire new facilities. In 1970, the various Sanitation

Districts pooled their resources and established a joint transfer and disposal system, operated by County Sanitation District No. 2. The County and the Sanitation Districts believed they had planned and implemented an excellent system; it was, however, one that would quickly prove to be inadequate for the waste generated in the County. In the early 1970's, materials and energy recovery as alternatives to landfilling were considered and rejected as unproven and expensive.

In 1972, the Legislature passed the California Solid Waste Management and Resource Recovery Act. This Act created the California Solid Waste Management Board to oversee solid waste management policies and programs in California. The 1972 Act assigned primary responsibility for solid waste management plans to the local governments. County solid waste management plans were the result. The state was responsible for statewide policy, approving county plans, providing technical and financial assistance, overseeing enforcement, inventorying disposal sites, and developing a state solid waste management plan. The California Solid Waste Management Board (CSWMB) developed five principles for solid waste management under the 1972 state policy:

1) Solid waste management must be planned and conducted in an economical and environmentally sound manner;

2) Solid waste management must be consistent and in compliance with state policy, county plans, and minimum state standards;

3) Solid wastes need to be reduced to conserve energy, natural resources, and land resources;

4) Material and energy recovery from wastes is to be encouraged; and

5) Adequate litter programs are needed to ensure environmental quality and public health, safety, and well-being.

The counties were required to adopt and maintain solid waste management plans which evaluated resource recovery options, and implement recovery programs which limited the dependency on landfill disposal. The CSWMB prepared planning guidelines and procedures for preparing these plans, including procedures for revising and amending plans. The CSWMB also

developed minimum standards for solid waste management. These standards still govern disposal in the state and were enforced by both the state and local governments. The CSWMB promoted waste-to-energy facilities as an alternative to landfilling in California. The CSWMB felt that a solid waste management "crisis" was real and that Southern California would run out of landfill space by 1982.

In 1976, the Solid Waste Control Act was enacted, requiring permits for landfills and transfer stations. The Act also required cities and counties to establish a local enforcement agency to enforce the permit requirements and the other provisions and regulations called for in the Act. The Department of Health Services was designated as the enforcement agency for solid waste facilities in the County.

As mentioned, the 1972 Act required local jurisdictions to develop a solid waste management plan in cooperation with cities and private industry. Los Angeles County developed its plan and the Board of Supervisors adopted it in 1976. It was approved by the CSWMB in 1977. Since that time, the County has reviewed and updated the plan, as required, several times. The current plan, the Los Angeles County Solid Waste Management Plan (the Action Plan), is dated March 1984. This, along with Revision A (August 1985), is the official document currently governing solid waste management planning in the County. The Action Plan set out the goal of developing a solid waste management system that minimized the quantity of waste produced and disposed in the County by source reduction, recycling, waste-to-energy, and/or new technologies.

Few of the goals enunciated in the Action Plan were ever realized. The waste-to-energy goals encountered strong public opposition and only two of the planned facilities were constructed. Source reduction and recycling also lagged in their implementation. The County concluded that additional solid waste facilities were required for the projected future waste flows. As a result, the County along with the County Sanitation Districts initiated the Solid Waste Management Siting Project. This effort established criteria and guidelines for siting solid waste facilities (transfer stations, waste-to-energy facilities and landfills). In addition, a search for landfill sites was initiated. The County and the County Sanitation Districts alternative site

study group reviewed an initial list of 101 potential sites. From this list, six sites were selected -- including Blind Canyon, Brown Canyon, Elsmere Canyon, Mission/Rustic-Sullivan Canyons, Towsley Canyon, and Toyon II.

In April 1988, in order to further the goals of the siting efforts, the Solid Waste Action Plan was developed. This document -- ironically containing source reduction, recycling and composting elements -- primarily focuses on landfills. The Action Plan calls for 50 years of landfill capacity held in public ownership. To achieve this goal, the Action Plan supports the expansion of existing landfill and the development of new landfills. The six sites selected in the alternative site study have been reviewed for feasibility and four have been determined to be feasible: Blind, Elsmere, Mission/Rustic, and Towsley Canyons.

In 1989, the California Integrated Waste Management Act was passed by the Legislature and signed into law. This Act (AB 939) revised the framework for solid waste management planning in the state. Most significantly, AB 939 established a hierarchy for the management of solid waste. It requires local jurisdictions to divert solid waste from landfills through source reduction, recycling, and composting. AB 939 also establishes clear mandates for diversion: 25 percent in 1995 and 50 percent in 2000. In addition to requiring cities and counties to prepare specific planning documents that demonstrate how the diversion mandates will be met, the Act revised the state level review and planning processes and established the California Integrated Waste Management Board (CIWMB).

In summary, the County of Los Angeles solid waste management planning, in the opinion of this report, is focused primarily on in-County landfill. The County's policies reflect this orientation of the Action Plan, which, until superseded, still has the force of law.

III. RATIONALE FOR A NEW APPROACH TO COUNTY SOLID WASTE MANAGEMENT PLANNING

This chapter summarizes the complex history of solid waste management in the U.S. as it has evolved over the last twenty-five years and its relevance to practices. Striking changes in our attitudes toward, and handling of, municipal solid waste have occurred during this period. In this context, it is necessary for Los Angeles County and all of its 88 cities to catch up with the times. The public demand for change is clear, resulting in new laws, new technologies, and new economics of solid waste management. It is entirely reasonable to assume that this pace of change will continue in the next twenty-five years.

A. PUBLIC DEMAND

The development of recycling and improvements in disposal technology in the United States is largely the result of grassroots efforts. Beginning with Earth Day in 1970, the general public has become more and more aware of their environment. This awareness has been heightened by environmental and conservation organizations' efforts at public education. The battle cry of these efforts has been, "We are a throw-away society -- the most wasteful nation on earth." Out of this point of view came the question, "What can one individual citizen do to make a difference in such a complex society?" The answer came clear, "I can recycle. I can control my own trash and I can conserve resources."

This attitude fostered volunteer recycling drop-off centers, such as the one in Berkeley, California that started in the early 1970s. With the growth of such centers, volunteers realized the need for wider participation and statewide coordinated efforts. This realization produced demand for legislated local and state recycling goals, with the result that most states now have enacted recycling laws. This trend continues. A survey conducted for Waste Management Inc. in 1995[7] indicates that 63 percent of consumers favor stricter recycling laws and 85 percent feel recycling is here to stay.

[7] "Attitudes and Behavior Regarding Recycling," The Gallup Organization for Waste Management, Inc., March 1995.

B. POLICY SHIFTS

The first statewide recycling law was passed in Oregon in 1983. Today, a total of 41 states have passed recycling legislation. Initially, most of these state laws set a statewide goal to be achieved by the local jurisdictions responsible for solid waste management. These goals stated a percentage of the solid waste to be recycled or diverted by a specified year. Originally, legislation left determination of the methods to attain goals up to the local jurisdiction. However, policies have shifted toward a mandatory requirement in about half the states, and many individual communities in states with voluntary goals are also choosing mandatory practices.

The federal government, after largely ignoring solid waste for a decade, shifted to a recycling-oriented policy reflected in their integrated waste management hierarchy: source reduce, recycle (including composting), combustion (with energy recovery) and landfilling. This integrated approach was first enunciated in *The Solid Waste Dilemma: An Agenda For Action* published by the U.S. Environmental Protection Agency (U.S. EPA) in 1989. This report stated a national goal of 25 percent recycling by 1992. This policy shift at the federal level was paralleled by additional shifts at the state and local levels. Many jurisdictions shifted from recycling goals to the broader requirement of reduction and diversion, instituting bans against landfilling specific materials including yard waste, tires, batteries, white goods (i.e., large appliances), waste oil and other specific materials. Some communities passed legislation banning the sale of products made of hard-to-recycle materials (e.g., foam plastic fast food containers). However, many of these bans were rescinded as markets became available or because of court challenges by manufacturers.

As discussed in Chapter II, California passed AB 939 in 1989. This law changed the focus of solid waste management from disposal to diversion by establishing a hierarchy which places landfilling on the lowest tier and setting diversion statewide goals of 25 percent by 1995 and 50 percent by 2000.

More recently, increasing recycling goals is one policy trend that is apparent. For example, New Jersey raised the original 25 percent reduction/recycling requirement to 60 percent in 1992. The City of Los Angeles has set a 70% diversion goal and Alameda County has set a goal of 75%. Also, realization has set in that removing materials from the waste stream alone is not enough. This realization is resulting in efforts to develop or expand markets for materials, and to contribute to the development of markets through purchase of products with recycled content. Laws and ordinances are being passed designed to encourage market development, and "Buy Recycled" programs are increasing nationwide.

Policy shifts have occurred in the private sector in concert with the grassroots demand for change. New laws to protect the environment have been passed and new technologies have been developed in the environmentally aware industries. The paper industry, for example, initially adopted a goal of recycling 40 percent of the waste paper generated each year in the U.S., then raised the goal to 50 percent. Browning Ferris Industries (BFI), a leading national solid waste management company, committed its resources to recycling. As a result, BFI has become the world's largest recycling firm. Thousands of businesses throughout the U.S. have invested billions of dollars in infrastructure to separate, process and utilize recycled materials.

A policy shift being implemented in Europe is the producer responsibility or the "take it all back" system. This system shifts the responsibility for recycling and disposal of products, particularly packaging, to the manufacturer or producer. This approach is being discussed in the United States and the business sector is strongly opposed. Implementation on a nationwide, not state or local basis, seems to make the most sense as is illustrated by the experience in Europe. Producer responsibility is discussed in Appendix A.

In this climate of policy shifts toward recycling from the grassroots to all levels of government, business and industry, Los Angeles County needs a policy shift to a proactive integrated waste management policy approach that places a priority on diversion.

C. DIVERSION TECHNOLOGY

As recycling and diversion policies changed, approaches to collecting recyclables evolved beyond the Berkeley-style volunteer drop-off center. The solid waste stream, originally viewed as a heterogeneous mass, is now divided into generator sectors (residential, commercial, institutional and industrial), product categories (tires, white goods, yard trimmings, batteries, etc.) and materials (ferrous metals, glass, paper, etc.). This fractionating is due to the needs of the diversion industry as well as the unique manner in which certain waste stream components (such as tires, rechargeable batteries or household hazardous wastes) must be managed in order to reduce the impacts on landfills.

The industrial segment of the economy has discovered that, in many cases, pollution prevention (i.e., not producing a waste in the first place) not only saves money on waste management but lowers the cost of product manufacture. This trend in the manufacturing sector caused a severe economic decline in the hazardous waste management industry. As the environmental regulations tightened during the 1980's due to RCRA and other requirements, the industry developed disposal facilities including hazardous waste incinerators and "secure" Subtitle C landfills. The price charged for hazardous waste disposal rose to cover the cost of these investments and their operation. The increase in disposal fees caused the generating industries to take a hard look at the "generate and dispose" policy. The result, in many generating industries, was a change in policy to pollution prevention. This policy focuses on examining industrial processes or the way products are made, then making changes in these processes to reduce the waste discharge. Many industries found that this not only reduced the cost of waste disposal allocated to a product, but improved the product quality.

The recycling industry, both public and private sectors, has found that recycling costs can be reduced if some individual waste components are never mixed in with the waste stream. This means changing the behavior of the individual waste generator in the home, office, business, and industry, so that different materials are placed in specific containers. The custodial, waste collection and waste processing functions require changing as a result. This change in behavior can be motivated by ethical, economic or cultural factors. It can occur spontaneously or by

design. The process is accelerated when there is an overall vision or policy, such as that stated by AB 939.

This source-separation eliminates some sorting and contamination clean-up steps. Chapter VII and Appendix B discuss separation technologies that have evolved. At the same time, sortation and clean-up technology has developed to the point where, for example, plastic containers can be economically sorted mechanically into individual resins. The pace of these developments is accelerating, and solid waste management planning should take this trend into account.

Implementation of technology requires investment. In the past decade, there has been a very large investment in the infrastructure necessary to implement diversion and recycling. For example, communities have made a multi-billion dollar investment in recycling collection and processing infrastructure. The paper industry has invested billions in existing plants and building new ones to accept and process recovered paper. Other industries have decided to use recycled materials to make new products and have modified processes and plants to utilize new feedstocks. In addition, communities and states have made major investments in market development. These include tax breaks, grants, and financing to businesses that utilize recovered materials, as well as siting, permit expediting, and other facilitation services. As a result, both the supply and demand portion of the markets for recovered materials looks positive, as discussed in Chapter VII. Investment and market structures are projected to improve in the future and these trends also impact solid waste management planning.

D. LANDFILL PROBLEMS

New landfills, as well as other solid waste facilities, have become difficult to site in urbanized areas. People living in or near a potential site area, and the businesses located there, have legitimate concerns based on the inherent nature of these facilities and their impacts. These include: truck traffic, noise, dust, odors, litter, and air and water pollution. Large facilities compound these characteristics, increasing their impacts in a non-linear fashion. These reasons alone are sufficient for a community to object to the siting of a large MSW landfill facility in

or adjacent to the community. While recently adopted laws and new technologies are designed to control environmental impacts, the performance of old landfills and dumps that are releasing air and water emissions without mitigation, promoting rats and other vectors, and contain hazardous wastes serve as a basis for community protests against these facilities. As landfills compete in urban and suburban areas with other land uses, these concerns will make siting landfills more difficult and expensive.

Modern landfill technology, including multi-layer liners (using plastic membranes and clay), leachate collection and treatment, methane gas collection, monitoring wells and cover requirements, is designed to address the problems presented by old dumps. However, the technologies are new and long-term performance data is not yet available. This presents problems in predicting the long-term impacts of landfills. For example, data on large-scale liner failure in a landfill containing 50 million tons of waste (e.g., Elsmere after 10 years of operation at design capacity) does not exist. Such a failure, whether due to technical or seismic problems, could result in correspondingly catastrophic groundwater contamination and other impacts. This makes estimating the cost of long-term operations and post-closure care difficult and subject to unproven assumptions.

The technical cost is not the only consideration. Once failure occurs and environmental damage results, litigation is initiated to determine liability among the owners, operators, and users. Legal costs (based on Superfund experience) are likely to exceed remediation costs. In addition, as discussed in Chapter VI, the human health risk from air emissions from landfills is greater that of waste-to-energy facilities.

E. CHANGES IN LANDFILL MANAGEMENT

New landfill management techniques have been developing over the past decades. These approaches have arisen in part to avoid some of the landfill management problems discussed above, such as application of daily cover materials to control odors, litter and vectors and to prevent landfill fires. Another driving factor in management changes is the need to conserve landfill capacity as a result of the difficulties encountered in siting new landfills or expanding

existing fills. The experience and potential for conserving or using landfill capacity most efficiently is discussed in Chapter VI and Appendix C. The pressures to innovate landfill improvements are accelerating in all the urban/suburban areas in the country, and in many rural areas as well. Implementation of appropriate landfill conservation management techniques need to be factored into landfill planning in Los Angeles County.

F. ECONOMICS

These trends impact the economics of solid waste management. These impacts are quantum changes, rather than incremental. For example, when communities first implemented curbside collection of materials for recycling, the initial result was a 10 to 15 percent diversion of the residential waste stream. The collection of recyclable materials from each household was implemented with new trucks and staff increased costs. Refuse collection costs, however, remained the same, even though the collected quantity dropped slightly. Communities were paying for two parallel collection systems. However, increasing diversion to 50 percent requires an entirely new system. This new system includes new containers, levels of service, trucks, personnel requirements, management strategies and fee structures. Chapter VII discusses many examples. The south half of City of Seattle contracts weekly automated waste collection, once per month automated recycling collection, and separate weekly yard waste collection. This Seattle system reports 55 percent recycling. The north half of Seattle contracts with a second vendor that uses a different system, recovering slightly less of the waste stream. To provide incentive for diversion, the City Solid Waste Utility charges a variable rate fees to households, operates as an enterprise fund, and uses a full cost accounting methodology to set these fees. Seattle's variable rate is based on the size of the waste disposal container requested by a household, with a total monthly cost of less than $10.00 to a household using the smallest size container. No fee is charged for recycling and yard waste collection. (See Appendix D for a description of Seattle's program and Appendix E for a discussion of enterprise funds and full cost accounting.)

Variable rate fees (either by container size as in Seattle or by weight of the disposed material) have been shown to reduce the total quantity of waste generated. Many communities

are not benefiting from the economies available from rationalizing their collection systems in keeping with the integrated waste management philosophy. These potential savings coupled with the potential revenues from recovered materials should be included in solid waste planning.

Nationwide, the trend in the cost of landfill construction and operation is upward as a result of increasingly stringent federal and State requirements. The cost of constructing new cells and landfills includes liners; leachate collection, storage, treatment and detection; and gas collection and processing and monitoring required by recent federal and State regulations contribute to this trend. Also, the cost of closure and post-closure maintenance add additional disposal cost, as the projected costs for these expenditures must be raised during the active life of the landfill. New rules have closed smaller, inefficient landfills, and encouraged the development of very large landfills that can spread higher development and operation costs over a greater tonnage of waste.

This rising cost trend appears to be in conflict with the short-term trend of lower tipping fees at various landfills in the Los Angeles region. This local downward pressure is caused by excess capacity and increased competition for smaller quantities of solid waste. The result of this will be an industry shakeout and consolidation in southern California.

G. FLOW CONTROL

The County should recognize that the reliance on in-county disposal capacity may have a serious legal flaw. On May 16, 1994, the Supreme Court of the United States examined the constitutionality of local government exercise of preference for the use of a local transfer station for solid waste. In a majority opinion by Justice Kennedy, the Court pronounced a Clarkstown, New York ordinance requiring the use of a local transfer station unconstitutional, because it discriminated against out-of-town providers of disposal services. *C & A Carbone v. Town of Clarkstown*, 114 S.Ct. 1677, 128 L.Ed.2d 399 (1994).

Similar reasoning to the County's "in-county" capacity policy led the State of New Jersey and its Department of Environmental Protection to require each garbage district in the State to

provice for disposal capacity within the district or another district through agreements. The New Jersey plan, with its preference for in-state and in-district disposal capacity planning, was struck down by the United States Court of Appeals for the Third Circuit, in *Atlantic Coast Demolition*.

The Supreme Court decision in the *Clarkstown* case and the Third Circuit's decision in the *Atlantic Coast Demolition* case indicates that, to the extent that the County solid waste management plan relies on the Action Plan with its requirement for 50 years of in-county landfill capacity and ordinances which favor in-county disposal, it is subject to successful legal challenge.

H. CONCLUSION

The developments and trends touched on above make integrated waste management planning difficult and imperative. The current fluid situation provides Los Angeles County with an opportunity to provide the leadership and coordination needed to develop an integrated waste management system for the County and its 88 cities that will serve its citizens well into the Twenty-first Century.

IV. WASTE GENERATION PROJECTIONS

A. STATEWIDE AND NATIONAL TRENDS

The increase in waste generation rates projected in the Elsmere Canyon DEIR/DEIS and the Siting Element are inconsistent with California State Board of Equalization reports and EPA forecasts. "Time-to-crisis" estimates in the DEIR/DEIS assume a waste generation increase rate of 2.5 percent per year from years 1993 to 2000. The Siting Element uses the CIWMB Adjustment Methodology to project even higher waste generation for the Los Angeles County.

In *Characterization of Municipal Solid Waste in the United States: 1994 Update*, the U.S. EPA projects that the national per capita waste generation rate will decrease from 4.4 pounds per person per day in the year 1993 to 4.3 pounds per person per day by the year 2000. A May 1995 study prepared for the CIWMB[2] calculated that the amount of solid waste disposed in California each day was 5.9 pounds per person in 1993, compared to 7.9 pounds per person as of January 1, 1990, and 7.4 pounds per person per day as of June 1985. This shows a 20.3 percent reduction in the eight years between 1985 and 1993. The report speculates that, "(t)he reduction in disposal amount is generally believed to be the result of the start-up of many new recycling programs and the reduction in generation amounts because of a prolonged recession in California."

The most important data is local. California State Board of Equalization waste disposal records, when compared with California Department of Finance population figures, reveal a descending trend in per capita waste generation rates in Los Angeles County.[3] Also, this is consistent with the efforts toward source reduction on the part of the County and the 88 cities as enunciated in the SRRE's.

[2]*Toward Ensuring Adequate Landfill Capacity*, prepared by Environmental Science Associates for the California Integrated Waste Management Board (CIWMB), May 9, 1995..

[3]References for data sources and methodology are provided on Table V-1.

Table IV-1 presents waste generation projections for Los Angeles County based on California State Board of Equalization reports and California Department of Finance census documents. For years 1990 to 1994, actual Population figures and quantities of Waste Disposed were used in Table IV-1. Using the diversion rates projected by the County in the DEIR/DEIS, the annual tonnage of Waste Generated was calculated [Waste Generated = Waste Disposed / (1 - Diversion Rate)]. This daily Waste Generated was converted to pounds by multiplying by 2,000 and converted to a daily figure by dividing by 365 and divided by the Population to derive the Per Capita Generation rate for 1990 through 1994. Waste Generated was calculated by multiplying Per Capita Generation by Population and converted to a six day per week basis.

Beyond the year 1994, California Department of Finance Population estimates and Diversion Rates anticipated by the County were used. To project Waste Generated, the first step was completing a linear regression on the Per Capita Generation data for years 1990 to 1994. All Per Capita Generation figures below the single line on Table IV-1 represent data points on the linear regression line. Based on the regression, there is obviously a downward trend in Per Capita Generation, which is expected as public participation in source reduction and recycling continues to rise. This projection is reasonable for Los Angeles County given the demographic changes discussed below and it is consistent with EPA forecasts. The Waste Generated for all years beyond 1994 are calculated by multiplying the Per Capita Generation by the Population.

In the DEIR/DEIS, the County showed waste generation rates increasing by 2.5 percent per year from 1993 to 2000, and then by 1 percent per year for all years beyond 2000. One percent was the assumed annual population growth, and per capita generation was assumed to increase by 1.5 percent per year until the year 2000. However, Table IV-1, based on records from the California State Board of Equalization and the California State Department of Finance, reveals that these assumptions do not reflect the actual trends. The annual percent change in population is slightly more than 1 percent, but per capita generation rates are declining. The reasons for the lower waste generation trend are discussed in the next section.

In the Siting Element, the County projects waste generation using the CIWMB approved standard adjustment method. The Adjustment Methodology is built up from the 1990 (base year)

Table IV-1. County of Los Angeles Projections For Waste Generation and Disposal

Year	Population[1]	Percent Change in Population	Waste Disposed (Tons)[2]	Diversion Rate (%)[3]	Waste Generated (Tons)	Materials Recycled (Tons)	Per Capita Generation (Pounds/Day)	Waste Generated (Tons/Day)
1990	8,997,500		12,197,677	15.00	14,675,216	2,577,539	9.1606	47,577
1991	9,016,094	1.3	12,062,900	19.40	14,966,377	2,903,477	9.0957	47,969
1992	9,128,197	1.2	12,073,556	20.80	15,244,389	3,170,833	9.1509	48,660
1993	9,246,713	1.3	11,288,268	22.20	14,509,342	3,221,074	8.5980	46,504
1994	9,364,835	1.3	12,068,712	23.60	15,796,743	3,728,031	9.2428	50,631
1995	9,489,576	1.3	11,624,443	25.00	15,499,258	3,874,814	8.9496	49,677
1996	9,636,490	1.5	10,976,380	30.00	15,680,542	4,704,163	8.9162	50,258
1997	9,769,611	1.4	10,294,491	35.00	15,837,678	5,543,187	8.8828	50,762
1998	9,908,514	1.4	9,601,519	40.00	16,002,531	6,401,013	8.8495	51,290
1999	10,043,552	1.4	8,887,711	45.00	16,159,475	7,271,764	8.8161	51,793
2000	10,180,868	1.4	8,159,212	50.00	16,318,425	8,159,212	8.7828	52,303
2001	10,308,177	1.3	8,229,862	50.00	16,459,724	8,229,862	8.7494	52,756
2002	10,437,186	1.3	8,301,089	50.00	16,602,178	8,301,089	8.7160	53,212
2003	10,563,974	1.2	8,369,770	50.00	16,739,541	8,369,770	8.6827	53,652
2004	10,689,131	1.2	8,436,393	50.00	16,872,786	8,436,393	8.6493	54,079
2005	10,812,672	1.2	8,501,140	50.00	17,002,280	8,501,140	8.6160	54,494
2006	10,936,119	1.1	8,564,747	50.00	17,129,494	8,564,747	8.5826	54,902
2007	11,059,924	1.1	8,628,039	50.00	17,256,078	8,628,039	8.5492	55,308
2008	11,185,267	1.1	8,691,772	50.00	17,383,544	8,691,772	8.5159	55,716
2009	11,312,477	1.1	8,756,187	50.00	17,512,375	8,756,187	8.4825	56,129
2010	11,441,900	1.1	8,821,534	50.00	17,643,069	8,821,534	8.4492	56,548
2011	11,573,880	1.2	8,888,057	50.00	17,776,114	8,888,057	8.4158	56,975
2012	11,709,189	1.2	8,956,322	50.00	17,912,645	8,956,322	8.3824	57,412
2013	11,848,248	1.2	9,026,621	50.00	18,053,242	9,026,621	8.3491	57,863
2014	11,991,827	1.2	9,099,503	50.00	18,199,006	9,099,503	8.3157	58,330
2015	12,137,604	1.2	9,173,172	50.00	18,346,344	9,173,172	8.2824	58,802
2016	12,287,579	1.2	9,249,113	50.00	18,498,226	9,249,113	8.2490	59,289
2017	12,440,565	1.2	9,326,399	50.00	18,652,797	9,326,399	8.2156	59,785
2018	12,596,568	1.3	9,405,005	50.00	18,810,011	9,405,005	8.1823	60,288
2019	12,755,268	1.3	9,484,668	50.00	18,969,335	9,484,668	8.1489	60,799
2020	12,916,552	1.3	9,565,277	50.00	19,130,555	9,565,277	8.1156	61,316
2021	13,079,741	1.3	9,646,310	50.00	19,292,620	9,646,310	8.0822	61,835
2022	13,243,874	1.3	9,727,043	50.00	19,454,085	9,727,043	8.0488	62,353
2023	13,409,051	1.2	9,807,539	50.00	19,615,079	9,807,539	8.0155	62,869
2024	13,574,969	1.2	9,887,570	50.00	19,775,141	9,887,570	7.9821	63,382
2025	13,741,575	1.2	9,967,090	50.00	19,934,180	9,967,090	7.9488	63,892
2026	13,908,376	1.2	10,045,737	50.00	20,091,473	10,045,737	7.9154	64,396
2027	14,074,529	1.2	10,122,901	50.00	20,245,803	10,122,901	7.8820	64,890
2028	14,240,348	1.2	10,198,815	50.00	20,397,631	10,198,815	7.8487	65,377
2029	14,405,759	1.2	10,273,429	50.00	20,546,858	10,273,429	7.8153	65,855
2030	14,570,887	1.1	10,346,834	50.00	20,693,669	10,346,834	7.7820	66,326
2031	14,735,527	1.1	10,418,889	50.00	20,837,779	10,418,889	7.7486	66,788
2032	14,899,270	1.1	10,489,311	50.00	20,978,621	10,489,311	7.7152	67,239
2033	15,062,569	1.1	10,558,424	50.00	21,116,847	10,558,424	7.6819	67,682
2034	15,225,602	1.1	10,626,357	50.00	21,252,714	10,626,357	7.6485	68,118
2035	15,388,723	1.1	10,693,359	50.00	21,386,718	10,693,359	7.6152	68,547
2036	15,552,029	1.1	10,759,496	50.00	21,518,991	10,759,496	7.5818	68,971
2037	15,715,662	1.1	10,824,863	50.00	21,649,727	10,824,863	7.5484	69,390
2038	15,879,914	1.0	10,889,659	50.00	21,779,318	10,889,659	7.5151	69,806
2039	16,044,951	1.0	10,953,991	50.00	21,907,982	10,953,991	7.4817	70,218
2040	16,211,079	1.0	11,018,060	50.00	22,036,120	11,018,060	7.4484	70,629
2041	16,373,190	1.0	11,078,399	50.00	22,156,798	11,078,399	7.4150	71,015
2042	16,536,922	1.0	11,138,843	50.00	22,277,686	11,138,843	7.3816	71,403
2043	16,702,291	1.0	11,199,388	50.00	22,398,776	11,199,388	7.3483	71,791

[1]California Department of Finance, Demographic Research Unit, 1993 Population Projection Series; Because projections only completed until 2040, years 2041 – 2043 are based on 1% annual population growth estimate.
[2]California State Board of Equilization
[3]Los Angeles County Department of Public Works

waste generation figures in the residential and commercial sectors, and utilizes the projected residential and commercial sector ratios of population, employment, and taxable sales to compute adjustment factors, that are in turn used to project the waste generation in the year of interest.

EPA's report and the County's solid waste planning efforts both start with a projection of waste generation. In its past planning efforts, called "time to crisis" calculations in the DEIR/DEIS and the Siting Element, the County has developed a number of waste projections. Two of these are shown in Table IV-2: the first data column is from the 1996 Siting Element and the second data column is from the 1995 DEIR/DEIS[4]. Interestingly, the County's most recent projection shows an increase in the per capita waste generation rate. Table IV-2 provides a comparison between data from the waste projection discussed above, County historical data and a calculation based on the social and economic factors discussed in Section B of this chapter.

It is the conclusion of this report that the County's projections are high and exaggerate the need for landfill disposal capacity. Figure IV-1 shows graphically how the County's change in the projection method from the DEIR/DEIS in 1995 to the Siting Element in 1996 impacted the projected landfill need. The top curve is the current Siting Element projection; the middle curve is from the DEIR/DEIS; and the bottom curve illustrates the projection developed in this chapter. In the DEIR/DEIS, the projected quantities of waste generated per day are some 4,400 tons lower than the Siting Element, with the corresponding reduction in disposal need.

B. LOS ANGELES DEMOGRAPHIC TRENDS

Since the publication of the County Action Plan in 1988, Los Angeles County has seen its robust economy take a downturn and stagger with the loss of industries, jobs and wage growth. In the County, for example,

- There were 335,000 fewer non-agricultural jobs in 1994 than in 1988;

[4]*Draft Environmental Impact Report/Draft Environmental Impact Statement, Elsmere Canyon*, U.S. Department of Agriculture and Los Angeles County, January 1995.

Table IV-2. Los Angeles County Solid Waste Generation Estimate Comparison

Year	County 1996 Estimated Total Generation[1] (Tons)	County 1995 Estimated Total Generation[2] (Tons)	Alternative Projected Total Generation[3] (Tons)
1995	15,640,000	14,679,912	15,499,258
1996	16,327,544	15,046,824	15,680,542
1997	16,719,120	15,423,096	15,837,678
1998	16,758,884	15,808,728	16,002,531
1999	16,865,731	16,204,032	16,159,475
2000	17,129,863	16,609,008	16,318,425
2001	17,530,719	16,774,992	16,459,724
2002	17,867,335	16,942,848	16,602,178
2003	18,203,390	17,112,264	16,739,541
2004	18,502,275	17,283,552	16,872,786
2005	18,786,215	17,456,400	17,002,280
2006	19,048,179	17,630,808	17,129,494
2007	19,288,491	17,807,088	17,256,078
2008	19,507,528	17,985,240	17,383,544
2009	19,705,384	18,164,952	17,512,375
2010	19,882,280	18,346,848	17,643,069
2013		18,902,520	18,053,242
2033		23,064,912	21,116,847
2043		25,477,920	22,398,776

[1]Source: *Countywide Siting Element*, Los Angeles County Department of Public Works, January 1996.

[2]Source: "Draft Environmental Impact Report/Environmental Impact Statement -- Proposed Elsmere Solid Waste Management Facility," Los Angeles County Department of Regional Planning, January 1995.

[3]Source: GBB.

- Unemployment in 1988 was hovering around 5 percent, but has since doubled to about 10 percent in 1994; and

- Jobs in the aerospace/high technology industries have declined by 45 percent, which translates to the loss of 125,200 jobs since 1988.

While the national recession was declared over in 1991 by the Council of Economic Advisors as other regions of the United States rebounded, in 1995 Los Angeles County remains mired in the recession with hopeful signs of weak upward swing to the end of the decade.

1. Economic Restructuring

Although not unique in undergoing restructuring from a manufacturing to a service and information based economy, Los Angeles is experiencing a far more rapid, intense, and complex transformation of its urban economy (Soda, Morals, and Wolf, 1983). In addition to the loss of aerospace jobs, employment losses hit a broad range of the County's economy. For example:

- The retail sector lost nearly 62,000 jobs, construction lost 3,000 jobs, public employment lost nearly 15,000 jobs, and the services sector remained about 10,000 jobs below its prior levels (Wolf and Grigsby, 1995).

- The value of two-way trade in the Los Angels Customs District, which grew by 13 percent during the 1988-89 period, rose by only seven percent in the 1994-95 time period.

- The County received 50,200 housing unit permits in 1988, but only received 25,300 in 1994, a decline of 50 percent.

2. Changing Demographic Climate

Los Angeles County continues to grow, from 7,477,400 people in 1980 to 8,863,200 in 1990 to an estimated population of 9,194,400 in 1993. The annual rates of growth have declined from about 1.6 percent a year from 1980 to 1990, to 1.2 percent since 1990. More importantly, Los Angeles County has undergone a dramatic shift in its ethnic composition since 1988. White-Nonhispanic share will decline from 41 percent in 1990 to 33 percent in the

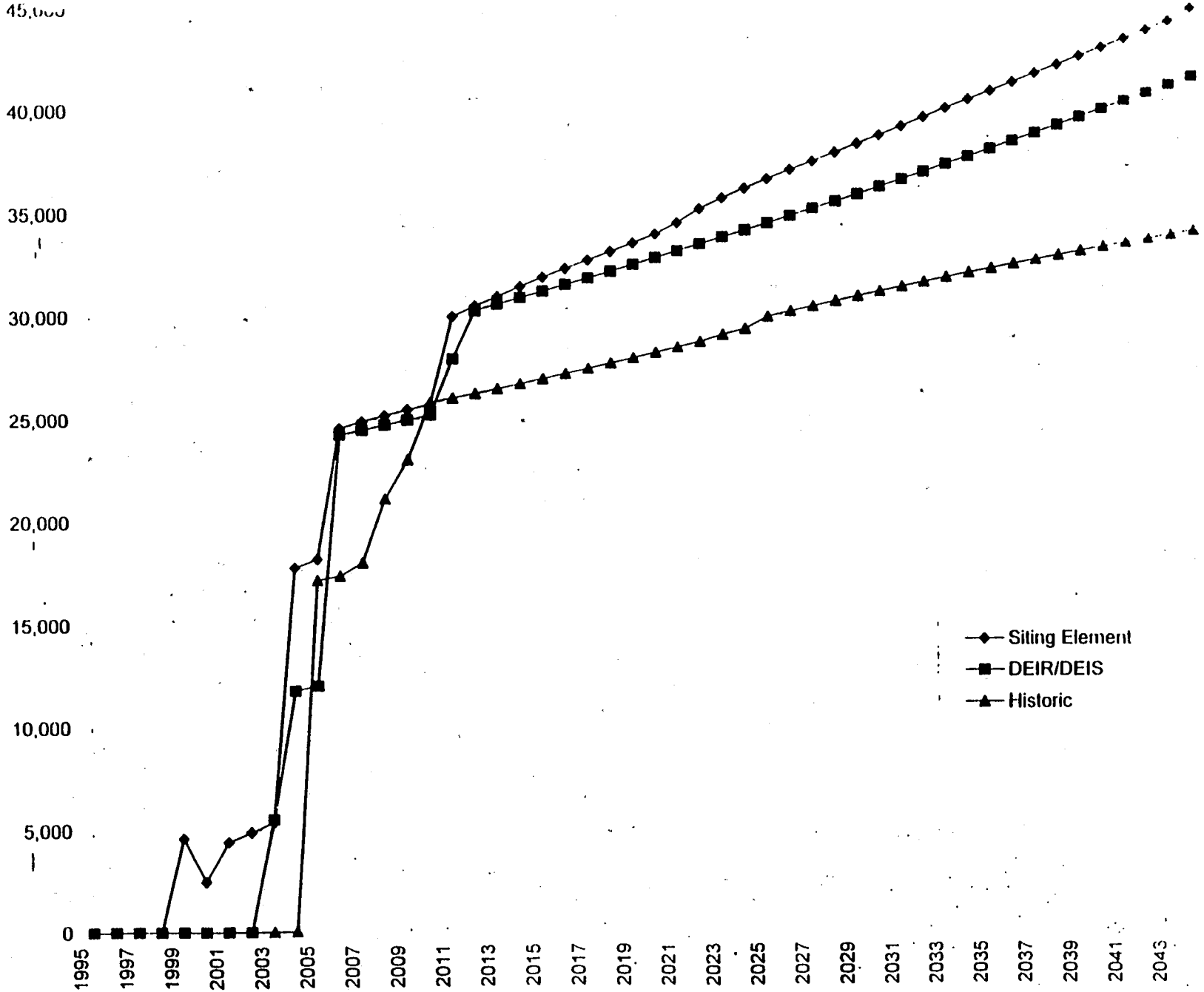


Figure IV-1. Comparison of Disposal Need Using Alternative Projections

year 2000. Moreover, the Hispanic share of the population (at 38 percent in 1990) is projected to rise to 46 percent by the year 2000. Hispanic population growth is fueled by larger family sizes and the continued influx of immigrants. White Non-hispanics are declining in share due to the outflows of population. For example:

- During the 1992-93 period, 112,800 persons moved out of Los Angeles County.
- Southern California Association of Governments has just recalibrated its projections for the five-county area downward by over half a million. They estimate that about 95,300 persons will leave the five-county SCAG region each year from 1995 to 1999. After the year 2000, the number of annual out-migrants from the SCAG region will rise to 135,000.
- The State Department of Finance estimates that almost all the growth Los Angeles County will experience over the next five years will result from immigration from abroad.

Los Angeles County has been transformed from a primarily white (Non-hispanic) population to one where Hispanic-, Asian-, and African-Americans account for 60 percent of the County's population.

3. Changing Income Structure

The vacuum created by the loss of a large number of high wage jobs associated with manufacturing and aerospace has been filled by service sector jobs paying lower wages with fewer benefits. About two-thirds of the County's Hispanic population are in non-manufacturing jobs. Hispanic-, Asian- and African-Americans are more likely to be located in the services sector, which is devoted to the generic consumption and maintenance activities required or expected in large urban areas. The kinds of retail and services provided -- markets, small to medium size retail stores, restaurants, car repair and medical care -- account for most of the low-wage job growth experienced by Los Angels County since the late 1980s.

Workers in lower occupation levels receive lower wages. With less discretionary income to spend, consumer patterns are less wasteful. Many anecdotal observations have been made

about the "conservation behaviors" of recent immigrants and lower income households who continually seek ways to extend the uses of material goods and products.

4. Implications of Waste Disposal Demand

The population forecast used in the DEIR/DEIS is too high. Any population projection estimated prior to 1990 will inflate future population growth. In 1993, the latest report available, the State Department of Finance lowered its population projections. In 1995, SCAG adjusted its 1990 population projects downward for the five-county region. The center for the Study of California's Economy has also lowered its population projections in its latest 1995 report.

The shift from a manufacturing to a service base economy will change waste disposal demand for Los Angels County. In general, service base economies are more likely to use recyclable materials, create less sludge, and produce refuse that can be converted to fuels. Many of these newer industries are more efficient and produce less waste.

The aggregate numbers hide significant compositional changes. The latest projections are lower but all assume some degree of growth. More importantly, the growth will be driven by immigration primarily from Mexico, Latin America and Asia. These changes in the components of growth and subsequent compositional changes challenge basic assumptions that waste disposal patterns of the past will be replicated in the near future.

Lower household incomes mean less waste per capita is generated. The association of higher incomes with greater consumption and waste has been well established. The current outlook of greater shares of lower income, non-white populations in Los Angeles County over the next decade projects to declining tonnage of waste disposal demand.

C. IMPORT/EXPORT OF WASTE

The Siting Element shows that 2,220 TPD of waste were imported into Los Angeles County from San Diego, Ventura, Orange and San Bernardino Counties. This totaled 692,640 tons of solid waste that were imported and disposed of in Los Angeles County landfills in 1995. The Siting Element also reports that 74,880 tons of solid waste were exported from the County in 1995. This results in a net import rate of 1,980 TPD on a six-day/week basis and 617,760 for the year. The DEIR/DEIS indicated that in 1993 the imports and exports were about equal and that the exports were approximately 485 TPD. Clearly, something has changed. The imports into the County in 1995 amounted to six percent of the waste landfilled. However, these data, in the opinion of this report, do not accurately reflect the true situation, as discussed below.

The past assumption that imports are approximately equal to exports is no longer a good assumption. The current situation is too dynamic. Several recent events exemplify the changes that affect waste import and export, including:

- The agreement between Orange County and WMI diverts the waste that was imported into Los Angeles County from San Diego County going to Riverside County instead. This agreement provides for 168,000 tons per year.
- The agreement between Orange County and Taormina Industries calls for 350 TPD in January 1996, increasing to 2,000 TPD by January 1997.
- The prospect of future importation from Ventura County has decreased due to a recent landfill expansion in Ventura.

The quantities that are included in the quarterly reporting required by CIWMB will not provide the data necessary to project future inter-county waste flows.

- The data is taken on a sampling basis for a period of one week every quarter. This is then projected over the other 11 weeks in the quarter. To be accurate, the data should be taken continually and summed for the quarterly report;

- Taking the origin data on a periodic sampling basis allows waste disposers to change their disposal location for the sampling period, thus distorting the data. This practice has been common in 1995 and it is well-known in the solid waste industry in the Los Angeles area; and
- The sampling does not reflect the fluid situation of landfills in and around Los Angeles. This is shown by the contract entered into by Orange County and others as discussed in Chapter V.

Poor information leads to poor policy and management decisions. It is recommended that the County and the 88 cities institute actual accounting of solid waste by weight and encourage the CIWMB to modify the reporting requirements for solid waste facilities so that the data reflects actual practice.

V. CURRENT AND FUTURE LANDFILL CAPACITY

The California Integrated Waste Management Act of 1989 requires Los Angeles County to continually have sufficient disposal capacity to accommodate the upcoming fifteen years of projected disposal need. The County of Los Angeles Department of Public Works has extended their planning period considerably further into the future, to 50 years as discussed in Chapter II. To demonstrate the need for the proposed Elsmere Canyon Landfill, it must be shown that the existing solid waste disposal facilities available to Los Angeles County are incapable of handling the waste generated over the 15-year period.

In the Elsmere Canyon DEIR/DEIS[11], the County predicted the "time-to-crisis" as shown in Table V-1. This is the point when there is no available landfill capacity in the County. According to the DEIR/DEIS, this occurs in 2004, when an Unsatisfied Need of 5,529 tons per day (TPD) capacity is projected.[12] The numbers and methodology used in Table V-1 and other DEIR/DEIS tables to project solid waste generation rates and disposal capacity were provided by the Los Angeles County Department of Public Works. This projection methodology covers the 50-year period preferred by the County.

Interestingly, in the Siting Element, the County provides a new and shorter "time to crisis". The County's projection from the Siting Element is shown in Table V-2 and indicates a Daily Disposal Capacity Shortfall in 1999. This loss of five years in the "time to crisis" is the result of the County's choice of data on which to base its waste generation projection as discussed in Chapter IV. In the Siting Element, the County has shortened the planning period to the 15 years required by AB 939. Summary data are presented in this Chapter, and year-by-year tables from which these summaries are prepared are included in Appendix F. The procedure used in Appendix F takes the same basic format utilized by the County "time-to-crisis

[11]Developed from Table 3.3.1, page 3-11, *Draft Environmental Impact Report/Draft Environmental Impact Statement*, Elsmere Canyon, USDA and LA County, January 1995. Format and data are the same.

[12]Actually, the table is abbreviated and does not show all of the data, including 2004. A year-by-year table is presented in Appendix F.

Table V-1. Existing Waste Management System Component Capacities and Projected Disposal Needs
County of Los Angeles Metropolitan Area
(Tons Per Day Assuming a 6-Day Disposal Week)

Year	Waste Generation Rate	Percent Diversion	Disposal Need	Landfill Capacities (tpd-6)									
				Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez	Sunshine	Chiquita	Calabasas	Unsatisfied Need
1993	44,784	22.2	34,842	12,000	3,000	12,000	2,022	7,000	3,333	0	1,443	2,426	0
7 yrs. – 2000	53,234	50.0	26,617	12,000	0	12,000	1,821	0	0	6,000	0	2,185	0
10 yrs. – 2003	54,847	50.0	27,424	12,000	0	12,000	1,876	0	0	6,000	0	2,251	0
15 yrs. – 2008	57,645	50.0	28,822	0	0	0	1,972	0	0	0	0	2,366	24,484
20 yrs. – 2013	60,585	50.0	30,293	0	0	0	0	0	0	0	0	0	30,293
40 yrs. – 2033	73,925	50.0	36,962	0	0	0	0	0	0	0	0	0	36,962
50 yrs. – 2043	81,660	50.0	40,830	0	0	0	0	0	0	0	0	0	40,830

Source: "Draft Environmental Impact Report / Environmental Impact Statement – Proposed Elsmere Solid Waste Management Facility," Los Angeles County Department of Regional Planning, January, 1995.

Table V-2. Scenario A – Time-To-Crisis Analysis

ASSUMING NO NEW OR EXPANDED LANDFILLS DURING THE PLANNING PERIOD

Based on October 1, 1994 through September 30, 1995 six day average tonnages and assuming AB 939 diversion is fully implemented
Los Angeles County Countywide Siting Element

Year	Waste Generation Rate	Percent Diversion	Total Disposal Need	Maximum Daily Transformation Capacity	Landfill Disposal Need	Daily Disposal Capacity Shortfall (Excess)
	(tpd-6)		(tpd-6)	(tpd-6)	(tpd-6)	(tpd-6)
1995	50,129	25.00%	37,596			
1996	52,332	30.00%	36,632	1,977	34,655	(22,425)
1997	53,587	35.00%	34,832	1,977	32,855	(8,734)
1998	53,714	40.00%	32,228	1,977	30,251	(2,543)
1999	54,057	45.00%	29,731	1,977	27,754	4,629
2000	54,903	50.00%	27,452	1,977	25,475	2,477
2001	56,188	50.00%	28,094	1,977	26,117	4,435
2002	57,267	50.00%	28,634	1,977	26,657	4,904
2003	58,344	50.00%	29,172	1,977	27,195	5,372
2004	59,302	50.00%	29,651	1,977	27,674	17,789
2005	60,212	50.00%	30,106	1,977	28,129	18,200
2006	61,052	50.00%	30,526	1,977	28,549	24,565
2007	61,822	50.00%	30,911	1,977	28,934	24,899
2008	62,524	50.00%	31,262	1,977	29,285	25,205
2009	63,158	50.00%	31,579	1,977	29,602	25,480
2010	63,725	50.00%	31,863	1,977	29,886	25,727

ASSUMPTIONS:

1. The waste Generation Rate was estimated using the CIWMB's adjustment methodology, utilizing population and economic projections available from the State Department of Finance and the Southern California Association of Governments.
2. 25% Diversion Rate in 1995 increases to 50% by 2000 and thereafter.
3. Sunshine Canyon Landfill becomes operational on July 1, 1996.

NOTES:

1. The 1995 diposal need quantity will be updated in the final CSE once complete 1995 Disposal Quantity Reporting Data are available.
2. "tpd-6": tons per day, 6 days per week.

Source: Los Angeles County Department of Public Works, January 1996.

tables, and modifies the calculations.

The presentations in the DEIR/DEIS and the Siting Element developed by the County [illegible] time to Crisis" or time to Daily Disposal Shortfall, due to its flawed assumptions and the selection of improbable scenarios. Specifically, the County fails to:

- project landfill operation at historically based waste acceptance rates (The landfills listed in Table IV-1 are all assumed to be operating at their maximum permitted capacity, so that in a given year, the projected amount of disposed waste can exceed the generated waste by up to 2.6 million tons, or over 7,000 TPD.);
- project the export of County-generated waste to out-of-County landfills;
- project the utilization of inert landfills, which have capacity for the inert fraction of the MSW stream;
- consider banning inappropriate materials, i.e., inerts and sewage sludge, from Class III landfills in Los Angeles County;
- include the capacity of the two waste-to-energy facilities operating in Los Angeles County; and
- consider the impact of the high diversion goal adopted by the City of Los Angeles.

The following section of the report adjusts the "time-to-crisis" calculations to account for the above factors. This is done in an incremental, step-by-step approach using a computer model that starts with the County's waste generation projection as published in the Siting Element and discussed in Chapter IV. The computer model starts with 1995 and projects waste generation for the next 50 years. Year-by-year tables are presented in Appendix F, which show the individual landfill and other waste allocations used to identify the exact "time-to-crisis" years and the individual effect of each step-by-step adjustment discussed in the text. Using the County's high waste projection emphasizes that alternatives to landfilling can and should be the primary thrust of the County's solid waste planning.

The majority of the information used in the adjusted tables is taken directly from documents and tables generated by the Los Angeles County Department of Public Works. The

County's calculations as shown in the Siting Element and presented in Table V-2, projects Los Angeles County to reach a "crisis" in disposal capacity in year 1999. However, as the landfill [illegible] assumptions in Table V-2 are modified in subsequent tables, it is revealed that the Los Angeles County solid waste disposal capacity is not in a "crisis." In fact, the "crisis" year is extended to 2014 -- fifteen years later and beyond the AB 939 planning period -- using the cumulative modifications discussed below.

A. WASTE MATERIALS FLOW MODEL

A computer model was developed to estimate the flows of solid waste materials generated in Los Angeles County. The model allocates the waste among waste-to-energy, diversion, and other alternatives to landfilling; and then allocates the remaining waste among the County landfills. Any unallocated waste is Daily Disposal Shortfall.

The computer model projects the quantity of waste needing disposal in the landfills in Los Angeles County beginning in 1996 and running through 2044. As mentioned above, the model uses the quantity of waste generated in each year projected by the County in the Siting Element. This is expressed as a daily rate based on a six-day week, as is the case in the solid waste permits. A portion of the waste generated is allocated to diversion, based upon the diversion rates projected by the County in the Siting Element. Waste is also allocated to the two waste-to-energy facilities at their capacity. Whatever waste remains each year is then variously allocated to landfills and diversion alternatives under a number of solid waste management strategy scenarios; each of the scenarios are designed to evaluate the differential impact of the various solid waste management strategies available to the County.

There a number of assumptions and parameters that are constant throughout all scenarios. These are:

1. Seventeen (17) permitted Class III landfills in Los Angeles County are included in the model. All are operating as of January 1996, except Sunshine Canyon -- which begins operating January 1997. No new landfills are opened.

2. The landfill daily allocations are initially based upon actual historic usage (1993), and rise to the permitted daily capacity as required. Total permitted capacity is the limiting factor as to how much a landfill can accept in the initial scenarios. These capacity quantities are taken from the Siting Element and are reproduced in Table V-3.

3. The waste to energy facilities are operated at 85.7 percent of maximum continuous rating (MCR). This percentage is the availability factor that allows for facility outages for preventive maintenance and repair. It is a conservative figure, as these plants can operate between 90 and 95 percent of MCR. The 1,760 TPD MCR is a seven-days-per-week figure, which is converted to the six-days-per-week figure used by the County. Therefore, 1,760 TPD on a seven day basis becomes 2,053 TPD on a six day basis. When multiplied by the availability factor of 85.7 percent, the result is 1,760 TPD on a six day basis. Also, no landfill space is allotted to the ash. This is because the Sanitation Districts are mixing the ash with cement to make concrete, then crushing the concrete, and using it for road sub-base. The County, in their calculations, uses 1,977 TPD permitted capacity for these facilities, which is higher than the plants' physical capacity.

4. The Lopez Canyon and BKK landfills are closed at the end of 1996.

5. The composition of the waste generated in Los Angeles County is that documented in the Interim Database assembled by the CIWMB and dated 1993.

The model allocates the quantity of waste generated each year based upon the historic actual uses of each landfill. For example, historically Puente Hills landfill has accepted about 16 percent of the County's annual quantity of waste needing disposal. Therefore, in projecting future disposal, the model attempts to maintain this proportion, even though Puente Hill's Permitted Daily Capacity is higher. As landfills reach their Total Permitted Capacity, or Expanded Capacity in Scenario 7, and close, the model allocates more waste to the open landfills -- until Permitted Daily Capacities are reached. Each landfill's Daily Permitted Capacity is never exceeded. Waste that cannot be allocated is summed as Unsatisfied Disposal Need. Los Angeles County overestimates the utilization of the landfills in the Siting Element. This is done by always projecting that landfills will be used at their Daily Permitted Capacity. This approach accelerates the "time to crisis" in the Siting Element by 2 years compared to that discussed in Section C, Landfill Waste Acceptance Rates.

Table V-3. Los Angeles County Landfill Capacities in Tons

Landfill	Remaining Permitted Capacity Jan. 1, 1996	Expanded Capacity	Permitted Daily Capacity	1994 Actual Utilization
Puente Hills	29,774,000	64,400,000	12,000	10,945
Spadra	2,147,000	2,147,000	3,700	2,156
BKK	2,652,000	2,652,000	12,000	8,878
Scholl	10,900,000	10,900,000	3,400	1,587
Bradley	7,506,000	7,506,000	7,000	4,448
Lopez	520,000	520,000	4,000	2,351
Sunshine Canyon	16,900,000	100,000,000	6,600	--
Chiquita Canyon	1,848,568	31,100,000	10,000	1,692
Calabassas	15,000,208	15,000,208	3,500	2,975
Brand Park	593,000	593,000	102	18
Antelope Valley Dump	2,129,000	8,300,000	750	539
Azusa Land Reclamation	3,086,000	3,086,000	6,000	695
Burbank	6,358,000	6,358,000	240	162
WM of Lancaster	472,600	11,100,000	1,000	435
Pebbly Beach Disposal	40,345	40,345	33	4
U.S. Navy	48,100	48,100	1	1
Whittier-Savage Canyon	2,663,000	2,663,000	350	217

Countywide Siting Element, Los Angeles County Department of Public Works, January 1996.

The initial run of the computer model or scenario provides a baseline allocation of waste and follows the County's strategy, which is: do the minimum diversion required by AB 939 and landfill the rest of the waste. Six other solid waste management strategies or scenarios are offered. Each of these is discussed in the following paragraphs. The rational for each strategy is discussed and the impact of that strategy is provided. The "time to crisis" is identified by the year that the County has an unsatisfied landfill need. The unsatisfied landfill need is also shown graphically to allow visual comparison of the impacts. Detailed values for each scenario are provided in Appendix F. Changes in the parameters in the Scenarios are not mutually exclusive and therefore have a cumulative impact, unless otherwise specified. This reflects the fact that an integrated solid waste management system for Los Angeles County is recommended to contain a combination of programs or strategies in order to achieve its objectives.

B. LANDFILL CLOSURES

In November, 1995 BKK and Browning Ferris Industries (BFI) announced that they had concluded an agreement which would close the BKK landfill in West Covina. The agreement has several contingencies including the reopening of the Sunshine Canyon landfill. Under the agreement BFI will acquire some of the assets of BKK including the ---transfer station and the Elsmere landfill project. The closure of the BKK landfill appears to be immanent and should occur before the end of 1996. Also, the City of Los Angeles has announced that it would close the Lopez Canyon landfill as of July 1996. This closure of these two landfills have an impact on the capacity available for Los Angles County waste.

The closure of the BKK and Lopez Canyon Landfills before they reach capacity reduces the County's available landfill space by some two to three million tons and reduces the useful life of the Los Angeles disposal system. To provide the most accurate representation of the current and future solid waste system for Los Angeles County, all subsequent landfill capacity and requirement estimates will be based on the assumed closure of the BKK and Lopez Canyon Landfills in 1996.

C. LANDFILL WASTE ACCEPTANCE RATES (SCENARIO 1)

In the Elsmere Canyon DEIR/DEIS and the Siting Element, the County projects Los Angeles County landfills to be perennially operating at their maximum permitted daily capacity. Table V-3 shows that in 1994 no operating Class III landfill (except perhaps the U.S. Navy) accepted the solid waste at its permitted capacity. On average, the County landfills operated at 53 per cent of permitted capacity in 1994. However, these landfills have historically operated at less than their permitted capacity.

The result of using maximum daily permitted capacities to calculate the "time-to-crisis" is that the annual total of disposed waste exceeds the projected total generated amount. For example, Table V-1 shows that 34,842 TPD of waste required landfill disposal in 1993; however, using the Daily Permitted Capacity, 43,224 TPD are assumed to be disposed.

Therefore, 8,382 TPD of waste, or 2.6 million tons per year, is shown to be disposed of in Los Angeles County landfills that is not generated. For all years before the "crisis" in Table V-1 and Table V-2, the projected total waste disposed of exceeds the generated amount.

It is unreasonable to project landfill acceptance rates that are independent of the key parameters, such as the waste generation and the diversion rates. Assuming that all landfills operate at full daily capacity leads to projected useful lives for each facility that are consistently short. Thus, the "time-to-crisis," based on the maximum utilization of landfills at the maximum permitted disposal capacities, does not present a true picture of landfill needs.

The model calculates data similar to Table V-2, except landfills are not assumed to operate at their maximum daily capacity, and the physical capacity of each landfill is assumed to be fully utilized. The total amount of waste requiring landfill disposal, Daily Disposal Capacity Shortfall, is proportionally divided among all of the operational landfills. The portion of the total generated waste allocated to each facility is prorated based on the tonnage of waste each landfill received in 1994, as reported by the California State Board of Equalization. For example, for Puente Hills in 1995, the average 1994 daily acceptance rate (10,945 tons) is divided by the summation of the average daily acceptance rates for all of the active landfills (47,912 tons) to yield 22.8 percent. This percentage is multiplied by the tonnage of waste requiring disposal to project the quantity disposed of in Puente Hills. The 1994 average daily acceptance rate for each landfill is shown in Table V-3. The daily acceptance rates were derived by dividing the annual tonnage received in 1994 (reported by the Board of Equalization) by 312 (days/year), to reflect six days of operation per week (6 days/week x 52 weeks). After the Chiquita Canyon landfill is expanded, the permitted daily capacity will rise-to 10,000 TPD. For the purpose of the model, an average daily acceptance rate of 7,000 tons was assumed.

The first year the remaining physical capacity of a landfill is less than the permitted annual capacity, the landfill is assumed to accept enough waste to reach capacity and begin closure. For example, when the remaining capacity of Lopez Canyon is less than 4,000 TPD (the permitted acceptance rate), it is assumed that during that year, Lopez Canyon will accept enough waste to reach its total permitted capacity.

As landfills reach their total permitted capacity and begin closure, the calculations used to allocate the total amount of generated waste to the remaining operational landfills are modified. When a facility reaches capacity, their daily acceptance rate is withdrawn from the summation of the daily acceptance rates used to prorate the allocation of waste to the various facilities, and the active landfills are responsible for a larger percentage of the annual generated waste. For example, when Lopez Canyon closes, the prorated percentage of waste allocated Puente Hills is 10,945 TPD divided by 45,561 TPD (the previous summation of the daily acceptance rates of 47,912 minus 2,351 tons, the daily acceptance rate of Lopez Canyon). However, this new percentage is not applied to the total amount of waste requiring disposal for that year because Lopez Canyon did accept some waste to reach closure. Therefore, the new percentage is applied to the total amount of waste requiring disposal minus the amount Lopez Canyon received to reach total capacity. The results of this calculation are shown in Figure V-1.

By comparing Table V-2 and Figure V-1, it is evident that projecting the landfills to operate at their maximum permitted capacity until closure has a negative effect on the "time-to-crisis. Table V-2 predicts that 1999 will be the first year Los Angeles County is without disposal capacity sufficient to accommodate the generated waste. However, Figure V-1, based on the rational assumption that the amount of waste landfilled will be approximately equivalent to the amount requiring disposal, projects 2001 to be the "crisis" year. Although there is potential for out-of-County waste to reach Los Angeles County disposal facilities, it can not be assumed that the landfills will continually operate at maximum capacity. Similarly, although there is potential for Los Angeles County waste to be hauled and disposed of outside of the County limits, it can not be assumed that the quantity of waste disposed of in Los Angeles County facilities will be less than the generated amount. From years 1995 to 2001, Table V-2 includes the disposal of over 12 million tons of waste in excess of the generated amount. This would mean that 24 percent of the waste shown to be disposed of in Los Angeles County Landfills over this period was not generated in Los Angeles County. For the year 1994, the Los Angeles County Department of Public Works reported that only 675 TPD, or 1.8 percent of the

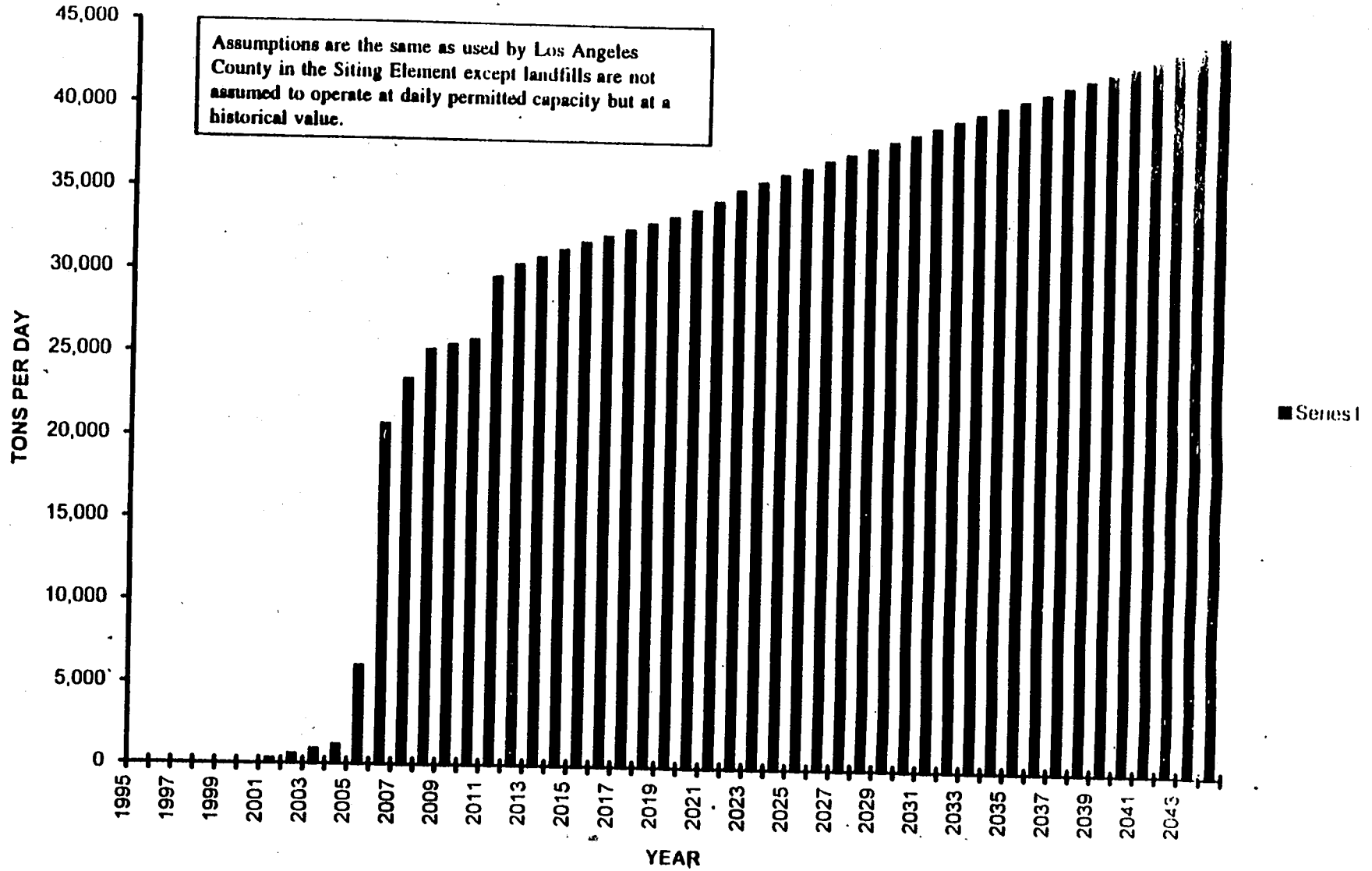


Figure V-1. Scenario 1 -- Using Historic Disposal Rates
Los Angeles County Disposal Need

disposed waste, is generated out-of-County.[13]

The first year that the County landfills experience a Daily Disposal Capacity Shortfall is 2001, when the Shortfall is projected to be 343 TPD. This is two years later than Shortfall is shown in the Siting Element. This difference is caused by the County approach of reducing the remaining capacity of each landfill by the Daily Permitted Capacity in its "time to crisis" calculation. The impact of this is mitigated slightly by the difference in the waste-to-energy facilities' capacity discussed above. The Shortfall in each year of the planning period is shown graphically in Figure V-1. As can be seen in the chart in Figure V-1, the Shortfall is small until 2006 -- when it is projected at 5,000 TPD. At the end of the AB 939 planning period, 2010, the Shortfall is 25,000 TPD.

D. OUT-OF-COUNTY ACCESSIBLE DISPOSAL FACILITIES (SCENARIO 2)

In addition to Class III landfills in Los Angeles County, landfill capacity accessible via rail or competitive truck transfer offers considerable potential in accommodating large amounts of County waste. Tables V-4 and V-5 list the out-of-County and out-of-State facilities that potentially could be utilized in a waste-by-rail system for Los Angeles County. These tables are adaptations of information developed by the City of Redlands[14] and the City of Los Angeles.[15]

Of the out-of-County facilities, Eagle Mountain, Rail Cycle/Bolo Station and Mesquite Regional Landfill projects all are planning for disposal capacities that exceed the proposed Elsmere Canyon Landfill. Western Waste, the operator of the El Sobrante Landfill, is proposing to expand the existing landfill and increase capacity from 4,000 to 10,000 TPD and a total capacity of 100 million tons. The final EIR for this is in preparation and it is expected that the

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[13]Draft table, "Remaining Permitted Combined Disposal Capacity of Existing Solid Waste Disposal Facilities in Los Angeles County as of January 1995," Los Angeles County Department of Public Works, March 1995.

[14]City of Redlands, *Solid Waste Landfill Disposal Options Available to the City of Redlands*, July 1995.

[15]City of Los Angeles, Bureau of Sanitation, Solid Resources Action Plan, November 1995.

Table V-4. Accessible Out-Of-County Landfills

Project Title	Rail-Cycle	Eagle Mountain Project	CA RailFill Systems	El Sobrante Landfill	Orange Co. Landfill
Facility	Solo Station Landfill	Eagle Mountain Landfill	Mesquite Landfill	El Sobrante Landfill	Orange Co. Landfill
Operator	Waste Management	Mine Remediation Corporation	Western Waste	Western Waste	Orange County IWMD
Landfill Location	Amboy, San Bernardino County	Eagle Mountain, Riverside County	Glamis, Imperial County	Western Riverside County	Bowerman, Prima Deshecha, Olina Alpha, Santiago Canyon
Status	EIR and CUP in progress.	EIR released.	Final EIR and CUP approved.	Operational. EIR prepared for expansion.	Operational.
Tons per day capacity	21,000	20,000	20,000	4,000 Proposed expansion to 10,000.	5,000 - 6,000 may soon be available for import.
Years of capacity	70	100	100	10	47 with import
Online date	—	—	Mid 1997	On line	On line
Tipping fee at landfill	$26.00	$25.00	Unknown	$10.46 for cities who contract with WWI. Waste transport must be from transfer stations.	$19.00 for contracted quantities; $35 other
Approximate distance from Los Angles (miles)[4]	190	190	240	65	70 or less
Method of Transportation	Rail Haul	Rail Haul	Rail Haul	Long Truck Haul	Truck Haul

Notes:
1. Estimates do not include rail haul costs or intermodal facility costs.
2. Long truck haul costs will vary according to the selection of options and vendors.
3. Transfer costs could vary according to selection of options and vendors, ranging from approximately $10.00 - $16.00 per ton.
4. Distance measured from the intersection of I-10 and I-5, via road.

Source: City of Redlands, California, *Solid Waste Landfill Options Available to the City of Redlands*, July 1995, modified and updated by GBB.

Table V-5. Accessible Out-Of-State Landfills

Facility	Butterfield	East Carbon County	La Paz	Yuma
Operator	Waste Management	East Carbon Development Company	Browning-Ferris (owned by La Paz County; a public/private partnership with BFI)	Sanifill
Location	Phoenix, Arizona Area	Carbon County, Utah	Parker, Arizona Area	Yuma, Arizona
Status	Operational	Operational	Operational	Operational
Tons per day capacity	Unlimited	20,000	Unlimited	
Years of capacity	100	10 - 30	Variable	
Tipping fee at landfill	$16.00 (negotiable)	Proposed $48.00 - $55.00/ton for transfer, rail transport and disposal	$15.00 - $20.00	
Approximate distance from Los Angeles (miles)[1]	370	582	270	330
Method of Transportation	Rail Haul	Rail Haul	Rail Haul/Long Truck Haul	Rail Haul

Note: 1. Distance measured from the intersection of I-10 and I-5, via road.

Source: City of Redlands, California, *Solid Waste Landfill Disposal Options Available to the City of Redlands*, July 1995, modified and updated by GBB.

expansion permit will be granted to El Sobrante shortly. When that happens, sixty percent of the waste disposed of in El Sobrante must come from neighboring communities in Los Angeles, Orange, San Bernardino, and San Diego Counties. This expansion would allow for continued operations of the landfill from 1996 to 2026. Western Waste, the operator of El Sobrante, has submitted a proposal for 15 years of disposal services to the City of Los Angeles. Recently, Riverside County announced that it would be offering capacity at its El Sobrante landfill for $30.00 per ton. The Campo Solid Waste Management Project proposes a disposal rate of 3,000 TPD; rail haul would be required for this to be feasible.

Following its bankruptcy, Orange County began to explore the option of importing waste into the County landfills as a means of generating revenue. The Board of Supervisors approved this approach in November 1995 with the goal of importing 5,000 TPD by January 1, 1996. Contracts have been concluded with Waste Management and Taormina Industries for 2,000 TPD starting January 1, 1996. This waste is expected to be generated in Los Angeles County because Riverside, San Bernardino, and Imperial Counties all have landfills actively competing for waste.

As an example of the possible use of out-of-county facilities, effective November 1, 1995, San Bernardino County entered into a 15-year contract with Norcal Waste Systems, Inc. to provide a broad range of services relating to the administration, engineering and operation and maintenance of the County's network of landfills. San Bernardino County currently has 17 different landfills serving the 27 incorporated municipalities in the County in addition to the unincorporated area. The County receives approximately 1.3 million tons per year of solid waste for disposal.

As a result of various policy changes, the Los Angeles County landfills are in jeopardy of losing tonnage. As in other California counties, cities have the ability to contract with service providers for both collection and disposal services and sometimes do so for a combined service and do not designate where waste should be taken for disposal. Waste from several cities in Los Angeles County already have their waste disposed of outside of the county. It is possible that additional cities may follow suit.

If this situation were to occur and the County/Norcal had additional capacity that they could offer to other waste suppliers, e.g., cities in Los Angeles County or area haulers, San Bernardino County could be in a similar situation as Orange and Riverside Counties and market that capacity either directly or through their contractor. According to Gerry Newcombe, Deputy Director, San Bernardino County Solid Waste Management Department, the County's contract with Norcal allows for spot tonnage to be brought into the County system by either party.[10]

Of the out-of-State facilities, East Carbon, Roosevelt and Butterfield Station Landfills would accommodate daily disposal capacities that equal or exceed the proposed Elsmere Canyon Landfill. Franconia has a permitted capacity of 10 million tons and no daily disposal limits. The La Paz County Landfill has a capacity of 5 million tons. In addition, the CIWMB reports that both the Franconia and La Paz County landfills have the potential for expansion.

Waste from the County has been exported in the past and exportation has been expanded, beginning in January 1996. In the past, the County has assumed that the exports are approximately equal to imports. However, as mentioned above, Orange County has contracts with private waste haulers servicing Los Angeles County to provide disposal at their (i.e., Orange County) landfills for 4,000 TPD, beginning January 1, 1996. These contracts, and others that are planned, will result in significant net exports of waste from Los Angeles County. These exports, and others that could result from Orange County's decision to import waste, are not considered in the Siting Element.

Waste export depends on transfer stations to be efficient. Presently there are 19 transfer stations in Los Angeles County with a combined capacity of over 50 percent of the waste disposed in the County. These transfer stations depend on large trucks with a maximum payload of 22 tons. Table V-6 lists eleven transfer station facilities which are in the planning stages. These facilities all plan to provide access to rail transportation, some of these facilities are operating but not as solid waste rail transfer stations. Several of these are well along in the planning process and could be operational in 1997. The advantages of rail transportation are

[10]Personal conversation: G. Newcombe and H. Gershman, GBB, November 30, 1995.

Table V-6. Planned Rail Transfer Station Projects

Facility	Location	Capacity TPD	Landfill	Status
Central Los Angeles Solid Waste Station	City of Los Angeles	---	BFI - LaPaz, AZ	Existing transfer station would be expanded.
East Los Angeles Intermodal Facility	City of Commerce	4,200	Unknown	Existing Rail Facility, No Solid Waste Permit
Hobart Intermodal Facility	City of Vernon	---	Unknown	Existing Rail Facility No Solid Waste Permit
Industry Intermodal Facility	City of Industry	---	Unknown	Existing Rail Facility No Solid Waste Permit
Industry Solid Waste Station	City of Industry	5,700	Unknown	Draft EIR mid May, Operate 1998
Pamona Materials Recovery Facility	City of Pamona	6,000	Unknown	Draft EIR in preparation
Puente Hills Materials Recovery Facility	near City of Whittier	4,000	Unknown	Final EIR released
Rail-Cycle LP Solid Waste Station	City of Commerce	4,200	Bolo Station Butterfield Station	Have permits; site work in progress
Southern Pacific Intermodal Facility	City of Long Beach	---	Unknown	Existing Rail Facility No Solid Waste Permit Operational 1998
Vernon Materials Recovery & Transfer Facility	City of Vernon	---	Unknown	Previous CUP expired
Western Waste Industries Transfer Station	City of Carson	---	Mesquite	Permits expected 1996 Operation 1997

lower operation costs, reduced truck traffic and lower environmental impact. A number of the projects include materials recovery processing in the planning of the rail transfer stations. One of these is the Puente Hills facility. The County Sanitation Districts have completed the final EIR[11] for a 4,200 TPD Materials Recovery Facility (MRF) located at Puente Hills with waste rail loading capability. The MRF is planned to divert 15 percent of the waste processed, resulting in 3,400 TPD requiring disposal. With rail facilities planned, it is logical that this waste would be rail hauled to one of the remote landfills discussed above.

While the Siting Element discusses rail haul, it does not take into account in computing disposal need. These exports have been, however, accounted for in this waste strategy. The exports, on a net basis, are at a rate of 2,000 TPD in 1996, and 3,500 TPD starting in 1997, which accounts for the Orange County contracts. Exports are raised to 6,000 TPD in 2001 to account for Puente Hills and other transfer station/MRF facilities on a conservative basis and continue through 2043.

The result is that the first year that Daily Disposal Shortfall occurs is 2007, extending the "time to crisis" by six years. The Shortfall in 2007 is 7,000 TPD and jumps to 16,000 TPD in 2008. This is shown on the chart in Figure V-2. At the end of the AB 939 planning period, 2010, the Shortfall is 20,000 TPD. This is 5,000 TPD less than Scenario 1, where export was not accounted for.

E. INERT MATERIALS AND BIOSOLIDS (SCENARIO 3)

Discussion of landfills in Los Angeles County usually focus on Class III sanitary landfills for non-hazardous materials. However, unclassified or inert landfills need to be included in solid waste management planning as well. Inert landfills can accept essentially non-decomposable materials, such as dirt and concrete. There are seven inert landfills in the County: Azusa, Calmat, Chandlers, NuWay, Peck Road, Reliance Pit #2, and Strathern, which were not

[11] *Puente Hills Waste Management Facility Environmental Impact Report*, County Sanitation Districts of Los Angeles County, May 1995.

considered in the Elsmere Canyon DEIR/DEIS and fully addressed for planning purposes in the Siting Element. These have a total permitted capacity of over 80 million tons.

In 1990, the Board of Equalization (BOE) shows 768,422 tons of inert materials delivered to County Class III landfills, which comprises 7.4 percent of the waste stream disposed of in these facilities.[12] Much of this material is recyclable, as discussed in Appendix B. However, assuming that it must be landfilled along with the current material accepted at these landfills, the permitted inert landfill capacity will accommodate the projected amount of inert material for the next 40 years with no additional recycling.

This waste management strategy assumes that inert material is prohibited from disposal in Class III landfills in the County. Also, it assumes that inert materials are banned from Class III landfills starting in 1996 and that these landfill bans will be enforced. However, even when bans are enforced, some amount of material slips by. Thus, for this Scenario, it is assumed that the effectiveness of the ban is 70 percent.

Additionally, approximately 500 TPD of biosolids (sewage sludge) are being landfilled currently by the Sanitation Districts. While this is not a lot of material and only totals some 156,000 tons per year, there are viable alternatives to this practice as discussed in Appendix B. In Chapter IX, it is recommended that biosolids be banned from disposal in County landfills. This material is totally under the control of the County and the Sanitation Districts and, therefore, the ban should be 100 percent effective. A landfill ban on biosolids does not impact the year in which Shortfall occurs, but it does make a positive impact.

These bans result in a net reduction of six percent in landfill disposal need. The implementation of this solid waste option extends the first year that Daily Disposal Shortfall occurs by two years, to 2009, as shown in Figure V-3. This Shortfall is 4,000 TPD in 2009, at the end of the AB 939 planning period, 2010, it increases to 13,000 TPD.

[12] CIWMB Interim Database Project - County of Los Angeles, August 4, 1993.

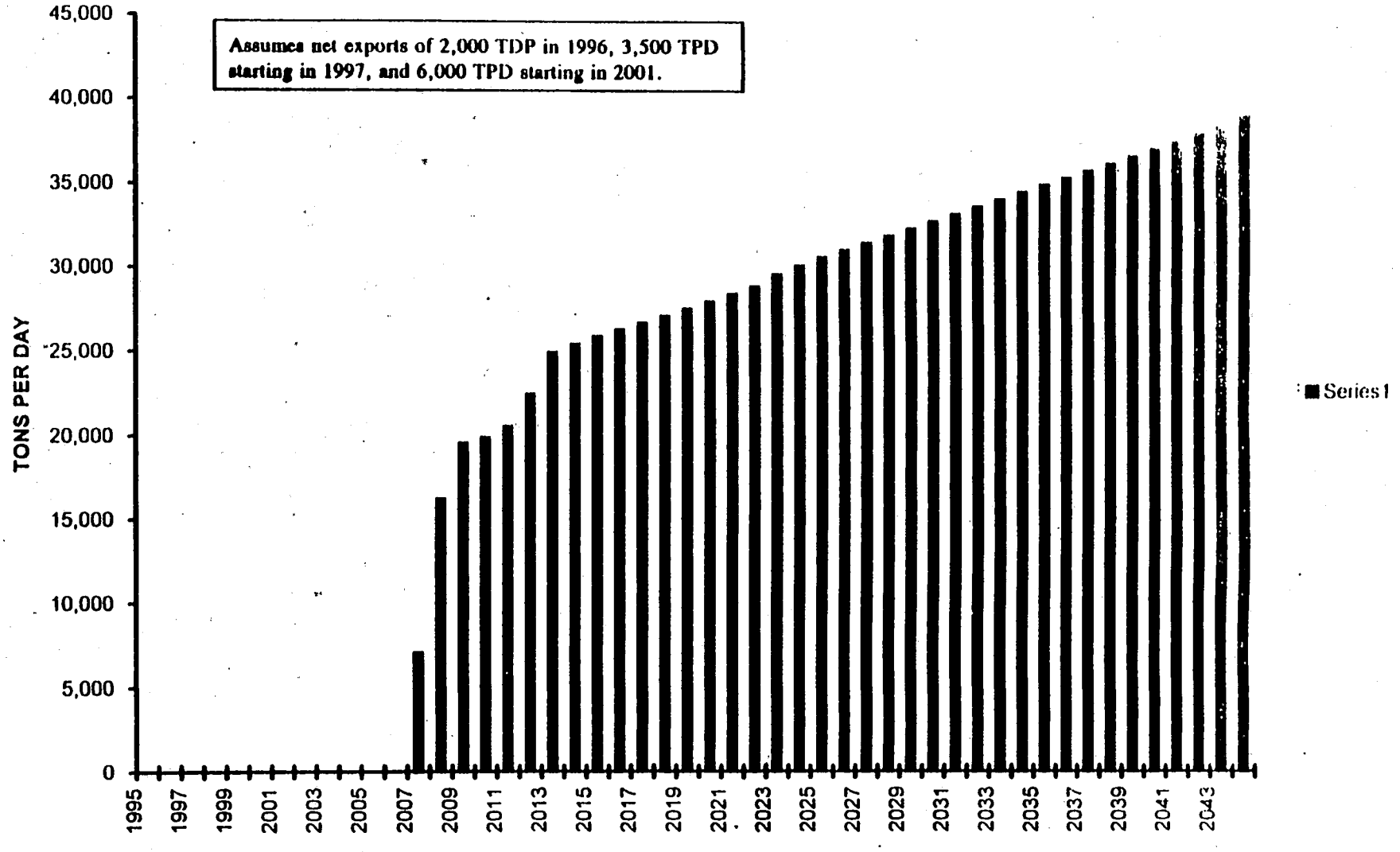


Figure V-2. Scenario 2 – Waste Export
Los Angeles County Disposal Need

F. CITY DIVERSION OF 70 PERCENT (SCENARIO 4)

The City of Los Angeles has adopted the goal of 70 percent diversion to be achieved in 2020. The planning in the Siting Element does not take the impact of achieving this goal into account in the calculation of landfill disposal need. In fact, the goal is not even acknowledged. The City generates 39 percent of the total waste generated in the County; diversion of 70 percent of this waste and diversion of 50 percent of the remaining waste generated in the County will result in an average of 59 percent diversion County-wide. Additionally, it is the position of this report that the County should be more proactive in the diversion of waste from landfills. One step the County could take is to adopt the 70 percent goal for the unincorporated areas to demonstrate the County's commitment to a diversion-based policy.

This strategy shows the results of the landfill disposal need calculation when the City and the County unincorporated area meet the 70 percent diversion goal. The waste for which the County is responsible has been included because the County has control of solid waste management policy and implementation of those policies. In Chapter 9, which outlines the recommendations for County policy, it recommended that the County adopt the 70 percent goal. Scenario 4 assumes that the City of Los Angeles and the County unincorporated areas achieve 70 percent diversion in 2020. The unincorporated area generates approximately nine percent of the total waste in the County. This added to the City's 39 percent results in 47 percent of the waste generated in the County subject to the 70 percent goal. The result is a total of 59 percent diversion in 2020.

This option does not have any impact until after the year 2000. Starting in 2001, the impact is to increase the diversion of the entire County by half a percent per year until 2020. The result is to extend the first occurrence of Daily Disposal Shortfall by one year compared to Scenario 3, to 2010. This can be seen in Figure V-4. The amount of the Shortfall is 5,700 TPD in 2010, compared to 11,700 TPD in 2011. Further reductions occur in subsequent years, as can be seen by comparing Figure V-3 and V-4.

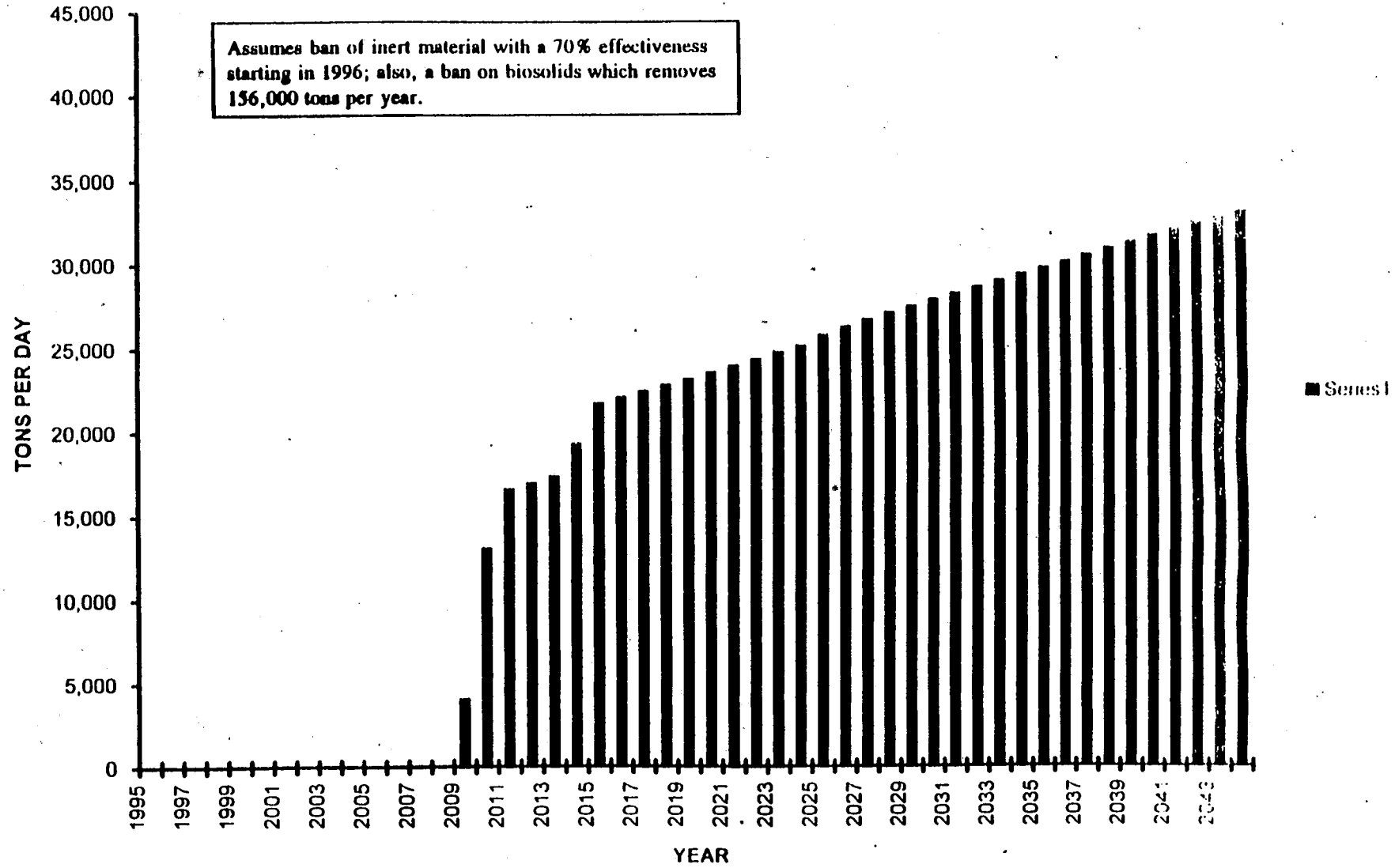


Figure V-3. Scenario 3 -- Inert Material and Sewage Sludge Bans Los Angeles County Disposal Need

The combination of the first four solid waste management strategies:

- Projecting landfill use based upon waste available and historic usage rather than permitted daily capacity;
- Export addition;
- Insert material and sewage sludge bans; and
- Diversion goal of 70 percent for the City and the unincorporated area.

result in essentially postponing the occurrence of Daily Disposal Shortfall beyond the AB 939 fifteen year planning period.

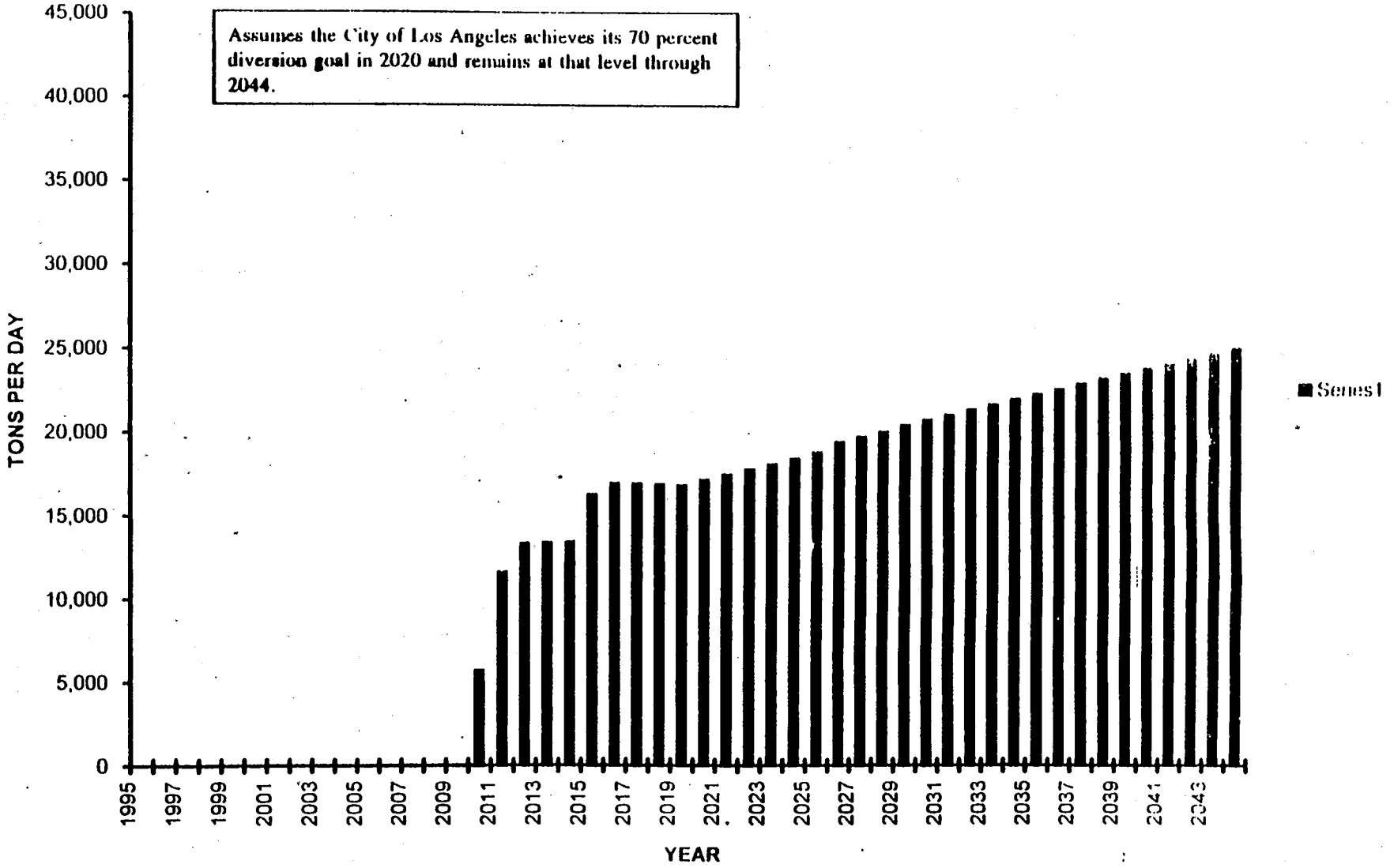


Figure V-4. Scenario 4 -- Diversion Goal of 70 Percent Los Angeles County Disposal Need

VI. STRATEGIES FOR CONSERVING LANDFILL CAPACITY

Considerable experience has been gained in recent years by public and private landfill operators in utilization of technologies and management techniques for conserving landfill space. A detailed discussion of landfill conservation approaches, and examples of their applications, are provided in Appendix C. For the purposes of estimating the amount of current landfill capacity in Los Angeles County that could be saved for future use by the application of landfill conservation techniques, two have been selected: (1) chemical or foam cover and (2) biostabilization. The application of these two techniques as applied to the landfills in Los Angeles County is discussed below.

A. CHEMICAL OR FOAM COVER (SCENARIO 5)

Chemical or foam compounds have been specifically developed to be used as intermediate daily cover on landfills and are available from nationally-reputable manufacturers. Their use is widespread and performance documented at numerous operating landfills. This experience shows that foam conserves between 20 and 33 percent of landfill capacity when used in place of daily cover soil, by allowing the replacement of the dirt by solid waste.

To project a "time-to-crisis" estimate for Los Angeles County based on the use of foam cover beginning in 1997, the total remaining capacity for each landfill was multiplied by 1.22 in the year it is converted to foam. The space saved by not using dirt accounts for the 22 percent capacity increase provided by foam cover.

Figure VI-1 is the County's "time-to-crisis" table, as modified in Chapters IV and V of this document, and showing phased-in use of synthetic foam cover at County landfills. The use of foam cover begins in 1997 with all landfills in the County using foam cover in place of dirt or other materials that consume landfill capacity.

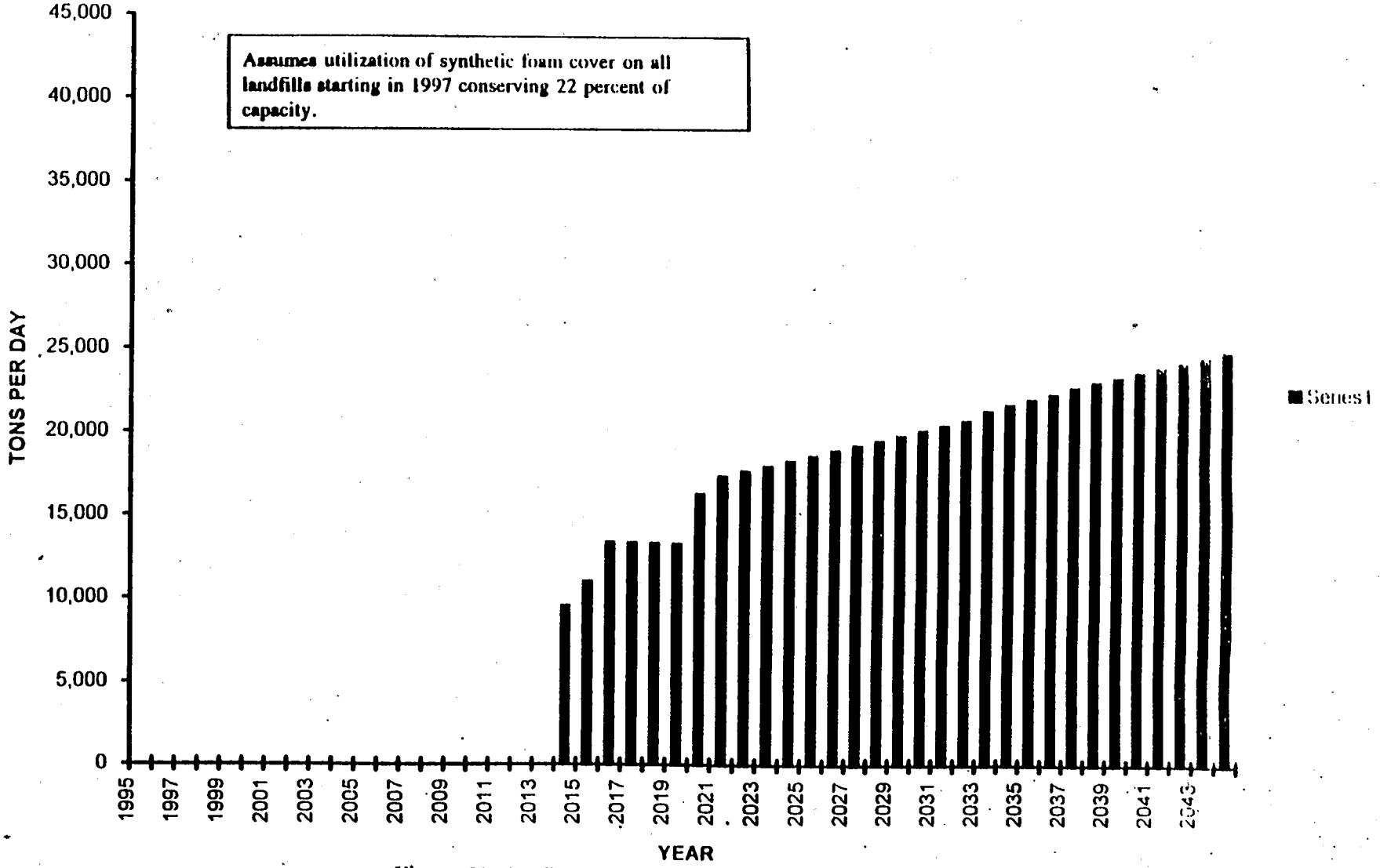


Figure VI-1. Scenario 5 -- Chemical Foam Landfill Cover Los Angeles County Disposal Need

The implementation of this technology extends the time until Daily Disposal Shortfall by four years, to 2014. In addition to moving the occurrence of Shortfall to 2014, foam cover significantly decreases the amount of the Shortfall in all subsequent years of the 50 year planning period. This can be seen on the chart in Figure VI-1.

B. BIOSTABILIZATION (SCENARIO 5A)

Current landfill management is based on a "high and dry" approach. Under this technique, both rain water and ground water are kept out of the landfill. Any water that does penetrate is collected and removed as "leachate. Leachate is treated in a waste water treatment plant and discharged. Opening and sorting old landfills has shown that very little breakdown of the organic materials takes place.[19] In many cases, old newspapers are still readable after 25 years.

Biostabilization incorporating shredding and leachate recirculation is a developing technology with excellent promise. This promotes the breakdown of the organic materials in the landfills, increases gas generation, and results in volume reduction. This allows additional waste to be deposited. Operating experience in Albany, New York indicates increases in landfill space utilization between 50 and 100 percent. At the higher levels, this could be thought of as "recycling" landfills. As mentioned previously, a discussion of operating techniques that allow additional waste to be disposed per unit of landfill volume are discussed in Appendix B.

Figure VI-2 shows the results achieved by application of this technology in the County landfills at the 50 percent level in conjunction with foam cover. Because the technology is developing and will take some time to implement, implementation is shown starting in 2000.

Figure VI-2 was developed using the same methodology as discussed in Section A except for each landfill, the amount of capacity consumed between years 2000 and 2043 is multiplied by 50 percent to estimate the capacity conserved due to biostabilization. This value is then

[19]Rathje, William. "Rubbish." *The Atlantic Monthly*, December 1989, pp. 99-109.

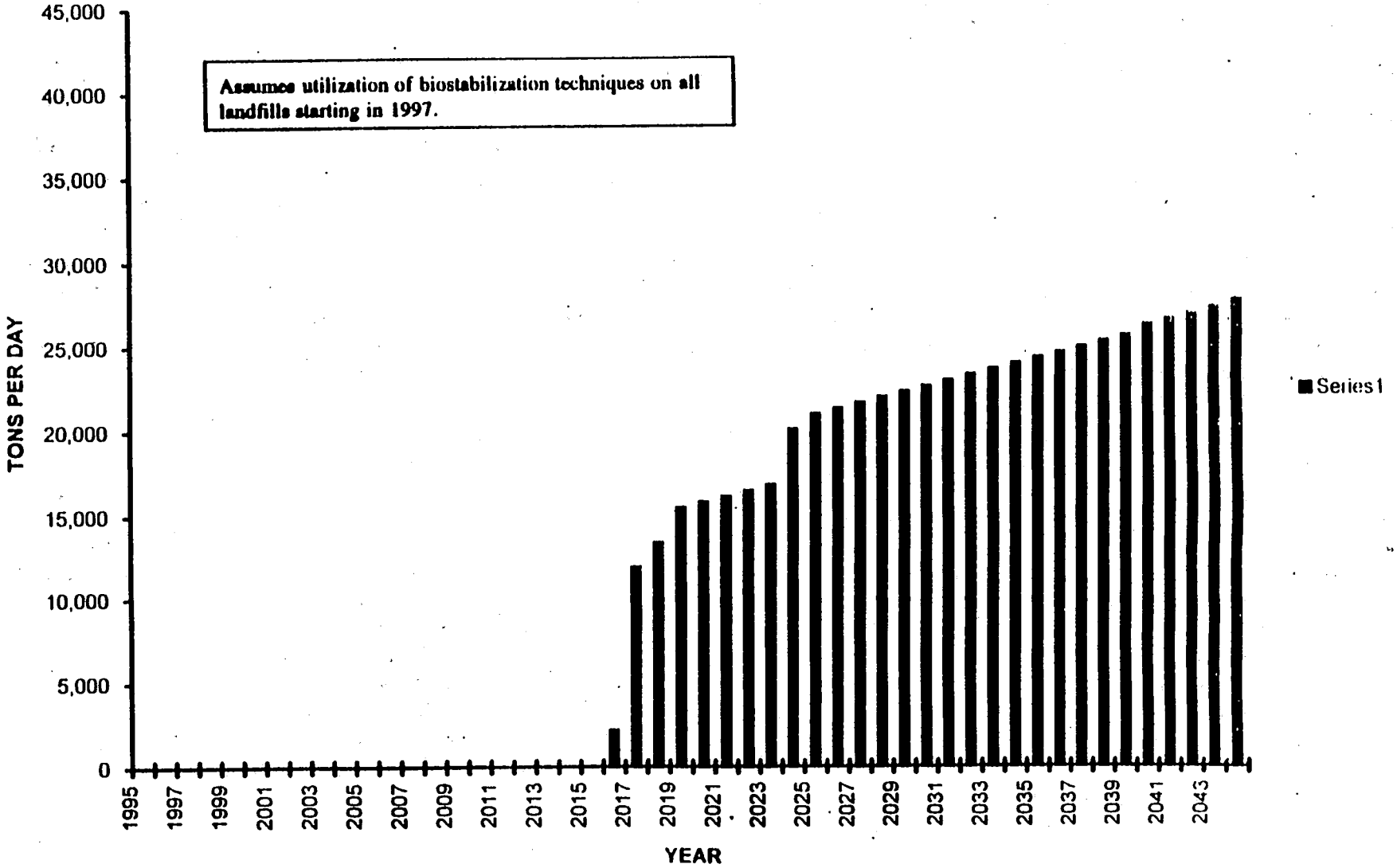


Figure VI-2. Projected Disposal Needs Through The Use of Biostabilization 1995

VII. DIVERSION OPPORTUNITIES

This Chapter focuses on the opportunities to increase diversion of solid waste from landfill disposal in Los Angeles County. The discussion provided below is a summary and evaluation of a more detailed analysis provided in Appendix B. Diversion Alternatives, supplemented by Appendix G. International Technology Applications. Appendix B looks at each of the available diversion alternatives presently in use by other communities in the U.S., assesses their appropriateness for implementation in Los Angeles County, and, where applicable, estimates the percentage of the County waste stream that could be addressed by each diversion alternative. The provision of information on alternative approaches applied in other countries in Appendix D further demonstrates that recovery of materials from the waste stream and avoidance of land disposal are not pioneering approaches to waste management, and are not unique to the U.S.

There is a correlation between a public policy that is committed to diversion and recycling and the achievement of diversion. The public policy is manifest in public documentation: statutes, regulations, planning reports and public information pieces (brochures, newsletters, press releases, instructional booklets, etc.). One familiar feature of a policy commitment to diversion is the diversion goal. Forty-one states have recycling goals and thirteen have goals of 50 percent or higher, including the state of California. The commitment is stronger and more effective when the goals are mandatory.

Many of the successful programs in the larger cities and counties have adopted and are actively working toward goals higher than state goals and on an accelerated schedule. These programs include: Seattle, WA with a goal of 60 percent and 1995 diversion of 53 percent for residential waste; King County, WA with a goal of 65 percent and a 1995 diversion of 49 percent; Ocean County, NJ with a goal of 60 percent and county-wide 1995 diversion of 59 percent where 11 of the 33 municipalities reported 50 percent or higher; and Minneapolis, MN that achieved the state goal of 50 percent in 1995.

The City of Los Angeles has adopted the goal of 70 percent recycling by the year 2020. San Jose achieved 43 percent diversion in 1995. This achievement shows what can be accomplished in only five years with a public policy decision followed up with a plan and implementation. However, in the "time to crisis" calculation the County has not accounted for the impact of the City's high diversion goal and its impact on the disposal needs.

The purpose of the exercise undertaken in Appendix B was not to identify a few selected technologies that could be calculated to bring Los Angeles County into compliance with the 50 percent diversion requirement by the year 2000. Instead, each technology or market was evaluated independently for its potential to address a specific portion of the County's waste stream. This allows comparison of what percentage could be diverted by each approach, assuming a reasonable capture rate for the type of material(s) addressed. The analysis was conducted by type of material, so as to avoid "double-counting." Diversion calculations for the materials were added to the computer model developed to calculate the landfill requirement as discussed earlier. The details of how these calculations are applied to the County Waste Stream are discussed in Appendix H.

This analysis shows that no single technical approach will meet diversion goals. However, by applying the full range of available technologies, summing together the fractions of the waste stream that could be diverted by each of the technologies deemed appropriate to Los Angeles County, the analysis shows that 74.5 percent of the waste stream could be diverted by recycling/reuse technologies by the year 2020. This is well beyond the legislatively-mandated 50 percent.

Also evaluated in this Chapter is the diversion potential of transformation (waste-to-energy) facilities. Transformation can be counted as 10 percent of the 50 percent diversion goal (i.e., a minimum of 40 percent must be diverted from disposal by other means) under California law. Review of the two existing waste-to-energy facilities and the potential of new facilities to reduce landfill capacity needs in Los Angeles County is discussed under Section VII.C below.

A. DIVERSION PROGRAMS

An analysis of current recycling programs and a diversion model to project future recycling rates was developed for this Chapter. Current program information is based on County-provided data, and diversion rates for individual materials, facilities, and programs are based on the discussion provided in Appendix B. In the discussion below, the year 1995 represents Level 1, Current Programs; year 2000 represents Level 2: Intensified Current Approaches; and year 2020 represents Level 3: Maximum Diversion.

1. Level 1: Current Programs

The current status of diversion programs can be summarized by saying that the County and the Cities have done the easy part. While not universal, residential diversion systems in the County include curbside collection, yard waste collection, and medium-level public information efforts directed to residents. Commercial and waste generators have developed, for the most part, only voluntary and economically-driven diversion programs. The County and most of the Cities have some public information programs directed toward the commercial and industrial sectors; however, these are not comprehensive efforts to maximize diversion. In summary, current programs are:

Residential
- Curbside Recycling Collection
- Yard Waste Collection
- Medium-level Public Information Campaign

Commercial/Industrial
- Voluntary Programs
- Economically-driven Programs
- Some Public Information Programs

In the DEIR/DEIS and the Siting Element, The County assumes that these programs will achieve 25 percent diversion in 1995. However, the Los Angeles County diversion analysis model, developed for this document and discussed in Appendix H, indicates a 20.33 percent

diversion rate in 1995. This rate reflects continued implementation of the above-mentioned programs. The fact that these programs have not been fully implemented, with uniform policy and administrative backup by the County and all 88 cities, is reflected in the recovery rates for the materials targeted in the programs. Recovery rates for individual recyclable materials are provided in Appendix H.

Table VII-1 shows the estimated overall diversion rate and the residential, commercial and industrial sector components from which this rate is derived on the first line of the Table (1995). Table VII-1 also shows that simply maintaining current programs will not achieve the 50 percent diversion goal required by AB 939 by 2000.

In order to attain 50 percent diversion in 2000, a new approach is required. As discussed in this document, the new approach is a County-wide policy shift to a diversion-oriented solid waste management strategy. Recommendations to the County for implementing this policy shift are presented in Chapter IX. These recommendations result in diversion programs that are executed by the public and private sectors in the County as well as by the County and the 88 cities.

2. Level 2: Intensify Current Approaches

The first step toward increasing diversion is to intensify the present approach to residential waste diversion, and increasing efforts in the commercial/industrial sectors. The commercial/industrial waste stream represents nearly half of the County waste stream. Increasing efforts in this area are essential to achieving the diversion goal. Level 2 efforts would include:

Residential
- Intensive Curbside Recycling Collection
- Yard Waste Collection
- Comprehensive Recycling Drop-off Facilities
- High-level Public Information Campaign covering source reduction, reuse, and recycling
- Mandatory Recycling Programs

Table VII-1. Projected Diversion By Sector for Intensive Programs

(TPD – 6)

Year	Total Waste Generation Rate	Residential Waste Generation Rate	Commercial Waste Generation Rate	Industrial Waste Generation Rate	Residential Waste Recovery Rate	Residential Percent Recovery Rate	Commercial Waste Recovery Rate	Commercial Percent Recovery Rate	Industrial Waste Recovery Rate	Industrial Percent Recovery Rate	Total Waste Recovery Rate	Total Percent Recovery Rate
1995	49,677	21,461	22,355	5,812	5,138	23.94	3,575	15.99	1,385	23.83	10,097	20.33
1996	50,258	21,712	22,616	5,880	6,398	29.47	4,926	21.78	1,731	29.44	13,054	25.97
1997	50,762	21,929	22,843	5,939	7,673	34.99	6,297	27.57	2,082	35.05	16,052	31.62
1998	51,290	22,157	23,081	6,001	8,978	40.52	7,699	33.36	2,440	40.66	19,117	37.27
1999	51,793	22,375	23,307	6,060	10,302	46.04	9,124	39.15	2,804	46.27	22,230	42.92
2000	52,303	22,595	23,536	6,119	11,652	51.57	10,576	44.94	3,175	51.88	25,403	48.57
2001	52,756	22,790	23,740	6,172	12,080	53.00	10,939	46.08	3,288	53.27	26,307	49.87
2002	53,212	22,988	23,945	6,226	12,514	54.44	11,308	47.22	3,403	54.66	27,225	51.16
2003	53,652	23,178	24,144	6,277	12,950	55.87	11,678	48.37	3,518	56.04	28,146	52.46
2004	54,079	23,362	24,336	6,327	13,388	57.31	12,049	49.51	3,634	57.43	29,071	53.76
2005	54,494	23,542	24,523	6,376	13,829	58.74	12,422	50.66	3,750	58.82	30,001	55.05
2006	54,902	23,718	24,706	6,424	14,272	60.18	12,798	51.80	3,867	60.21	30,938	56.35
2007	55,308	23,893	24,889	6,471	14,720	61.61	13,178	52.95	3,986	61.59	31,884	57.65
2008	55,716	24,070	25,072	6,519	15,174	63.04	13,562	54.09	4,106	62.98	32,842	58.94
2009	56,129	24,248	25,258	6,567	15,635	64.48	13,952	55.24	4,227	64.37	33,813	60.24
2010	56,548	24,429	25,447	6,616	16,102	65.91	14,347	56.38	4,351	65.76	34,799	61.54
2011	56,975	24,613	25,639	6,666	16,576	67.35	14,748	57.52	4,476	67.15	35,801	62.84
2012	57,412	24,802	25,836	6,717	17,059	68.78	15,157	58.67	4,604	68.53	36,820	64.13
2013	57,863	24,997	26,038	6,770	17,552	70.22	15,574	59.81	4,734	69.92	37,860	65.43
2014	58,330	25,199	26,249	6,825	18,055	71.65	16,001	60.96	4,867	71.31	38,922	66.73
2015	58,802	25,403	26,461	6,880	18,565	73.08	16,433	62.10	5,001	72.70	40,000	68.02
2016	59,289	25,613	26,680	6,937	19,086	74.52	16,874	63.25	5,139	74.08	41,100	69.32
2017	59,785	25,827	26,903	6,995	19,616	75.95	17,323	64.39	5,279	75.47	42,219	70.62
2018	60,288	26,045	27,130	7,054	20,155	77.39	17,780	65.54	5,421	76.86	43,356	71 91
2019	60,799	26,265	27,360	7,114	20,702	78.82	18,244	66.68	5,566	78.25	44,512	73.21
2020	61,316	26,488	27,592	7,174	21,258	80.26	18,714	67.83	5,713	79.64	45,686	74 51

Commercial/Industrial
Mandatory Recycling Programs
Food Waste Composting Facilities
Comprehensive Recycling Drop-off Facilities
Public Information, Training and Assistance

In the residential waste generation sector, three new programs are recommended to meet the goal: (1) expanded curbside recyclables collection, (2) a system of comprehensive drop-off recycling centers, and (3) a more comprehensive public information program covering source reduction, reuse, and recycling. These programs are discussed in Appendix B. For the commercial and industrial waste generation sectors, four new programs are recommended: (1) mandatory recycling and diversion, (2) food waste composting, (3) a system of comprehensive recycling drop-off centers, and (4) a public information, training and assistance program targeted to these generators. This latter program should include waste audits, waste reduction, utilization of waste materials as industrial feedstocks, and recycling. The separate handling of food waste in the composting program will substantially lower the contamination of corrugated and other paper in the commercial waste stream.

The projected results of the policy shift and implementation of the Level 2 recommended programs is shown as the year 2000 line on Table VII-1. This Table indicates that implementation starts in 1996, expands through 1999, and is completed in the year 2000. The diversion analysis model projects an overall diversion rate of 48.57 percent for this scenario in 2000. While this projected rate essentially achieves the AB 939 goal of 50 percent diversion, it does not represent the full potential of a diversion-oriented solid waste management policy.

3. Level 3: Maximum Diversion

Full implementation of the diversion-oriented waste management policy requires additional programs to be developed and executed by the County and the 88 cities. Level 3 efforts include:

Residential
Intensive Curbside Recycling Collection

Yard Waste Collection
Comprehensive Recyclables Drop-off Facilities
High-level Public Information Campaign
HHW Curbside Collection
Mixed Waste Composting
Weight or Volume-Based Fees

Commercial/Industrial
Mandatory Recycling Programs
Food Waste Composting
Comprehensive Recyclables Drop-off Facilities
High-level Public Information, Training, Assistance and Enforcement
Commercial/Industrial Materials Recovery Facilities (MRFs)
Special Waste Management

Under the maximum implementation approach, three additional programs are recommended for the residential sector: (1) curbside collection of household hazardous waste (HHW), (2) mixed waste composting, and (3) variable rates. The first two programs are linked. A key problem encountered in implementing mixed waste composting facilities in the U.S. has been the quality of the end product as discussed in Appendix B. A County-wide program of HHW collection at the curb has the potential to significantly reduce toxic contaminants prior to composting, resulting in a high-quality compost product. As discussed in Appendix I, Cost Issues, variable rate programs have been shown to increase diversion rates and decrease the amount of waste generated in the residential sector. A more intensive public information program will be necessary to make these programs work. Table VII-1 shows the projected results of implementing these additional programs. These programs would be implemented incrementally, culminating in 2020. The residential sector diversion increases to 80.3 percent.

In the commercial and industrial waste generation sectors, jurisdictions would begin enforcement of the mandatory commercial/industrial recycling program requirements, and two new programs are recommended: (1) special waste management, and (2) commercial/industrial mixed waste processing. The latter program would require that all permitted solid waste transfer and disposal facilities have processing capability to divert recyclable materials from all commercial/industrial waste received. In other words, every waste management site would have a commercial/industrial materials recovery facility (MRF) equipped to recover recyclables from the mixed commercial/industrial waste stream. The special waste management program

complements the MRF program by removing from the mixed waste many of the substances that can contaminate recyclable materials. The level of public information, training and assistance [illegible] to be increased to implement these programs. Implementation of these additional programs, with their new facilities, will take some time. Therefore, Level 3 is projected to be fully implemented in 2020. Table VII-1 shows the projected diversion rate for the commercial sector would be 44.9 percent in 2000, and at full implementation in 2020, 67.8 percent. In 2000, the diversion rate is 51.9 percent for the industrial sector, increasing to 79.6 percent in 2020.

B. MARKET TRENDS

1. Introduction

The success of any recycling program depends on the security of the markets for recyclable products. A material can be recycled only if a market and/or an end use exist. This Section presents a general overview of the various types of markets for potentially recyclable materials, the types of recyclables in the waste stream, and the uses of recyclables as commodities. In addition, this Section addresses some of the trends that have influenced markets in the past and making some projections for the future. A more detailed discussion of the markets for individual materials can be found in Appendix J.

2. Recyclables as Commodities

For recycling to work, adequate markets must exist for all of the materials. Many communities have experienced setbacks in their recycling programs due to faltering of one or more markets. In these cases, separated materials may be stored, but most ultimately are landfilled. Successful recycling is therefore dictated by markets.

Recyclable materials separated from the waste stream become commodities, similar to the virgin materials used to make nearly every manufactured item. For example, aluminum beverage cans -- either flattened, baled, or shredded -- become a metal commodity similar to

aluminum produced from bauxite (ore). The recycled aluminum cans are essentially pure aluminum and can be used to manufacture all of the products manufactured using ore-derived aluminum.

The same type of relationship described above for aluminum generally exists between virgin materials sources and recyclable materials sources for the other recyclables, such as ferrous metals, paper, glass, and plastics. However, the relationship is not identical in all cases. For example, the equipment and processing requirements for making paper from virgin material (wood pulp) are different from those used for making paper from recycled paper. Consequently, a paper mill may have the processing equipment to handle only virgin material (i.e., wood pulp) and cannot use recycled paper as feedstock. For this type of mill, recycled paper is not interchangeable with virgin wood pulp. However, as noted earlier, a large number of paper mills in the United States have made or are making an investment in the capability to use either recycled or virgin feedstock. Thus, the total market for recycled paper exhibits the characteristics of a commodity market.

Commodities markets function worldwide and suppliers are indifferent about the destination of their commodities. The objective is to achieve the highest price (net of transportation costs). A corollary objective is that the market will be a repeat customer since the supplier needs continuing markets for commodities. Dropping one customer to supply another -- whether a domestic or foreign entity -- for a higher price, will not pay off in the long run if the new customer does not offer repeat business. The first supplier will be displaced by another supplier for the market that was dropped, and the first supplier may have difficulty reacquiring the original customer.

Many factors affect commodities markets, and thus the prices paid for recyclable materials. Domestic production and production capacity, imports, consumption, energy and transportation costs, changing technology, new product opportunities, and availability of substitute material are among the factors that affect markets for recyclable materials. International markets are affected by the same forces as well as by foreign trade tariffs, currency

exchange rates, trade policy and programs, and other political forces. All of these elements are expressed in the language of economists as the law of supply and demand.

Export markets for recyclable materials are large and active for the United States. Paper is a prime example. Greatly expanded recycling programs on the East Coast have generated more paper than regional mills can absorb. At the same time, the growing economies of the Pacific Rim countries demand fiber that cannot be produced locally, forcing importation of recovered paper from the United States and Europe. Paper is now the number one export (in annual tons) for the Port of New York. U.S. exports (all grades) of wastepaper for the period in 1994 was 7.7 million tons. This represents a 31 percent increase over 1993 and two years of declining exports.

The greater number of factors involved in export markets serve to increase the volatility of prices paid for recycled materials. It is important to understand that domestic marketers of recyclable materials must compete with export markets for the same materials. Domestic markets would rather not compete with export markets nor pay the higher prices bid by foreign competitors.

The factors that can increase prices can also drive them down, although the principles of economics will limit the lower end. Suppliers will no longer be willing to sell materials below a certain price. Once the price drops below the full cost of producing virgin material, recyclable material will begin to displace the raw material (where interchangeable). Furthermore, once domestic production requirements (demand) for recyclable materials are satisfied, suppliers will look for export markets. Many overseas markets have no domestic virgin material supplies to compete for the available demand.

All of the market forces discussed above combine to affect the value of recyclable materials. Prices offered for recyclables have shifted significantly in recent times -- some increasing, some decreasing. An important point to realize in secondary material markets is that future prices will be more or less than any current price. Accordingly, recycling programs should be designed to lessen dependency on day-to-day materials prices.

C. TRANSFORMATION FACILITIES

This Section focuses on existing transformation (waste-to-energy or WTE) facilities and opportunities for optimum operation. This Section provides recommendations regarding existing WTE capacity to the County of Los Angeles, and the rationale behind the recommendations.

A discussion of additional WTE capacity is also provided because waste combustion for energy (steam and/or electricity) generation presents a very real option for diverting non-recoverable waste from landfill disposal. However, given the potential for public opposition as well as difficulty in obtaining permits for additional emissions in the Southern California airshed, new WTE facilities located in the County or the expansion of capacity at existing facilities are not considered in calculating diversion from the waste stream for the purposes of this report.

1. Current Transformation Facility Capacity

Los Angeles County presently has two operating waste-to-energy facilities. Both facilities are of the mass-burn type, where the MSW is not processed into a fuel prior to combustion. These facilities are described below:

a. City of Commerce

This facility is owned by the Commerce Refuse to Energy Authority and operated by the L.A. Sanitation Districts. The Commerce facility began operations in 1986. Its design capacity is 380 tons per day (TPD), and it generates electricity. Air emissions control equipment includes a spray dry absorber to reduce acid gas emissions, a fabric filter to capture particulates and heavy metals, nitrogen oxide (NOx) controls, and continuous emissions monitoring. In addition, lime injection into the combustion unit is used to further reduce acid gases. The Commerce facility recovers 1,600 tons per year of ferrous metals from the facility ash. The present tipping fee at the City of Commerce facility is $30.00 per ton. The overall reported recycling rate for the City of Commerce in 1994 was 23 percent.

b. City of Long Beach

The Southeast Resource Recovery Facility (SERRF) is owned by a joint powers authority (L.A. Sanitation Districts and the City of Long Beach Inc.) is operated by Montenay Corporation. Operations began in 1988. The Long Beach facility's design capacity is 1,380 TPD and the facility generates electricity. Air emissions control equipment includes a spray dry absorber as well as a dry scrubber for acid gas control, NOx control, a fabric filter to capture particulate and heavy metals, and continuous emissions monitoring. Long Beach recovers 13,000 tons per year of ferrous metals from the facility ash. The 1995 tipping fee at the Long Beach facility is $27.50 per ton. The facility operator notes that 800 tons per week accepted from a transfer station contains a lot of dirt, lowering the heat value of the waste, and thus reducing the energy output of the facility.

Together, these two facilities have a rated capacity of 1,760 TPD on a seven-day per week basis (expressed as 1,760 TPD_7); in 1994, these facilities processed 1,686 TPD on a six-day per week basis (1,686 TPD_6).[20] Currently, the facilities report that they are operating at near capacity, but are threatened by relatively cheap landfill disposal capacity available in the region. For example, waste presently flowing to the Long Beach SERRF may be lost to the Orange County Landfill, which is offering disposal for a tipping fee at the $20.00 per ton level. Unlike landfill capacity that can be "banked" for future use, WTE capacity not used each day is lost capacity. Additionally, any low-heat value waste (such as the dirt-laden transfer station waste sent to City of Commerce), reduces the energy output of the facility and increases operating costs because of the lost revenues. Therefore, it is recommended that the County:

- develop policies and plans to fully utilize capacity at the two existing waste-to-energy facilities in the future; and
- develop policies to ensure that the waste delivered to the WTE facilities is combustible (i.e., not dirt).

[20]Based on 1994 annual tonnage data reported by the California State Board of Equalization.

2. Future Expansion and/or Additional Transformation Capacity

The DEIR/DEIS indicates that WTE alternatives were not considered because they "take material away" from diversion and recycling. This is no more true of WTE facilities than it is of landfills. Integrated waste management calls for planning a mix of alternatives. If Los Angeles County achieves 70 percent diversion in the year 2020, there will still be 10,000 tons per day of waste needing disposal. Four 2,500 TPD WTE facilities[15] would reduce the need for landfilling to approximately 3,000 TPD, taking into account the seven-day per week operation and 25 percent (by weight) ash generation of WTE facilities and would generate 280 mega watts of electrical power.

There is a total of 121 municipal waste-to-energy facilities operating in the U.S.[16] These WTE facilities are constructed using two entirely different technologies, mass burn and refuse-derived fuel (RDF). Mass burn WTE facilities accept mixed MSW into a storage area and feed this material directly into the furnaces for combustion. The heat generated is used to produce steam and electricity. Refuse derived fuel facilities have additional processing beyond receiving and storage. This processing usually includes removal of non-combustible materials and shredding the combustible portion to a uniform particle size. The shredded material, RDF, is reading to be fired directly into dedicated boilers or in combination with other fuels in existing boilers. RDF can also be compressed into pellets for easier storage and handling.

One advantage of the RDF approach is that the fuel can be prepared in a different location from the combustion site. RDF processing could be incorporated as part of the transfer station/MRF facilities contemplated for rail haul. RDF technology would allow location of combustion power plants outside the Southern California airshed, eliminating concern about the impact of WTE emissions in Los Angeles County.

[15]Ten thousand tons per day (10,000 TPD) 6 days per week converts to 8,571 on a seven day basis; sizing the facilities to be 85 percent available results in four facilities with a total rated capacity of 10,084 TPD. This was rounded to four 2,500 TPD facilities. The 2,500 TPD of ash generated 7 days per week would result in 2,917 TPD going to landfill 6 days per week.

[16]Integrated Waste Services Association (IWSA), *Municipal Waste Combustion Directory of the United States*, 1995.

A major opportunity is for existing coal-fired power plants to substitute refuse-derived fuel (RDF) for a portion of their coal feedstock. The logical choice of power plants would be those which supply some of the region's electrical power, such as the Southern California Edison Mohave plant in Nevada or the City of Los Angeles Intermountain plant in Utah.[23] Each of these plants burns approximately 12,000 TPD of coal and is accessible by rail. If they obtained 10 percent of their energy from RDF, these two plants would utilize about 5,000 TPD of RDF. This has been done by Northern States Power in Wisconsin and Minnesota, resulting in both lower air emissions and increased waste management capacity, while maintaining power output.

Expansion of the two existing WTE facilities is a possible future option for Los Angeles County; however, there are several reasons for not entertaining this option at the current time. First, the facilities must compete with relatively cheap landfill prices in the region. Expansion should have the effect of lowering their per-ton operating costs on a per-ton basis (since adding a new line or two is lower-cost than building an entire new facility), but it is unlikely that they could reach the $20/ton tip fee and without endangering the financial stability of the facilities. There is enough challenge in maintaining waste flow for current capacity. Second, expansion could mean renegotiating their power agreements with Southern California Edison, and the new power purchase rates would be much lower than present rates. Both are presently receiving $0.13 to 0.14 per kilowatt hour (kWh) with a floor price of $0.09/kWh. New rates would be about $0.01 to 0.02/kWh, which would force tipping fees up to $85 to $100/ton.

Potential environmental and human health impacts of waste-to-energy have received considerable attention from the media and from the environmental activist community in recent years. What has not been made clear in this dialogue is that WTE is a cleaner power generator that the two primary sources of electricity in the U.S., e.g., coal and oil. Further, WTE air emissions only slightly exceed natural gas (the cleanest-burning fossil fuel) in the amount of pollutants emitted per unit of energy produced. A detailed side-by-side health risk analysis that compares a new landfill with a mass burn waste-to-energy plant "...shows that WTE plants may

[23]*Electric Power Monthly*, Energy Information Administration, U.S. Department of Energy, November 1995.

be a better choice than landfills for minimizing health risks and environmental effects."[24] Finally, WTE does not present the potentially grave environmental and health impacts associated with [illegible].

A recent article in *Environmental Health Perspectives*[25] prepared by scientists and health professionals from the University of North Carolina at Chapel Hill, the U.S. EPA, and Mecklenburg County Health Department, reports on the first year of a three-year study of air quality and respiratory function and symptoms in six communities. Three of the communities have waste combustion facilities (one municipal solid waste-to-energy facility, one biomedical incinerator, and one liquid industrial hazardous waste incinerator). Each of these three communities were paired with comparable communities that do not have such facilities, for a total of six study sites. The article notes that results of the first year air monitoring showed, "(d)irect measurements of air quality and estimates based on a chemical mass balance receptor model showed that incinerator emissions did not have a major or even a modest impact on routinely monitored air pollutants." Similarly, the results of the epidemiological surveys showed that, "(a) one-time baseline descriptive survey (n = 6963) did not reveal consistent community differences in the prevalence of chronic or acute respiratory symptoms between incinerator and comparison communities, nor did we see a difference in baseline lung function tests or in the average peak expiratory flow rate measured over a period of 35 days." In conclusion, the article abstract notes, "(b)ased on this analysis of the first year of our study, we conclude that we have no evidence to reject the null hypothesis of no acute or chronic respiratory effects associated with residence in any of the three incinerator communities."

Southern California receives electrical power from a variety of primary as well as alternative energy sources. Major primary sources include coal-fired out-of-State power plants

[24]"Comparing Air emissions from Landfills and WTE Plants," Kay H. Jones, *Solid Waste Technologies*, March/April 1994.

[25]Carl M. Shy, et al., "Do Waste Incinerators Induce Adverse Respiratory Effects? An Air Quality and Epidemiological Study of Six Communities," *Environmental Health Perspectives*, Journal of the National Institute of Environmental Health Sciences, V. 103, No. 7-8, pages 714-724, July-August 1995.

as discussed above. Alternative sources include hydropower (from Hoover Dam), wind energy, and some experimental solar salt ponds at the Salton Sea. As L.A. County's population continues to grow, electrical service requirements will also continue to grow. New power capacity will be developed to meet this demand. Some or all of this demand could be met by conservation measures in the near term; however, sufficient conservation is unlikely under present legislative and regulatory structures. Because of the significant line losses experienced when transmitting power long distances, development of local power generation capacity is preferable to wheeling power in from outside the Los Angeles area.

New electrical power source options include new or expanded facilities based on fossil fuels (coal, oil, and natural gas). Coal and oil, in particular, would be difficult to justify given the air pollution concerns in the Southern California Air Quality Management District (SCAQMD). Siting a nuclear power plant is also problematic due to concern about possible earthquake damage to reactor containment (e.g., Diablo Canyon).

Expansion of existing alternative energy facilities or development of new ones is also limited. There are no rivers of sufficient year-round flow volume in Southern California that can provide additional hydropower from dams, not to mention the significant environmental impacts that result from damming up rivers to fill canyons. Both windpower and solar salt pond locations are relatively remote from populated areas, so long-distance line transmission would be required if these sources are expanded. Expansion of the wind farms in the desert near the Little San Bernardino Mountains is likely to encounter opposition from the growing desert cities (Palm Springs, Rancho Mirage, Desert Hot Springs, Palm Desert, etc.), as vast areas of (potentially subdividable) desert are already dedicated to wind farms. Solar technologies, including salt ponds, are still considered developing technologies, and have cost as well as technical limitations to their application.

Another developing technology that may become available for future power generation in Los Angeles County is pyrolysis (gasification) of municipal solid waste or selected feedstocks from the waste stream (e.g., tires). This technology breaks down the organic components of the waste into combustible gases, char, and oil by exposing the feedstock to high temperatures

in the absence of oxygen. Pyrolysis has been demonstrated under various private and federally-sponsored research projects; however, no successful commercial applications exist to date. However, in the 50-year planning period considered by the County, maturation and application of this technology is a reasonable possibility.

In conclusion, waste transformation technology is a viable option for future application to two problems that need to be addressed in Los Angeles County: diversion of municipal solid waste from landfill disposal, and generation of electricity to meet new population demands.

VIII. NEW PROJECTIONS FOR DISPOSAL DEMAND

Chapters IV through VII identify flaws in the design and calculations used by the County in the DEIR DEIS and Siting Element "time-to-crisis" projections for the Los Angeles County solid waste disposal system. Each chapter highlights a portion of these projections, and provides an alternative projection, oftentimes supported by Los Angeles County government documentation. The strategy presented in this chapter includes all of the projection alterations, except landfill expansion, made in Chapters IV through VII. The alterations include the utilization of the following:

- closing of the BKK and Lopez Canyon landfills in 1996;
- increased waste exports;
- inert landfill capacity;
- waste-to-energy facilities in Los Angeles County;
- all operational Class III landfills in Los Angeles County;
- historically justified waste disposal rates;
- foam as an alternative daily landfill cover; and
- aggressive (but obtainable) recycling diversion rates.

Two different scenarios were run with the waste materials flow model to illustrate the impact of the intensive recycling and diversion strategy that is recommended for Los Angeles County. These are:

Scenario 6A: Achievement of a 70 percent diversion goal for all 88 cities and the County in the residential, commercial, and industrial sectors. This is targeted for achievement in 2020, the same schedule as the City of Los Angeles.

Scenario 6B; A strategy of diversion through landfill bans for corrugated board (cardboard), wood and yard waste. A landfill ban on all recyclable materials would accelerate this strategy; however, bans on these three illuminate this strategy's effectiveness.

Both of these Scenarios build on the strategies recommended and illustrated in the first five Scenarios as discussed in Chapter V. However, both are mutually exclusive -- that is, they are not combined into a single model run. In actuality, an intensive diversion and recycling strategy would employ the 70 percent goal and landfill bans for recyclable materials. In addition, this strategy must include a wide variety of diversion programs and facilities for processing materials banned from landfills. These facilities range from MRF's, such as the 4,400 TPD facility planned for Puente Hills with a 15 percent diversion, to the 1,000 TPD Bio Gro/Wheelabrator facility with diversion close to 100 percent. The full program recommended for the County is outlined in Chapter VIII and technologies discussed in Appendix B.

Scenario 6A: Total County 70 Percent Diversion

This Scenario assumes that all the cities, in addition to the City of Los Angeles and the County unincorporated area as discussed in Scenario 4, achieve 70 percent diversion in 2020. This would mean the cities, which represent 53 percent of the waste generated in the County, adopt and implement this 70 percent diversion goal.

This option does not have any impact until after the year 2000. Starting in 2001, the impact is to increase the diversion of the entire County by one percent per year and to extend the Shortfall by two years compared to Scenario 5, to 2016. This can be seen in Figure VIII-1. The amount of the Shortfall is 3,500 TPD in 2016, and increases to 10,000 in 2023. Further reductions, in excess of 5,000 tons per day (TPD), occur in subsequent years, as can be seen by comparing Figure VIII-1 and VIII-2.

Scenario 6B: Recyclable Material Bans

Most recycling and diversion programs target specific materials in the waste stream. The programs in Los Angeles County are no exception. Table VIII-1 lists these materials, along with the fraction of the County waste stream which they constitute. These materials total 57 percent of the waste disposed. Table VIII-1 also shows the estimated quantity of each of these materials disposed in landfills in 1995. It is recognized that the composition of the waste stream has

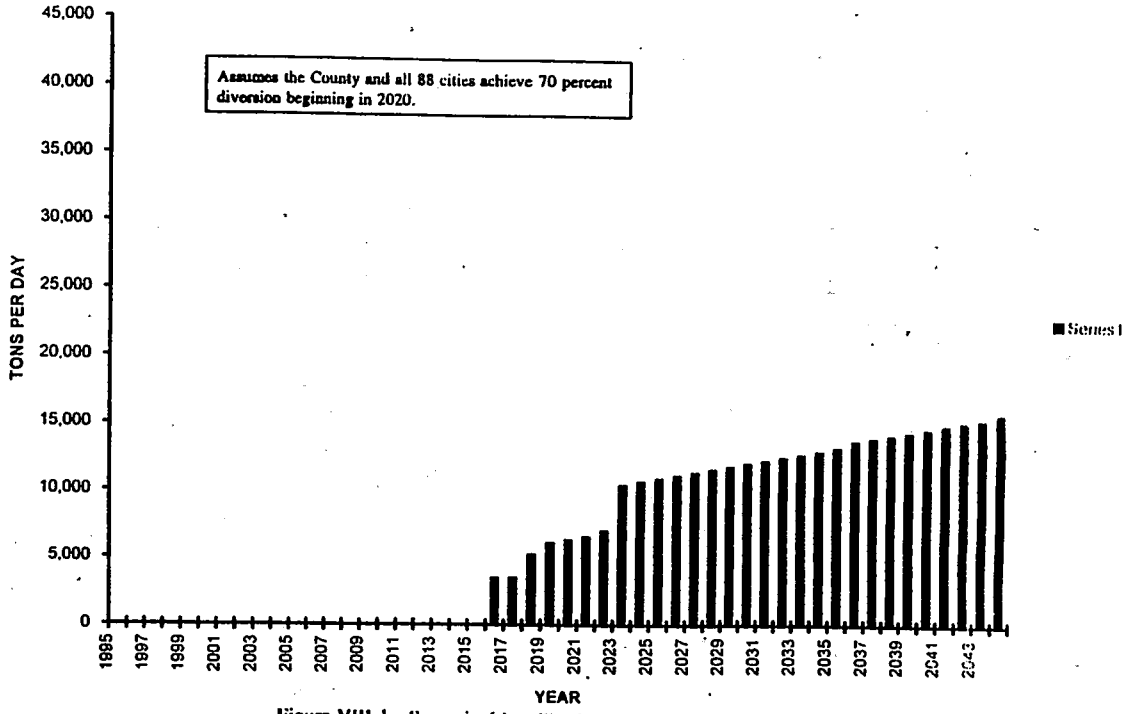


Figure VIII-1. Scenario 6A -- Total County 70 Percent Diversion
Los Angeles County Disposal Need

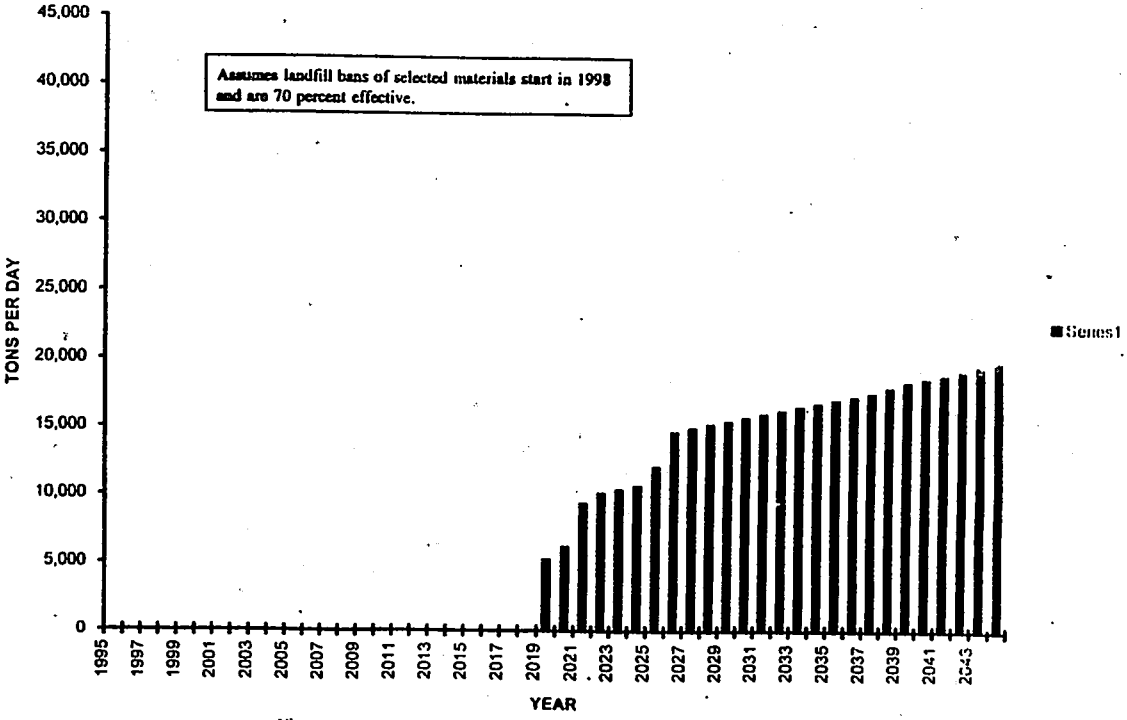


Figure VIII-2. Scenario 6B -- Landfill Bans of Selected Recyclables
Los Angeles County Disposal Need

changed since the 1990 SRRE's and the CIWMB Interim Database, the source of this data. These changes in subsequent waste composition are caused by changes in products in the marketplace. For example, the weight of individual glass and metal containers has decreased

Table VIII-1. Los Angeles County
Estimated Average Waste Composition of Selected Recyclable Materials

Waste Categories & Types	Composition As Disposed (%)	1995 Quantities Disposed (Tons)
Cardboard & Bags	8.3	868,241
Mixed Paper	11.7	1,223,906
Newspaper	5.1	533,498
Hi-Grade Ledger Paper	2.0	209,215
HDPE Containers	1.0	104,607
PET Containers	0.3	31,382
Recyclable Glass	3.0	313,822
Aluminum Cans	0.3	31,382
Ferrous & Tin Cans	3.9	407,969
White Goods	0.3	31,382
Yard Waste	12.7	1,328,513
Wood	8.8	920,545
TOTAL:	57.4	6,009,462

Source: CIWMB Interim Database Project, revised August 4, 1993.

in the last six years, and material substitutions in products, such as plastics for metals and glass, have changed the relative concentrations of these materials. In addition, the waste stream composition is altered by diversion. For example, diversion of all newspaper would result in an increase of the percentages of all other materials. Because of these changes -- and the fact that landfill bans, even when enforced, are never 100 percent effective -- not all of these banned materials will be diverted. To account for these factors, it is assumed in this Scenario that 70 percent of these materials will be diverted due to the landfill bans.

For this Scenario, the three materials (corrugated, wood and yard waste) shown in Table VIII-1 are banned from landfill disposal, beginning in 1998. These constitute 8.8, 8.3 and 12.7 percent, respectively, of the waste disposed (or approximately 30 percent total). The ban is

assumed to be 70 percent effective, allowing 30 percent of the banned material still to be landfilled. This strategy illustrates the effectiveness of immediate action on the part of the County. It postpones the Daily Disposal Shortfall until 2019, a gain of five years over Scenario 5 (Chapter VII). This is shown graphically in Figure VIII-2. Every year of delay in the implementation of this and other diversion strategies results in loss of landfill capacity. This capacity is difficult to replace.

As the model Scenarios illustrate, intensive recycling and diversion is an effective strategy for managing waste and conserving landfill space. Applying landfill bans to all the recyclable materials referred to in Table VIII-1 and developing recycling programs for these materials in the residential, commercial, and industrial sectors will further reduce the need for landfills in the County. The sooner this strategy is implemented, the greater its impact will be.

IX. LANDFILL EXPANSION POTENTIALS (SCENARIO 7)

The solid waste management strategies discussed in the previous chapters clearly will eliminate the need for additional in-county landfills in the short term (AB 939, 15 year planning period), if implemented. In the long term, The County and the 88 Cities will need to implement additional solid waste management strategies. After implementing all the strategies discussed the County and the Cities will have some 15,000 to 20,000 tons per day of waste to manage. A number of alternatives have been discussed but not included in the projections, including additional export (rail haul and remote landfilling), refuse derived fuel burned in existing coal fired powerplants, and composting. Expansion of existing in-county landfills is examined but not recommended in the following paragraphs.

Potential landfill expansions and closures play a large role in identifying the "time-to-crisis" for Los Angeles County. Depending on what is assumed with regard to expansions and closures, projections will indicate no crisis or a crisis in the next year. Projections in Table V-1, which were used in the Elsmere Canyon DEIR/DEIS, neglect the expansion potential of the landfills, which is an important factor in identifying a more realistic "time-to-crisis." In the Siting Element, six existing landfills were projected to expand and four new ones developed. It is true that there is no guarantee that permits will be renewed and extensions may be contested; however, the vast majority of landfill permits are extended, making this scenario the most probable outcome. Table IX-1 provides current and potential capacities for the landfills in Los Angeles County. All of the information in Table IX-1 is taken from reports generated by the Los Angeles County Department of Public Works.

In the Siting Element, the County suggests a scenario in which six landfills are expanded to their physical capacity. These are: Antelope Valley[20], Chiquita, Lancaster, Lopez, Puente Hills and Sunshine. In addition, the County shows the opening of four new landfills: Blind, Elsmere, Mystic/Rustic-Sullivan, and Towsley. This scenario results in a surplus of landfill capacity in the County through the planning period. The surplus is over 50,000 TPD at the end

[20]Antelope Valley has been issued a revised permit that increases daily disposal capacity to 1,400 TPD.

Table IX-1. Current and Potential Disposal Capacities for the Los Angeles County Landfills

Landfill	Permitted Disposal Capacity[1] (TPD)	Average Daily Disposal 1994	Total Permitted Capacity (million tons)[1]	Total Expanded Capacity (million tons)
Puente Hills	12,000	10,945	33.0	67.4[2,3]
Spadra	3,700	2,156	2.81	2.81
Scholl Canyon	3,400	1,587	11.5	11.5
Bradley	7,000	4,448	3.91	8.91
Sunshine Canyon	6,600	0	17.0	100.0[2]
Chiquita Canyon	5,000[4]	1,692	2.31	32.31[2]
Calabasas	3,500	2,975	12.6	12.6
Brand Park	102	18	0.6	0.6
Antelope Valley Dump	750	539	2.3	2.3
Azusa Land Reclamation	6,000	695	3.5	3.5
Burbank	240	162	6.4	6.4
Lancaster	1,000	435	0.66	0.66
Pebbly Beach Disposal	33	4	0.044	0.044
Whittier-Savage Canyon	350	217	2.73	2.73

[1]Draft table, "Remaining Permitted Combined Disposal Capacity of Existing Solid Waste Disposal Facilities in Los Angles County as of January, 1995," Los Angeles County Department of Public Works, March, 1995.

[2]"Expansion of Existing In-County Waste Disposal Sites and Projected Disposal Needs," Los Angeles County Department of Public Works.

[3]Based on the calculation of 12,000 TPD x 312 days/year x 18 years (1995 to 2013) = 67.4 million tons.

[4]After expansion, the permitted daily capacity will increase to 10,000 TPD.

of the 15 year planning period, in 2010. In fact, the County's scenario of landfill expansion would result in excess landfill capacity in the County even without the new landfills.

This section (Scenario 7) examines a more modest landfill expansion strategy, where five landfills are expanded. Lopez and BKK have been dropped from the expansion list because they are scheduled to close in 1996. Also, this strategy reduces the size of the expansions of the five landfills. The values for expansion are as follows:

Antelope Valley	5.3 million tons
Chiquita	17.0 million tons
Lancaster	5.7 million tons
Puente Hills	50.0 million tons
Sunshine	60.0 million tons

These values for expansion were calculated by taking the difference between the total physical capacity and the present Total Permitted Capacity, dividing this potential increase in half, and adding this increase to the remaining Permitted Capacity. This value was then rounded.

This strategy is effective after the strategies described in Scenario 1 through Scenario 5 in Chapter V are implemented, as is the landfill conservation strategy discussed in Chapter VI. Intensive recycling and diversion described in Scenario 6 are not activated. The strategy in this Scenario postpones the "time to crises" to 2023, well beyond the AB 939 required planning period. Further, the Shortfall, when it does occur, is not severe, starting at 800 TPD and increasing to 10,000 and growing slowly thereafter. This is shown graphically in the chart in Figure IX-4.

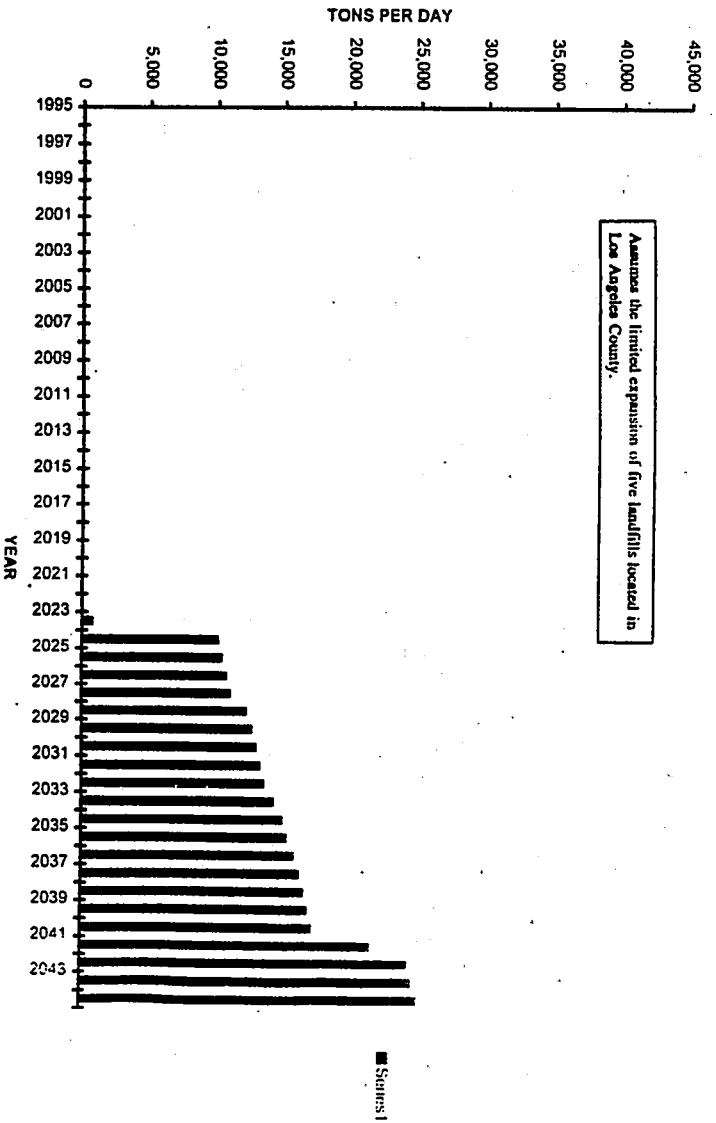


Exhibit IX-1. Scenario 7 – Landfill Expansions
Los Angeles County Disposal Need

X. RECOMMENDED COUNTY ACTIONS

This Chapter draws upon preceding Chapters to establish the County's potential for a leadership role, as well as pointing out direct actions presently within the purview of the County government. Recommendations cover:

- Changes to the County structure that will foster a policy shift to diversion/transformation as the preferred methods for addressing solid waste, and
- Specific, practical applications.

Sections within the Chapter, where appropriate, estimate the amount of diversion that can be accomplished by implementing a particular recommendation.

The estimated cost of implementing a recommended plan is normally developed as part of the planning process. Because this report has been developed without County input, however, there are many unknown cost factors that make estimation of overall costs a misleading exercise. Some critical cost issues are discussed in Appendices E and I. It should also be noted that cost is not the deciding factor in determining the level of implementation for solid waste diversion programs; State law and federal EPA guidelines make it clear that source reduction/recycling are the preferred modes of managing solid waste, whether it is cheaper in the short run or not. Further, the guidelines for Environmental Impact Statements require consideration of alternatives without regard to cost.

A. USE OF COUNTY SOLID WASTE TASK FORCE

The Los Angeles County Solid Waste Management Committee (the Committee) has been in the forefront of solid waste planning for years. With the passage of AB 939, the Committee was given the task force responsibility as required under this legislation, by the County. The Committee has provided policy guidance for the Los Angeles County Board of Supervisors. Also, the Committee is responsible for coordination of solid waste management issues on a county-wide basis. The Committee has failed to develop a policy direction for the County that focuses on alternatives to in-county landfills.

Recommended County Action

The Board of Supervisors should reconstitute the Committee and give the reconstituted Committee the charge of developing diversion-oriented policies for the County.

B. WASTE DISPOSAL PRACTICES OF COUNTY DEPARTMENTS

Waste from government-owned and/or operated facilities can be a substantial portion of the municipal waste stream. This waste often goes unnoticed because it is considered "commercial waste" in traditional waste composition studies. However, where localities have conducted an analysis of that portion of the commercial waste stream attributable to government operations, the results can demonstrate significant opportunities for government diversion activity. For example, in the City of Los Angeles, an estimated 2.3 million tons of the total waste generated in 1995 was under City control and 29 percent of this was generated by government agencies.

Los Angeles County Public Works Department should seek assistance from other County Departments in achieving AB 939 goals and extending the life of in-County landfills. This is particularly important in light of the increased emphasis being placed in the County on commercial and institutional recycling rates and the expansion of residential curbside programs to include mixed paper and yard trimmings. All County agencies should be responsible for achieving 50% or greater recycling rates as well, including county offices, health facilities, prisons, parks and recreation facilities, maintenance facilities, etc.

Clearly, County Public Works does not have the authority to require such diversion activity from other County agencies. However, it can, and should, use its position to gather and analyze data, track recycling rates, and make recommendations to the County Board of Supervisors, which can then direct each individual agency to institute and report on diversion activities.

The ancillary benefits of such an approach are also substantial. Agencies are often unaware of their solid waste costs, focusing on diversion will result in significant source reduction as well as recycling. These efforts will produce cost savings to the generating agencies.

The County should recommend that the Board of Supervisors require the following of each County agency:

1. Commit to 50% recycling rate by 1998 and 65 percent by 2000.
2. Develop a plan to achieve these diversion rates, with year to year goals.
3. Prepare a report in 1996 that contains the following information:
   a. Describe how solid waste for the agency is picked up and disposed (agency employees, contracts with haulers, etc.)
   b. Provides a cost estimate for disposal (total and cost per ton)
   c. Describes service level utilized (number of containers, size of containers, frequency of pick-ups, etc.)
   d. Estimates the tons/year disposed of by the agency.
4. Prepare a report in 1996 that summarizes agency recycling activity, if any, and quantifies the cost, cost/benefit of those programs.
5. Submits quarterly narrative reports to the Department of Public Works, which are then summarized and included in DPW's Quarterly Report on the Action Plan to the Board of Supervisors.
6. Submits annual reports to the Board of Supervisors on status of recycling programs, including quantification of diversion rate.

The County Sanitation Districts of Los Angeles County (Sanitation Districts) operate two buy back/drop off centers for the general public: one at the Puente Hills Landfill and the other at the Palos Verdes Landfill in Rolling Hills Estates. The Palos Verdes Recycling Center opened in November 1977 and the Puente Hills Recycling Center opened in October 1982. Customers can receive money for their recyclables or "donate" them to a designated charity.

These are in addition to the four active landfills, a transfer station, three landfill gas-energy facilities, and the Commerce waste-to-energy plant operated by the Sanitation Districts.

Since their opening, both facilities have added materials to the list of recyclables accepted from the public and currently both accept glass in three colors, aluminum, steel, PET and "other plastic" containers, and newspaper. Over time, each facility gradually increased tonnage and customers and then began to experience a decrease in both tonnage and customers. For example, the Puente Hills Recycling Center started in 1982 with 424 customers bringing in 36 tons, grew to 7,499 customers bringing in 376 tons in 1991, and then dropped to 180 tons received from 4,535 customers in 1994. Similarly, the Palos Verdes facility accepted 449 tons from 4,627 customers in 1997, grew to 4,597 tons from 23,914 customers in 1991, and dropped to 689 tons from 16,688 customers in 1994. While some of this drop in the quantity of materials can be attributed to the initiation of curbside programs throughout the County, some of this drop is due to a lack of public information and promotion.

Both facilities could assist in the achievement of County-wide goals by filling gaps in curbside service and by encouraging residents and small businesses to drop off source separate materials for free as a means of avoiding disposal charges. The easily recycled materials, including corrugated cardboard, magazines, office paper and mixed paper, should certainly be added to the materials accepted by the centers. Harder-to-recycle materials, including white goods, tires, batteries, separated construction and demolition waste, and wood, should also be accepted. In addition, a drop-off site for clothing and small durables could be added in cooperation with a charitable organization. Information could be distributed at the site regarding other opportunities to divert materials in Los Angeles County. Through this and other types of activities, the Sanitation Districts could fill voids in County diversion services and increase overall tonnages diverted County-wide.

Recommended County Actions:

It is recommended the Sanitation Districts expand the drop-off system. This should include expanding the material accepted as discussed above and increasing the number of sites. The Sanitation Districts own and/or operate some 20 facilities throughout the County. An expanded citizens drop off center should be located at each of these facilities, if practical.

The Sanitation Districts should adopt and implement the 65 percent diversion goal for its facilities (offices and plant as applicable), as discussed above.

C. UNINCORPORATED AREA ACTIONS

Based on Los Angeles County's AB 939 disposal surveys, the unincorporated area of the County landfilled 211,057 tons of waste per quarter, compared to 2,923,059 tons landfilled from all localities in the County. This represents 7.22% of Los Angeles County landfilled waste, a substantial portion of County landfill usage. Overall, County quarterly disposal reports indicated that solid waste facilities in the County received a total of 289,010 tons of waste from the unincorporated area, compared with 3,756,290 tons from all Los Angeles County localities, or 7.7% of the total. The latter includes tons salvaged, transformed, landfilled and used as ADC in solid waste facilities in the County.

Los Angeles County Department of Public Works has a unique opportunity to both extend landfill life and to provide a leadership role in demonstrating diversion opportunities through its management of waste collection systems in the County unincorporated area. Therefore, it is recommended that Los Angeles County use the unincorporated area as a demonstration for intensive recycling and diversion. To do this the County would need to implement the Level 3 Maximum Diversion program described in Chapter VII.

Recommended County Actions:

Los Angeles County should implement the maximum diversion program. To initiate this program it is recommended that the County:

- Make a formal announcement to adopt the program;
- Adopt a 70 percent diversion goal for the unincorporated area;
- Establish a program team to develop a detailed plan and implement;
- Establish an enterprise fund administration and accounting system for solid waste in the unincorporated area solid waste system and fund it.

D. MANAGEMENT OF COUNTY BIOSOLIDS

The Sanitation Districts collect and treat wastewater for 78 cities and unincorporated areas in Los Angeles County. The Sanitation Districts operate 11 wastewater treatment facilities with a combined daily flow of more than 500 million gallons. Seven of the facilities are located in the metropolitan area of Los Angeles County, two in the Santa Clarita Valley, and two in the Antelope Valley.

The largest of the facilities is the Joint Water Pollution Control Plant located in the city of Carson. Approximately 1,250 wet tons of biosolids are generated at this facility daily. Total wet tons for 1994 were 473,200. Wastewater treatment for the Santa Clarita Valley is conducted at the Saugus and Valencia Water Reclamation Plants and solid generated during treatment are processed at the Valencia facility. A total of 20,000 wet tons of biosolids were disposed of in 1994 at the Chiquita Canyon Landfill. The Antelope Valley facilities include the Lancaster and Palmdale Water Reclamation Plants. Approximately 20 wet tons are produced daily from these facilities, where anaerobically digested, dried biosolids are intermittently released for soil amendment material. For example, the Antelope Valley biosolids have been used in agriculture, for landscaping at the Mira Loma Jail, and to revegetate perimeter slopes at local landfills.

Despite contracts for composting, land application, and Nox reduction in cement kilns, some 3,000 wet tons per week are sent to Puente Hills Landfill from Los Angeles County, out of a total of approximately 9,600 tons per week produced by all County-operated facilities. At an average of 500 tons per day (TPD) disposed in Puente Hills Landfill (6 day week), biosolids utilized almost 4% of Puente Hills daily capacity (13,200 TPD) and 4.6% of the average daily tonnage disposed of at Puente Hills in 1994. This was mentioned in Chapter VII and represents a significant usage of Puente Hills capacity which could be utilized to either extend Puente Hills' landfill life or to accept residential and commercial waste in the future which would otherwise have to be disposed of at out-of-County or out-of-state landfills.

Recommended County Actions:

The Sanitation Districts should institute a policy of 100% composting, land application and NO_x reduction in cement kilns for all County-generated biosolids, with Puente Hills Landfill disposal utilized only as a backup when other alternatives fail in an emergency.

Since sludge was not calculated in the AB 939 aggregated County tonnages, this means that the 500 TPD of material sent to Puente Hills shows up County-wide as an increase in disposed waste over 1990 in the disposal surveys done for AB 939 compliance in 1995. While it is not certain, the small amount shown in the CIWMB interim database was probably as a result of the City of Los Angeles disposed tonnage.

E. MANAGEMENT OF COUNTY LANDFILLS

Landfills in Los Angeles County can be managed to maximize diversion and conserve landfill capacity. The start for this approach would be the adoption of a policy by the County that recognizes that land for urban landfills is a scarce and diminishing commodity. The current landfill tipping fees do not reflect this fact; however, it is demonstrated by growing public objection to new and existing landfills. The County policies should reflect this problem, and take concrete action. The recommendations offered in this Section are some of the actions the County could take.

First, the County should implement Item 5 of the 1988 Action Plan, direct billing for collection and disposal of solid waste. To be most effective, this billing should itemize the various components of the cost: recycling, yard waste, solid waste collection, disposal, etc. The basis for this must be full cost accounting, utilizing an enterprise fund as discussed in Appendix E. The coupling of direct billing with a variable rate structure based on weight or volume has been shown to reduce total generation of waste and to increase diversion in communities that use this approach. A variable rate structure is applicable to both residential and commercial wastes. Currently, larger U.S. private haulers are implementing weight-based systems using scales on their trucks to weigh each container as it is dumped. They are finding that the cost of the system, about $10,000 per truck, is paid for by more accurate billing of generators based upon weight the same way the hauler pays by weight at the landfill. The City of Seattle Case Study provided in Appendix A describes the application of a variable rate system to a residential integrated waste system.

As discussed in Chapter V, prohibiting landfill disposal of specific materials is effective in achieving diversion. Enforcement of bans for such materials as yard waste, white goods designated recyclables, and so on cannot be 100 percent effective for a variety of reasons, as discussed in Chapter V. However, if 70 percent effective, bans would reduce the material being landfilled by approximately 21 percent.

It is recommended that a chemical foam system be adopted as the daily cover method used by all the landfills in the County. This alternative landfill management technique is discussed in Chapter VI. Included as part of this is the recommendation that shredded yard waste no longer be permissible as alternative daily cover. Implementation of this recommendation will increase the capacity of all the landfills by 25 percent (i.e., the space taken up by the use of dirt and other cover materials such as shredded yard waste).

Technology discussed in Chapter VI is under development to accelerate the breakdown and stabilization of the mainly organic material in landfills using shredding, moisture adjustment and leachate recirculation. Los Angeles County could initiate a development project to demonstrate the effectiveness and cost of the approach. This would involve implementing this

management technique in one operating landfill and collecting data on operational and cost elements. If successful, accelerated biostabilization has the potential to double the capacity of existing landfills, based upon the Albany, New York experience.

Recommended County Actions:

- Implement direct billing of a variable rate based upon full cost accounting in the unincorporated areas. It is also recommended that the County meet with the Cities to develop cooperative methods to implement similar systems in all jurisdictions in the County. It is recommended the County and the Cities pass ordinances to require similar billing by private haulers and that the data collected be part of a periodic reporting requirement.

- Prohibit the disposal of the following materials in all public and private class III landfills in the County: materials designated for recyclable collection, yard waste, white goods, tires, vehicle batteries, inert materials, wood, and biosolids.

- Encourage the adoption of foam (or tarp) daily cover in lieu of dirt or green waste alternative daily cover at all landfills in the County. The County could initiate a demonstration program at one landfill to test effectiveness of various products, and provide a site for training public and private landfill staff.

- Prohibit the use of shredded greenwaste as alternative daily cover.

- Initiate a demonstration project for accelerated biostabilization of landfilled organic wastes, documenting costs and experiences, and providing training to other landfill owners and operators.

- Require all commercial/industrial waste disposal to be MRF-processed, at transfer stations or at the landfill sites.

- Develop commercial/industrial waste Materials Processing Facilities (MRFs) at landfills located in the County, as discussed in Chapter VII. MRFs may be publicly-sponsored, private enterprises, or joint efforts.

F. MANAGEMENT OF TRANSFORMATION FACILITIES

While the County does not have direct control over the operations of two existing waste-to-energy (transformation) facilities in the County, the Sanitation Districts have direct participation in both facilities. The 380 TPD City of Commerce facility is operated by the

Sanitation Districts. In the case of the Southeast Resource Recovery Facility (SRRF) in the City of Long Beach, the Sanitation Districts entered into a Joint Powers Authority (JPA) agreement; this JPA owns the SERRF in Long Beach. In addition, the County has the power to direct waste from County-operated transfer stations and through County waste collection contracts to these two facilities.

It is recommended that the County:

- In consultation with the operators of the Commerce and Long Beach facilities, direct waste from County-operated transfer stations to the waste-to-energy facilities in amounts sufficient to maintain MCR (maximum continuous rating) at each facility;

- Manage incoming wastes at transfer stations so that largely non-combustible loads are diverted to landfill or inert landfill disposal rather than transferred to the waste-to-energy facilities;

- As feasible, require combustible waste collected by the County or by private haulers under County contracts be delivered directly or via transfer stations to the two waste-to-energy facilities; and

- Work with the two cities and the Sanitation Districts to explore potential for expanding capacity of the two facilities to meet permitted limits (3,230 TPD).

G. MANAGEMENT OF COUNTY TRANSFER STATIONS

In 1994, the County of Los Angeles reported that approximately 19 transfer stations were operating in the County.[21] Transfer stations are used by individual communities or solid waste collection firms to optimize their transportation costs. This is accomplished by limiting the use of small collection trucks to picking up wastes from the generators and transferring the waste to more efficient transfer trailers for long-distance hauling to the disposal site. Due to the fact that transfer stations are sited to reduce collection truck route distances, they are designed to serve a defined area and generally range in size from 500 to 3,000 TPD.

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[21]County of Los Angeles, Department of Public Works, Waste Management Division, *Nondisposal Facility Element*, March 1994.

Many private transfer stations perform some "dump and pick" operations to recover high grade materials. These operations have little specialized equipment, using a front-end loader and laborers to separate the materials on the tipping floor. The diversion rate for this type of operation ranges from zero to ten percent of the incoming waste. More technically advanced transfer station recovery systems are called mixed waste processing facilities (MWPFs). A minority of the 19 transfer stations in the County have invested in separation equipment to actively process all or a portion of the waste stream and can be classified as MWPFs. Based upon data from facilities surveyed by GAA,[22] the recovery rate for these facilities ranges between 8 and 30 percent of the incoming waste stream. Only one of the 19 transfer stations in the County exceeds 30 percent and processes a significant waste quantity.

In contrast, the 950 TPD MWPF owned by the City of Sunnyvale and operated by Western Waste diverts 46 percent of the incoming waste. This facility operates on a mix of 25 percent residential waste and 75 percent commercial waste. Some source separation takes place prior to collection of the waste delivered to the MWPF. The Sunnyvale MWPF recovers 12 grades of paper, all six plastic resin categories and other plastics, metals, glass, tires, batteries, white goods, waste oil and household hazardous waste. To achieve diversion at this scale, a substantial investment in building and processing equipment must be made. The Sunnyvale facility cost in excess of $23 million. In addition, the waste stream coming into the facility must be managed to facilitate recovery of the separate materials. This means not only segregating waste loads on the tipping floor, but modifying collection routes to reduce contamination of recoverable materials.

Transfer station planning for the future in Los Angeles should incorporate rail transfer for waste and recyclable materials in the siting and design stages. While this will tend to make the facilities larger due to the capital investment necessary, the advantages are more than off-setting. The first advantage is the reduction in truck traffic achieved by using rail transport instead of long-haul transfer trailer trucks. Second, the air emissions of a rail haul system are

[22]Eileen Brettler Berenyi, *the Materials Recycling And Processing Industry In the United States, 1995-96 Yearbook)*, Government Advisory Associates, Inc., 1995. —

significantly less than long-haul trucks, a new landfill, or a waste-to-energy facility.[23] These factors combined with the difficulties of siting large landfills in an urban area where available, [illegible] haul an attractive option. The Sanitation Districts are planning a rail haul transfer system based at the Puente Hills landfill,[24] that would include recovery of materials from the tipping floor prior to transfer (the Puente Hills Materials Recovery Facility), but no implementation has been initiated. It is possible to implement this MWPF in stages. The Sanitation Districts could construct the basic transfer building and implement the diversion activities immediately. Rail spur construction and intermodal transfer equipment could be added at a later time when closure of Puente Hills is imminent. Intensive materials recovery at the proposed Puente Hills MRF could equal the 46 percent diversion accomplished by the City of Sunnyvale MWPF discussed above.

Given the advantages discussed above, why hasn't rail haul been implemented in Los Angeles County? Part of the answer is the lack of full cost accounting for solid waste in the County. For example, the DEIR/DEIS[25] compares the estimated cost of rail haul ($50 per ton) to the estimated cost of landfilling ($20 per ton) at the proposed Elsmere landfill and concludes that the cost differential is too high. This, despite the presentation of information in the DEIR/DEIS that over 75 percent of the waste will arrive in transfer trucks. No cost for these transfer operations was considered.

The 19 transfer stations have a permitted capacity of approximately 20,000 TPD or 57 percent of the 1995 disposal requirement. The cost of transfer, which averages between $15 and $25 per ton, should be added to the disposal cost of most of the waste going to landfill to make any comparison of feasibility. The lack of a direct billing or full cost accounting system for solid waste obscures this issue.

[23]*The Feasibility of Hauling Solid Waste from the San Gabriel Valley to Remote Disposal Sites*, Southern California Association of Governments (SCAG), April 1988.

[24]*Intermodal Facility and a Waste-by-Rail Disposal System Originating from the Puente Hills Materials Recovery Facility, Draft Environmental Impact Report*, Sanitation Districts of Los Angeles County, December 1994.

[25]Page 3-20, DEIR/DEIS. —

Recommended County Actions:

- Encourage County Sanitation Districts to begin construction and operation of the proposed Puente Hills Materials Recovery Facility including rail transfer capability as soon as possible;
- Transfer haul combustible loads, as necessary, from the County's transfer facility, and assist in negotiating agreements for transfer of combustible loads from the proposed Puente Hills MRF and existing transfer facilities, sufficient to keep the two waste-to-energy facilities operating at MCR (see Chapter V, section C);
- Encourage diversion at the existing public and private transfer stations in the County, by such measures as a revolving low-interest loan fund for purchase of equipment or expansion of facilities, providing markets information and assistance in developing cooperative marketing activities, etc;
- Incorporate the cost of transfer operations and haul when comparing disposal fees at landfills.
- Develop a system of regional transfer stations that will serve the communities in the County to reduce collection truck travel and optimize waste management. Transfer stations in the system should include diversion and rail transfer capability.

H. MARKET DEVELOPMENT

The County continues to place its planning emphasis on the disposal portion of its integrated waste management strategy. The majority of the County's waste management resources are directed toward landfilling. The official policy of the State of California and the County state that 50 percent of the waste stream shall be diverted from landfills by the year 2000. Because diversion is a new approach to solid waste management, the County and the 88 cities should devote a larger portion of the planning effort and resources of the waste management activity to determining just where the diverted materials will go. As discussed in the materials markets trend description in Chapter VII and in Appendix J, recycling, which is the primary form of diversion, takes place only when the material collected by curbside or other programs is used to make a new product. This makes the manufacturers that utilize the recovered materials critical to diversion.

According to a recent report from U.S. EPA,[26] manufacturers that utilize recovered materials in their manufacturing process to make new products also produce economic and environmental benefits, including: creation of manufacturing jobs; creation of sales revenue and economic growth; reduction in air and water pollution; reduced energy and resource consumption; and reduction of the extraction impacts of developing virgin resources. In contrast to the "recyclers", collectors and processors, the manufacturers receive most of the economic benefits of recycling. For example, a ton of old newspaper is worth about $5 collected at the curb, $25 when sorted to specification, and $570 made into new newsprint. The addition of capitol and labor to the recovered materials through the recycling process creates value. Additionally, while jobs are created during the collection and processing of the materials, almost half of the total job creation occurs in the manufacturing phase. The U.S. EPA report uses the example of the processing of 15,000 tons of old newspaper annually; this creates 30 jobs in collection, 40 jobs in processing, and 75 jobs in the manufacture of new newsprint.

Given the economic trends in Los Angeles County, as discussed in Chapter V, the County would be well served by a policy that focused on the development of the manufacturing of new products aspects of the recycling process. The key to this development and the economic benefits it can produce is market demand for the recovered materials. It is a truism that when there is no market for a product, the economic activity associated with the product drops to zero. As discussed in the sections on recovered materials market trends, the industrial sector of the economy has made major investments in the use of recovered materials as feedstocks. There are many things local governments can do to support and assist industry in this. Some examples of specific programs that have been implemented were compiled by the Local Government Commission in the report *Capturing the Local Economic Benefit of Recycling*. .The section of this report, Local Officials Are Playing a Critical Role, is reprinted in Appendix I. They boil down to two recommendations for the County:

- Establish a policy of purchasing and using products that are recovered, reprocessed or made from recovered materials; and

[26]United States Environmental Protection Agency, *Manufacturing From Recyclables: 24 Case Studies of Successful Recycling Enterprises*. No. 530 R95001, February 1995.

- Make industries that add value to secondary materials or use recovered materials in new products a high priority in the County's economic development program.

I. PUBLIC EDUCATION

A County of Los Angeles public education campaign is an essential part of successfully stepping into a proactive role in solid waste reduction/diversion efforts. The County's public education approach would vary by the type of audience. Audiences the County must reach include:

- Residents of the unincorporated areas (for whom the County provides collection services directly or on contract);
- The County public-at-large, including the residents of the 88 cities; and
- The commercial/industrial sector.

1. Residents of County Service Areas

A public information campaign directed to residents of the unincorporated areas that are served by County or County-sponsored collections would primarily convey practical information on "how to" and "why to" participate in source reduction and recycling efforts. The tools available include flyers or brochures distributed along residential collection routes or at central locations such as supermarkets; press releases to local newspapers, advertisers, and community newsletters; presentations to civic organizations; participation or sponsorship of local events; and so on. Spots and programs on radio and television, both commercial and public stations, are very effective. For example, Santa Monica has run extensive programs on waste diversion and disposal. Continual reminders of how and what to recycle are needed to maintain effective residential participation in recycling programs; the information may be developed and distributed by the County or by their contractors under County supervision. Whatever efforts are undertaken to reach this audience must be coordinated with the County-wide campaign discussed below.

2. County-wide Public Information Campaign

Each of the incorporated jurisdictions in the County has developed their own recycling source reduction program, as outlined in their SRREs and implemented by the community. Each will have its own public information component to support the program. However, the County must develop a County-wide Plan that incorporates all of the SRREs (including the SRRE prepared by the County for the unincorporated areas). Preparation of this County-wide Plan is an opportunity for the County to also develop a coordinated public information campaign that enhances the efforts taken by each locality. The County's function in this campaign is that of cheerleader and role model. Highlights might include:

- Develop a model recycling program for all County offices, facilities and operations. Document the development of each type of program, including such factors as waste audits, program planning, costs, employee education, market development, and track program results. Use these "case study" model programs as training materials for private sector recycling/source reduction development projects.
- Develop a County-wide "reduce-recycle" theme advertising campaign.. The campaign theme would then be used for all County public relations efforts and would be made available to local jurisdictions to support their efforts.
- County-wide media campaigns, such as public transit "remember to recycle" posters or broadcast media Public Service Announcement (PSA) spots.
- County-sponsored support programs, such as seminars for local recycling staff, a regional on-line materials exchange, and a County-maintained data bank on regional markets and market prices for recovered materials.
- Development of local media advertisements or public information materials that can be personalized by the local jurisdictions, such as a "home composting" ad or brochure that leaves room for the addition of local contact names, telephone numbers, and addresses.
- A County-wide program targeted to public and private primary and secondary schools that will supplement local school programs, such as a travelling theater show for specific age groups or County-wide art contests.
- Provide continual feed-back on how well this program is doing as is done in other public campaigns.

3. Commercial/Industrial Sectors

County efforts in this area are crucial. The commercial waste stream represents 32.3 percent of the overall waste flow in Los Angeles County; and industrial is 17.0 percent, for a total of 44.4 percent.[7] This fraction includes County government offices, agencies and service providers, as well as private businesses and multi-family housing. Without the cooperation of this broad sector, efforts toward significant reductions in the amount of waste requiring disposal are futile. The business sector has not embraced recycling as wholeheartedly as the public/residential sector (with some prominent exceptions, such as set recycling efforts in the film industry). This attitude on the part of business is understandable as 84 percent of the 212,252 employers in the County are small businesses employing less than 20 people. Small business are more apt to feel they cannot "afford" to recycle and do not understand how it can benefit their bottom line. Larger firms often get caught up in bureaucratic procedures similar to government agencies. The focus of the commercial/industrial/institutional sector is on manufacturing a product and selling it on the market, providing a service and bringing in new customers, or otherwise fulfilling their business aims and goals. However, the message that source reduction and recycling are part of "good business" must be conveyed.

Recommended County Actions:

- Convince businesses that source reduction and recycling, properly implemented, can reduce their operating costs. Make businesses aware of the value of their discards.
- Let the business sector (including County government) know that recycling is appreciated by their customers. Generating customer approval is good business.
- Promote local jurisdiction "waste audits" for businesses, provide technical support.
- Make businesses aware of the liabilities of their discards. Source reduction or elimination of hazardous wastes can pay off in reduced disposal costs.

[7]Totals do not add to 100% due to rounding. *Source Reduction and Recycling Element (SRRE) for Unincorporated Los Angeles County*, County of Los Angeles, Department of Public Works, December 1991. See Appendix G.

Additionally, under the Superfund law, what you threw away yesterday can come back to haunt you in the future.

- Make sure businesses (including County government) understand the consequences of not participating -- State fines (up to $10,000 a day) for not reaching 50 percent diversion impact everyone's taxes; new business and job creation opportunities are lost; and waste transfer and landfill costs will go up.

J. PUBLIC POLICY INITIATIVES

The operative public policy that addresses solid waste management in Los Angeles County is the 1988 Action Plan, which, until superseded, has the force of law in the County. Much has changed in both Los Angeles County and in solid waste management in the last eight years. In fact, AB 939 requires that the County change its public policy to divert solid waste from landfills and document this change in an Integrated Solid Waste Management Plan. This plan has not been published, let alone adopted. In the past, the County has taken a leadership role in solid waste management -- it has provided abundant and cheap landfill capacity. It is time for the County to shift its public policy to the new reality, conservation and diversion, and supply the leadership for this new vision.

There are a number of public policy initiatives that the County could take to supply the leadership that 88 cities cannot supply. The programs that can be implemented to carry out these policies are discussed in the body of this report and its appendices.

Recommended County Actions:

- State that it is the County policy to provide the leadership in conservation of the County's resources and diversion of materials from landfills;
- Lead by example, set and achieve high diversion goals, (above 50 percent) for the unincorporated area and the County facilities;
- Establish variable rate direct billing with itemized cost elements for all generators in the unincorporated area;
- Establish an enterprise fund accounting system for all solid waste management in the County;

- Modify the tax structure in the County to provide incentives to divert materials and meet diversion goals and disincentives for not meeting goals;
- Minimize the landfilling of recyclable materials in County landfills by adoption of landfill bans;
- Declare a moratorium on the approval of new landfill sites in the County;
- Minimize the consumption of existing landfill space;
- Promote the development of facilities necessary to achieve additional diversion, such as composting facilities, MRFs, etc.;
- Establish enforcement that supports diversion;
- Establish requirements on private solid waste management firms that operate in the County to maximize diversion including mandatory recycling, variable rate billing, itemized cost element billing, reporting, etc.;
- Develop reporting and database system that support diversion;
- Develop information and technical assistance programs to support the cities and private industry in source reduction and diversion; and
- Work to establish organizational structures among the cities, Sanitation Districts and the County to coordinate and unify the reduction and diversion efforts.

APPENDIX A

APPENDIX A

PRODUCER RESPONSIBILITY OR TAKE IT ALL BACK

A. BACKGROUND

The basic principle of producer responsibility is that selling a product to someone else does not absolve the seller - manufacturer, wholesaler, or retailer - from the responsibility for the disposal of the product when its useful life is over. This concept has been discussed in Europe and the U. S. since the 1970's. The European Community (EC) began legislated enforcement of the concept with implementation in 1985 of the Liquid Food Containers Directive.

The German Packaging Ordinance was passed by the German Parliament in April 1991, about the time the EC started to work on a directive for all packaging. Two years later, France enacted the Eco-Emballages system and Austria enacted the Alsstoff Recycling Austria. The other EC countries adopted or are working on "take it all back" systems that are similar to the German system (e.g. Belgium), or differ widely (e.g. Britain). All of these systems have to meet the aims of the EC Packaging Directive that was adopted in 1995, i.e.:

- To reduce the overall impact of packaging on the environment; and
- To remove trade barriers and distortions of competition among EC members.

Over the next few years will see an effort to reconcile the national programs that are in place with the EC Packaging Directive. This will take considerable political energy. In the meantime, additional "take it all back" directives are being developed for batteries, electronic products and automobiles.

B. THE GERMAN SYSTEM

The German Packaging Ordinance has had a significant impact on that nation's packaging manufacturers, distributors, retailers, and consumer products industries. Industry has the

obligation to take back used packaging and ensure it is reused or recycled. This obligation applies to all packaging. The goal of the regulation is to reduce packaging waste by six to eight million metric tons annually, or 20 to 25 percent of the residential waste stream. Packaging currently accounts for half the volume and one-third the weight of Germany's residential waste stream.

The Ordinance is markedly different from the many North American attempts to control packaging in that it assigns the private sector the responsibility for reducing waste. The German Environment Ministry is adamant that suppliers of a product, not municipal governments, are obligated to take back product packaging.

The implementation of the Ordinance was divided into three phases; each phase focused on a different type of packaging.

The first phase of the Ordinance addressed transport packaging (mostly corrugated cardboard, but also barrels, canisters, cases, sacks, pallets, polystyrene, and shrink wrap) and went into effect December 1, 1991. It required that the 2.3 million metric tons of transport packaging used to deliver goods to retailers be returned for reuse or recycling.

The second phase addressed secondary or distribution packaging -- basically, packaging designed to get the product to the store and promotion packaging, including cartons, canisters, trays, and plastic bags -- and went into effect April 1, 1992. At that time, consumers were permitted to leave secondary packaging in stores.

The third, final, and most controversial and widely publicized phase addressed primary packaging -- i.e. the immediate covering for a product, such as bottles for wine, cans for coffee (sealed with plastic), cans, jars (for mayonnaise, mustard, caviar), aseptic boxes, blister packs, and tubes for tooth paste, etc. -- and went into effect January 1, 1993. Retailers were required to either provide facilities to take back waste packaging or to participate in a privately funded collection system that guarantees minimum recycling rates for specific packaging materials. If those rates were not achieved, the government threatened to impose deposits on a variety of

packaging types. Germans already buy 72 percent of their beverages in refillable glass and plastic containers that carry deposits of from 30 to 70 pfennings (US 18 to 42 cents). The packaging ordinance stipulates that the market share of refillable containers must not fall. By July 1, 1995, the Ordinance had been modified to require that 80 percent of each type of packaging material must be collected. Also, that least 80 percent of each material collected must be separately sorted for recycling.

Reluctant to become repositories for the country's discarded packaging, German retailers, along with 600 packaging firms, consumer products companies, and raw material suppliers, formed a company, Duales System Deutschland (DSD), that created a dual (hence, "Duales") system that was to be separate and distinct from existing municipal garbage collection services. DSD, a Bonn based enterprise, began initial implementation in July 1991, with pilot collection programs in selected regions -- including seven cities. By March, 1992, DSD had signed contracts in 138 regions of the country, serving 21 million people or 25 percent of the population. A goal was to serve 90 percent of German's 80 million people by 1993 was set and a nationwide system of drop-off facilities and collection programs for eligible packaging waste was established.

The DSD system was initially intended to completely replace municipal collection of packaging materials. That, however, led to accusations of DSD creating an illegal monopoly. Thus, its collection strategy was changed to encourage cooperative relationships between it and municipal haulers. Collection for the DSD is now provided by public or private haulers under a contractual agreement with DSD, with each community having a slightly different contractual arrangement, based on existing collection and recycling programs.

The basic DSD concept is to collect glass (sorted by color) and mixed paper at drop-off centers using "igloos." While igloos had been distributed in most regions of the country prior to DSD's existence, more containers since been strategically placed to serve about 500 residents per site. All other packaging materials are collected at curbside in yellow bins. It has been estimated that the implementation of this waste system will ultimately require about 200 sorting and processing facilities because of the increased volume of recyclable materials. The cost of

implementing the DSD system was originally estimated at 7 billion Marks (US $4.2 billion), with annual operating costs of 2 billion Marks (US $1.2 billion). DSD's operating costs for 1994 were about DM 3.3 billion, and costs in 1995 were forecast to be around DM 3.9 billion. Both are well above the original estimates. By 1995, the total network provided an estimated 18,000 jobs.

The DSD raises the revenue to pay for the facilities through the "green dot" system. Under this system, participating companies pay a licensing fee that varies according to the size and material of the package. With these licensing fees, the consumer products companies obtain the right to display the green dot on their packaging. Packages displaying the green dot are guaranteed a market by materials processors and, thus, effectively come with the warranty that they will be recycled. By April, 1992, DSD had sold 5,000 licenses to hundreds of domestic and foreign based companies. By 1995, this number had grown to more than 17,000. Because most of Germany's large retailers have threatened to provide shelf space only to those products carrying the green dot, DSD estimates that 80 percent of all packaging will have the symbol by the end of this year.

Companies using plastic and certain types of aluminum packaging must, prior to using the green dot, obtain additional take-back guarantees from trade associations. Because plastics are the most expensive material to collect and recycle, licensing fees for them are 25 percent higher than for other types of packaging and will soon increase by at least 50 percent. The average is two pfennings (a little more than a US penny) per container. Average consumer prices will rise by half a percent because the additional cost of this green dot licensing will be passed on to consumers. The DSD will thus cost an estimated $120 per household per year, and raise about $1.2 billion annually. Much of this DSD revenue will be spent on a multi-media campaign to educate consumers.

Consumer reaction has been positive to the option of being able to return packaging waste.

C. RESULTS OF GREEN DOT PROGRAM (DSD) TO DATE

The DSD program seems to be a success in terms of the German Packaging Ordinance's original goals. A recent study by a large German retailer concluded that secondary packaging in grocery stores has been reduced by up to 98 percent, or 51,000 metric tons annually. A random survey of 400 DSD members determined that 199 types of packaging materials (26 percent) had recently been entirely eliminated and that a quarter of all products they handle no longer come with any packaging. Of the 146 members that had formerly used plastic blister packs, only one still does. Polyvinyl chloride packaging, which had previously been used by 57 members, has been universally eliminated. Plastic foams also were abandoned after previously being used by 35 respondents. Paper and cardboard often are substituted for packaging that is difficult to recycle. A quarter of packaging materials used by respondents now contains recycled materials.

The DSD system, however, is very expensive and almost went bankrupt. The reasons for its financial difficulties are:

- The emphasis in on materials recovery with very high recycling targets - DSD has to insure that 64 % of the plastic packaging is recycled;
- Short implementation time - 18 months for the countrywide system;
- DSD is responsible for all collection and sorting costs and re-processors receive the material for free;
- DSD concluded unfavorable contracts due to the time constraints and, thus, its weak bargaining position; and
- Firms used the green dot label and did not pay or were late in paying their fees.

In the last year or so DSD has addressed these issues. Contracts have been renegotiated and controls on the use of the green dot tightened up. Also, starting in January 1996, re-processors have been paying the market price for materials.

The DSD system, with its green dot recycling guarantee, provides a financial incentive for industry to design packaging which is easily recyclable. However, it still has been widely criticized. Environmentalists and some politicians view it as an easy way out of more expensive requirements involving deposits and take back requirements for retailers. Other critics contend that the fees for the DSD system are not high enough to eliminate much of the throw-away packaging and that, despite the green dot, some materials, such as plastics, remain too difficult to recycle. Proponents of the DSD system counter that because packaging that is more difficult to recycle will incur higher processing costs, the system provides a built-in incentive for manufacturers to use materials which are easily recycled. They also assert that because the green dot licensing fee is based on the size of the package, it provides a reason for firms to use smaller packaging.

Additionally, DSD's educational campaign has been attacked for appearing to suggest that products bearing the green dot are environmentally friendly.

And, the rapid implementation of the DSD collection system has been blamed for putting large quantities of recovered materials on markets that were not capable of absorbing them. This has caused, it is claimed, the prices paid for these materials to drop and thereby jeopardize the entire recycling effort. While it is true that recovered materials prices have dropped in Europe and worldwide in the past year, it is highly unlikely that this is solely due to the DSD system implementation.

There is a perceived threat to the current prevalent system of returnable bottles, which is seen in Germany as one of the most effective ways to eliminate packaging waste. Such refillable containers would not be part of the DSD system and would not bear the green dot, and hence may be viewed as not being environmentally sound. To address the danger, the Ordinance stipulated that the market share of refillable containers must not drop below the current 72 percent for beer, water, soft drinks, juice and wine, or 17 percent for milk. If the market share goes below those levels, the exemption from mandatory deposits on all beverage containers will not apply. Many environmentalists are not satisfied with those quotas, contending that they preserve the status quo and do nothing to increase the use of returnable containers. Further,

because the returnable bottles favor local bottling and short transportation links, the EC may decide that this approaches a device to restrain trade. This could result in a major political battle.

APPENDIX B

APPENDIX B: DIVERSION ALTERNATIVES

In this Appendix, various technologies and management techniques for solid waste that have been applied in other U.S. communities are discussed. Frequently, examples of community experiences are provided along with a description of the approach to illustrate what practically can be accomplished (as opposed to theoretical diversion estimates). For some technologies, where sufficient operating experience across many facilities is available (such as waste-to-energy) specific examples are not needed.

A. SOURCE REDUCTION

Reduction at the source is the first of California's hierarchy of integrated waste management practices. Defined in AB 939 as "any action which causes a net reduction of solid waste" source reduction represents a proactive, front-end approach to waste diversion. In the SRRE* the County estimates that it will achieve a 4.3 percent diversion of the total waste stream by 2000 through source reduction. The Cities have similar goals. Section 18734.3 of the regulations lists a minimum source reduction alternatives in four categories:

1. Rate structure modifications;
2. Economic incentives;
3. Technical assistance and promotion; and
4. Regulatory programs.

Of these the County rated Rate Structure Modifications the most effective. Within each of the categories there are a number of specific programs that the County and the Cities could adopt and promote. The objective is to get the individual waste generators including the County and the Cities to reduce their waste generation. Seven strategies that waste generators should apply are:

1. Purchase products for recyclability and reduce the use of non-recyclable materials;
2. Reduce packaging and reduce the toxicity of packaging and products;
3. Increase the amount of recycled materials in packaging and products;
4. Replace disposable products with reusable products and products made with recycled materials;
5. Use materials and products more efficiently, i.e. print on both sides of paper;
6. Purchase products with longer useful lives, i.e. 60,000 mile tires, and products designed to be repairable; and
7. Reduce yard waste by on-site management, i.e. "grasscycling".

The key to source reduction is modifying individual behavior. Policies, programs, and incentives that support source reduction goals have been implemented in the communities that are most successful in diverting waste from landfills. These alternatives work synergistically with recycling programs to maximize diversion. This can be seen in the Seattle, Washington case study discussed in Appendix D.

The sections below focus on two types solid waste management approaches that can be used to increase diversion: collection techniques and processing technologies. The collection techniques discussed in Section A are applicable to diverting many types of materials, and bring them into the processing facilities. The processing facilities discussed in Section B can also be applied to different waste stream materials. In order to avoid "double counting" waste stream material diversion achievable by application of these processing technologies, specific materials are discussed separately under each technology heading. These technologies have been applied to divert the Los Angeles waste stream in Chapter VII.

B. COLLECTION

The techniques used to collect MSW have an impact on the diversion potential. Once recyclable materials are mixed in with materials that are potential contaminants, they are harder

to recover. For example, when food waste from a supermarket is placed in the same container as old corrugated containers (OCC), then collected in the same truck, the OCC is contaminated by the food and is less recyclable. The food-contaminated OCC is unacceptable as feedstock to a paperboard manufacturing plant, but could be composted to a lower-value humus product.

The general approach is to identify specific materials in the residential, commercial and industrial waste streams that contain recyclable materials or that should be collected separately to maximize recycling and diversion. Optimization of collection systems and routes has a large economic return for both the public and private sectors because collection generally consumes about two-thirds of every solid waste management dollar (see Appendix E).

Techniques that have potential to increase diversion and improve the quality of recovered materials include the following:

1. Intensive Residential Curbside Collection

This approach adds residential mixed paper (junk mail, OCC, boxboard, phone books, kraft bags, and magazines and catalogues) and textiles to the standard set out and collection. Separate set out and collection of yard waste, if not used, should be added. This alternative may be coupled with new collection techniques such as the split container and truck system used in Visalia, California; or the once per month collection of recyclables used in Seattle, Washington. Based on a survey of 19 California programs[1] the average household set out 189 pounds of mixed paper (excluding newspaper) in 1994. Based upon the addition of mixed paper to County-wide recycling collection to 2,989,552 households, the additional diversion at this rate would be an estimated 283,000 tons. Seattle, Washington averages over 100 pounds per family higher in residential mixed paper collection than the 19 California programs. If an intensive program such as Seattle's was implemented County-wide, an estimated 383,000 tons per year could be diverted. This is only 10 percent of the estimated total paper disposed of in the County in 1994.

[1] *Resource Recycling*, June 1995.

Table C-1. Recovered Paper Volumes from Selected Curbside Recycling Collection Programs
(Pounds per Household per Year)

Program	Households	Paper Fraction[1]	ONP	RMP	OMG	OTD	OCC	Total
Barrie, ON	27,000	59%	169	16[2]	[3]	[3]	44	229
California[4]	947,669	85%	241	151	[5]	[5]	38	430
Evansville, IN	42,000	81%	143	46	[5]	[5]	[6]	189
Goldsboro, NC	11,000	65%	[3]	[3]	[3]	[3]	[3]	251
Green Bay, WI	31,300	75%	[3]	[3]	[3]	[3]	[3]	327
London, ON	83,000	70%	271	6[2]	[3]	[3]	15	292
Portland, OR	125,500	81%	321	73	28	[5]	54	476
Seattle, WA (North)	69,538	74%	335	214	[5]	6	77	632
Seattle, WA (South)	66,640	76%	274	198	[5]	5	82	559
Vancouver, WA	15,524	82%	258	250	4	[5]	37	549

ONP – newspaper
RMP – residential mixed pper
OMG – magazines
OTD – telephone directories
OCC – corrugated cardboard

[1] Of total volume of recyclables collected by curbside recycling collection programs.
[2] Includes only OCC; household fine paper is collected with ONP.
[3] Collected with ONP, shown in Total Column.
[4] Summary of 19 programs that range in size from 10,000 to 275,000 households.
[5] Processed with residential mixed paper.
[6] Small pieces of OCC accepted with RMP; large OCC is not accepted.

Source: *Resource Recycling*, June 1995.

Table C-1 shows mixed paper recovery from programs in 12 cities. The mixed paper is broken into its components: (1) newspaper - ONP, (2) residential mixed paper - OMP, (3) magazines - OMG, (4) telephone directories - OTD, and (5) old corrugated containers - OCC. The cities vary in size and results; however, all show a significant increase in paper recovery over newspaper alone. In 1994, Ecodata, Inc. conducted a survey of 60 randomly selected cities with curbside programs.[2] The diversion rate for the curbside programs averaged 13.4 percent, with a range of 3 percent to 34 percent. Eight cities were identified as high achievers with 20 percent or more diversion: Daytona Beach, Florida; Elmhurst, Illinois; Hoffman Estates, Illinois; North Las Vegas, Nevada; Paramus, New Jersey; Port Huron, Michigan; Stamford, Connecticut; and Valley Stream, New York. Five of the eight cities collect mixed paper at the curbside.

A number of communities have added textiles to their curbside collection programs. These include: Bloomfield, Connecticut; Windsor, Connecticut; and Ann Arbor, Michigan. In October 1994, St. Paul, Minnesota expanded an existing pilot program that collects textiles and reusable items to a city-wide service. These materials have accounted for 1.8 percent of St. Paul's curbside collection.[3]

2. Wet-Dry Collection

Wet/dry collection originated in Europe. The system has the waste generator separate waste into either two or three categories and use two or three bins. The two-bin system is a wet/dry separation. The two streams are collected separately and are processed by different systems. Dry materials are processed at a materials recovery facility (MRF) and the wet fraction is composted. The three-bin system adds a residue bin that is collected separately for disposal. Wet/dry collection has application in both residential and commercial sectors. Applied to the residential sector, recovery well above the 50 percent level has been demonstrated. Santa Barbara County[4] conducted a pilot program with several different collection schemes: both two-bin and three-bin systems. The diversion rates ranged between 57 and 73 percent, with an average of 65 percent. The project recognized that high rainfall had increased yard waste; adjusting for this factor, the average diversion in the Santa Barbara pilot program was 58 percent. A number of communities in Canada and the United States have implemented full-scale wet/dry programs. These include: the City of Guelph and the City of St. Thomas, Ontario; Mackinac Island, Michigan; and East Hampton, New York.

Other communities are separating selected organic waste fractions for collection and processing. These programs target food waste from restaurants, supermarkets and food processing companies for composting. Some programs also include soiled paper, paper mill sludge and other organic materials in the composting mix. Commercial collection of food waste from restaurants, supermarkets and other food service establishments that are collected on a single route could be delivered to a composting facility. The non-food waste from other commercial establishments such as offices then would be free of food contamination and more easily recovered. For example, waste from some office buildings contains 90 percent paper. Without the addition of other materials during collection, waste paper from offices is highly recoverable. There are many examples of high level commercial/industrial waste diversion, ranging from 60 to 90 percent. These include major U.S. and California firms, such as AT&T, IBM, Fetzer Vineyards and Transamerica Corporation.

Separate collection of food waste is a rapidly expanding technique. Programs have been implemented in Freehold, New Jersey; Calgary, Alberta; Jasper National Park, Alberta; and Burlington, Vermont. A number of food market chains are interested in the approach and have initiated programs including Shop-Rite in five states, Safeway in Ontario, and Stew Leonard's in Connecticut. In California, Vons has implemented a program with Community Recycling and Resource Recovery, Inc. This program manages food waste from all 325 Vons stores. The food waste collected in this program is composted at CRRRI's facility in Lamont, California.

[2] *Resource Recycling*, October 1995.

[3] *Resource Recycling*, April 1995.

[4] *The Santa Barbara County Pilot Waste Collection Project*, Final Report, April 1994.

3. Construction Waste

During construction projects, the general contractor usually provides a roll-off box that is used for waste from all subcontractors on the site. The materials in the roll-off are mixed as a result. If subcontractors had to remove their own waste, or if the general contractor provided separate containers, then lumber from the carpenters, gypsum from the drywall contractor, asphalt shingles from the roofer, and other specialized materials from individual trades would be separately collected and would be recyclable. This is currently being done by Cornerstone Material Recovery, a private firm in the Chicago, Illinois metropolitan area and is expanding to other cities in the United States.[5]

4. Comprehensive Drop-off Centers

To augment other collection alternatives, a system of centers designed to accept all types of waste and recyclable materials will divert additional material. Some of these drop-off facilities accept reusable items such as building materials and furniture, household hazardous waste (e.g., paint, batteries, household cleaners), used oil, auto parts, appliances, yard waste and refuse. Urban Ore in Berkeley, California is an example of a usable material drop-off; it has been operating since the early 1970s. Champion Paper, Inc. has established a system of 1,000 drop-off centers in Houston, Texas. Champion operates these centers under a 20-year contract to collect paper for their Houston plant.

At a drop-off facility, reusable and recyclable items could be accepted at no charge, while refuse requiring disposal could carry a small charge. Fairfax County, Virginia operates a large multi-material drop-off adjacent to its transfer station. The Fairfax facility accepts all the regular recyclable materials, yard waste, white goods, used oil, and wood; all of which are recycled. In addition, conveyors are provided to accept bagged waste and a conveyor transfer system for bulky non-recyclable materials. The facility is staffed to assess fees for larger loads from residents and small commercial operators.

[5] *Biocycle* Magazine, Pages 62-63, August 1992.

C. PROCESSING FOR DIVERSION

1. Materials Recovery Facilities (MRFs)

Material recovery facilities (MRFs) are designed and built to process a variety of solid waste streams. These include: (1) source separated materials from curbside collection or drop-offs, (2) commercial waste with high levels of recyclable materials such as office paper, (3) the dry stream from a wet/dry collection, (4) selected construction and/or demolition (C&D) waste, and (5) mixed municipal solid waste. The source-separated materials facilities are most commonly known as MRFs, commercial mixed waste facilities are often referred to as "dusty MRFs," and C&D or mixed MSW facilities are called "dirty MRFs."

The objective of all MRFs is to recover materials from the waste stream by separating them into marketable commodities. For example, glass is separated from other containers and contaminants, then sorted by color (amber, green and clear). The product is a clean, color-sorted glass that meets the glass manufacturing industry's specifications for glass cullet used to manufacture new glass products. The processes used by a MRF to accomplish these separations can be low-tech (relying primarily on hand-sorting) or high-tech (utilizing mechanical equipment as well as hand-sorting as needed). The materials processed and marketed by MRFs depend on the MRF feedstock.

Source-separated materials MRFs generally include all types of containers (glass, aluminum, steel and plastics); plus various types and grades of paper including newsprint, office paper, mixed paper, corrugated cardboard, etc. In the source-separated MRF, usually only PET and HDPE plastic containers are sorted, although other resins may be recovered. Technology now exists to mechanically separate plastic containers by resin and color; the identification of these are made using a variety of sensors employing x-ray, infra-red and other electromagnetic spectra. The prototype of this machinery is installed in Salem, Oregon and operates at 1,250 pounds per hour. Development of the prototype resulted from Oregon's legislation requiring that all rigid containers be refilled, be recycled or contain recycled material. This is an example of policy driving technology development and implementation.

A national survey of MRFs completed at the end of 1995 identifies and describes 386 facilities, 90 percent of which were in operation or under construction at the time of the survey.[6] No transfer stations with "dump and pick" operations are included in the current MRF list, an indication of the maturity of the MRF technology.

MRFs have the potential to process and market a significant portion of the solid waste stream in Los Angeles County. Even though there are an estimated 200 facilities which do some processing presently operating in Los Angeles County, additional facilities will be needed. MRF processing is an integral part of the strategy recommended for Los Angeles County to implement a diversion-oriented policy that achieves or exceeds the 50 percent goal. The diversion projections discussed in Chapter VII are predicated on the following assumptions:

- Intensive residential curbside collection is instituted County-wide
- Curbside collection is provided to single-family households in the County except those rural areas where population densities do not warrant it;
- Curbside collection is supplemented by a system of comprehensive drop-off facilities, particularly in rural areas not served by curbside collection, and multi-family dwellings;
- Private haulers are mandated to provide recyclable material collection to their contract accounts (businesses, industries, institutions);
- High participation rates for all forms of diversion collection are achieved by high levels of public information and enforcement of mandatory requirements;
- Materials processed by MRFs include: glass, steel and aluminum food and beverage containers; HDPE and PET plastic containers; all clean paper (newsprint, magazines, corrugated cardboard, mixed paper); and textiles;
- Potential contaminants such as food waste are collected and processed separately from commercial/industrial waste;
- MRF residue (non-processible material sent for disposal after processing) is 15 percent; and
- Commercial/industrial wastes are processed in a MRF prior to disposal.

[6] *The Materials Recycling and Processing Industry in the United States*, Eileen Brettler Berenyi, Governmental Advisory Associates, Inc., 1995.

2. Composting Facilities

Composting is defined as the bacterial decomposition of organic materials. All of the composting technologies commercially available today rely on aerobic decomposition (that is, utilizing bacteria that live in the presence of oxygen). Anaerobic digestion of waste stream materials (composting that utilizes organisms existing in an oxygen-free environment) is still in development and is not considered further in this report. Composting reduces the quantity of incoming organic material by about 50 percent by weight, through the loss of moisture and production of carbon dioxide during the decomposition process. When non-digestable materials such as metals, plastics and glass are present in the feedstock, a residue will result. The quantity of residue depends on the quantity of non-compostable material in the feedstock.

During the composting process, high temperatures generated by bacterial activity serve to kill pathogens as well as most seeds and spores. Processing can be relatively low-tech, such as windrow piles that are turned occasionally to maintain proper moisture and temperature for bacterial activity, to high-tech, totally enclosed and mechanized reactors that have been applied to a variety of waste feedstocks. All of the technologies discussed below are focused on processing quantities diverted from the waste stream, as opposed to home composting approaches. Home composting can divert residential yard and food wastes (except meat and dairy wastes). Composting, by its nature, produces odors which must be controlled.

Markets for compost derived from components of the MSW stream are still developing. Composting is used to convert organic material into a usable soil amendment. Compost can be used as mulch, or can amend clay or sandy soils to improve moisture retention and friability. The market for this material is the same as the market for peat moss, including farmers, home gardeners, landscapers, nurseries, potting soil manufacturers, etc. The industries and farms that can utilize these materials in significant amounts are tentative about risking their livelihood on a relatively unfamiliar product. Considerable education efforts, demonstration programs, and scientific studies are still needed to open these markets to the very large amount of materials composting is expected to divert from the waste stream.

a. Yard Waste

Yard waste materials are the most common compost feedstock. All yard waste materials (also called "green waste") must be diverted from disposal in California. Many of the Cities in Los Angeles County collect yard waste separately. In the City of Los Angeles, yard trimmings from the curbside collection program are used by San Joaquin Composting (SJC) as bulking agents for composting the City's biosolids (see below) at SJC's facility in Lost Hills, California. This City program is known as Full Cycle Recycle (FCR). FCR presently diverts all biosolids generated by the City of Los Angeles, and all yard trimmings collected at curbside. As of the beginning of 1995, about 250 tons per day were delivered to SJC, and the remaining material was either composted elsewhere or used as mulch. As the curbside collection program continues to expand, all future yard trimmings collections will be incorporated into the FCR program, thus diverting all residential yard waste generated in the City from disposal. The FCR plan calls for the creation of local facilities that will play a major role by serving as yard trimming drop-off and transfer to SJC sites, and, after processing, centers for bagging and distributing the product, "TOPGRO." TOPGRO is presently bagged at the Lost Hills facility and marketed by an SJC subsidiary, Organix Supply, Inc. TOPGRO is sold by local outlets, such as Fedco membership department stores and Armstrongs' -- The Home and Garden Place. The compost is also used by City agencies in maintaining City-owned parks, gardens, and golf courses, and for facility landscaping.[7]

The green waste fraction of yard wastes (i.e., leaves, grass clippings, weeds, small prunings) can be composted alone or in conjunction with other waste materials, such as biosolids, food wastes, contaminated paper that otherwise cannot be recovered (such as disposable diapers), and similar organic fractions of the waste stream. An estimated 100 compost facilities were in operation in California as of May 1995.

Yard waste is also diverted from disposal through source reduction approaches, specifically, the "don't bag it" method of leaving grass clippings on the lawn to provide nutrients

[7] "Co-Composting in Los Angeles Optimizes Resource Management," *BioCycle*, December 1994.

and reduce waste, and home composting. In Alameda County, California's Master Composter program has trained 39 Master Composters, who, in turn, have trained over 5,000 home composters in the County. In 1993, 6,600 home compost bins were sold by the County program to homeowners. A follow-up survey showed 94 percent of the recipients regularly used their bins. Previous survey work in Alameda County demonstrated that each home compost bin diverts approximately 600 pounds of compostables each year. Based on the participation rates, the County estimates that the 1993 bins divert 1,800 tons from the County waste stream. San Diego County has established a Master Composter demonstration center at Quail Botanical Gardens. The Master Composters trained at the Center commit to 40 hours for teaching the knowledge and skills they have gained to others.[8]

In addition to use as a bulking agent for composting, woody waste (i.e., tree limbs, branches, brush) can be chipped and used as mulch or wood fuel (as discussed above). The Public Utilities Commission's deregulation of the electric utility industry caused a number of wood-waste-to-energy plants to close in California; as a result, the fuel market for wood chips is limited at the moment. Because of a medfly quarantine in Southern California, all yard trimmings have to be processed within the quarantined area before they can be transported elsewhere. Chipping and composting interfere with medfly reproduction.

Yard wastes lend themselves to low-tech composting operations, because the low nitrogen content means relatively low potential for odors during the composting process. Some materials, such as grass clippings, are high-nitrogen and must be handled more carefully to manage odor. Larger facilities may roof over the composting area, the pads may be paved, and some facilities enclose the initial composting area to avoid operational problems, such as excessive moisture from precipitation, over-drying from winds, or materials blowing off-site. Each "improvement" to the system adds to the overall cost.

In January 1995, the California Integrated Waste Management Board (IWMB) issued a ruling that shredded yard waste could be used as alternative daily cover on landfills and that this

[8] "Mastering the Way to Home Composting," *BioCycle*, January 1994.

use would count toward achievement of the 50 percent diversion goal. This reduces the incentives to develop markets for compost and mulch and consumes landfill capacity. The Natural Resources Defense Council (NRDC) initiated a lawsuit against the IWMB. The NRDC contended that this practice is not recycling or diversion, but landfilling. In February 1996, the Sacramento County Superior Court ruled against the IWMB. IWMB has appealed.

California Futures/Global Futures estimates that less than two percent of the potential agricultural demand of 10.6 million tons of compost per year is utilized.[9] Policies in the State and County should provide incentives to meet this potential demand.

b. Food Waste

Composting of food wastes is more problematic than yard waste, because of the potential for generating odors and attracting birds, rodents, and insects. Consequently, food waste composting is generally carried out in enclosed vessels (in-vessel or static-pile systems) during the first stages of decomposition. The later stages of decomposition can be carried out in windrow-type operations that are used for yard wastes. As discussed previously, a number of food waste composting project are operating in the U.S. These include school programs in New Hampshire, Freehold, NJ, Calgary Alberta, Minneapolis-St. Paul, MN, and the Von grocery stores project in Southern California.

It should be noted that food waste is collected, cooked, and used as hog and other animal feed in some parts of the country. In Florida, Walt Disney World has been sending five tons per day of food waste to Kenny Camp Farms since 19092. Two companies are actively marketing processing equipment to make feed pellets from food waste. However, markets are not readily available in Los Angeles County.

The product resulting from food waste composting is higher in valuable nutrients than yard waste compost. The product can be utilized as a fertilizer in addition to its soil amendment

[9]California Futures/Global Futures, *Agricultural Markets for Compost and Mulch: Costs, Benefits and Policy Recommendations*, December 1993.

properties. Because of the higher nutrient content, food waste compost has a higher market value.

c. Biosolids

Biosolids are also referred to as sewage sludge; this material is the solids portion resulting from wastewater treatment. Properly conducted composting processes reduce the pathogen contents to safe levels. The U.S. EPA has published regulations concerning composting (and landspreading) of biosolids (Clean Water Act, Part 503). The Part 503 requirements specify both the process parameters (time, temperature, moisture, etc.) and application limits depending on the product quality.

Because of the high moisture content of the biosolids entering the compost process (usually biosolids have been dewatered but are still 50 to 80 percent water) and the potential for odors, biosolids composting is initially conducted in enclosed vessels. The nearly-completed compost can mature in windrow piles.

Biosolids compost is, if made from uncontaminated feedstocks, a high quality soil amendment and, if properly marketed, will sell easily. In 1994 there were 201 operating biosolids composting facilities in the U.S. and another 117 under development.[10] Of the total 318, a number of commercial biosolids compost products are successfully marketed, including Philadelphia's EarthGro and the Maryland Environment Service's COMPRO, which sells in bulk to developers for $17 per ton and is bagged for consumer sales.

The City of Los Angeles' Full Cycle Recycle program provides feedstock to the TOPGRO manufacturer, as discussed earlier. In addition, Wheelabrator (Biogro) has proposed a facility with capacity for 500 TPD biosolids and 1,000 TPD other organics. This facility is planned for the Antelope Valley.

[10] 1994 Biocycle Biosolids Survey, *BioCycle*, December 1994.

d. Combination Feedstocks (including manure)

The example of a combined feedstock approach is being implemented at the Zoo in Griffith Park. The Griffith Park Composting Project, undertaken by the City of Los Angeles Biosolids Management Division with the Departments of Public Works and Recreation and Parks, will compost Zoo manure with biosolids and green trimmings from the park. If the current demonstration project is successful, a permanent facility will be built. The compost will be sold as a specialty product under the TOPGRO label.[11]

Combining feedstocks requires the compost processor to tailor the facility design, operations and equipment to the needs of the more problematic materials, such as manure. Enclosed buildings, compost vessels, and process air cleaning equipment (to reduce odor emissions) are all needed to reduce environmental impacts of these facilities. Combining feedstocks, however, allows the operator to "design" the end product to meet the specifications of a particular market, including balancing nutrient content, moisture, degree of stabilization, and particle size.

e. Mixed MSW

There were 17 mixed MSW composting facilities operating in the U.S. as of January 1995.[12] However, mixed waste composting is still in the development stage. Most facilities operate at a small scale in order to allow strict control of the waste entering the system. The largest facility in that list that is still operating is the Bedminster BioConversion system in Sevier County, TN. This plant started operation in 1992 and will process 200 TPD when the current expansion is complete. The systems used are high-tech, and in most approaches, the waste must be pre-processed to remove potential contaminants (glass, plastics and other inerts, and items with toxic components such as batteries) so that the resultant compost is low in chemical contaminants.

[11] Reba Fabrikant and Ray Kearney, "CoComposting in Los Angeles Optimizes Resource Management," *Biocycle*, December 1994.

[12] *Municipal Solid Waste Composting: A Status Report*, prepared by GBB for the Solid Waste Association of North America (SWANA), April 1995.

The markets for compost made from mixed MSW have so far been limited. The mixed waste composting process can result in a product that meets the EPA's Part 503 standards for biosolids compost; however, of the 17 operating facilities only one is successfully doing so. Both product quality and market development is needed. It should be noted that the Sevier County, Tennessee facility, which accepts 150 TPD of solid waste and some biosolids, has been successfully marketing its product to agricultural and horticultural users since 1992.

The amount of materials that can be diverted by composting programs differs by feedstocks. Assumptions used in calculating composting diversion are:

- The County bans disposal of all green waste, resulting in 95 percent of this material diverted from disposal. Most will be composted; woody waste will be chipped and used as mulch or as a bulking agent for biosolids composting.
- Food waste is not readily separated and collected from residences, because the material must be collected daily to avoid odor problems. Therefore, the target group for food waste composting would be large producers, such as canneries or other food processors, restaurants, and institutions. The target group is part of the commercial waste stream, where food waste is approximately 13 percent of the waste. Eighty percent of this is projected to be separately collected and composted.
- No biosolids should be landfilled in LA County. The current composting efforts should be expanded to provide capacity for all biosolids produced by wastewater treatment plants. Composting can be supplemented by landspreading programs in some areas of the County.
- Special projects are developed for unique feedstocks (such as LA City's Zoo manure project). These waste streams are too small to impact diversion rates County-wide.
- Mixed MSW composting projects are envisioned as part of Level 3, as discussed in Chapter VII, for residential waste not collected separately.
- Compost markets need to be developed to accommodate the feedstocks listed above before any further compost products could be considered.

4. Construction And Demolition Waste Facilities

With construction and demolition (C&D) materials amounting to as much as 30 percent of municipal solid waste, diversion through C&D recovery operations conserves large amounts of landfill space and adds years of useful life to landfill facilities. The City of Los Angeles calculates that nearly 15 percent of the solid waste stream is construction and demolition (C&D) materials. In some Southern California jurisdictions, C&D materials represent almost half of the total waste stream.[13] C&D materials generation is dependent on economic activity in the construction and building fields. Also, natural disasters can significantly increase the amount of C&D material in the waste stream.

The three basic categories of recoverable materials within C&D are inert materials, shredded wood products, and ferrous metal. Recovered inert materials, such as asphalt, concrete, dirt, rock and brick, are used for land reclamation, landfill final cover, fill for roads and airports, embankments, road base and subbase, aggregate for filter layers in landfills, French drains and bridge abutments, and asphaltic concrete. Uses for shredded wood include landfill cover, boiler fuel, animal bedding, composting bulking medium, pulp mill feedstock, and raw material for particle board. Recovered ferrous metals are used in remanufactured steel.

There are two basic types of facilities that process C&D materials. The first type accepts only clean loads of a single material such as concrete, asphalt, or wood. Processing usually includes size reduction with a hammermill or shredder, followed by sizing through a trommel screen or vibrating deck screen. Some manual sorting may be required to ensure the highest possible quality in the end product.

The second type of facility processes mixed C&D material. The material is brought to a tipping area, usually in a dump truck or roll-off box. Large pieces of materials, such as concrete, wood and metal, are pulled from the pile for processing. The remaining materials are fed into a mechanical processing system.

[13] *Business Recycling and Waste Reduction Guide*, The County of San Bernardino Solid Waste Management Department and The Cities of San Bernardino County.

The steps and equipment involved in mechanical separation and size reduction of C&D waste are generally very similar. Because many systems contain mobile equipment, the configuration of the machinery may be revised as characteristics of the feed and products change. Processing systems typically use trommel, disc or vibrating flat-bed screens to separate rock and soil. Density separation (e.g., pneumatic or hydraulic sink/float operations) is then used to divert wood scrap from heavier fractions. After wood scrap is size reduced though a hammermill or grinder, the material is often subjected to magnetic separation to remove the metal fraction.

Depending on the incoming waste stream, C&D processing facilities can range in size from under 50 tons per day to well over 2,500 tons per day. Cyclean, Inc., an asphalt recovery plant in Los Angeles, has kept over a million tons of asphalt out of the landfill in the last seven years and has saved the City $10 million.[14] Cyclean uses a microwave technology to make hot mix from 100 percent recycled asphalt. In addition to old pavement, crumb rubber from old tires can easily be incorporated into the Cyclean asphalt. The Cyclean product is sold at a discounted rate to the City of Los Angeles.

Pallets and dimension lumber are also reusable. A survey completed by *Pallet Profile Weekly* in December 1993 revealed that 70 percent of all pallets received for recycling are repaired for resale. Only one percent of the pallets are disposed in landfills.[15] The remainder of the pallets are dismantled for repair supplies, or ground into chips for use as boiler fuel, mulch, animal bedding, or particle board furnish. Guadalupe Landfill, in San Jose, California, has taken an innovative approach to managing the high percentage of redwood materials it receives from demolition projects. New World Furniture, an affiliated company, separates and reprocesses the redwood material, then an on-site carpenter re-works the wood to create home and garden items. The company grinds the unsuitable material to a 2-inch minus size, and markets this redwood mulch through Valley's Pride Organics, a Guadalupe Landfill division. In Portland, Oregon, the number of wood processing facilities jumped from three to eleven in

[14] "Paving with Recycled Asphalt," *BioCycle*, September 1994.

[15] Roger Guttentag, "Making Recovery Pallet-able," *Resource Recycling*, November 1994.

1990. Currently, recycling facilities in the area handle 100,000 tons of wood each year.[16] Most of these facilities are now charging nothing for clean, source-separated wood and are selling it for $20.00 to $45.00 per ton.

The diversion potential of C&D recovery operations were well demonstrated in the 94.5 percent recovery rate experienced by the City of Los Angeles and the Los Angeles Sanitation Districts after the Northridge earthquake. Within a month of issuing a contract, a C&D waste processing line was in place at the landfill. From October 1994 through March 1995, the program diverted over 47,437 tons of dirt and 41,873 tons of concrete from landfill disposal.[17]

Based on the above discussion, and the fact that there is ample inert landfill capacity for non-processible C&D wastes, 100 percent of C&D materials should be diverted from disposal in Class III landfills.

5. White Goods

White goods are large appliances such as dishwashers, refrigerators, etc. These materials contain high-quality steel and are recyclable through existing scrap industries. In 1994, the CIWMB database calculation indicates a total of 36,206 tons of white goods were landfilled from MSW generated in the County. This tonnage should be diverted from disposal in the future, either through separate bulk waste collection programs or separated at the transfer station/landfill.

6. Tire Recycling

As material recovery technologies continue to develop, many successful methods of recycling used tires have emerged. In addition to being retreaded for resale, old tires have been successfully diverted from landfill disposal through use as fuel, playground and athletic

[16] Randy Woods, "C&D Debris: Construction & Dismantling?," *Waste Age*, April 1994.

[17] Janet E. Coke, "Recycling Program Diverts Debris from Earthquake Cleanup," *Public Works*, June 1995.

field subbase, reroofing supplement, material for irrigation channels and other civil engineering applications, road subbase, plastics filler, composting supplement to prevent excessive compaction, and as an additive in modified asphalt. One recent estimate predicts that by the end of 1998, market demand for used tires will exceed the amount generated annually.[18]

Because tires have a high Btu value, they can be processed into Tire Derived Fuel and burned with other solid fuels, or they can be fed whole into cement kilns where they serve as fuel and as a source of constituents needed in the manufacture of cement. A report by the CIWMB notes that the consumption potential of burning shredded tires -- only in cement kilns located in California -- is nearly 25 million tires per year, which exceeds the estimated 21 million waste tires generated annually in California.[19]

Processing tires into crumb rubber for use in asphalt and other applications has significant potential. In particular, there is a huge, multi-billion dollar market for this material as a plastics filler. Overseas markets for tire chips for processing into crumb rubber for new tires is growing as well. BAS Recycling built a crumb rubber plant in San Bernardino, California, that has processed over 1.5 million tires to date.[20] BAS received a $100,000 grant from the CIWMB to transform recycled rubber into playground matting. Shredded tires also have been utilized in construction of drainage systems, retaining walls and other civil works, including landfill construction.[21]

Recovery of tires from the solid waste stream is primarily already handled by companies that market new tires at retail or wholesale, by managers of large fleets, and through such local government programs as bulk waste collection and cleanups. Problem tires are those resulting from illegal dumping or those that get buried in with the regular waste (in roll-offs, for

[18] David Riggle, "Finding Markets for Scrap Tires," *BioCycle*, March 1994.

[19] *Tires as a Fuel Supplement: Feasibility Study*, California Integrated Waste Management Board, January 1992.

[20] *Resource Recovery Report*, July 1995.

[21] *Resource Recycling*, October 1995 and *World Wastes*, September 1995.

example). Because the markets are so promising, the County should work with a manufacturer/exporter(s) to develop facilities and a bounty system to attract tires to market and away from disposal. It is assumed that, coupled with the existing systems, new tire programs, while desirable and effective, will not divert sufficient materials to affect the overall waste diversion rate for LA County.

APPENDIX C

APPENDIX C: LANDFILL CAPACITY CONSERVATION TECHNOLOGIES

Conservation of landfill capacity is a rapidly developing field. Getting the most use out of existing, permitted landfill airspace is particularly urgent in those areas where population densities make siting new landfills difficult, such as the East Coast of the United States, or where the geology is unfavorable (e.g., Florida). Consequently, most of the experience in applying techniques to conserve landfill capacity is from these parts of the country. However, it should be noted that experience with landfill conservation has also been gained by private landfill operators interested in obtaining the maximum amount of tipping fees for their permitted capacity. They, too, are obviously better off placing waste in their airspace rather than cover dirt.

Some techniques are available commercially and others are in development that conserve landfill space and thereby reduce the need for siting new landfills. The first three approaches described below are various Alternative Daily Cover (ADC) technologies that reduce the amount of airspace normally filled with dirt. The remainder are operational changes that follow placement of more waste in the available space. A CIWMB-funded study released in May 1995 noted the value of utilizing these techniques. Some of these techniques can be combined to increase savings (e.g., ADC with baling).

Secondary compaction in large landfills is also a conservation factor. Secondary compaction will occur as lifts of waste are layered upon each other. Fresh Kills Landfill, that has served New York City since 1948, is billed as the world's largest landfill. It covers 2,800 acres and presently accepts 13,000 tons per day. In some areas, the waste is piled 20 stories high.[1] Fresh Kills Landfill reports an in-place density of 1,800 pounds per cubic yard after settlement.[2]

[1] "Environmental Quality Shows Gains and Declines Since 1970, a Report Finds," *New York Times*, December 5, 1995

[2] Anne Magnuson, "The Economics of Landfill Compaction," *MSW Management*, November/December 1992.

1. Alternative Daily Cover (ADC)

The functions of daily cover are to: prevent windblown debris, reduce the amount of precipitation seeping into the filled area, suppress odors from decomposing fill, and deter scavengers (birds, rodents, and insects). Most landfills stockpile and use soil excavated during construction of landfill cells as a source of daily cover; however, this material is often not sufficient for the life of the landfill cell. Consequently, dirt must be purchased and trucked to the landfill site at considerable expense. In areas where suitable soil is scarce or landfill space is particularly precious, public and private landfill owners and operators have used ADCs since the late 1980s. ADCs include chemical or foam covers, tarps (also referred to a geosynthetic blankets), and other ADCs that make use of selected components of the waste stream itself for cover material.

Using the conventional daily cover of six inches of dirt consumes about 26 percent of a landfill's capacity.[3] In the case of the currently operating landfills in the County, this accounts for 16,949 cubic yards of wasted landfill airspace daily,[4] based on the Draft *Solid Waste Quarterly Disposal Quantity Reporting Summary* prepared by the Los Angeles Department of Public Works for the first quarter of 1995. In-place compacted density of cover soil is roughly 2000 pounds per cubic yard, so the cover materials represent roughly 10,000 tons per day of MSW capacity. This approach may over-calculate cover soil airspace requirements slightly, because of the higher-than-average compaction resulting from the weight of overlying layers of waste in extremely deep canyon landfills.

2. Chemical Or Foam Cover

The cost of foam can be a deterrent, particularly for small landfills. An expanding market, plus vendor competition, is helping to reduce the cost of foam. The City of Glendale, Arizona arranged for their vendor to retain ownership of the application equipment

[3] Darlene Snow, "Alternative Daily Cover Material," *MSW Management*, September/October 1994.

[4] Assumes 38,461 TPD disposed daily at 1,180 pounds per cubic yard.

as well as supplying the product. This strategy means the landfill owner does not have to pay the equipment capital cost up front, and competitive bidding is facilitated because the landfill is not locked in to using only a foam product compatible with purchased equipment. Additionally, foam application is less labor- and time-consuming than using dirt, thus lowering costs. Logan Miller, the Delaware Authority's Facilities Engineer, says, "About 20 minutes before we close, they will go over half the working face with the compactors and dozers and smooth it...Approximately half the working face will be foamed prior to closing...As soon as you're done you turn off the foam supply, and approximately 10 seconds later you turn off the air supply. What happens is that in 10 seconds air is blowing through all the lines, blowing the foam. You shut it down and you go home."[5]

The following foam-type materials have been identified:

- AC-645 Long Duration Foam, manufactured and marketed by Rusmar, Inc., West Chester, Pennsylvania;
- ConCover 180, by New Waste Concepts, Perrysburg, Ohio;
- SaniFoam SDC (synthetic daily cover), by CoverFoam Services, Inc., Florence, SC; and
- TerraFoam ADC and Pneumax Compressed Air Foam Systems, by Chubb Environmental Security, Exton, Pennsylvania.

AC-645

AC-645 is a single component foam composed of non-hazardous and non-toxic anionic surfactants and polymers. The product is supplied in concentrated form, in bulk or 55-gallon fiber drums, and is diluted with water prior to application. Foam is generated using a pneumatic foam unit (PFU). The foam is biodegradable, odorless, and non-reactive, can withstand light to moderate rainfall, presents no fire or explosion hazard, and can be colored to provide low visibility.

[5] Lynn Merrill, "ADC Gets the Dirt Out!" *MSW Management*, September/October 1995.

The viscous foam, which has a consistency of shaving cream, can be applied manually to the working face of small landfills, such as NPLF, with a completely self-contained and portable hand-line foam generating unit. The 800 gallon solution tank of the model 800-40 PFU requires three drums of concentrated AC-645 per filling. The concentrate has no shelf-life restriction and the mixture can be applied in winds under 50 mph, hot or sub-freezing temperatures, although storage should be at non-freezing temperatures. Since the foam product is single component and requires no mixing, there is no need to clean clogged nozzles, hoses and other components.

AC-645 can maintain properties for 36 hours after application. The foam does not harden or dry out, although it will freeze when applied in subfreezing temperatures, and is not intended for vehicular or human traffic after application. However, the foam will not deteriorate overnight, and traffic can operate on the foam the next morning when additional solid waste is disposed. At that time, the additional solid waste will compress the foam without reduction of airspace.

Use of AC-645 foam improves leachate management at landfills, due to reduction of isolated cell formation, and minimizes the potential for perched zone seeps. In addition, infiltration of precipitation is minimized and run-off is promoted if the foam is applied in a thick continuous layer.

Rusmar, Inc., foam products have been used as daily cover at other landfills. AC-645 has been permitted for use at the Lycoming County Landfill, Montgomery, Pennsylvania; Grand Central Sanitation, Inc. Penn Argyl, Pennsylvania; Wayne Township Landfill, McElkattan, Pennsylvania; Delaware Central Solid Waste Facility, Dover, Delaware; Empire Sanitary Landfill, Taylor, Pennsylvania; Keystone Sanitary Landfill, Dunmore, Pennsylvania; Northern Tier Solid Waste Authority Landfill, Blossburg, Pennsylvania; Winnebago County Sanitary Landfill, Lake Mills, Iowa; Cherry Island Landfill, Wilmington, Delaware; Pioneering Crossing Landfill, Birdsboro, Pennsylvania; City of Casper-Balefill, Regional Solid Waste Facility, Casper, Wyoming; and Taziguas Landfill, Santa Barbara County, Goleta, CA. Other facilities are awaiting permit approval.

Disadvantages in use of this foam product include: initial equipment cost is high; specialized personnel training is required; direct contact with skin and eyes should be avoided to prevent irritation; it may be difficult to place in wet weather and high winds; and it cannot be traversed by vehicular traffic.

AC-645 foam costs between $.06 and $.12 per square foot, when applied 3 inches to 6 inches thick, respectively.[6] The trailer mounted 400/25 PFU costs approximately $45,000, and can cover the landfill working face at a rate of 300 to 500 square feet/minute. Larger more expensive units can more than double the rate of coverage.

ConCover 180

ConCover 180 is a "long duration" foam injected, spray applied slurry, usable in both daily and intermediate cover applications. The dry feed material, consisting of an "advanced blend" of "earth-based" components, in a self-setting soluble binder and "recycled material" (wood pulp and shredded newspaper as a bulking agent), is slurried with water in a CAPS-180 (ConCover All Purpose Sprayer-180) and entrained with air (foamed) just prior to application.

Three models/sizes of sprayers are available, each manually operated with either a deck-mounted cannon with 200-foot range or 150-foot self-coiling hose and reel. The CAPS machines also can be used for dust control, power washing, fire fighting and seeding.

ConCover 180 was developed for use in high humidity situations, and can be applied in all climate conditions, including rain and hot or cold temperatures. The "cured" foam sheds water to provide good run-off. The material is environmentally safe, non-toxic and biodegradable; color is either blue or brown. ConCover 180 also can be pH-adjusted to accommodate a variety of water quality.

[6]Personal Communication, Kathy Smith, Rusmar Incorporated (November 30, 1995).

The smallest equipment available to apply ConCover 180 is the CAPS 900-180, a 940-gallon capacity trailer mounted unit, which can apply approximately 7,000 square feet of foam, approximately 1 inch thick, in 15 to 20 minutes. Total capacity is 9,000 square feet. Discharge distance is up to 150 feet. The system is reported to cost approximately $35,000, and foam cost is approximately $.08 per square foot (1/2-inch thick).

ConCover 180 has been used as daily cover in a number of landfills. These include: Cumberland County, Fayetteville, North Carolina; Dane County Department of Public Works, Madison, Wisconsin; Wood County Landfill, Bowling Green, Ohio; and Tremont Landfill Company, Springfield, Ohio.

In general, the disadvantages of ConCover 180 are similar to those previously cited for AC-645.

Sanifoam SDC

Sanifoam SDC is a two-liquid component stable aminoplast resin; the two components consist of a foaming agent and a foam stabilizer. The product is diluted with water prior to application and is foamed with compressed air or nitrogen (compressed air normally would be used at a landfill). A pull behind hand-line applicator such as the model PB250-D with two 500-gallon storage tanks would provide 200,000 square feet coverage per application.

The plastic foam, which sets from a fluid to a solid somewhat softer than styrofoam, in 10 to 60 seconds, provides a reflective resilient surface which supports water run-off 15 minutes after application. Maximum water resistance is attained two hours after application. The product is non-toxic and allows plant growth and rooting if part of final cover; also the foam is non-corrosive, contains no irritating, reactive, or pressure generating compounds, and is non-explosive. The foam is non-flammable and self-extinguishing, conforms to OSHA Standards for the workplace, and poses no significant environmental hazard.

[7]Personal Communication, Tim Johnson, New Waste Concepts (November 30, 1995).

SaniFoam SDC can be applied at any ambient temperature, but solutions and material delivery lines must be protected against freezing. It can be applied in moderate winds up to 35 mph (with handheld equipment only) and during light to moderate rainfalls. Once applied and set up, the material can withstand moderate to heavy rain, depending on thickness and method of application. A 1-inch layer of Sani-Foam SDC is claimed to perform equivalent to 6 inches of compacted soil.

The unmixed SaniFoam stabilizer has a shelf-life of approximately 90 days and should be stored in a heated area during cold weather; the foaming agent has no shelf-life restriction. The nozzle used to spray the foam must be cleaned after each use, and equipment flushed with hot water; a hot water flush/rinse down system is a component of the application equipment. Mixing of SaniFoam components and equipment flushing are performed automatically by the equipment.

SaniFoam SDC has been tested and used at several landfill sites, including: the City of Arlington, Texas; City of Corpus Christy, Texas; Outagamie Solid Waste Authority, Appleton, Wisconsin; CDT Landfill, Inc., Joliet, Illinois; Waste Management of Pennsylvania, Inc., Morrisville, Pennsylvania; Peoria Disposal Company, Peoria, Illinois; E.I. Dupont Facility, Victoria, Texas; and U.S. Army Munitions Plant, Texarkana, Texas.

Similar to other foam products, cost of application equipment is high; minimum cost for the PB250-D Spray Bar applicator is approximately $105,000. However, these units will be provided for free by CoverFoam Services, Inc. if the customer commits to long-term use of the foam product. SaniFoam SDC foam costs approximately $.08 per square foot.[8]

TerraFoam

TerraFoam is a natural, biodegradable protein-based material that stays moist after application. Two TerraFoam products are available. The low expansion product lasts 72 hours

[8]Personal Communication, Ernie Straus, CoverFoam Services, Inc. (November 30, 1995).

or longer when left undisturbed. It is wind- and rain-resistant, inhibits fire from starting or spreading, and can be applied to a landfill surface by Pneumax skid units, custom-designed, foam application vehicles operated by one person. TerraFoam can also be applied using a Pneumax Spray Bar unit for larger applications. A higher expansion TerraFoam product, which is produced with additional air-entrainment, can resist wind and light rain for more than 24 hours. Both products are recommended for six-inch thick application.

TerraFoam is environmentally safe and, after application, begins to degrade through evaporation with total effectiveness depending on climate conditions. The product compresses under solid waste disposed the next working day, thus extending landfill life beyond that filled with soil cover.

Currently, TerraFoam is being used at several landfills in California, including: High Grove Landfill, Riverside; San Marcos Landfill, San Diego County; and Ojai Landfill, San Diego County.

Several sizes of delivery equipment are manufactured: a tractor mounted system for large landfills, skid mounted on truck body, and a small trailer mounted unit. The trailer mounted unit can be served by water truck, is simple, requires little clean-up time and components need not be pre-mixed.

The average cost of a 4 to 6-inch thick blanket of TerraFoam is approximately $.10 per square foot. The cost of the small trailer mounted TerraMAC unit is approximately $30,000; application rate is about 250 square feet per minute (5,000 square feet in 20 minutes).

2. Tarp Cover

Tarps or geosynthetic materials are another form of alternative daily cover that can provide dramatic savings in landfill airspace. Although tarps cost considerably more per square foot than dirt, they are cost-efficient due to their reusability.

The following geosynthetic materials have been identified:

- Airspace Saver, manufactured and marketed by Wire Rope Specialists, Baton Rouge, Louisiana;
- Aqua-Shed, by Aqua-Shed Manufacturing Corporation, Florence, South Carolina;
- Covertech C-440, manufactured by Fabrene Inc., Mississauga, Ontario, Canada, and marketed by Covertech Fabricating, Inc., Etobicoke, Ontario, Canada;
- Daily Landfill Covers manufactured by Belton Industries, Inc., Atlanta, Georgia, and marketed by Pallen Enterprises, Inc., Conyers, Georgia;
- Fabrisoil, by Phillips Fibers Corporation, Greenville, South Carolina;
- GeoCover 601, by New Waste Concepts, Perrysburg, Ohio;
- Permalon X-150, by Reef Industries, Houston, Texas;
- Sani-Cover, manufactured by Amoco Fabrics & Fiber Co., Atlanta, Georgia (series 100 and 200) and Hoechst Celanese Corporation, Spartanburg, South Carolina (Series 300), and marketed by Fluid Systems, Inc., Cincinnati, Ohio; and
- Typar DLC (daily landfill cover), manufactured by Reemay, Inc., Old Hickory, Tennessee, and marketed by Exxon Chemical, Summerville, South Carolina.

Geosynthetic products used for ADCs generally are distributed as sheets or panels in rolls or pallets (accordion pleated and rolled or folded). The panels are placed manually or with use of wheeled or track-type vehicles. After application and overlapping, these materials generally are prevented from blowing loose using tires or sandbags as weights. Concrete blocks also are used, but may damage the product if not used with care. Prior to deposition of solid waste during the next working day, the panels are removed and stored for reuse near the working face.

Most geosynthetic products either are woven, nonwoven or are produced as a film. Films resist water and landfill gas penetration whereas the other products generally will allow some gas and water to penetrate to some degree, depending on pore size. This can provide problems in application or roll-back when water increases weight during rainy weather or when water in pores freezes during cold weather use. Geosynthetic products generally are inert, non-reactive,

lightweight, strong, reusable, and flame resistant.

Final cost of a geosynthetic panel is determined by the number of times it can be reapplied (recycled). After final use, the panel can be discarded in the landfill.

Airspace Saver

Airspace Saver is a woven polyethylene fabric, coated on both sides with additional polyethylene to render it water resistant.[9] Maximum standard panel size is 48 x 50 feet; multiple panels can be overlapped to cover a larger area. The manufacturer also can custom fabricate larger pieces by heat welding 12-foot wide panels.

The product is supplied accordion pleated and rolled. Nylon web straps are spaced 12 feet apart and secured to the panels either in one direction or two directions in a checkerboard pattern across the panels. D-rings are attached to the ends of the web steps for ease of installation. The manufacturer will optionally sew a 3/8-inch chain or wire rope into the perimeter of finished panels to aid security in windy weather.

Two products are available. Product TJBX is a 7.2 mil thick fabric weighing approximately 5 oz. per square yard. Cost is $.25 per square foot; rated life is 6 to 10 months, depending on how the material is handled. Product TGNN is 17.2 mils thick, weighing 9.6 oz. per square yard. Cost is $.40 per square foot, with life rated at 1 to 1 1/2 years (some products have displayed a life of approximately 2 years). Cost of chain or wire rope around the perimeter of the finished panel is approximately $2 per linear foot.

Airspace Saver is used in a number of landfills as daily cover. These landfills include, for instance: City of Lynchburg, City Landfill, Lynchburg, Virginia; Chesterfield County, Virginia; and Lunenburg County Landfill, Lunenburg, Virginia. Product TGNN is used at each of these landfills.

[9]Personal Communication, Marion Yarborough, Wire Rope Specialists (May 6, 1993).

The following Waste Management, Inc. landfills use Airspace Saver daily cover: Skyline Landfill, Ferris, Texas; Gulf Coast Landfill, Ft. Meyers, Florida; Hickory Hill Landfill, Ridgeland, South Carolina; Piedmon: Landfill, Kernersville, North Carolina; Brushy Hill Landfill, Little Rock, Arkansas; East Oak Landfill, Oklahoma City, Oklahoma; Central Disposal, Pompano, Florida; Plantation Landfill, Sibley, Mississippi; Quarry Landfill, Tulsa, Oklahoma; and Westside Landfill, Aledo, Texas. Airspace Saver also is used at Thurston County Public Works, Hawk Prairie Landfill, Olympia, Washington; and Winnebago Reclamation, Rockford, Illinois.

Aqua-Shed

Aqua-Shed is a lightweight, reusable, tan colored PVC sheet. For long-term use, as intermediate cover, the sheets are coated on one side with a polybutene aqueous emulsion glue for adherence to the landfill surface. The sheets are 6 mils in thickness and supplied in palletized cardboard boxes in sizes from 168 square feet (28 x 6 feet) to 4800 square feet (100 x 48 feet); this sheet thickness may make installation difficult on windy days. Weight of an Aqua-Shed panel is approximately 50 pounds per 1,000 square feet. Panels soon will be available in rolls.

The panels are not combustible (self-extinguishing) and can elongate 300 percent before breaking; the material is easy to patch. Installation can be accomplished by two persons without mechanical equipment.

Aqua-Shed has been used as daily and intermediate cover on the Kona Municipal Landfill, Hilo, Hawaii. It is reported that Aqua-Shed has reduced incidences of fires at the landfill.[10] The product also has been used at the Bath Landfill, Bath, Maine, where it is noted that the panels could not be punctured with the operator's steel-wheeled compactor.[11]

[10]Department of Public Works, Hilo, Hawaii. Letter signed by Galan M. Kuba, P.E., Solid Waste Division (April 7, 1992).

[11]Kimball Chase Company, Inc., Bath, Maine. Letter signed by Stephen C. DeWick, P.E., Vice President (April 14, 1992).

Cost of Aqua-Shed (unglued) is $.10 per square foot, F.O.B. Florence, South Carolina. Aqua-shed cover is reported to last 90 to 700 days, depending on how it is handled.

Covertech C-440

Covertech C-440 is a clear or pigmented (colored) woven polyolefin fabric.[12] The material is made of high density polyethylene tapes coated on both sides with low density polyethylene. Reinforced web straps support the material on both sides every 12 feet in both directions, with straps extending over the hem with a D-ring. This design allows for easy installation over compacted solid waste using existing equipment or manpower. None of the woven polyolefins are considered hazardous under normal conditions. The material is stable, chemically inert, and does not present a health hazard.

Due to the fabric's high slip factor (compared to non-woven materials) the cover can be dragged easily on and off solid waste. If the area to be covered is small (e.g., 48 x 50 feet), two to four persons can easily drag it over the working face. The material is secured with tires or sandbags; however, the manufacturer will include an optional chain in the hem for added weight around the perimeter.

Life expectancy of Covertech C-440 is between 10 and 18 months, depending on use. Cost is $.40 per square foot, and it is supplied with one dimension in multiples of 12 feet, up to 72 feet (stock size is 48 x 50 feet).

Covertech C-440 has been used at a number of landfills: Pottstown Landfill (Waste Management of PA, Inc.), Pottstown, Pennsylvania; Kankakee Recycling & Disposal Facility (Waste Management of Illinois, Inc.), Kankakee, Illinois; B.F.I. Charlotte Motor Speedway Landfill, Charlotte, North Carolina; B.F.I. Samson County Landfill (Roseborough, North Carolina); B.F.I. Muskigum Landfill (Zanesville, Ohio); and others.

[12]This product is identical to Airspace Saver.

Daily Landfill Covers

Daily Landfill Covers are fabricated to specific requirements from wide width panels of woven polypropylene. A wide-range of fabric weights (ranging from 3.8 to 8 oz./square yard), strengths and blanket configurations are offered. The basic cover can be manufactured with pockets on each corner to facilitate ease of movement in all directions either manually or with machinery.

The material generally is available in 12.5 foot or 15 foot widths which can be fabricated, double-stitched, into covers up to 75 feet wide and any desired length. Rolls come on 4-inch diameter heavy duty corrugated cores.

Panels are either black, grey, or white in color, and also can be supplied with straps and D-rings at corners. Of six styles offered,[13] styles 796 and 113 generally are used by landfill operators. Style 796 is a 5.4 oz. per square yard black fabric costing $.20 to $.22 per square foot, depending on size. Style 113 costs $.30 to $.32 per square foot and weight 8 oz./square yard. Cost includes web straps and D-rings.[14]

Daily Landfill Covers are used at a number of landfills. Style 796 is used at the Hall County, Georgia, Landfill and City of Macon, Georgia, Landfill. Style 113 is used in 75 x 100-foot panels at BFI and Chambers Development Company landfills, and others. These include, for instance: Roberts Road Landfill, Fayetteville, Georgia (BFI); Oak Ridge Landfill, Dorchester, South Carolina (Chambers) and Chambers Atlanta Landfill, Georgia.

Fabrisoil

Fabrisoil reusable ADCM is a nonwoven, needlepunched polypropylene fabric which is heat set on both surfaces. The staple fiber, needlepunched, heat set construction provides a 3-

[13]Styles 768, 507, 776, 777, 796 and 113.

[14]Personal Communication, Gregory T. Pallen, Pallen Enterprises (May 6, 1993).

dimensional structure which resists snagging on solid waste, and will not de-laminate on reuse.

Generally, a Fabrisoil panel can be used as long as two weeks or more. The panels are shipped folded accordion-style, then rolled up.

Fabrisoil is strong enough to be pulled into place with existing equipment, and if the area is small (say 30 x 50 feet), two persons can easily install. Edges are secured every 20 feet with tires or sandbags. If it is windy, more anchoring may be required. Typically a 100 x 100-foot area can be covered in 10 to 15 minutes. This represents a reduction in time of installation of 85 percent compared to installation using soil as daily cover.

Fabrisoil has been used on more than 20 landfills. At the Rowan County Landfill, Salisbury, North Carolina, the average working face is 100 x 100 feet. At the McLean County Landfill, Bloomington, Illinois (owner-operator John Sexton Contractors Company), life of the Fabrisoil is 15 to 20 uses, saving about 167 cubic yards of airspace per day (daily working face measure 90 x 100 feet).

Fabrisoil costs about $2 per square yard (approximately $.22 per square foot).

GeoCover 601

GeoCover 601 is a nonwoven geosynthetic polypropylene fabric. Each GeoCover 601 panel is custom made specifically for the customer and is delivered to the landfill site ready to use. The manufacturer suggests that panels be no wider than 80 feet. The cover is lightweight (6 oz. per square yard) and has a very low moisture absorption rate, making it easy to handle. The panels are constructed with webbing sewn around the perimeter and with handles every 20 feet.

The product is rolled or dragged, either manually or with on-site landfill equipment, across the surface of the landfill; life of the material depends on how it is handled. For instance, use in Wayne, Michigan, has displayed a life of approximately 30 days. At a site in

Minnesota, a 6-month life was observed.

The product is "certified" for use at landfills in 15 states.[15] Cost is $1.20 per square yard.

Permalon X-150

Permalon X-150 is described as an "alloyed high-density, PE membrane." The product is manufactured with 12 layers of polyethylene oriented in the machine direction, the transverse direction and at 45 degree angles to both directions. Stock size sheets are available up to 100 x 100 feet, constructed of 4-foot wide heat-seamed panels; larger sheets are available up to 200 x 200 feet. All covers can be custom fabricated with grommets, pipeloops, etc. . Thickness of Permalon X-150 is 8.6 mils, with a weight of 30.4 lb per 1,000 square feet.

The product is watertight, but currently is not fire retardant.[16] Cost of Permalon X-150 is $.10 to $.14 per square foot depending on quantity ordered. Currently, the manufacturer is testing an improved product, with geotextile backing (6 oz. nonwoven). Cost is projected to be $.18 to $.20 per square foot.

Permalon X-150 is used at the North Western Landfill (Mid-American Waste Systems), Parkersburg, West Virginia, and the County Environmental Landfill (Envirite Corporation), Pontiac, Illinois.[17]

Sani-Cover

Sani-Cover is available in woven polypropylene (Series 200), non-woven needlepunched polypropylene (Series 100), and non-woven needlepunched "Trevira" 100 percent continuous

[15]Personal Communication, Berthold Rossnagel, New Waste Concepts (May 4, 1993).

[16]Personal Communication, Lynn Ciolli, Reef Industries (May 6, 1993).

[17]Personal Communication, Ralph Jelic, R.A. Jelic Company (May 7, 1993).

filament polyester fabric (Series 300), to serve various field conditions. Non-woven polypropylene and polyester panels provide higher elongation characteristics which reduce the possibility of sharp or pointed objects tearing or puncturing Sani-Cover during deployment. Woven polypropylene, on the other hand, displays water repellency for use in rainy climates.

Sani-Cover is designed for quick and easy deployment using minimal time and labor. For instance, bars can be inserted into pockets sewn into the finished panel for ease in pulling across the landfill working face. The product either can be installed using on-site landfill equipment or it can be deployed manually.

A standard size panel, approximately 100 x 100 feet, can be installed by three persons in approximately 10 minutes.[18] Panels can achieve a lifecycle of more than 60 days use. The cost of Sani-Cover is $.15 per square foot, F.O.B. plant at Dallas, South Carolina.

Sani-Cover is being used at more than 100 landfill sites around the country. On the east coast, these sites include: City of Waco, South Carolina; City of Greensboro, North Carolina; Caldwell County (Hudson, North Carolina); Southern Solid Waste Management Center, Georgetown, Delaware; and Millersville Landfill, Anne Arundel County, Maryland.

At the Millersville Landfill, two Series 200 panels, each measuring 150 x 150 feet, were purchased at a cost of $6,000. The first panels was replaced after seven weeks use. As of May 1993, the second panel had been in use three weeks. Material from the first panel currently is being used to line stormwater diversion ditches and other structures, thereby extending the useful life. Landfill personnel at Millersville are satisfied with Sani-Cover.[19]

[18]Personal Communication, David Powell, Fluid Systems (May 5, 1993).

[19]Personal Communication, Dub Deeson, Millersville Landfill, Anne Arundel County, Maryland (May 27, 1993).

Typar DLC

Typar DLC is made from thermally-spunbonded (non-needlepunched) polypropylene fibers.[20] Standard size fabric panels, in stock, measure 46 x 100 feet; however, the manufacturer can fabricate custom-made panels in any size. Panels are shipped accordion-folded and rolled for ease of application. Depending on how panels are handled, use can extend for at least a year (the vendor advertises a 6-month life). Panels do not snag; however, if necessary, they can be repaired easily.

Although the product is permeable, Typar DLC tends to shed water. In addition, the product does not take on water or excess soil during use, which would increase weight and cause problems in handling.

Typar DLC can be installed using existing machinery or can be handled manually. A 46 x 100 foot panel weighs approximately 200 pounds (about 6.25 oz. per square yard and can be deployed in 10 or 15 minutes by three people). Cost is $530 (about $0.11.5 per square foot).

Among others, Typar Daily Landfill Cover is being used at the Pekin Metro Landfill, Pekin, Illinois; Clinton Landfill, Clinton, Illinois, and Taswell County Landfill (Waste Management of Illinois), East Peoria, Illinois, where service life of panels has exceeded six months.

3. Other ADC Technologies

Alternative daily covers used by some communities make use of materials that would otherwise be part of the waste stream. An example is the fine material generated by Construction and Demolition debris (C&D waste) processing that consists primarily of soil and shredded wood utilized by Waste Management at the Collier County Landfill in Florida. C&D processing now diverts much of the C&D material from disposal, and the fines ADC, which

[20]Personal Communication, Tom Miller, Exxon Chemical (May 7, 1993).

would have been landfilled in the past, now saves the operator $250,000 per year that would have been spent on cover dirt.[21]

Another ADC that is familiar to Los Angeles County is the use of ground green wastes. The Los Angeles Sanitation Districts estimate that up to 600,000 tons (roughly half) of the green wastes could be used as ADC per year. However, because of opposition by the Natural Resources Defense Council (NRDC), the CIWMB may change its policy of counting the use of green wastes used as ADC toward achieving the County diversion goal. The CIWMB considered the problem, and recently confirmed its decision to accept green waste ADC as diversion until such time that adequate markets for green waste compost and mulch develop.

Finally, several commercial slurry products make use of recycycled materials. The following slurry-type materials have been identified:

- ConCover, manufactured and marketed by New Waste Concepts, Perrysburg, Ohio; and
- Posi-Shell, by Landfill Service Corporation, Apalachin, New York.

ConCover

ConCover is an ADCM engineered for use as a daily landfill cover with a life expectancy of 1 to 10 days. The "earth based" polymer spray-applied slurry is composed of two components: a fiber matrix and polymer binding agent. The fiber matrix (bulking agent) is prepared with recycled shredded newspapers and wood pulp.

ConCover can be mixed and applied with the same equipment used to apply ConCover 180, described earlier in this Appendix (see Foam Products). Complete coverage can be attained with a 1/4-inch thick layer, which provides protection equivalent to 6 inches of soil. In approximately 60 minutes, the cover will resist climate conditions; prior to that time, the product

[21] Lynn Merrill, "ADC Gets the Dirt Out!," *MSW Management*, September/October 1995.

is subject to deterioration if an extreme rainfall takes place. ConCover performs best in lower humidity conditions.

At the landfill in Wood County, Ohio, ConCover replaces approximately 150 cubic yards of daily soil cover, saving approximately 43,000 cubic yards of air space annually.[22] Each morning, the mobile spray equipment is filled with 200 gallons of water, to be used for dust control and on-site fires, if necessary. At the end of the day, landfill personnel add bags of ConCover (and an additive, if it is raining). The mixed slurry is then applied over the 150 x 40 foot working face in about 15 minutes, forming a crust in 30 minutes to 1 hour.

ConCover also is used at two landfills in the State of Iowa. These include the Linn County Landfill, which serves the area around Cedar Rapids, and the Webster County Landfill, which services the area around Ft. Dodge.

The cost of ConCover is $.07 per square foot, with equipment cost the same as cited with ConCover 180.

Posi-Shell

Posi-Shell is an environmentally compatible combination of: a filler consisting of a mixture of solids containing 100 percent recycled cellulose fibers and plastics; and a recycled alkaline mineral binder liquid; which is formulated to be mixed either with water or landfill leachate, and sprayed onto the landfill surface. The mineral binder component acts to neutralize odors and contaminants present in landfill leachate. After application, the Posi-Shell slurry hardens to an earth-tone, non-flammable coating.

A horizontal mobile silo is used to store and dispense the binder and a mobile Posi-Shell Applicator mixes ingredients supplied in Posi-Pak bags, and maintains the slurry in constant agitation prior to application. Larger landfills may require multiple set-ups. The mobile

[22]Landfill Uses Old Newspapers as Daily Cover Materials. Pollution Engineering, pp. 122-123 (September 1991).

The increased moisture content from recirculating leachate promotes biological activity, resulting in faster decomposition of organic materials and a concomitant increase in the rate of landfill gas production. The more rapid loss of solids from decomposition in the landfill speeds the consolidation of the landfilled material and the resultant settling.

Laboratory studies of leachate recirculation have shown that decomposition periods can be reduced to 18 to 36 months, as opposed to the 20- to 30-year period normally associated with refuse decomposition.[24] Although these studies are done on small-scale models and field tests do not reveal such dramatic increases in stabilization rates, leachate recirculation has proven to have a considerable effect on waste decomposition in landfills. At the Alachua County Southwest Landfill in Florida, it was assessed that in cells with leachate recirculation, the half-life of the waste's biodegradable mass was decreased to 3 to 5 years; this compares to a half-life of 10 or more years for the waste in untreated sections of the landfill.[25]

2. Biostabilization

An evolving concept of landfilling, stabilized placement or biostabilization, is gaining significant interest as a means to substantially conserve landfill space, particularly where disposal capacity is at a premium and conservation of natural soils is important. In the biostabilization process, following the removal of recyclables, solid waste to be landfilled is shredded and the moisture content is adjusted (preferably to between 40 and 60 percent). The shredded waste is then aerated for a period of 60 to 90 days. Following the aeration period, the waste is compacted with standard landfill compaction equipment. Experience at an operating facility in Albany, New York indicates that after biostabilization, 50 to 100 percent more refuse can be placed in the landfill cell when compared with conventional landfilling.[26]

[24]Kevin O'Leary, "Development of Leachate Disposal Processes," *Waste Age*, July 1995.

[25]T. Townsend, W. Miller, R. Bishop, and J. Carter, "Combining Systems for Leachate Recirculation and Landfill Gas Collection," *Solid Waste Technologies*, July/August 1994.

[26]David L. Hansen, "Biostabilization of Landfill Waste," *Waste Age*, June 1995.

3. Baling

Baling solid waste prior to landfill disposal is another technique that has proven to conserve landfill space. By operating the landfill as a balefill, on average, 45 percent greater compaction will be achieved when compared with conventional compaction methods. Typical bales (3' x 5' x 4') of MSW weigh up to 3,000 pounds, and a well-designed and operated balefill may consume less than half of the equivalent active fill or cell area as a conventional landfill operation for the same tonnage of waste and the same height of fill.

At the Jonesboro Landfill in Craighead County, Arkansas, an initial density of 1,500 pounds per cubic yard is achieved by feeding the waste through a baler prior to disposal (a 25 percent increase over the density estimated for Elsmere).

4. Landfill Reclamation (Mining)

Landfill reclamation, or landfill mining, is the excavation and mechanical processing of previously landfilled material to recover materials or landfill airspace, reduce the size of the landfill, or transfer material from an unlined to a lined landfill.

An extensive evaluation of a landfill mining site was performed in Collier County, Florida by the U.S. EPA's Risk Reduction Engineering Laboratory. During a two-week demonstration period in 1992, County staff mechanically processed 292 tons of excavated material through coarse and fine screens, an air knife/de-stoner, and magnetic separators into nine fractions. Two of these fractions -- a soil fraction and a ferrous metal fraction -- were determined to be reusable. The recovery of ferrous metals averaged about 75 percent with a purity of 82 percent.[27]

A reclamation project at the Frey Farm Landfill, in Lancaster, Pennsylvania, involves continual hauling of the excavated waste to a neighboring WTE facility. The Lancaster County

[27]John T. Aquino, "Reclaiming Landfills: Amazing Interest," *Waste Age*, February, 1994.

Solid Waste Management Authority (LCSWMA) reports that revenues from the sale of electricity and recovered ferrous metal offset operating costs of the landfill reclamation project and result in net revenues of $3.94 for every ton of reclaimed refuse delivered to the WTE facility. Additionally, the mining operations are creating 2,500 cubic yards of vacant landfill space each week.[21]

[21]John T. Aquino, "Landfill Reclamation Attracts Attention - and Questions," *Waste Age*, December 1994.

APPENDIX D

APPENDIX D: SEATTLE, WASHINGTON CASE STUDY

A. INTRODUCTION

The successful recycling program in the City of Seattle, Washington proves that diversion rates of 50 percent and beyond are realistic and obtainable. The latest recycling program studies reveal that Seattle experienced a 48.2 percent recovery rate in 1993. Given that Seattle's diversion rate has leaped from 22.0 percent in 1985, to 40.0 percent in 1990, to 48.2 percent in 1993, it can be inferred that the current recycling rate is well over 50 percent.[1] The following is a summary of the management and success of Seattle's waste and recyclables collection system.

B. BACKGROUND AND LEGISLATIVE FRAMEWORK

Seattle's Solid Waste Utility was established in 1961 to manage collection and disposal of waste in the City of Seattle. It is a public Utility of the City of Seattle and a division of the City's Engineering Department. The Utility, which was established as an Enterprise Fund, is self-supporting, primarily by user fees, and receives no subsidies from the City's General Fund.

The Utility functions both in an administrative role and as a direct service provider. It contracts with private companies for residential waste and residential recyclables collection and processing services; develops overall policies that affect private collection of commercial waste; and contracts for solid waste transport and disposal, as well as certain household hazardous waste transport and disposal services. It also owns and operates transfer stations and a permanent household hazardous waste drop-off facility.

Resolution 25872, adopted by Seattle's City Council on August 14, 1978, called for establishment of recycling goals, and stressed the importance of market stability, source separation, and support for the existing recycling organizations. Recycling targets in the City

[1] "City of Seattle November/December Curbside Recycling Report," City of Seattle, February 1995.

have been steadily increasing since the late 1970s. In 1988, the City Council adopted Resolution 27871 establishing the solid waste management policies that are the basis for Seattle's Integrated Solid Waste Management Plan (the Plan). The Plan is adopted by the City under the authority of the Revised Code of Washington, 70.95.080 (1), which allows the City to "prepare and deliver to the County auditor of the County in which it is located, its plan for its own solid waste management for integration into the comprehensive County plan."

The Plan sets waste reduction and recycling goals of 40 percent by 1991, 50 percent by 1993, and 60 percent by 1998, and it directs the Utility to implement the waste reduction, recycling, composting, and disposal programs necessary to achieve these goals. Resolution 27871 also mandates a schedule for implementation of these programs and expresses the intent of the City of Seattle to manage the disposal of its residential and commercial solid waste independent of King County.

C. COLLECTION AND TRANSFER SYSTEM

1. Residential Collection

The City contracts with two local companies, U.S. Disposal (owned by Rabanco, Inc.) and General Disposal (owned by Waste Management, Inc.), for mandatory, weekly residential waste collection (including single-family households and multi-family properties of up to four units) in three areas of the City. The contractors serve approximately 250,000 households. Customers are offered a choice between curb/alley and backyard collection, with a 40-percent rate discount incentive for choosing curb/alley collection. For curb/alley customers, contractors supply containers sized according to the customer's chosen level of service, ranging from a mini-can (19 gallons) to a 90-gallon cart. A pre-paid trash sticker is also available for excess waste.

Waste generated by Seattle households and collected by the two City contractors is hauled to one of two City-owned transfer stations. The waste is then transferred to City trucks and hauled by the City to the rail yard transfer station. It is then rail-hauled to Columbia Ridge

Landfill in Arlington, Oregon, which is owned and operated by Washington Waste Systems, a subsidiary of Waste Management, Inc.

In 1988, the City began offering curbside collection of recyclables to residents. Curbside recycling services are offered on a voluntary, subscription basis to 148,500 single-family households and multi-family units (up to four-plexes) by two local hauling companies: Recycle America and Recycle Seattle. The North-side contractor, Recycle America (a Waste Management Company), provides weekly pick-up of recyclables in three, 15-gallon stacking bins -- one for newspaper, one for mixed paper (all forms of residentially-generated paper, e.g., newspaper, magazines, junk mail, cereal boxes, and corrugated cardboard), and one for glass, plastic (PETE and HDPE), and metal (tin, aluminum, and bimetal) containers. The South-side contractor, Recycle Seattle (a Rabanco Company), provides monthly pick-up of the same materials in 60- or 90-gallon wheeled toters. To alleviate some of the glass breakage occurring during commingled collection of the materials, Recycle Seattle has provided customers with a small container for glass storage that hooks onto the outside of each toter.

The City also provides contracted curbside collection of yard trimmings. Curbside yard trimming collection service is provided by two companies: (1) General Disposal Corporation provides weekly pickup year-round; and (2) U.S. Disposal Service provides bi-weekly pick-up from March through October, and monthly pick-up from November through February. Yard trimmings are also accepted from businesses and residents at the two City transfer stations. All yard trimmings collected in the City are then hauled to Rabanco's Cedar Grove Compost Facility for processing. The City also operates an education program to encourage backyard composting.

Except for yard trimmings, there is no additional charge for curbside recycling services. Residents are charged monthly for yard trimming collection; the cost of collecting other recyclables is included in the residential fee structure. A multi-family recycling program targeted at multi-family residences with more than four units began in 1993.

In addition to the City's curbside recycling program, the two City transfer stations provide drop boxes for all materials accepted at the curb, as well as vehicle batteries, motor oil,

oil filter containers, mattresses, "sharps" (i.e., needles), ferrous and non-ferrous scrap metal, and used lumber and wood. Residents can drop off these materials free of charge. White goods and used automobile tires are accepted for a charge.

The Utility participates in the Regional Household Hazardous Waste Program and has owned and operated a permanent household hazardous waste facility (located next to the South Transfer Station) since 1988. The facility is open to both City and County residents.

2. Commercial Collection

Commercial solid waste collection in Seattle is regulated by the Washington Utilities and Transportation Commission (WUTC). Although the City has the authority to contract for commercial waste collection, and may do so in the future, Seattle's businesses and industries are served by four collection companies holding certificates from the WUTC. The City monitors WUTC decisions and, through the Plan, establishes recycling service levels, rate structure requirements, and data-reporting requirements necessary to meet the City's recycling goals. Although the City does not set rates for commercial collection, it participates in WUTC rate hearings to ensure a rate structure that encourages waste reduction and recycling in accordance with the Plan.

3. Government/Institutional Sector Collection

City government buildings are considered a residential customer; they use dumpsters and receive waste-collection services from Rabanco and Waste Management. Other government buildings and most City institutions contract for waste collection with private haulers.

4. Transfer Stations

There are four transfer stations located in Seattle where collection vehicles transfer waste to larger transfer trailers (rail cars) for long-haul to the Columbia Ridge Landfill in Arlington, Oregon. Two of the transfer stations are owned and operated by the City within the Enterprise Fund. Generally, the two City-operated transfer stations serve the self-haul customers and the residential collection contractors hired by the City.

The two private transfer stations are owned and operated by two private companies that collect waste from commercial accounts in Seattle and outside of the City. One such facility, owned by Rabanco, receives, processes, and transfers many different types of materials, including recyclables from the residential curbside recycling contract, commercial paper loads, construction and demolition debris, and commercial MSW. The Eastmont Development Transfer Station, owned and operated by Waste Management, receives waste from Bayside Disposal and other collection firms operated by Waste Management in the Seattle area. Waste from commercial and industrial accounts inside and outside of the City and residential waste from outside of Seattle are delivered to the Eastmont Development site.

D. VARIABLE RATES

The City Utility has instituted a weight-based rate system, which is calculated by the size of the container provided to each generator. As shown in Table A-1, rates range from a 12-gallon "Micro Can" at $9.37 per month up to a 90-gallon cart at $44.94 per month for curbside collection. The Utility has experimented with on-board weighing systems to provide more accurate weight-based fees, but has not implemented a full-scale program.

Collection service also provides, for the larger can sizes, the option of backyard (rather than curbside/alley) service for an additional cost. Note that there are no charges for recyclables collection, and the $3.00/month rate for yard waste collection is set low enough to encourage resident diversion.

Table D-1. City of Seattle, Washington Rates

Residential Monthly Rates of Containers

	Weight Limits	Curb/alley	Backyard
Micro Can (12 gal)	- 20 lbs.	$ 9.37	not available
Mini Can (19 gal)	- 30 lbs.	$11.50	not available
32 Gallon Can	- 60 lbs.	$14.98	$20.96
60 Gallon Cart or (2 32-gal)	- 120 lbs.	$29.96	$41.94
90 Gallon Cart or (2 32-gal)	- 180 lbs.	$44.94	$62.92
Yardwaste 5 units/week	- 60 lbs.	$ 3.00	not available

Disposal Stations Fees and Charges
(Reyclables can be dropped off free of charge)

	White Goods (large appl.)	Garbage, Tires and Mattresses	Clean Yard Waste Clean Wood Waste
Passenger vehicle	$14.00/item	$ 7.00/trip	$ 6.00/trip
Non-passenger vehicle	$14.00/item	$83.00/ton	$64.00/ton
Minimum disposal fee Non-passenger vehicle	$14.00/item	$13.50/trip	$10.00/trip

"Clean" means a load is entirely yard waste or entirely wood waste. Mixed loads will be charged the garbage rate. If you bring yard waste and garbage in the same vehicle, you pay the rate for garbage.

Yard waste and garbage must be separated prior to disposal.

If you bring appliances and garbage in the same vehicle, you pay the rate for garbage plus $5 per appliance.

Source: *The Economics of Recycling and Solid Waste Management for the 90s*, Harvey Gershman, GBB, Municipal Waste Management Association, March 24, 1994.

Similarly, there is no fee for recyclables drop-off at Disposal Stations, where residents can bring bulk wastes.

E. RECYCLABLES DIVERSION

The key to the success of the City of Seattle's recycling program is the participation rate among eligible households. As of December, 1994, 91.1 percent of the 149,500 eligible households are participating in the City recycling program. On the North Side of the City, 98.9 percent of the households participate. In addition, Seattle averages five new sign-ups per day.[2]

The latest quantitative analysis of the recycling program, which is for the year 1993, revealed that the City of Seattle experienced a 48.2 percent diversion rate. The breakdown of generation and diversion rates for each waste component is included as Table A-2.

In 1985, 22.0 percent of the waste in Seattle was being recovered, and in 1990, a 40.0 percent diversion was experienced. Given the 1993 diversion rate of 48.2 percent, and recognizing the upward trend in recycling recovery rates, it seems Seattle is on target to reach the 1998 goal of 60 percent diversion.

[2] "City of Seattle November/December Curbside Recycling Report," City of Seattle, February 1995.

Table D-2. Summary of Recycling Program Impacts For Scenario 1 (in tons per year)

SECTOR: RESIDENTIAL COLLECTION
YEAR: 1993

Source ------>	Utility, New and Private Recycling			Generation and Disposal		Recycling %
Material	Util & New Recycling (1)	Exist Priv Activity (2)	Total Recycled (3=1+2)	Total Generated (4)	Total Disposed (5=4-3)	Percent Recycled (3/4)
NEWSPAPER	19917.2	17175.7	37092.9	45099.4	8006.5	82.2
CORRUGATED-KRAF	5317.2	4158.9	9476.1	18413.0	8936.8	51.5
COMPUT-OFF PAP	0.0	2903.2	2903.2	3387.0	483.8	85.7
MIXED SCRAP	15357.3	2825.0	18182.4	27577.3	9394.9	65.9
OTHER PAPER	0.0	0.0	0.0	25144.0	25144.0	0.0
PLASTICS	321.7	248.4	570.1	17849.8	17279.7	3.2
YARD WASTE	37821.3	0.0	37821.3	40805.2	2983.9	92.7
WOOD	0.0	0.0	0.0	1927.1	1927.1	0.0
FOOD WASTE	0.0	0.0	0.0	24408.1	24408.1	0.0
OTHER ORGANICS	0.0	303.5	303.5	9670.5	9367.0	3.1
BEVERAGE GLASS	4445.7	55.1	4500.8	7208.3	2707.4	62.4
CONTAINER GLASS	7685.0	3100.5	10785.5	15429.6	4644.1	69.9
OTHER GLASS	0.0	0.0	0.0	385.6	385.6	0.0
FOOD CANS	1583.3	1000.5	2583.8	4697.0	2113.2	55.0
OTHER FERROUS	0.1	0.0	0.1	607.1	607.0	0.0
ALUM BEVERAGE	987.5	1989.9	2977.4	3659.7	682.3	81.4
OTHER ALUM	0.0	0.0	0.0	256.8	256.8	0.0
OTHER NON FERROUS	0.0	0.0	0.0	289.2	289.2	0.0
CONSTRUCT DEBRIS	0.0	0.0	0.0	924.6	924.6	0.0
MISCELLANEOUS	0.0	163.3	163.3	16595.2	16431.9	1.0
TOTAL	93436.5	33923.9	127360.3	264328.1	136967.8	48.2

APPENDIX E

APPENDIX E: ENTERPRISE FUNDS AND FULL COST ACCOUNTING

This Appendix discusses some of the cost issues relevant to integrated solid waste management planning. It is not possible to develop a detailed cost plan for the recommendations made in the report. To do so would require obtaining present cost data from the County and the County Sanitation Districts of Los Angeles County, as well as from each of the Cities in the County.

Determining the actual cost of solid waste management is one of the most difficult tasks encountered by communities developing integrated solid waste management plans. Many costs, particularly overhead costs such as personnel management, are handled by separate departments. The amount of time allocated to management of solid waste personnel must be estimated as part of the overall cost of solid waste. In addition, divisions often share equipment, marshalling yards or supervisory personnel, or pitch in together to provide emergency services, making it difficult to identify solid waste-specific costs.

The objective in this Appendix is to get the County thinking about how to develop a coherent integrated solid waste management system and help communities control costs. The County can function in a key coordinating role. This does not mean that the County shoulders all costs or manages all facilities; it means that the County actively supports the Cities and facilitates their operations. Elaborate solid waste systems can be very costly if program components are added piecemeal. County leadership can be critical in this area through:

- preparing the County Comprehensive Plan to coordinate efforts between the various County jurisdictions or provides joint City/County-sponsored facilities;
- developing facilities that serve multiple jurisdictions (e.g., transfer stations) that, through economies of scale, keep costs down despite possible longer haul distances;
- developing County model programs, including a variable rate fee system for County-collected areas and technology demonstration programs for landfill operations (see Chapter IX.F); and
- maintaining the economic viability of existing facilities, for example, through waste transfer to the WTE facilities (Chapter IX.H) or developing a policy of purchasing

supplies from recycling enterprises ("Buy Recycled") that utilize recyclables collected in Los Angeles County.

In addition to the coordinating role, the County can pioneer some innovative ways of financing solid waste management programs that also foster diversion of waste from disposal, including: enterprise fund accounting, and variable rate fees ("unit pricing"). Also discussed in this Appendix are the relative share of the solid waste dollar cost for different system components, and factors influencing costs. These two topics provide background for Report discussions.

A. ENTERPRISE FUNDS

Operating an integrated solid waste management system as an enterprise fund allows communities to track the true cost of service, and keeps the funding for services separate from the political vagaries of the government budgeting process. In an enterprise fund, all revenues and costs go to a cost center. Revenues do not go to the General Fund, debt service is not paid for by Finance, benefits by Personnel, or fuel by the Transportation Department, etc., which is often the case when solid waste is part of a jurisdiction's operation. Future post-closure costs and sinking funds are established in enterprise accounting, and it possible to tell the cost for solid waste service and charge for it -- by the ton, by the household, by the business address, etc.

B. VARIABLE RATES

Local governments need to find ways to charge the generator for the service received in order to get solid waste costs out of the General Fund. Direct billing of customers for the solid waste service received is a key component of enterprise fund accounting. These fees, plus other revenues such as from the sale of recovered materials, make up the funds used to pay costs. Generator billing should be done in a way that encourages source reduction as well as maximizes diversion. A variable rate system (also called "unit pricing") goes far to accomplish this and is also an important part of enterprise accounting for solid waste management. Variable rate pricing has been the norm in commercial collection for years -- the generator is billed based

either on the weight of the material collected by the hauler, or by the size of the waste storage container used by the generator. For the residential customer, it can mean higher costs for more waste, or lower costs for less waste and more recycling. For the commercial generator, it can mean differential fees (or no fee) for loads that can be recycled. As consumerism is applied to solid waste services, the generator will have incentive to dispose of less and to set aside more materials for recycling. An example of a variable rate fee system is provided in Appendix A, Case Study of the City of Seattle.

C. COSTS FOR SOLID WASTE SERVICES

The solid waste dollar goes to many functions, depending upon the make-up of the specific system. Shown in Figure E-1 is a pie chart, developed from data from several cities, that graphically portrays how the solid waste dollar is split up. Administrative costs for each of the components are included in each portion of the pie. As can be seen, collection-related costs comprise over 60 percent of the pie, followed by disposal at 30 percent, and lastly by processing at 8 percent. It should be noted that solid waste collection includes bulk waste and special collections (such as post-special event collections and disaster debris), while recycling collection costs include yard waste collection as well as curbside service for materials. The pie chart shows recycling-related collection costs at 20 percent -- or almost one-third of the collection expenditures. Recycling costs overall can represent over one-quarter of the way the solid waste dollar is spent.

In addition to the above service-related and direct administrative costs, a community can expend considerable funds on specialized services, such as Household Hazardous Waste (HHW) collection and public information campaigns to encourage recycling and HHW diversion. Many communities have turned to surcharges on landfill or transfer station tipping fees as a means of funding new diversion programs, particularly for programs such as HHW that have a high unit cost and do not produce revenues to help pay for the program. Monies collected through surcharges can "get lost" in the General Fund; enterprise fund accounting can keep these resources dedicated to solid waste management programs.

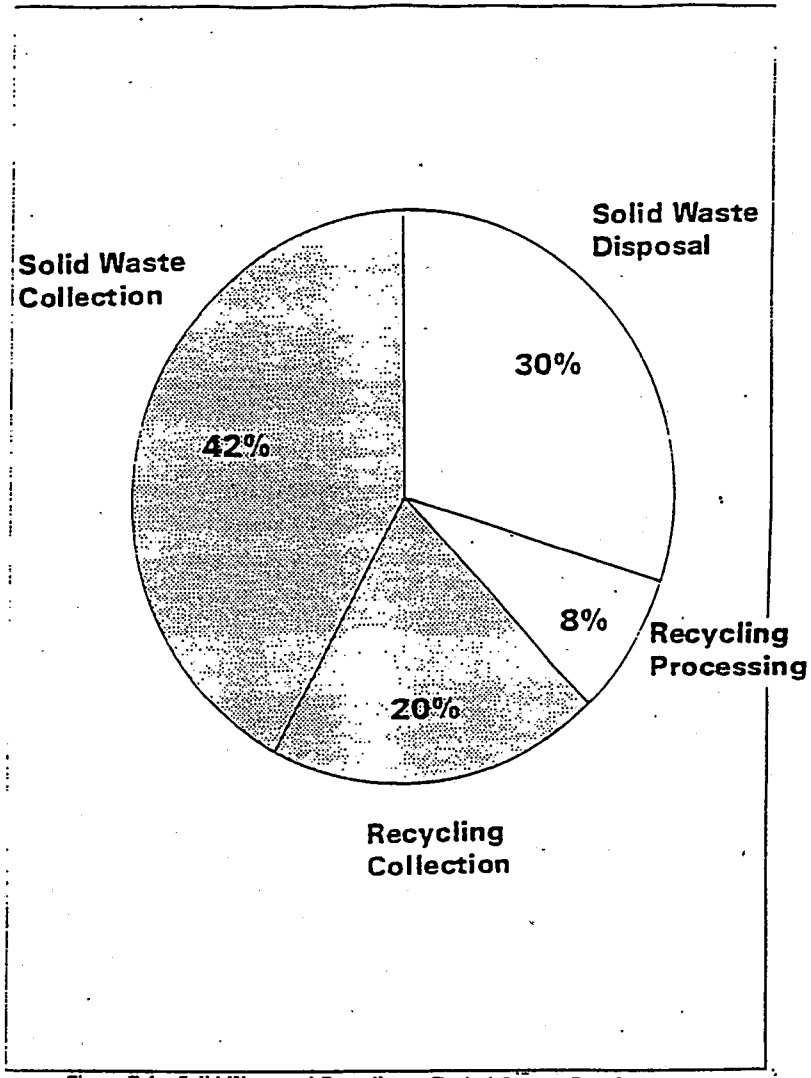


Figure E-1. Solid Waste and Recycling – Typical System Cost Components

D. FACTORS INFLUENCING COSTS

Trends that influence recycling and solid waste disposal costs are discussed in various Report Chapters, and are summarized here by the service component. Overall, the cost of solid waste management is rising, but offsetting trends are discussed as well.

1. Collection

Two factors are driving the cost of solid waste collection. First, obtaining high-quality recyclables from the waste stream often means curbside collection of source-separated designated materials. This adds specialized recycling collection trucks and personnel routed through the same neighborhoods as the solid waste collection packer trucks. Yard wastes are also collected through a separate route system. Bulk wastes may also be collected separately using open-bed trucks equipped with a grapple. Each additional collection system will increase the number of trucks and personnel needed to get the job done.

Second, as the solid waste management system has evolved, the equipment industry has been evolving along with it. Automated collection equipment allows a single driver to complete a route, rather than the two- or three-man crews required for traditional packer trucks. Sophisticated routing software and GIS mapping allow a jurisdiction to consolidate routes, so that as recycling collection expands, solid waste collection routes can be adjusted proportionally, and optimum routes (i.e., the most material in the least time) can be devised for each type of collection. Other equipment features, such as split packers, allow a single truck to perform double duty while on a route. These options can be used to reduce the cost of collection.

Communities are innovating to contain the costs resulting from these trends. Automated collection has been applied to recyclable materials as well as refuse. Rebanco in Seattle has utilized authomated recycling collection in 96 gallon carts and reduced the collection frequency to once per month. Guelph, Ontario is implementing wet/dry collection citywide in the city, with a population of 80,000. This followed an extensive pilot program to establish the cost and effectiveness of the program. Because the collection function represents a majority of the solid

waste management cost, efficiency in this area has the largest reduction in overall cost for the investment.

2. Transfer

Collection costs can also be contained by adding transfer station(s) to the system. As discussed in Chapter IX, transfer stations can reduce collection costs by keeping collection packer truck routes as short as possible (less than 30 miles). A transfer trailer can carry three times the amount of waste as a packer truck and rail cars can carry six times the amount. Shifting the waste to larger-capacity, more efficient transfer vehicles for transport to the disposal site reduces the number of personnel and vehicles needed.

Even though transfer operations add capital and operations costs for transfer stations and vehicles, they have the potential to significantly reduce the overall cost. The reduction in the non-productive time for the route collection trucks has a double pay-off. First, the cost per collection route is reduced and second, the route collection trucks can collect from additional routes. This lowers the investment in trucks and crews.

3. Solid Waste Disposal

Class III Sanitary Landfills are still the primary method of managing solid waste in Los Angeles County. The cost of landfill disposal is a political issue as well as a technical one. The true cost of local landfill disposal is not reflected in $20.00 per ton tipping fees. Some long-term costs of landfill disposal can be deferred (rather than paid out of tipping fees), particularly closure, post-closure, and Title V Remediation Funds, plus, for existing landfills, the cost of the site may have already been paid for and does not reflect current land values. However, a jurisdiction may choose to keep landfill prices low in order to keep waste from leaving to lower-cost disposal sites in order to maintain cash flow at the landfill, or (as in the case of Orange or Riverside Counties) may reduce the price to attract waste from outside the jurisdiction and thus increase cash flow in the short term.

The actual cost of landfill disposal is driven by the cost of the land, pre-development costs for planning and permitting, plus the construction and operation costs of the facility over its life. The U.S. EPA promulgated new rules for landfill management on October 9, 1991. These rules, as subsequently adopted by the State of California, set standards for:

- Location. Includes limits on proximity to airports, 100-year floodplains, wetlands, fault areas, seismic impact areas, and unstable areas.
- Design. Requires composite liner and leachate collection systems to maintain less than 30-cm depth of leachate over liner. Liner systems combine compacted clay and synthetic membranes. Leachate collection piping is sandwiched in a porous layer between liners.
- Operations. Requires exclusion of Hazardous Wastes and bulk or uncontainerized liquid wastes, daily cover and control of disease vectors, methane gas monitoring and control and other air emissions control (i.e., no open burning), access restrictions to prevent illegal dumping, control of precipitation run-on and runoff, and recordkeeping for groundwater monitoring, methane gas, inspection reports, and closure/post-closure plans. No discharges to surface water are permitted.
- Groundwater Monitoring. Monitoring wells required within compliance area. Testing required for 62 pollutants (15 heavy metals and 47 volatile organic chemicals). If pollutants exceed background levels, testing must be conducted for another 245 hazardous inorganic and organic constituents. If specified levels of pollutants found, a corrective action procedure must be initiated.
- Closure and Care. Written closure plan required. Closure include a cap designed to minimize infiltration and erosion, including infiltration layer minimum of 18 inches and permeability no greater than $1x10^{-5}$ cm/sec of material. Care of the facility required for 30 years after closure, including regular inspections for cap integrity and well monitoring.
- Financial Assurance. Must provide detailed estimates of costs for closure and post-closure and to perform corrective action as required; must provide an acceptable mechanism to guarantee funding for these future activities.

In addition to the cost of the modern sanitary landfill, the State of California requires landfills to fund Article V Remediation Costs. Article V regulations require establishment of a fund to cover potential remediation of contaminated groundwater caused by landfills.

The impact of these rules has been to increase the cost per acre of constructing landfills; this, in turn, has resulted in a trend toward development of very large landfills that can keep costs down through the larger volume of waste that can be disposed of at the site. Given the size of these new landfills, there is a parallel trend toward developing new facilities in remote areas with rail or highway access where land is cheaper and large tracts available.

4. Processing

Through the 1970s and 1980s, transformation, or waste-to-energy, facilities were seen as a preferred alternative to increasingly scarce and costly landfill disposal. Facilities financed and built during that period have tip fees in the $30.00 per ton range. As a result of changes in tax law as well as increased air pollution control requirements, tip fees for new facilities would be close to $100.00 per ton.

Trends in recycling markets are discussed in detail in Chapter VII, Section B. There is a present downturn in markets following on the heels of a rapid expansion. As in the case of other commodities, market prices and opportunities for recovered materials will fluctuate; however, it is expected that markets will remain strong as a result of new final market and export market development. The processing costs of materials recovery facilities (MRF) vary among communities and average $50 per ton according to a recent NSWMA study. This includes both the capital costs and the operations and maintenance costs. Revenues from the sale of materials can off-set these costs, depending on the markets.

Unlike other recyclable materials, the markets for yard waste compost products have yet to expand. Processors are producing good material; the problem lies more in learning to present the product in a manner acceptable to the potential major markets (farmers, horticultural firms, etc.). These markets have specific needs and require a proven product. The specifications for compost products derived from waste materials need to reflect the traditional soil amendments used by these markets (e.g., peat moss), so that the user can understand how the compost can be applied to their needs.

APPENDIX F

APPENDIX F. YEAR-BY-YEAR TABLES FOR LANDFILL CAPACITY PROJECTIONS

The following tables provide year-by-year projections of the waste generation and disposal rates for Los Angeles County. The last column in each table, Unsatisfied Need or Daily Disposal Capacity Shortfall, projects the amount of generated waste in excess of the available disposal capacity. The first year a value in the Unsatisfied Need column is greater than zero denotes the "crisis" year, when the quantity of waste generated is larger than the available disposal capacity. As the tables are modified (based on the incremental adjustments discussed in Chapter V, Chapter VI, and Chapter VIII), the "crisis" year is postponed. Ultimately, the solid waste disposal system for Los Angeles County is proven to have much longer useful life than originally projected.

Table F-1. Projected Daily Disposal Capacity Shortfall
Scenario 1 – Base Case With Historical Acceptance Rates

Scenario :

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOU
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Processing Facility Diversion	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported / Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50 729		25.0	0	1 780	-	35 837	5 849	1 910	5 194	755	3 813	2 055
1996	52 332		30.0	0	1 780	(2 000)	32 872	5 548	1 875	5 080	723	3 541	2 529
1997	53 567		35.0	0	1 780	(3 500)	29 572	7 157	2 420	0	3 223	4 578	0
1998	53 714		40.0	0	1 780	(3 500)	26 988	2 936	2 811	0	2 465	5 078	0
1999	54 345		45.0	0	1 780	(3 500)	24 471	5 183	0	0	2 541	5 234	0
2000	54 903		50.0	0	1 780	(3 500)	22 192	6 672	0	0	2 578	5 508	0
2001	56 184		50.0	0	1 780	(8 000)	20 334	5 650	0	0	2 58	0	0
2002	57 061		50.0	0	1 780	(8 000)	20 874	5 879	0	0	2 756	0	0
2003	58 344		50.0	0	1 780	(8 000)	21 412	9 108	0	0	2 829	0	0
2004	59 302		50.0	0	1 780	(8 000)	21 891	9 312	0	0	2 893	0	0
2004	60 213		50.0	0	1 780	(8 000)	22 348	9 508	0	0	2 953	0	0
2005	61 362		50.0	0	1 780	(8 000)	22 766	9 888	0	0	3 103	0	0
2006	61 822		50.0	0	1 780	(8 000)	23 151	7 782	0	0	3 400	0	0
2007	62 524		50.0	0	1 780	(8 000)	23 502	0	0	0	3 019	0	0
2008	63 158		50.0	0	1 780	(8 000)	23 819	0	0	0	0	0	0
2009	63 778		50.0	0	1 780	(8 000)	24 103	0	0	0	0	0	0
2010	64 158		50.0	0	1 780	(8 000)	24 324	0	0	0	0	0	0
2011	65 022		50.0	0	1 780	(8 000)	25 201	0	0	0	0	0	0
2012	66 818		50.0	0	1 780	(8 000)	25 849	0	0	0	0	0	0
2013	67 [illegible]		50.0	0	1 780	(8 000)	25 134	0	0	0	0	0	0
2014	68 68		50.0	0	1 780	(8 000)	26 583	0	0	0	0	0	0
2015	69 511		50.0	0	1 780	(8 000)	26 985	0	0	0	0	0	0
2016	[illegible]		50.0	0	1 780	(8 000)	27 391	0	0	0	0	0	0
2017	[illegible]		50.0	0	1 780	(8 000)	27 798	0	0	0	0	0	0
2018	[illegible]		50.0	0	1 780	(8 000)	28 214	0	0	0	0	0	0
2019	[illegible] 500		50.0	0	1 780	(8 000)	28 640	0	0	0	0	0	0
2020	[illegible] 965		50.0	0	1 780	(8 000)	29 075	0	0	0	0	0	0
2021	[illegible] 554		50.0	0	1 780	(8 000)	29 517	0	0	0	0	0	0
2022	[illegible] 451		50.0	0	1 780	(8 000)	29 965	0	0	0	0	0	0
2023	[illegible] 345		50.0	0	1 780	(8 000)	30 414	0	0	0	0	0	0
2024	[illegible] 236		50.0	0	1 780	(8 000)	30 858	0	0	0	0	0	0
2025	[illegible] 364		50.0	0	1 780	(8 000)	31 287	0	0	0	0	0	0
2026	[illegible] 900		50.0	0	1 780	(8 000)	31 680	0	0	0	0	0	0
2027	[illegible] 755		50.0	0	1 780	(8 000)	32 123	0	0	0	0	0	0
2028	92 616		50.0	0	1 780	(8 000)	32 548	0	0	0	0	0	0
2029	93 466		50.0	0	1 780	(8 000)	32 974	0	0	0	0	0	0
2030	93 334		50.0	0	1 780	(8 000)	33 407	0	0	0	0	0	0
2031	93 206		50.0	0	1 780	(8 000)	33 844	0	0	0	0	0	0
2032	94 081		50.0	0	1 780	(8 000)	34 282	0	0	0	0	0	0
2033	94 496		50.0	0	1 780	(8 000)	34 718	0	0	0	0	0	0
2034	95 973		50.0	0	1 780	(8 000)	35 151	0	0	0	0	0	0
2035	96 684		50.0	0	1 780	(8 000)	35 562	0	0	0	0	0	0
2036	97 [illegible]		50.0	0	1 780	(8 000)	36 011	0	0	0	0	0	0
2037	98 396		50.0	0	1 780	(8 000)	36 440	0	0	0	0	0	0
2038	99 255		50.0	0	1 780	(8 000)	36 866	0	0	0	0	0	0
2039	100 [illegible]		50.0	0	1 780	(8 000)	37 297	0	0	0	0	0	0
2040	100 [illegible]		50.0	0	1 780	(8 000)	37 728	0	0	0	0	0	0
2041	101 844		50.0	0	1 780	(8 000)	38 182	0	0	0	0	0	0
2042	102 716		50.0	0	1 780	(8 000)	38 597	0	0	0	0	0	0
		Total Capacity Used (Tons)						32 566 382	2 812 688	3 829 579	11 363 944	8 809 008	1 433 774

Table F-1. Projected Daily Disposal Capacity Shortfall
Scenario 1 – Base Case With Historical Acceptance Rates
(*Continued*)

D WASTE FACILITIES AND POTENTIAL EXPANSIONS
WASTE DISPOSAL RATES
POLITAN AREA - 1995

Landfill Waste Acceptance Rate - (tpd-6)

Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Park	Antelope Valley Dump	Azusa Land Reclamation	Burbank	Waste Management of Lancaster	Pebbly Beach Disposal	U.S. Navy	Whittier Savage Canyon	Unsatisfied Need
3 457	5 162	1 807	9	387	3 097	84	518	2	05	181	0
3 344	5 [illegible]	[illegible]	9	380	3 040	82	507	2	05	1[illegible]	0
4 316		2 289	12	490	5 095	108	654	3	07	229	0
4 186		2 536	13	544	0	117	426	3	07	254	0
4 [illegible]		2 81[illegible]	13	561	0	121	0	3	07	281	0
4 [illegible]		2 [illegible]33	[illegible]	45[illegible]	0	99	0	2	06	213	0
3 [illegible]46		2 766	14	593	0	128	0	3	08	[illegible]	0
3 354		2 539	15	606	0	131	0	3	08	284	0
3 492		2 913	15	624	0	135	0	3	08	291	0
3 [illegible]19		2 978	15	638	0	138	0	3	09	298	0
3 [illegible]72		3 040	16	651	0	141	0	3	09	304	0
3 309		3 194	16	684	0	148	0	4	09	319	0
		3 500	34	750	0	240	0	8	10	350	[illegible]107
		3 500	91	6	0	240	0	20	10	350	18 274
		3 500	102	0	0	240	0	24	10	350	19 [illegible]
		3 500	102	0	0	240	0	24	10	350	19 886
		3 500	102	0	0	240	0	33	10	350	20 599
		2 225	102	0	0	240	0	0	10	350	22 483
		0	102	0	0	240	0	0	10	350	24 956
		0	102	0	0	240	0	0	10	350	25 441
		0	102	0	0	240	0	0	10	350	25 880
		0	102	0	0	240	0	0	10	350	26 302
		0	102	0	0	240	0	0	10	350	26 698
		0	102	0	0	240	0	0	10	350	[illegible]06
		0	102	0	0	240	0	0	10	350	[illegible]521
		0	102	0	0	240	0	0	10	350	[illegible]947
		0	102	0	0	240	0	0	10	350	28 382
		0	102	0	0	240	0	0	10	350	28 824
		0	102	0	0	240	0	0	10	66	29 556
		0	86	0	0	240	0	0	10	0	30 074
		0	0	0	0	240	0	0	10	0	30 617
		0	0	0	0	240	0	0	10	0	31 046
		0	0	0	0	240	0	0	10	0	31 449
		0	0	0	0	240	0	0	10	0	31 882
		0	0	0	0	240	0	0	10	0	32 307
		0	0	0	0	240	0	0	10	0	32 733
		0	0	0	0	240	0	0	10	0	33 188
		0	0	0	0	240	0	0	10	0	33 603
		0	0	0	0	240	0	0	10	0	34 041
		0	0	0	0	240	0	0	10	0	34 477
		0	0	0	0	240	0	0	10	0	34 910
		0	0	0	0	240	0	0	10	0	35 341
		0	0	0	0	240	0	0	10	0	35 770
		0	0	0	0	240	0	0	10	0	36 198
		0	0	0	0	240	0	0	10	0	36 627
		0	0	0	0	240	0	0	10	0	37 058
		0	0	0	0	240	0	0	10	0	37 487
		0	0	0	0	240	0	0	10	0	37 921
		0	0	0	0	240	0	0	10	0	38 356
											45000
[illegible]348 944	3 314 568	15 728 208	588 884	2 300 976	3 504 336	3 216 583	655 952	44 680	14 297	2 731 448	

Table F-2. Projected Daily Disposal Capacity Shortfall
Scenario 2 – Waste Exports

Scenario 2

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Processing Facility Diversion	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported / Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50 129		25.0	0	1 780	-	35 837	5 649	1 910	9 184	1 755	3 613	2 085
1996	52 332		30.0	0	1 780	(2 000)	32 872	5 548	1 875	6 080	1 723	3 547	2 529
1997	53 587		35.0	0	1 780	(3 500)	29 572	7 157	2 420	0	2 223	4 578	0
1998	53 714		40.0	0	1 780	(3 500)	26 958	7 806	2 641	0	2 465	5 078	0
1999	54 257		45.0	0	1 780	(3 500)	24 471	8 183	0	0	2 542	5 234	0
2000	54 905		50.0	0	1 780	(3 500)	22 192	6 672	0	0	2 072	6 508	0
2001	56 188		50.0	0	1 780	(6 000)	20 334	6 650	0	0	2 687	0	0
2002	57 267		50.0	0	1 780	(6 000)	20 874	8 879	0	0	2 756	0	0
2003	58 344		50.0	0	1 780	(6 000)	21 412	9 108	0	0	2 829	0	0
2004	59 305		50.0	0	1 780	(6 000)	21 891	9 312	0	0	2 883	0	0
2005	60 212		50.0	0	1 780	(6 000)	22 346	9 506	0	0	2 953	0	0
2006	61 262		50.0	0	1 780	(6 000)	22 788	9 888	0	0	3 103	0	0
2007	61 825		50.0	0	1 780	(6 000)	23 151	7 782	0	0	3 400	0	0
2008	62 524		50.0	0	1 780	(6 000)	23 502	0	0	0	3 019	0	0
2009	63 158		50.0	0	1 780	(6 000)	23 819	0	0	0	0	0	0
2010	63 795		50.0	0	1 780	(6 000)	24 103	0	0	0	0	0	0
2011	64 468		50.0	0	1 780	(6 000)	24 424	0	0	0	0	0	0
2012	65 922		50.0	0	1 780	(6 000)	25 201	0	0	0	0	0	0
2013	66 818		50.0	0	1 780	(6 000)	25 649	0	0	0	0	0	0
2014	67 785		50.0	0	1 780	(6 000)	26 134	0	0	0	0	0	0
2015	68 681		50.0	0	1 780	(6 000)	26 583	0	0	0	0	0	0
2016	69 511		50.0	0	1 780	(6 000)	26 995	0	0	0	0	0	0
2017	70 301		50.0	0	1 780	(6 000)	27 391	0	0	0	0	0	0
2018	71 112		50.0	0	1 780	(6 000)	27 799	0	0	0	0	0	0
2019	71 943		50.0	0	1 780	(6 000)	28 214	0	0	0	0	0	0
2020	72 800		50.0	0	1 780	(6 000)	28 640	0	0	0	0	0	0
2021	73 665		50.0	0	1 780	(6 000)	29 075	0	0	0	0	0	0
2022	74 554		50.0	0	1 780	(6 000)	29 517	0	0	0	0	0	0
2023	75 452		50.0	0	1 780	(6 000)	29 965	0	0	0	0	0	0
2024	76 349		50.0	0	1 780	(6 000)	30 414	0	0	0	0	0	0
2025	77 236		50.0	0	1 780	(6 000)	30 858	0	0	0	0	0	0
2026	78 064		50.0	0	1 780	(6 000)	31 287	0	0	0	0	0	0
2027	78 900		50.0	0	1 780	(6 000)	31 680	0	0	0	0	0	0
2028	79 785		50.0	0	1 780	(6 000)	32 123	0	0	0	0	0	0
2029	80 618		50.0	0	1 780	(6 000)	32 548	0	0	0	0	0	0
2030	81 466		50.0	0	1 780	(6 000)	32 974	0	0	0	0	0	0
2031	82 334		50.0	0	1 780	(6 000)	33 407	0	0	0	0	0	0
2032	83 206		50.0	0	1 780	(6 000)	33 844	0	0	0	0	0	0
2033	84 081		50.0	0	1 780	(6 000)	34 282	0	0	0	0	0	0
2034	84 966		50.0	0	1 780	(6 000)	34 718	0	0	0	0	0	0
2035	85 870		50.0	0	1 780	(6 000)	35 151	0	0	0	0	0	0
2036	86 864		50.0	0	1 780	(6 000)	35 582	0	0	0	0	0	0
2037	87 843		50.0	0	1 780	(6 000)	36 011	0	0	0	0	0	0
2038	88 396		50.0	0	1 780	(6 000)	36 440	0	0	0	0	0	0
2039	89 235		50.0	0	1 780	(6 000)	36 868	0	0	0	0	0	0
2040	90 114		50.0	0	1 780	(6 000)	37 297	0	0	0	0	0	0
2041	90 977		50.0	0	1 780	(6 000)	37 728	0	0	0	0	0	0
2042	91 844		50.0	0	1 780	(6 000)	38 162	0	0	0	0	0	0
2043	92 714		50.0	0	1 780	(6 000)	38 597	0	0	0	0	0	0
		Total Capacity Used (Tons)						32 566 382	2 812 886	3 829 579	11 383 944	8 909 008	1 433 224

Table F-2. Projected Daily Disposal Capacity Shortfall
Scenario 2 – Waste Exports
(*Continued*)

D WASTE FACILITIES AND POTENTIAL EXPANSIONS
WASTE DISPOSAL RATES
POLITAN AREA - 1995

Landfill Waste Acceptance Rate - (tpd-6)

Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Park	Antelope Valley Dump	Azusa Land Reclamation	Burbank	Waste Management of Lancaster	Pebbly Beach Disposal	U.S. Navy	Whittier-Savage Canyon	Unsatisfied need
3 42[illegible]	5 162	1 807	9	387	3 097	84	516	2	05	18[illegible]	0
3 344	2 257	1 773	9	380	3 040	82	507	2	05	1[illegible]	0
4 21[illegible]	[illegible]	2 259	12	490	5 065	106	654	3	[illegible]	229	0
4 [illegible]86	[illegible]	2 538	13	544	0	117	426	3	[illegible]	254	0
4 [illegible]35	[illegible]	2 [illegible]17	13	56[illegible]	0	[illegible]	0	3	[illegible]	[illegible]85	0
4 [illegible]35	[illegible]	2 133	11	457	0	99	0	2	06	215	0
[illegible]5[illegible]	[illegible]	2 786	14	593	0	128	0	3	08	[illegible]7[illegible]	0
[illegible]5[illegible]	[illegible]	2 839	15	606	0	131	0	3	08	284	0
[illegible]354	[illegible]	2 839	15	624	0	135	0	3	08	291	0
[illegible]49[illegible]	[illegible]	2 913	15	624	0	138	0	3	09	298	0
[illegible]5[illegible]	[illegible]	2 978	15	638	0	138	0	3	09	304	0
[illegible][illegible]	[illegible]	3 040	16	651	0	141	0	3	09	310	0
[illegible]309	[illegible]	3 194	16	684	0	148	0	4	09	350	[illegible]107
[illegible]	[illegible]	3 500	34	750	0	240	0	5	10	350	[illegible]5 274
[illegible]	[illegible]	3 500	91	6	0	240	0	20	10	350	[illegible]9 662
[illegible]	[illegible]	3 500	102	0	0	240	0	24	10	350	[illegible]9 886
[illegible]	[illegible]	3 500	102	0	0	240	0	24	10	350	20 509
[illegible]	[illegible]	3 500	102	0	0	240	0	33	10	350	22 483
[illegible]	[illegible]	2 025	102	0	0	240	0	0	10	350	24 956
[illegible]	[illegible]	0	102	0	0	240	0	0	10	350	25 441
[illegible]	[illegible]	0	102	0	0	240	0	0	10	350	25 890
[illegible]	[illegible]	0	102	0	0	240	0	0	10	350	26 302
[illegible]	[illegible]	0	102	0	0	240	0	0	10	350	26 698
[illegible]	[illegible]	[illegible]	102	0	0	240	0	0	10	350	[illegible]7 106
[illegible]	[illegible]	[illegible]	102	0	0	240	0	0	10	350	[illegible]7 521
[illegible]	[illegible]	0	102	0	0	240	0	0	10	350	[illegible]7 947
[illegible]	[illegible]	0	102	0	0	240	0	0	10	350	28 382
[illegible]	[illegible]	0	102	0	0	240	0	0	10	350	29 574
[illegible]	[illegible]	0	102	0	0	240	0	0	10	66	29 556
[illegible]	[illegible]	0	90	0	0	240	0	0	10	0	30 074
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	30 617
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	31 048
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	31 449
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	31 882
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	32 307
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	32 733
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	33 188
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	33 603
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	34 041
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	34 477
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	34 910
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	35 341
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	35 770
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	36 199
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	36 627
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	37 056
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	37 487
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	37 921
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	38 356
[illegible]	[illegible]	0	0	0	0	240	0	0	10	0	45000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] 548 544	3 314 568	15 728 208	598 884	2 300 978	3 504 336	3 216 503	655 852	44 680	14 297	2 731 448	[illegible]

Table F-3. Projected Daily Disposal Capacity Shortfall
Scenario 3 – Landfill Bans for Inert Materials and Biosolids

Scenario 3

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported / Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50 729		25 0	2 597	1 780	-	33 240	5 240	1 771	5 745	1 628	3 351	1 915
1996	52 332	500	30 0	2 711	1 780	(2 000)	29 662	4 808	1 626	5 272	1 494	3 075	2 678
1997	53 58	500	35 0	2 776	1 780	(3 500)	28 296	6 018	2 034	0	1 869	3 847	0
1998	53 714	500	40 0	2 782	1 780	(3 500)	23 886	6 510	3 584	0	2 [illegible]	4 183	0
1999	54 25	500	45 0	2 800	1 780	(3 500)	21 171	7 080	0	0	2 190	4 528	0
2000	54 903	500	50 0	2 844	1 780	(3 500)	18 848	6 303	0	0	1 956	4 031	0
2001	56 38	500	50 0	2 911	1 780	(6 000)	16 923	4 834	0	0	1 [illegible]	5 558	0
2002	57 58	500	50 0	2 986	1 780	(6 000)	17 407	7 405	0	0	2 300	0	0
2003	58 344	500	50 0	3 022	1 780	(6 000)	17 880	7 810	0	0	2 364	0	0
2004	59 302	500	50 0	3 072	1 780	(6 000)	18 319	7 783	0	0	2 421	0	0
2005	60 215	500	50 0	3 119	1 780	(6 000)	18 727	7 886	0	0	2 475	0	0
2006	61 083	500	50 0	3 162	1 780	(6 000)	19 104	8 128	0	0	2 524	0	0
2007	61 922	500	50 0	3 202	1 780	(6 000)	19 449	8 273	0	0	2 570	0	0
2008	62 524	500	50 0	3 239	1 780	(6 000)	19 783	8 741	0	0	2 715	0	0
2009	63 156	500	50 0	3 272	1 780	(6 000)	20 047	7 643	0	0	3 400	0	0
2010	63 775	500	50 0	3 301	1 780	(6 000)	20 302	0	0	0	2 982	0	0
2011	65 168	500	50 0	3 376	1 780	(6 000)	20 948	0	0	0	0	0	0
2012	65 922	500	50 0	3 415	1 780	(6 000)	21 296	0	0	0	0	0	0
2013	66 318	500	50 0	3 461	1 780	(6 000)	21 698	0	0	0	0	0	0
2014	67 [illegible]	500	50 0	3 511	1 780	(6 000)	22 122	0	0	0	0	0	0
2015	68 56	500	50 0	3 558	1 780	(6 000)	22 525	0	0	0	0	0	0
2016	69 51	500	50 0	3 601	1 780	(6 000)	22 885	0	0	0	0	0	0
2017	70 302	500	50 0	3 642	1 780	(6 000)	23 249	0	0	0	0	0	0
2018	71 [illegible]	500	50 0	3 684	1 780	(6 000)	23 615	0	0	0	0	0	0
2019	71 [illegible]	500	50 0	3 727	1 780	(6 000)	23 987	0	0	0	0	0	0
2020	72 [illegible]	500	50 0	3 [illegible]	1 780	(6 000)	24 369	0	0	0	0	0	0
2021	73 569	500	50 0	3 816	1 780	(6 000)	24 759	0	0	0	0	0	0
2022	74 554	500	50 0	3 862	1 780	(6 000)	25 155	0	0	0	0	0	0
2023	74 452	500	50 0	3 908	1 780	(6 000)	25 557	0	0	0	0	0	0
2024	75 349	500	50 0	3 955	1 780	(6 000)	25 959	0	0	0	0	0	0
2025	76 236	500	50 0	4 001	1 780	(6 000)	26 357	0	0	0	0	0	0
2026	76 984	500	50 0	4 045	1 780	(6 000)	26 742	0	0	0	0	0	0
2027	77 [illegible]	500	50 0	4 087	1 780	(6 000)	27 103	0	0	0	0	0	0
2028	78 [illegible]	500	50 0	4 132	1 780	(6 000)	27 491	0	0	0	0	0	0
2029	80 918	500	50 0	4 178	1 780	(6 000)	27 872	0	0	0	0	0	0
2030	81 468	500	50 0	4 220	1 780	(6 000)	28 254	0	0	0	0	0	0
2031	82 334	500	50 0	4 265	1 780	(6 000)	28 642	0	0	0	0	0	0
2032	83 209	500	50 0	4 310	1 780	(6 000)	29 034	0	0	0	0	0	0
2033	84 [illegible]	500	50 0	4 356	1 780	(6 000)	29 427	0	0	0	0	0	0
2034	84 868	500	50 0	4 401	1 780	(6 000)	29 817	0	0	0	0	0	0
2035	85 823	500	50 0	4 448	1 780	(6 000)	30 208	0	0	0	0	0	0
2036	86 664	500	50 0	4 490	1 780	(6 000)	30 582	0	0	0	0	0	0
2037	87 543	500	50 0	4 535	1 780	(6 000)	30 977	0	0	0	0	0	0
2038	88 399	500	50 0	4 579	1 780	(6 000)	31 360	0	0	0	0	0	0
2039	89 255	500	50 0	4 623	1 780	(6 000)	31 744	0	0	0	0	0	0
2040	90 114	500	50 0	4 668	1 780	(6 000)	32 129	0	0	0	0	0	0
2041	90 9[illegible]	500	50 0	4 713	1 780	(6 000)	32 516	0	0	0	0	0	0
2042	91 844	500	50 0	4 758	1 780	(6 000)	32 905	0	0	0	0	0	0
2043	92 714	500	50 0	4 803	1 780	(6 000)	33 294	0	0	0	0	0	0
			Total Capacity Used (Tons)					32 556 382	2 812 686	3 437 315	11 353 944	8 909 009	1 433 224

Table F-3. Projected Daily Disposal Capacity Shortfall
Scenario 3 – Landfill Bans for Inert Materials and Biosolids
(Continued)

D WASTE FACILITIES AND POTENTIAL EXPANSIONS
WASTE DISPOSAL RATES
POLITAN AREA - 1995

Landfill Waste Acceptance Rate - (tpd-6)

Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Park	Antelope Valley Dump	Azusa Land Reclamation	Burbank	Waste Management of Lancaster	Pebbly Beach Disposal	U.S. Navy	Whittier-Savage Canyon	Unsatisfied need
3 150	4 788	1 676	9	359	2 873	78	470	2	0 5	168	0
2 900	3 63	1 538	8	329	2 636	71	430	2	0 4	154	0
3 629	0	1 924	10	412	5 723	89	550	2	0 5	192	0
3 325	0	2 082	11	446	0	96	635	2	0 5	208	0
4 255	0	2 264	12	485	0	105	0	3	0 6	254	0
3 851	0	2 048	10	432	0	93	0	2	0 5	203	0
3 315	0	1 646	8	331	0	72	0	2	0 4	155	0
4 465	0	2 388	12	507	0	110	0	3	0 6	233	0
4 569	0	2 434	13	521	0	113	0	3	0 6	243	0
4 566	0	2 492	13	534	0	115	0	3	0 6	249	0
4 504	0	2 547	13	546	0	118	0	3	0 6	255	0
4 900	0	2 599	13	557	0	120	0	3	0 6	260	0
4 989	0	2 648	14	567	0	122	0	3	0 8	265	0
4 486	0	2 795	14	599	0	129	0	3	0 8	280	0
	0	3 500	28	748	0	240	0	6	1 0	350	4 130
	0	3 500	93	0	0	240	0	21	1 0	350	13 134
	0	3 500	93	0	0	240	0	21	1 0	350	16 743
	0	3 500	95	0	0	240	0	21	1 0	350	17 079
	0	3 500	97	0	0	240	0	21	1 0	350	17 479
	0	1 987	102	0	0	240	0	21	1 0	350	19 421
	0	0	102	0	0	240	0	0	1 0	350	21 832
	0	0	102	0	0	240	0	0	1 0	350	22 202
	0	0	102	0	0	240	0	0	1 0	350	22 556
	0	0	102	0	0	240	0	0	1 0	350	22 925
	0	0	102	0	0	240	0	0	1 0	350	23 294
	0	0	102	0	0	240	0	0	1 0	350	23 678
	0	0	102	0	0	240	0	0	1 0	350	24 066
	0	0	102	0	0	240	0	0	1 0	350	24 465
	0	0	102	0	0	240	0	0	1 0	350	24 864
	0	0	102	0	0	240	0	0	1 0	350	25 266
	0	0	102	0	0	240	0	0	1 0	62	25 952
	0	0	102	0	0	240	0	0	1 0	0	26 399
	0	0	37	0	0	240	0	0	1 0	0	26 825
	0	0	0	0	0	240	0	0	1 0	0	27 250
	0	0	0	0	0	240	0	0	1 0	0	27 831
	0	0	0	0	0	240	0	0	1 0	0	28 013
	0	0	0	0	0	240	0	0	1 0	0	28 401
	0	0	0	0	0	240	0	0	1 0	0	28 793
	0	0	0	0	0	240	0	0	1 0	0	29 186
	0	0	0	0	0	240	0	0	1 0	0	29 578
	0	0	0	0	0	240	0	0	1 0	0	29 965
	0	0	0	0	0	240	0	0	1 0	0	30 351
	0	0	0	0	0	240	0	0	1 0	0	30 736
	0	0	0	0	0	240	0	0	1 0	0	31 119
	0	0	0	0	0	240	0	0	1 0	0	31 503
	0	0	0	0	0	240	0	0	1 0	0	31 888
	0	0	0	0	0	240	0	0	1 0	0	32 275
	0	0	0	0	0	240	0	0	1 0	0	32 664
	0	0	0	0	0	240	0	0	1 0	0	33 053
											45000
348 344	2 314 568	15 728 208	598 884	2 300 878	3 504 336	3 057 380	655 952	44 680	13 677	2 731 448	

Table F-4. Projected Daily Disposal Capacity Shortfall
Scenario 4 – City and Unincorporated Diversion at 70 Percent

Scenario 4

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOU
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported / Exported	Landfill Disposal Need	Puente Hills	Sanitation	BKK	Scholl	Bradley	Lopez
[illegible]	[illegible]	[illegible]	25.0	2,587	1,780	[illegible]	33,240	5,240	1,771	5,745	1,628	3,351	1,915
[illegible]	[illegible]	500	30.0	2,711	1,780	(2,000)	29,652	4,808	1,626	5,272	1,494	3,075	2,879
[illegible]	[illegible]	500	35.0	2,778	1,780	(3,500)	26,286	6,016	2,034	0	1,869	3,847	0
[illegible]	[illegible]	500	40.0	2,782	1,780	(3,500)	23,886	6,510	3,584	0	2,002	4,183	0
[illegible]	[illegible]	500	45.0	2,800	1,780	(3,500)	21,171	7,080	0	0	2,199	4,529	0
[illegible]	[illegible]	500	50.0	2,844	1,780	(3,500)	18,848	8,303	0	0	1,958	4,551	0
[illegible]	[illegible]	500	50.5	2,917	1,780	(6,000)	16,659	4,722	0	0	1,461	5,556	0
[illegible]	[illegible]	500	50.9	2,906	1,780	(6,000)	16,889	7,176	0	0	2,229	0	0
[illegible]	[illegible]	500	51.4	3,022	1,780	(6,000)	17,087	7,280	0	0	2,255	0	0
[illegible]	[illegible]	500	51.9	3,072	1,780	(6,000)	17,204	7,318	0	0	2,273	0	0
[illegible]	[illegible]	500	52.4	3,119	1,780	(6,000)	17,312	7,384	0	0	2,288	0	0
[illegible]	[illegible]	500	52.8	3,162	1,780	(6,000)	17,382	7,394	0	0	2,297	0	0
[illegible]	[illegible]	500	53.3	3,202	1,780	(6,000)	17,415	7,408	0	0	2,301	0	0
[illegible]	[illegible]	500	53.8	3,239	1,780	(6,000)	17,412	8,235	0	0	1,937	0	0
[illegible]	[illegible]	500	54.2	3,272	1,780	(6,000)	17,378	9,941	0	0	3,088	0	0
[illegible]	[illegible]	500	54.7	3,301	1,780	(6,000)	17,306	3,573	0	0	3,400	0	0
[illegible]	[illegible]	500	55.2	3,378	1,780	(6,000)	17,579	0	0	0	1,718	0	0
[illegible]	[illegible]	500	55.6	3,415	1,780	(6,000)	17,568	0	0	0	0	0	0
[illegible]	[illegible]	500	56.1	3,461	1,780	(6,000)	17,605	0	0	0	0	0	0
[illegible]	[illegible]	500	56.6	3,511	1,780	(6,000)	17,662	0	0	0	0	0	0
[illegible]	[illegible]	500	57.1	3,558	1,780	(6,000)	17,643	0	0	0	0	0	0
[illegible]	[illegible]	500	57.5	3,601	1,780	(6,000)	17,667	0	0	0	0	0	0
[illegible]	[illegible]	500	58.0	3,642	1,780	(6,000)	17,632	0	0	0	0	0	0
[illegible]	[illegible]	500	58.5	3,684	1,780	(6,000)	17,599	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	3,[illegible]	1,780	(6,000)	17,562	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	3,[illegible]	1,780	(6,000)	17,868	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	3,816	1,780	(6,000)	18,180	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	3,852	1,780	(6,000)	18,498	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	3,908	1,780	(6,000)	18,819	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	3,965	1,780	(6,000)	19,142	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,001	1,780	(6,000)	19,460	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,045	1,780	(6,000)	19,788	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,087	1,780	(6,000)	20,057	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,132	1,780	(6,000)	20,388	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,178	1,780	(6,000)	20,673	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,220	1,780	(6,000)	20,979	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,265	1,780	(6,000)	21,280	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,310	1,780	(6,000)	21,604	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,358	1,780	(6,000)	21,918	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,401	1,780	(6,000)	22,231	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,448	1,780	(6,000)	22,542	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,490	1,780	(6,000)	22,851	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,535	1,780	(6,000)	23,159	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,579	1,780	(6,000)	23,466	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,623	1,780	(6,000)	23,774	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,668	1,780	(6,000)	24,082	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,713	1,780	(6,000)	24,392	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,758	1,780	(6,000)	24,703	0	0	0	0	0	0
[illegible]	[illegible]	500	58.9	4,803	1,780	(6,000)	25,015	0	0	0	0	0	0
			Total Capacity Used (Tons)					32,550,382	2,812,668	3,437,315	11,363,844	8,909,008	1,433,224

Table F-4. Projected Daily Disposal Capacity Shortfall
Scenario 4 – City and Unincorporated Diversion at 70 Percent
(Continued)

D WASTE FACILITIES AND POTENTIAL EXPANSIONS
WASTE DISPOSAL RATES
POLITAN AREA - 1995

Landfill Waste Acceptance Rate - (tpd-6)

Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Park	Antelope Valley Dump	Azusa Land Reclamation	Burbank	Waste Management of Lancaster	Pebbly Beach Disposal	U.S. Navy	Whittier-Savage Canyon	Unsatisfied Need
3 160	4 788	1 676	9	359	2 873	78	479	2	05	166	0
2 900	2 631	1 538	8	329	2 636	71	439	2	04	154	0
3 628	0	1 924	10	412	5 725	89	550	2	05	192	0
3 325	0	2 082	11	446	0	96	635	2	06	208	0
4 265	0	2 264	12	485	0	105	0	3	06	226	0
4 05	0	2 155	11	432	0	93	0	2	06	202	0
3 345	0	1 511	8	324	0	70	0	2	04	151	0
4 [illegible]	0	2 266	12	486	0	106	0	3	07	229	0
4 378	0	2 322	12	497	0	107	0	3	07	232	0
4 413	0	2 340	12	501	0	108	0	3	07	234	0
4 44[illegible]	0	2 355	12	505	0	109	0	3	07	235	0
4 456	0	2 384	12	507	0	109	0	3	07	238	0
4 46[illegible]	0	2 369	12	508	0	110	0	3	07	237	0
3 515	0	1 964	10	427	0	92	0	2	06	196	0
[illegible]	0	3 179	16	681	0	147	0	4	09	318	0
[illegible]	0	3 500	32	466	0	240	0	[illegible]	10	350	5 734
[illegible]	0	3 500	[illegible]	0	0	240	0	16	10	350	11 884
[illegible]	0	3 500	78	0	0	240	0	17	10	350	13 381
[illegible]	0	3 500	78	0	0	240	0	17	10	350	13 418
[illegible]	0	3 500	79	0	0	240	0	18	10	350	13 475
[illegible]	0	685	102	0	0	240	0	31	10	350	16 274
[illegible]	0	0	102	0	0	240	0	0	10	350	16 974
[illegible]	0	0	102	0	0	240	0	0	10	350	16 939
[illegible]	0	0	102	0	0	240	0	0	10	350	16 906
[illegible]	0	0	102	0	0	240	0	0	10	350	16 869
[illegible]	0	0	102	0	0	240	0	0	10	350	16 775
[illegible]	0	0	102	0	0	240	0	0	10	350	16 48[illegible]
[illegible]	0	0	102	0	0	240	0	0	10	350	17 805
[illegible]	0	0	102	0	0	240	0	0	10	350	18 126
[illegible]	0	0	102	0	0	240	0	0	10	350	18 448
[illegible]	0	0	102	0	0	240	0	0	10	282	18 835
[illegible]	0	0	102	0	0	240	0	0	10	0	19 425
[illegible]	0	0	102	0	0	240	0	0	10	0	19 714
[illegible]	0	0	83	0	0	240	0	0	10	0	20 044
[illegible]	0	0	0	0	0	240	0	0	10	0	20 432
[illegible]	0	0	0	0	0	240	0	0	10	0	20 738
[illegible]	0	0	0	0	0	240	0	0	10	0	21 049
[illegible]	0	0	0	0	0	240	0	0	10	0	21 383
[illegible]	0	0	0	0	0	240	0	0	10	0	21 677
[illegible]	0	0	0	0	0	240	0	0	10	0	21 980
[illegible]	0	0	0	0	0	240	0	0	10	0	22 301
[illegible]	0	0	0	0	0	240	0	0	10	0	22 610
[illegible]	0	0	0	0	0	240	0	0	10	0	22 918
[illegible]	0	0	0	0	0	240	0	0	10	0	23 225
[illegible]	0	0	0	0	0	240	0	0	10	0	23 533
[illegible]	0	0	0	0	0	240	0	0	10	0	23 841
[illegible]	0	0	0	0	0	240	0	0	10	0	24 151
[illegible]	0	0	0	0	0	240	0	0	10	0	24 462
[illegible]	0	0	0	0	0	240	0	0	10	0	24 774
[illegible]											45000
[illegible] 948 944	2 314 568	45 728 208	588 864	2 300 976	3 504 336	3 011 297	655 952	44 680	13 481	2 731 448	

Table F-5. Projected Daily Disposal Capacity Shortfall
Scenario 5 – Capacity Saving By Use of Foam Cover

Scenario 5

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METR
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported / Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Laidlaw
1996	50 129		25.0	2,597	1,780	-	33,240	5,240	1,771	5,745	1,628	3,351	1,915
1997	52 332	500	30.0	2,711	1,780	(2,000)	29,882	4,287	1,449	4,700	1,332	2,742	3,689
1998	53 587	500	35.0	2,776	1,780	(3,500)	29,298	6,827	2,240	0	2,059	4,234	0
1999	53 714	500	40.0	2,782	1,780	(3,500)	23,686	5,509	1,862	0	1,711	3,523	0
2000	54 265	500	45.0	2,800	1,780	(3,500)	21,771	5,655	3,675	0	1,751	3,811	0
2001	54 303	500	50.0	2,844	1,780	(3,500)	19,848	5,303	0	0	1,958	4,031	0
2002	56 158	500	50.5	2,911	1,780	(6,000)	16,659	5,571	0	0	1,731	3,563	0
2003	57 726	500	50.9	2,986	1,780	(6,000)	16,889	5,641	0	0	1,752	3,606	0
2004	58 344	500	51.4	3,022	1,780	(6,000)	17,087	4,638	0	0	1,441	5,184	0
2005	59 302	500	51.9	3,072	1,780	(6,000)	17,204	7,318	0	0	2,273	0	0
2006	60 210	500	52.4	3,119	1,780	(6,000)	17,312	7,384	0	0	2,288	0	0
2007	61 052	500	52.8	3,162	1,780	(6,000)	17,382	7,384	0	0	2,297	0	0
2008	61 822	500	53.3	3,202	1,780	(6,000)	17,415	7,408	0	0	2,301	0	0
2009	62 524	500	53.8	3,239	1,780	(6,000)	17,412	7,407	0	0	2,301	0	0
2010	63 158	500	54.2	3,272	1,780	(6,000)	17,378	7,391	0	0	2,296	0	0
2011	63 725	500	54.7	3,301	1,780	(6,000)	17,306	7,362	0	0	2,287	0	0
2012	64 168	500	55.2	3,378	1,780	(6,000)	17,579	7,478	0	0	2,323	0	0
2013	65 022	500	55.6	3,415	1,780	(6,000)	17,568	7,361	0	0	2,287	0	0
2014	66 818	500	56.1	3,481	1,780	(6,000)	17,605	11,352	0	0	2,588	0	0
2015	67 [illegible]	500	56.6	3,511	1,780	(6,000)	17,662	0	0	0	3,400	0	0
2016	66 567	500	57.1	3,558	1,780	(6,000)	17,683	0	0	0	2,418	0	0
2017	69 511	500	57.5	3,601	1,780	(6,000)	17,667	0	0	0	0	0	0
2018	70 302	500	58.0	3,642	1,780	(6,000)	17,632	0	0	0	0	0	0
2019	71 [illegible]	500	58.5	3,684	1,780	(6,000)	17,599	0	0	0	0	0	0
2020	[illegible]	500	58.9	3,721	1,780	(6,000)	17,562	0	0	0	0	0	0
2021	73 500	500	58.9	3,771	1,780	(6,000)	17,868	0	0	0	0	0	0
2022	74 567	500	58.9	3,818	1,780	(6,000)	18,180	0	0	0	0	0	0
2023	75 324	500	58.9	3,862	1,780	(6,000)	18,498	0	0	0	0	0	0
2024	75 450	500	58.9	3,908	1,780	(6,000)	18,819	0	0	0	0	0	0
2025	76 349	500	58.9	3,955	1,780	(6,000)	19,142	0	0	0	0	0	0
2026	77 [illegible]	500	58.9	4,001	1,780	(6,000)	19,460	0	0	0	0	0	0
2027	78 264	500	58.9	4,045	1,780	(6,000)	19,788	0	0	0	0	0	0
2028	79 300	500	58.9	4,087	1,780	(6,000)	20,057	0	0	0	0	0	0
2029	79 765	500	58.9	4,132	1,780	(6,000)	20,364	0	0	0	0	0	0
2030	80 618	500	58.9	4,178	1,780	(6,000)	20,673	0	0	0	0	0	0
2031	81 468	500	58.9	4,220	1,780	(6,000)	20,979	0	0	0	0	0	0
2032	82 334	500	58.9	4,265	1,780	(6,000)	21,290	0	0	0	0	0	0
2033	83 206	500	58.9	4,310	1,780	(6,000)	21,604	0	0	0	0	0	0
2034	84 084	500	58.9	4,356	1,780	(6,000)	21,918	0	0	0	0	0	0
2035	84 956	500	58.9	4,401	1,780	(6,000)	22,231	0	0	0	0	0	0
2036	85 833	500	58.9	4,448	1,780	(6,000)	22,542	0	0	0	0	0	0
2037	86 664	500	58.9	4,490	1,780	(6,000)	22,851	0	0	0	0	0	0
2038	87 543	500	58.9	4,535	1,780	(6,000)	23,159	0	0	0	0	0	0
2039	88 396	500	58.9	4,579	1,780	(6,000)	23,466	0	0	0	0	0	0
2040	89 254	500	58.9	4,623	1,780	(6,000)	23,774	0	0	0	0	0	0
2041	90 114	500	58.9	4,668	1,780	(6,000)	24,082	0	0	0	0	0	0
2042	90 977	500	58.9	4,713	1,780	(6,000)	24,392	0	0	0	0	0	0
2043	91 844	500	58.9	4,758	1,780	(6,000)	24,700	0	0	0	0	0	0
2044	92 714	500	58.9	4,803	1,780	(6,000)	25,015	0	0	0	0	0	0
			Total Capacity Used (Tons)					39,718,786	3,431,479	3,258,819	13,884,012	10,888,980	1,748,533

Table F-5. Projected Daily Disposal Capacity Shortfall
Scenario 5 – Capacity Saving By Use of Foam Cover
(*Continued*)

D WASTE FACILITIES AND POTENTIAL EXPANSIONS
WASTE DISPOSAL RATES
POLITAN AREA - 1995

Landfill Waste Acceptance Rate - (tpd-4)

	Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Pars	Antelope Valley Dump	Azusa Land Reclamation	Burbank	Waste Management of Lancaster	Peoby Beach Disposal	U.S Navy	Whittier-Savage Canyon	Unsatisfied need
	3 160	4 788	1 676	9	350	2 873	78	479	2	0 5	166	0
	3 565	4 253	1 37*	-	284	2 350	63	392	2	0 4	13*	0
	3 366	2	2 *19	**	454	3 833	98	605	2	0 6	2**	0
	2**	2	1 *8*	9	3**	4 848	82	503	2	0 5	1*8	0
	4**	2	1 808	9	367	2	84	566	2	0 6	19*	0
	3 80	2	2 *15	12	432	2	93	2	2	0 6	2**	2
	2 359	2	1 *8*	9	382	2	82	2	2	0 5	1*8	2
	4**	2	1 804	9	387	2	83	2	2	0 5	180	0
	2 ***	2	1 483	9	318	0	69	0	2	0 4	148	0
	4 4*3	2	2 340	12	501	0	108	0	3	0 7	234	0
	4 44*	2	2 355	12	506	0	109	0	3	0 7	2*5	0
	4 459	2	2 364	12	507	0	109	0	3	0 7	236	0
	4 46*	2	2 369	12	508	0	110	0	3	0 7	23*	0
	4 466	2	2 369	12	508	0	110	0	3	0 7	23*	0
	4 4**	2	2 364	12	508	2	109	2	3	0 7	236	2
	4 42*	2	2 354	12	504	2	109	2	3	0 7	235	2
	4 509	2	2 39*	12	512	0	111	0	3	0 7	239	0
	4 ***	2	2 354	12	504	0	109	0	3	0 7	235	0
		2	2 674	14	573	0	124	0	3	0 8	26*	0
		2	3 500	42	479	2	240	0	9	1 0	350	9 641
		2	3 500	68	0	0	240	0	15	1 0	350	11 091
		2	3 500	79	0	0	240	0	18	1 0	350	13 480
		2	3 500	9	2	2	240	2	1*	1 0	350	13 445
		2	3 500	9	2	2	240	2	2*	1 0	350	13 4*2
		2	3 500	8	2	2	240	2	2	1 0	350	13 375
		2	1 *48	2	2	2	240	2	33	1 0	350	18 394
		2	2	2	2	2	240	2	2	1 0	350	17 465
		2	2	2	2	2	240	2	2	1 0	350	17 805
		2	2	2	2	2	240	2	2	1 0	350	18 *26
		2	2	2	2	2	240	0	2	1 0	350	18 449
		2	2	2	0	0	240	0	0	1 0	350	18 787
		2	2	2	2	2	240	0	0	1 0	350	19 075
		2	2	2	2	0	240	0	0	1 0	350	19 364
		2	2	2	2	2	240	2	0	1 0	350	19 675
		2	2	2	2	2	240	0	0	1 0	350	19 980
		2	2	2	2	2	240	0	0	1 0	350	20 288
		2	2	2	0	0	240	0	0	1 0	350	20 597
		2	2	2	2	2	240	2	0	1 0	350	20 911
		2	2	2	2	2	240	2	0	1 0	55	21 520
		2	2	2	2	2	240	0	0	1 0	0	21 888
		2	2	2	2	2	240	0	0	1 0	0	22 199
		2	2	2	2	2	240	0	0	1 0	0	22 537
		2	2	2	2	2	240	0	0	1 0	0	22 918
		2	2	2	2	2	240	2	0	1 0	0	23 225
		2	2	2	2	2	240	0	0	1 0	0	23 533
		2	2	2	2	2	240	0	0	1 0	0	23 841
		2	2	2	2	2	240	0	0	1 0	0	24 151
		2	2	2	2	2	240	0	0	1 0	0	24 462
		0	0	0	0	0	240	0	0	1 0	0	24 774
												45000
		3 523	19 188 414	728 174	2 807 191	4 275 790	2 820 486	800 261	54 510	12 904	3 332 367	

Table F-6. Projected Daily Disposal Capacity Shortfall
Scenario 5A – Capacity Saving By Use of Biostabilization

Scenario 5

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported / Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
1995	50 129		25.0	1 948	1 780	-	33 889	5 342	1 806	5 857	1 680	3 417	1 952
1996	52 332	500	30.0	1 888	1 780	(2 000)	30 475	4 462	1 508	4 892	1 386	2 854	1 631
1997	53 587	500	35.0	1 804	1 780	(3 500)	27 267	6 872	2 323	0	2 135	4 395	0
1998	53 714	500	40.0	1 669	1 780	(3 500)	24 709	6 250	2 113	0	1 941	3 997	0
1999	54 057	500	45.0	1 540	1 780	(3 500)	22 431	5 308	1 794	0	1 649	3 395	0
2000	54 903	500	50.0	1 422	1 780	(3 500)	20 270	5 917	2 000	0	1 538	3 784	0
2001	56 188	500	50.5	1 442	1 780	(6 000)	18 128	5 401	1 978	0	1 678	3 454	0
2002	57 267	500	50.9	1 455	1 780	(6 000)	18 380	6 146	0	0	1 909	3 931	0
2003	58 344	500	51.4	1 468	1 780	(6 000)	18 621	6 227	0	0	1 934	3 982	0
2004	59 302	500	51.9	1 478	1 780	(6 000)	18 788	6 286	0	0	1 953	4 020	0
2005	60 211	500	52.4	1 488	1 780	(6 000)	18 945	5 678	0	0	1 760	5 802	0
2006	61 052	500	52.8	1 492	1 780	(6 000)	19 052	8 104	0	0	2 518	0	0
2007	61 822	500	53.3	1 488	1 780	(6 000)	19 121	8 134	0	0	2 527	0	0
2008	62 524	500	53.8	1 498	1 780	(6 000)	19 154	8 147	0	0	2 531	0	0
2009	63 158	500	54.2	1 497	1 780	(6 000)	19 150	8 146	0	0	2 531	0	0
2010	63 725	500	54.7	1 495	1 780	(6 000)	19 112	8 130	0	0	2 525	0	0
2011	64 168	500	55.2	1 513	1 780	(6 000)	19 442	8 270	0	0	2 569	0	0
2012	65 922	500	55.6	1 515	1 780	(6 000)	19 468	8 281	0	0	2 573	0	0
2013	66 818	500	56.1	1 519	1 780	(6 000)	19 547	8 315	0	0	2 583	0	0
2014	67 687	500	56.6	1 525	1 780	(6 000)	19 649	8 358	0	0	2 596	0	0
2015	68 687	500	57.1	1 528	1 780	(6 000)	19 713	9 440	0	0	2 932	0	0
2016	69 511	500	57.5	1 530	1 780	(6 000)	19 739	9 309	0	0	3 400	0	0
2017	70 302	500	58.0	1 530	1 780	(6 000)	19 744	0	0	0	3 400	0	0
2018	71 119	500	58.5	1 530	1 780	(6 000)	19 752	0	0	0	2 104	0	0
2019	71 948	500	58.9	1 531	1 780	(6 000)	19 758	0	0	0	0	0	0
2020	72 805	500	58.9	1 549	1 780	(6 000)	20 080	0	0	0	0	0	0
2021	73 669	500	58.9	1 567	1 780	(6 000)	20 429	0	0	0	0	0	0
2022	74 554	500	58.9	1 586	1 780	(6 000)	20 773	0	0	0	0	0	0
2023	75 452	500	58.9	1 605	1 780	(6 000)	21 122	0	0	0	0	0	0
2024	76 349	500	58.9	1 624	1 780	(6 000)	21 472	0	0	0	0	0	0
2025	77 236	500	58.9	1 643	1 780	(6 000)	21 818	0	0	0	0	0	0
2026	78 094	500	58.9	1 661	1 780	(6 000)	22 152	0	0	0	0	0	0
2027	78 900	500	58.9	1 678	1 780	(6 000)	22 466	0	0	0	0	0	0
2028	79 645	500	58.9	1 697	1 780	(6 000)	22 803	0	0	0	0	0	0
2029	80 616	500	58.9	1 715	1 780	(6 000)	23 134	0	0	0	0	0	0
2030	81 468	500	58.9	1 733	1 780	(6 000)	23 466	0	0	0	0	0	0
2031	82 334	500	58.9	1 752	1 780	(6 000)	23 803	0	0	0	0	0	0
2032	83 209	500	58.9	1 770	1 780	(6 000)	24 144	0	0	0	0	0	0
2033	84 085	500	58.9	1 788	1 780	(6 000)	24 485	0	0	0	0	0	0
2034	84 956	500	58.9	1 807	1 780	(6 000)	24 824	0	0	0	0	0	0
2035	85 823	500	58.9	1 826	1 780	(6 000)	25 161	0	0	0	0	0	0
2036	86 684	500	58.9	1 844	1 780	(6 000)	25 497	0	0	0	0	0	0
2037	87 543	500	58.9	1 862	1 780	(6 000)	25 831	0	0	0	0	0	0
2038	88 399	500	58.9	1 881	1 780	(6 000)	26 165	0	0	0	0	0	0
2039	89 255	500	58.9	1 899	1 780	(6 000)	26 498	0	0	0	0	0	0
2040	90 114	500	58.9	1 917	1 780	(6 000)	26 833	0	0	0	0	0	0
2041	90 977	500	58.9	1 935	1 780	(6 000)	27 169	0	0	0	0	0	0
2042	91 844	500	58.9	1 954	1 780	(6 000)	27 507	0	0	0	0	0	0
2043	92 714	500	58.9	1 972	1 780	(6 000)	27 845	0	0	0	0	0	0
			Total Capacity Used (Tons)					48 834 588	4 719 032	3 353 809	17 045 916	13 365 512	1 117 036

Table F-6. Projected Daily Disposal Capacity Shortfall
Scenario 5A – Capacity Saving By Use of Biostabilization
(*Continued*)

D WASTE FACILITIES AND POTENTIAL EXPANSIONS
WASTE DISPOSAL RATES
POLITAN AREA - 1995

	Landfill Waste Acceptance Rate - (tpd-d)											
	Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Park	Antelope Valley Dump	Azusa Land Reclamation	Bursank	Waste Management of Lancaster	Pebbly Beach Disposal	U.S. Navy	Whittier-Savage Canyon	Unassigned Need
	3 [illegible]	4 881	706	9	366	2 929	79	488	2	05	171	0
	3 59	5 247	427		308	2 446	66	408	2	04	143	0
	3 144	2	3 19		471	3 787	102	528	3	06	220	0
	2 765	2	999	12	428	3 426	93	57	2	06	200	0
	2 [illegible]	2	99	9	364	4 280	79	485	2	05	170	0
	3 568	2	1 992	12	405	2	88	574	2	05	189	0
	3 [illegible]	2	[illegible]	9	370	2	80	2	2	05	173	0
	2 [illegible]	2	1 985	12	421	3	91	2	2	06	197	0
	2 755	2	1 991	12	427	0	92	0	2	06	199	0
	3 79	2	2 010	10	431	0	93	0	2	06	201	0
	3 [illegible]	2	1 815	9	389	0	84	0	2	05	181	0
	4 58	2	2 592	13	555	0	120	0	3	07	259	0
	4 905	2	2 601	13	557	0	120	0	3	07	260	0
	4 913	2	2 605	13	558	0	121	0	3	07	261	0
	4 [illegible]	2	2 605	13	558	0	121	0	3	07	260	0
	4 901	2	2 600	13	557	0	120	0	3	07	260	0
	4 96	2	2 645	14	567	0	122	0	3	08	264	0
	4 954	2	2 648	14	567	0	123	0	3	08	265	0
	[illegible]	2	2 659	14	570	0	123	0	3	08	266	0
	[illegible]	2	2 673	14	573	0	124	0	3	08	267	0
	[illegible]	2	3 019	16	647	0	140	0	3	09	302	0
		0	3 500	23	750	0	208	0	5	10	350	2 194
		2	3 500	47	225	0	240	0	11	10	350	11 975
		2	3 500	79	0	0	240	0	17	10	350	13 481
		2	3 500	88	0	0	240	0	20	10	350	15 560
		2	3 500	90	0	0	240	0	20	10	350	15 890
		2	3 500	91	0	0	240	0	20	10	350	15 226
		2	3 500	93	0	0	240	0	21	10	350	16 569
		2	3 500	94	0	0	240	0	21	10	350	16 916
		2	541	102	0	0	240	0	27	10	350	20 212
		0	0	102	0	0	240	0	0	10	350	21 125
		0	0	102	0	0	240	0	0	10	350	21 459
		0	0	102	0	0	240	0	0	10	350	21 773
		0	0	102	0	0	240	0	0	10	350	22 110
		0	0	102	0	0	240	0	0	10	350	22 441
		0	0	102	0	0	240	0	0	10	350	22 773
		0	0	102	0	0	240	0	0	10	350	23 110
		0	0	102	0	0	240	0	0	10	350	23 451
		0	0	102	0	0	240	0	0	10	350	23 792
		0	0	102	0	0	240	0	0	10	350	24 131
		0	0	102	0	0	240	0	0	10	350	24 468
		0	0	102	0	0	240	0	0	10	350	24 804
		0	0	102	0	0	240	0	0	10	350	25 138
		0	0	102	0	0	240	0	0	10	350	25 472
		0	0	102	0	0	240	0	0	10	350	25 805
		0	0	102	0	0	240	0	0	10	24	26 465
		0	0	102	0	0	240	0	0	10	0	26 826
		0	0	102	0	0	240	0	0	10	0	27 164
		0	0	85	0	0	240	0	0	101	0	27 520
												45000
	26 923 418	3 471 852	23 562 312	886 286	3 451 484	5 256 504	2 785 989	983 928	67 020	12 932	4 097 172	

Table F-7. Projected Daily Disposal Capacity Shortfall
Scenario 6A – Extensive Recycling Using 70 Percent Goal Countywide
(Continued)

D WASTE FACILITIES AND POTENTIAL EXPANSIONS
WASTE DISPOSAL RATES
POLITAN AREA - 1995

Landfill Waste Acceptance Rate - (tpd-d)

	Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Park	Antelope Valley Dump	Azusa Land Reclamation	Burbank	Waste Management of Lancaster	Pebbly Beach Disposal	U.S. Navy	Whittier Savage Canyon	Unsatisfied need
	3 [illegible]	4 788	1 675	9	359	2 573	78	479	2	0 5	186	0
	2 565	4 263	1 37[illegible]	[illegible]	294	2 350	63	392	2	0 4	13[illegible]	0
	3 996	0	2 119	11	454	3 633	86	605	2	0 6	215	0
	3 [illegible]	0	1 782	9	377	4 848	82	503	2	0 5	178	0
	3 41[illegible]	0	1 506	9	387	2	84	586	2	0 5	181	0
	3 87[illegible]	0	2 045	12	432	2	93	2	2	0 6	205	0
	3 [illegible]96	0	1 750	9	375	2	81	2	2	0 5	175	0
	3 [illegible]79	0	1 739	9	373	2	80	2	2	0 5	174	0
	3 509	0	1 33[illegible]	[illegible]	285	0	62	2	2	0 4	133	0
	4 39[illegible]	0	2 169	11	465	0	100	0	2	0 6	217	0
	4 [illegible]2[illegible]	0	2 138	11	458	0	99	0	2	0 6	214	0
	3 96[illegible]	0	2 100	11	450	0	97	0	2	0 6	210	0
	3 [illegible]79	0	2 057	11	441	0	95	0	2	0 6	206	0
	3 786	0	2 008	10	430	0	93	0	2	0 6	201	0
	3 564	0	1 954	10	419	0	90	0	2	0 6	196	0
	3 [illegible]77	0	1 895	10	406	2	88	2	2	0 5	189	0
	3 [illegible]55	0	1 874	10	402	0	87	0	2	0 5	187	0
	3 43[illegible]	0	1 819	9	390	0	84	0	2	0 5	182	0
	3 [illegible]35	0	1 769	9	379	0	82	0	2	0 5	177	0
	3 519	0	1 867	9	357	0	77	0	2	0 5	167	0
		0	294	2	63	2	14	0	2	0 [illegible]	29	0
		0	3 500	26	750	2	233	0	5	1 0	350	3 507
		0	3 500	27	251	2	240	0	5	1 0	350	3 523
		0	3 500	42	0	2	240	0	8	1 0	350	5 284
		0	3 500	46	0	2	240	0	10	1 0	350	6 [illegible]79
		0	3 500	4[illegible]	0	2	240	0	10	1 0	350	6 389
		0	3 500	46	0	2	240	0	[illegible]	1 0	350	6 61[illegible]
		0	3 186	183	0	2	240	0	33	1 0	350	[illegible]078
		0	0	183	0	2	240	0	33	1 0	350	12 495
		0	0	183	0	2	240	0	[illegible]4	1 0	350	10 [illegible]47
		0	0	183	0	0	240	0	0	1 0	350	10 989
		0	0	183	0	0	240	0	0	1 0	350	11 211
		0	0	183	0	0	240	0	0	1 0	350	11 419
		0	0	183	0	0	240	0	0	1 0	350	11 642
		0	0	183	0	0	240	0	0	1 0	350	11 862
		0	0	183	0	0	240	0	0	1 0	350	12 082
		0	0	183	0	0	240	0	0	1 0	350	12 308
		0	0	183	0	0	240	0	0	1 0	350	12 532
		0	0	183	0	0	240	0	0	1 0	350	12 758
		0	0	183	0	0	240	0	0	1 0	350	12 983
		0	0	183	0	0	240	0	0	1 0	299	13 257
		0	0	183	0	0	240	0	0	1 0	0	13 779
		0	0	183	0	0	240	0	0	1 0	0	14 001
		0	0	183	0	0	240	0	0	1 0	0	14 222
		0	0	183	0	0	240	0	0	1 0	0	14 443
		0	0	70	0	0	240	0	0	1 0	0	14 666
		0	0	0	0	0	240	0	0	1 0	0	14 889
		0	0	0	0	0	240	0	0	1 0	0	15 213
		0	0	0	0	0	240	0	0	1 0	0	15 436
												45000
	[illegible]	2 [illegible]	19 188 414	728 174	2 807 191	4 275 790	2 633 33[illegible]	900 261	54 510	[illegible]2 082	3 332 367	

Table F-8. Projected Daily Disposal Capacity Shortfall
Scenario 6B – Extensive Recycling Using Landfill Bans

Scenario 6

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
199[illegible]	50 129		25.0	1 948	1 780	- -	33 889	5 342	1 808	5 857	1 880	3 417	1 862
199[illegible]	52 332	500	30.0	1 888	1 780	(2,000)	30 474	3,752	1,288	4 114	1 186	2 400	1 304
199[illegible]	53 58[illegible]	500	35.0	1 804	1 780	(3 500)	27 268	9 872	2,323	0	2 135	4 386	0
[illegible]	53 [illegible]4	500	40.0	8 392	1 780	(3 500)	18 076	3 838	1 297	0	1 192	2 455	0
[illegible]	54 26[illegible]	500	45.0	7 742	1 780	(3 500)	16 229	4 649	1 575	0	1 444	2 973	0
[illegible]	54 903	500	50.0	7 148	1 780	(3 500)	14 543	3 950	2 732	0	[illegible]	2 526	0
[illegible]	56 [illegible]58	500	50.5	7 247	1 780	(6 000)	12 323	4 12[illegible]	0	0	[illegible]282	2 636	0
[illegible]	57 28[illegible]	500	50.9	7 318	1 780	(6 000)	12 519	4 186	0	0	1 300	2 6[illegible]	0
[illegible]	58 344	500	51.4	7 382	1 780	(6 000)	12 707	4 249	0	0	1 320	2 718	0
[illegible]	59 302	500	51.9	7 431	1 780	(6 000)	12 845	4 298	0	0	1 334	2 747	0
[illegible]	60 [illegible]2	500	52.4	7 471	1 780	(6 000)	12 960	3 008	0	0	934	5 893	0
[illegible]	61 [illegible]6	500	52.8	7 501	1 780	(6 000)	13 044	5 549	0	0	1 724	0	0
[illegible]	61 822	500	53.3	7 520	1 780	(6 000)	13 097	5 571	0	0	1 731	0	0
[illegible]	62 524	500	53.6	7 528	1 780	(6 000)	13 123	5 582	0	0	1 734	0	0
[illegible]	63 [illegible]58	500	54.2	7 52[illegible]	1 780	(6 000)	13 120	5 581	0	0	1 734	0	0
[illegible]	63 [illegible]5	500	54.7	7 517	1 780	(6 000)	13 090	5 568	0	0	1 730	0	
[illegible]	65 [illegible]68	500	55.2	7 608	1 780	(6 000)	13 347	5 678	0	0	1 764	0	
[illegible]	65 922	500	55.6	7 615	1 780	(6 000)	13 368	5 686	0	0	1 766	0	
[illegible]	66 818	500	56.1	7 637	1 780	(6 000)	13 430	5 713	0	0	1 775	0	
[illegible]	[illegible]8[illegible]	500	56.6	7 664	1 780	(6 000)	13 509	5 746	0	0	1 785	0	0
[illegible]	68 68[illegible]	500	57.1	7 682	1 780	(6 000)	13 559	5 766	0	0	1 792	0	0
[illegible]	69 5[illegible]	500	57.5	7 689	1 780	(6 000)	13 579	5 776	0	0	1 794	0	0
[illegible]	[illegible]1 30[illegible]	500	58.0	7 69[illegible]	1 780	(6 000)	13 583	5 732	0	0	1 781	0	0
[illegible]	[illegible]	500	58.[illegible]	[illegible]603	1 780	(6 000)	13 560	[illegible]062	0	0	1 03[illegible]	0	0
[illegible]	[illegible]4[illegible]	500	58.9	7 695	1 780	(6 000)	13 584	0	0	0	3 400	0	0
[illegible]	[illegible]1 50[illegible]	500	58.9	7 786	1 780	(6 000)	13 853	0	0	0	3 400	0	0
[illegible]	[illegible]1 969	500	58.9	7 870	1 780	(6 000)	14 117	0	0	0	496	0	0
[illegible]	[illegible]4 554	500	58.9	7 973	1 780	(6 000)	14 386	0	0	0	0	0	0
[illegible]	[illegible]1 45[illegible]	500	58.9	8 069	1 780	(6 000)	14 658	0	0	0	0	0	0
[illegible]	[illegible]5 34[illegible]	500	58.9	8 165	1 780	(6 000)	14 931	0	0	0	0	0	0
[illegible]	[illegible]1 73[illegible]	500	58.9	8 260	1 780	(6 000)	15 201	0	0	0	0	0	0
[illegible]	[illegible]5 06[illegible]	500	58.9	8 352	1 780	(6 000)	15 461	0	0	0	0	0	0
[illegible]	[illegible]9 90[illegible]	500	58.9	8 438	1 780	(6 000)	15 706	0	0	0	0	0	0
[illegible]	[illegible]1 [illegible]64	500	58.9	8 531	1 780	(6 000)	15 989	0	0	0	0	0	0
[illegible]	52 61[illegible]	500	58.9	8 622	1 780	(6 000)	16 228	0	0	0	0	0	0
[illegible]	5[illegible] 468	500	58.9	8 713	1 780	(6 000)	16 486	0	0	0	0	0	0
[illegible]	55 334	500	58.9	8 805	1 780	(6 000)	16 749	0	0	0	0	0	0
[illegible]	56 206	500	58.9	8 889	1 780	(6 000)	17 015	0	0	0	0	0	0
[illegible]	54 [illegible]61	500	58.9	8 993	1 780	(6 000)	17 281	0	0	0	0	0	0
[illegible]	54 866	500	58.9	9 086	1 780	(6 000)	[illegible]7 548	0	0	0	0	0	0
[illegible]	55 [illegible]73	500	58.9	9 178	1 780	(6 000)	17 809	0	0	0	0	0	0
[illegible]	56 684	500	58.9	9 271	1 780	(6 000)	18 071	0	0	0	0	0	0
[illegible]	[illegible]1 [illegible]43	500	58.9	9 362	1 780	(6 000)	18 331	0	0	0	0	0	0
[illegible]	58 386	500	58.9	9 454	1 780	(6 000)	18 592	0	0	0	0	0	0
[illegible]	59 [illegible]55	500	58.9	9 546	1 780	(6 000)	18 852	0	0	0	0	0	0
[illegible]	60 [illegible]14	500	58.9	9 637	1 780	(6 000)	19 112	0	0	0	0	0	0
[illegible]	61 [illegible]7	500	58.9	9 730	1 780	(6 000)	19 375	0	0	0	0	0	0
[illegible]	[illegible]1 844	500	58.9	9 822	1 780	(6 000)	19 636	0	0	0	0	0	0
[illegible]	62 [illegible]14	500	58.9	9 915	1 780	(6 000)	19 902	0	0	0	0	0	0
			Total Capacity Used (Tons)					39 718 786	3 431 479	3 110 867	13 864 012	10 868 980	2 687 918

Table F-8. Projected Daily Disposal Capacity Shortfall
Scenario 6B – Extensive Recycling Using Landfill Bans
(*Continued*)

D WASTE FACILITIES AND POTENTIAL EXPANSIONS
WASTE DISPOSAL RATES
POLITAN AREA - 1995

Landfill Waste Acceptance Rate - (tpd-d)

Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Park	Antelope Valley Dump	Azusa Land Reclamation	Burbank	Waste Management of Lancaster	Peasy Beach Disposal	U.S. Navy	Whittier Savage Canyon	Unassigned Need
3 [illegible]	4 88	706	9	366	2 929	79	488	2	05	[illegible]	0
3 [illegible]	4 [illegible]	700	6	257	2 057	56	343		03	120	0
4 [illegible]		2 [illegible]	11	471	3 787	102	628	3	08	220	0
[illegible]		[illegible]	6	263	4 950	57	35		04	[illegible]	0
[illegible]		1 48	5	319		69	56		04	149	0
[illegible]		[illegible]	6	[illegible]		58			04	128	0
[illegible]		[illegible]		252		51			04	[illegible]	0
[illegible]		[illegible]		287		62		2	04	134	0
[illegible]		[illegible]		291	0	63	0	2	04	136	0
[illegible]		[illegible]		294	0	64	0	2	04	137	0
[illegible]		[illegible]	5	208	0	44	0		03	[illegible]	0
[illegible]		[illegible]		[illegible]		[illegible]			05	[illegible]	0
3 348		[illegible]	9	380	0	82	0	2	05	178	0
3 360		[illegible]	9	382	0	82	0	2	05	179	0
[illegible]		[illegible]	9	383	0	83	0	2	05	178	0
[illegible]		[illegible]	9	382	0	83	0	2	05	178	0
[illegible]		[illegible]	9	382	0	82	0	2	05	178	0
[illegible]		[illegible]	9	382	0	82	0	2	05	182	0
[illegible]		[illegible]	9	389	0	84	0	2	05	182	0
[illegible]		[illegible]	9	390	0	84	0	2	05	183	0
[illegible]		[illegible]	9	391	0	85	0	2	05	183	0
[illegible]		[illegible]	9	394	0	85	0	2	05	184	0
[illegible]		[illegible]	9	395	0	85	0	2	05	184	0
[illegible]		[illegible]	9	396	0	85	0	2	05	185	0
[illegible]		[illegible]	9	393	0	85	0	2	05	183	0
[illegible]		[illegible]		[illegible]		[illegible]			03	[illegible]	[illegible]
		[illegible]	5	226	0	49	0	0	02	350	5 317
		3 500	30	750	0	240	0	0	10	350	5 266
		3 500	33	55	0	240	0	0	10	350	9 454
		3 500	61	0	0	240	0	14	10	350	10 217
		3 500	64	0	0	240	0	14	10	350	10 487
		3 500	55	0	0	240	0	15	10	350	10 759
		3 500	67	0	0	240	0	15	10	350	12 203
		2 271	102	0	0	240	0	33	10	350	14 742
		0	102	0	0	240	0	27	10	350	15 013
		0	102	0	0	240	0	0	10	350	15 278
		0	102	0	0	240	0	0	10	350	15 535
		0	102	0	0	240	0	0	10	350	15 783
		0	102	0	0	240	0	0	10	350	16 056
		0	102	0	0	240	0	0	10	350	16 322
		0	102	0	0	240	0	0	10	350	16 568
		0	102	0	0	240	0	0	10	350	16 853
		0	102	0	0	240	0	0	10	350	17 118
		0	102	0	0	240	0	0	10	350	17 378
		0	102	0	0	240	0	0	10	350	17 638
		0	102	0	0	240	0	0	10	208	18 041
		0	102	0	0	240	0	0	10	0	18 509
		0	102	0	0	240	0	0	10	0	18 768
		0	102	0	0	240	0	0	10	0	19 032
		0	102	0	0	240	0	0	10	0	19 314
		0	83	0	0	240	0	0	10	0	19 861
		0	0	0	0	240	0	0	10	0	45000
[illegible]	[illegible]	19 188 414	728 174	2 807 191	4 275 290	2 424 087	800 291	54 510	1 208	3 332 367	

Table F-9. Projected Daily Disposal Capacity Shortfall
Scenario 7 – Landfill Expansions

Scenario

PROJECTED DISPOSAL NEEDS THROUGH USE OF EXISTING SOL
BASED ON HISTORICALLY JUSTIFIED
COUNTY OF LOS ANGELES METRO
(TPD)

Year	Waste Generation Rate	Sewage Sludge Ban	Recycling Diversion Percent	Landfill Bans Impact	WTE Facility Disposal	Waste Imported / Exported	Landfill Disposal Need	Puente Hills	Spadra	BKK	Scholl	Bradley	Lopez
[illegible]	50 129		25.0	2 597	1 780	-	33 240	5,240	1 771	5 745	1 678	3 351	1 915
[illegible]	52 332	500	30.0	2 711	1 780	(2 000)	29 652	4 345	1 499	4 763	1 350	2 779	3 699
[illegible]	53 58[illegible]	500	35.0	2 778	1 780	(3 500)	26 298	5 387	1 821	0	1 673	3 445	0
[illegible]	52 [illegible]4	500	40.0	2 782	1 780	(3 500)	23 686	4 198	1 419	0	1 304	2 685	0
[illegible]	54 25[illegible]	500	45.0	2 800	1 780	(3 500)	21 171	6 191	2 093	0	1 923	3 956	0
[illegible]	54 363	500	50.0	2 844	1 780	(3 500)	18 848	5 329	2 425	0	1 655	3 408	0
[illegible]	56 188	500	50.5	2 911	1 780	(6 000)	16 659	5 408	0	0	1 879	3 457	0
[illegible]	57 267	500	50 9	2 986	1 780	(6 000)	16 888	5 474	0	0	1 700	3 501	0
[illegible]	58 344	500	51 4	3 022	1 780	(6 000)	17 087	5 538	0	0	1 720	3 542	0
[illegible]	59 302	500	51.9	3 072	1 780	(6 000)	17 204	5 116	0	0	1 589	4 709	0
[illegible]	60 212	500	52 4	3 119	1 780	(6 000)	17 312	7 089	0	0	2 202	0	0
[illegible]	61 052	500	52 8	3 162	1 780	(6 000)	17 382	7 117	0	0	2 211	0	0
[illegible]	61 822	500	53 3	3 202	1 780	(6 000)	17 415	7 131	0	0	2 215	0	0
[illegible]	62 524	500	53 8	3 239	1 780	(6 000)	17 412	7 130	0	0	2 215	0	0
[illegible]	63 158	500	54 2	3 272	1 780	(6 000)	17 378	7 115	0	0	2 210	0	0
[illegible]	63 [illegible]25	500	54 7	3 301	1 780	(6 000)	17 308	7 086	0	0	2 201	0	0
[illegible]	64 [illegible]68	500	55 2	3 378	1 780	(6 000)	17 579	7 198	0	0	2 238	0	0
[illegible]	65 922	500	55 6	3 415	1 780	(6 000)	17 588	7 194	0	0	2 235	0	0
[illegible]	66 3[illegible]8	500	56 1	3 481	1 780	(6 000)	17 605	7 209	0	0	2 239	0	0
[illegible]	67 [illegible]9	500	56 6	3 511	1 780	(6 000)	17 662	7 232	0	0	2 247	0	0
[illegible]	68 66[illegible]	500	57 1	3 558	1 780	(6 000)	17 663	7 241	0	0	2 249	0	0
[illegible]	69 5[illegible]	500	57 5	3 601	1 780	(6 000)	17 667	7 234	0	0	2 247	0	0
[illegible]	[illegible] 3[illegible]	500	58 0	3 642	1 780	(6 000)	17 632	7 565	0	0	1 508	0	0
[illegible]	[illegible]	500	58 5	3 684	1 780	(6 000)	17 599	8 256	0	0	0	0	0
[illegible]	[illegible] 648	500	58 9	3 727	1 780	(6 000)	17 562	8 239	0	0	0	0	0
[illegible]	[illegible] 50[illegible]	500	58 9	3 771	1 780	(6 000)	17 868	8 383	0	0	0	0	0
[illegible]	[illegible]3 669	500	58 9	3 816	1 780	(6 000)	18 180	8 529	0	0	0	0	0
[illegible]	[illegible]4 554	500	58 9	3 862	1 780	(6 000)	18 498	8 678	0	0	0	0	0
[illegible]	[illegible]5 452	500	58 9	3 908	1 780	(6 000)	18 819	7 666	0	0	0	0	0
[illegible]	[illegible]5 349	500	58 9	3 955	1 780	(6 000)	19 142	0	0	0	0	0	0
[illegible]	[illegible]5 [illegible]36	500	58 9	4 001	1 780	(6 000)	19 460	0	0	0	0	0	0
[illegible]	[illegible]5 084	500	58 9	4 045	1 780	(6 000)	19 788	0	0	0	0	0	0
[illegible]	[illegible]5 90[illegible]	500	58 9	4 087	1 780	(6 000)	20 057	0	0	0	0	0	0
[illegible]	[illegible]5 [illegible]65	500	58 9	4 132	1 780	(6 000)	20 388	0	0	0	0	0	0
[illegible]	5[illegible] 5[illegible]6	500	58 9	4 178	1 780	(6 000)	20 673	0	0	0	0	0	0
[illegible]	[illegible]1 466	500	58 9	4 220	1 780	(6 000)	20 979	0	0	0	0	0	0
[illegible]	[illegible]2 334	500	58 9	4 265	1 780	(6 000)	21 280	0	0	0	0	0	0
[illegible]	53 209	500	58 9	4 310	1 780	(6 000)	21 604	0	0	0	0	0	0
[illegible]	54 [illegible]85	500	58 9	4 356	1 780	(6 000)	21 918	0	0	0	0	0	0
[illegible]	54 [illegible]69	500	58 9	4 401	1 780	(6 000)	22 231	0	0	0	0	0	0
[illegible]	55 [illegible]72	500	58 9	4 448	1 780	(6 000)	22 542	0	0	0	0	0	0
[illegible]	56 584	500	58 9	4 480	1 780	(6 000)	22 851	0	0	0	0	0	0
[illegible]	5[illegible] 343	500	58 9	4 535	1 780	(6 000)	23 159	0	0	0	0	0	0
[illegible]	58 [illegible]06	500	58 9	4 579	1 780	(6 000)	23 466	0	0	0	0	0	0
[illegible]	59 [illegible]55	500	58 9	4 623	1 780	(6 000)	23 774	0	0	0	0	0	0
[illegible]	[illegible]0 [illegible]4	500	58 9	4 668	1 780	(6 000)	24 082	0	0	0	0	0	0
[illegible]	[illegible]0 9[illegible]	500	58 9	4 713	1 780	(6 000)	24 392	0	0	0	0	0	0
[illegible]	[illegible]1 844	500	58 9	4 758	1 780	(6 000)	24 703	0	0	0	0	0	0
[illegible]	[illegible]2 [illegible]14	500	58 9	4 803	1 780	(6 000)	25 015	0	0	0	0	0	0
			Total Capacity Used (Tons)					61 000 000	3 431 479	3 278 841	13 884 012	10 868 880	1 748 533

Table F-9. Projected Daily Disposal Capacity Shortfall
Scenario 7 -- Landfill Expansions
(Continued)

D WASTE FACILITIES AND POTENTIAL EXPANSIONS
WASTE DISPOSAL RATES
POLITAN AREA - 1995

Landfill Waste Acceptance Rate - (tpd-6)

Sunshine Canyon	Chiquita Canyon	Calabasas	Brand Park	Antelope Valley Dump	Azusa Land Reclamation	Burbank	Waste Management of Lancaster	Pebbly Beach Disposal	U.S. Navy	Whittier-Savage Canyon	Unsatisfied Need
3 160	4 788	674	9	359	2 873	78	479	2	05	188	0
3 600	3 966	389	-	288	2 382	64	397	2	04	139	0
3 248	2	723	9	389	2 953	80	492	2	05	172	0
2 631	2	345	-	283	5 496	62	384	2	04	134	0
3 [illegible]	2	960	12	424	2	92	566	2	06	198	0
3 [illegible]	2	704	9	365	2	79	487	2	05	171	0
3 [illegible]	2	729	9	370	2	80	494	2	05	173	0
3 [illegible]	2	750	9	375	2	81	500	2	05	175	0
3 [illegible]	2	[illegible]	9	379	2	82	506	2	05	[illegible]	0
3 385	2	836	8	351	0	78	467	2	05	164	0
4 276	2	2 267	12	486	0	105	648	3	06	227	0
4 292	2	2 278	12	488	0	105	650	3	07	228	0
4 300	2	2 280	12	489	0	106	652	3	07	228	0
4 299	2	2 280	12	489	0	106	651	3	07	228	0
4 290	2	2 275	12	488	0	105	650	3	07	228	0
4 [illegible]	2	2 266	12	486	0	105	647	3	06	[illegible]	0
4 [illegible]	2	2 305	12	493	0	107	658	3	07	230	0
4 308	2	2 300	12	493	0	106	657	3	07	230	0
4 304	2	2 305	12	494	0	107	659	3	07	231	0
4 [illegible]	2	2 313	12	496	0	107	661	3	07	231	0
4 306	2	2 315	12	496	0	107	662	3	07	232	0
4 307	2	2 313	12	496	0	107	661	3	07	231	0
4 [illegible]	2	2 419	12	518	0	112	691	3	07	242	0
4 [illegible]	2	2 640	14	566	0	122	754	3	08	264	0
[illegible]	2	2 635	14	565	0	122	753	3	08	263	0
[illegible]	2	2 681	14	574	0	124	766	3	08	268	0
[illegible]	2	[illegible]	14	584	0	126	779	3	08	273	0
[illegible]	2	[illegible]	14	585	0	126	780	3	08	273	0
4 [illegible]	2	430	20	750	0	[illegible]	000	4	10	350	519
4 800	2	0	39	750	0	240	1 000	9	10	350	10 153
4 800	2	0	39	750	0	240	1 000	9	10	350	10 471
4 800	2	0	40	750	0	240	1 000	9	10	350	10 778
4 800	2	0	41	750	0	240	1 000	9	10	350	11 087
4 800	2	0	46	750	0	240	128	10	10	350	12 245
4 800	2	0	47	750	0	240	0	10	10	350	12 675
4 800	2	0	48	750	0	240	0	11	10	350	12 980
4 800	2	0	49	750	0	240	0	11	10	350	13 289
4 800	2	0	49	750	0	240	0	24	10	350	13 589
4 800	2	0	54	352	0	240	0	0	10	350	14 320
4 800	2	0	56	0	0	240	0	0	10	350	14 984
4 800	2	0	57	0	0	240	0	0	10	350	15 294
4 800	2	0	60	0	0	240	0	0	10	124	15 826
4 800	2	0	61	0	0	240	0	0	10	0	16 257
4 800	2	0	62	0	0	240	0	0	10	0	16 563
4 800	2	0	63	0	0	240	0	0	10	0	16 870
4 800	2	0	64	0	0	240	0	0	10	0	17 177
[illegible]	2	0	102	0	0	240	0	0	10	0	21 508
[illegible]	2	0	102	0	0	240	0	0	10	0	24 380
[illegible]	2	0	102	0	0	240	0	0	10	0	24 672
											45000
[illegible]	[illegible]	19 188 414	471 515	6 466 000	4 275 200	2 420 380	6 964 000	54 510	11 907	3 332 387	

APPENDIX G

APPENDIX G: INTERNATIONAL TECHNOLOGY APPLICATIONS

This Appendix was prepared by Dr. Eugene Grigsby and Dr. Leobardo Estrada, based on information provided by personal contacts supplemented by a literature search. Included in this review are London, England; Hong Kong; and Japan. These international sites display in varying degrees characteristics that make their circumstances applicable to issues in Los Angeles County, including size of population, population densities, economic and social conditions, and level of technical sophistication.

As can be seen from the following writeups, use of landfills is the most common method of municipal solid waste (MSW) disposal. The issue of dwindling disposal capacity is a problem for all three of the locations examined. Recycling is receiving a major push, as is reuse of existing landfills. In Japan, waste-to-energy is a major alternative to the use of landfills. It would appear that London will increasingly turn to waste-to-energy to solve its growing landfill capacity problem. It should also be noted that in Japan a downturn in the economy had a dramatic impact on the volume of waste generation.

Lessons for Los Angeles

1. Economic downturn significantly impacts waste generation. Los Angeles is still in the throes of a recession; therefore, previous projections relative to waste generation are no longer valid.

2. Population growth and population composition also directly affect the waste stream. The rate of growth has slowed and the number of lower-income households have increased, thus the previous projections of waste generation are no longer valid. (Note that in Hong Kong, where there are a large number of low-income households, the majority of the waste is from commercial and industrial sources).

3. No world class city has found a single quick, easy solution to solid waste management.

4. Alternatives to utilization of landfill are being strongly encouraged and implemented.

5. Strategies include a combination of reuse of older landfill sites, recycling and waste-to-energy with minimal reliance on landfills.

A. LONDON

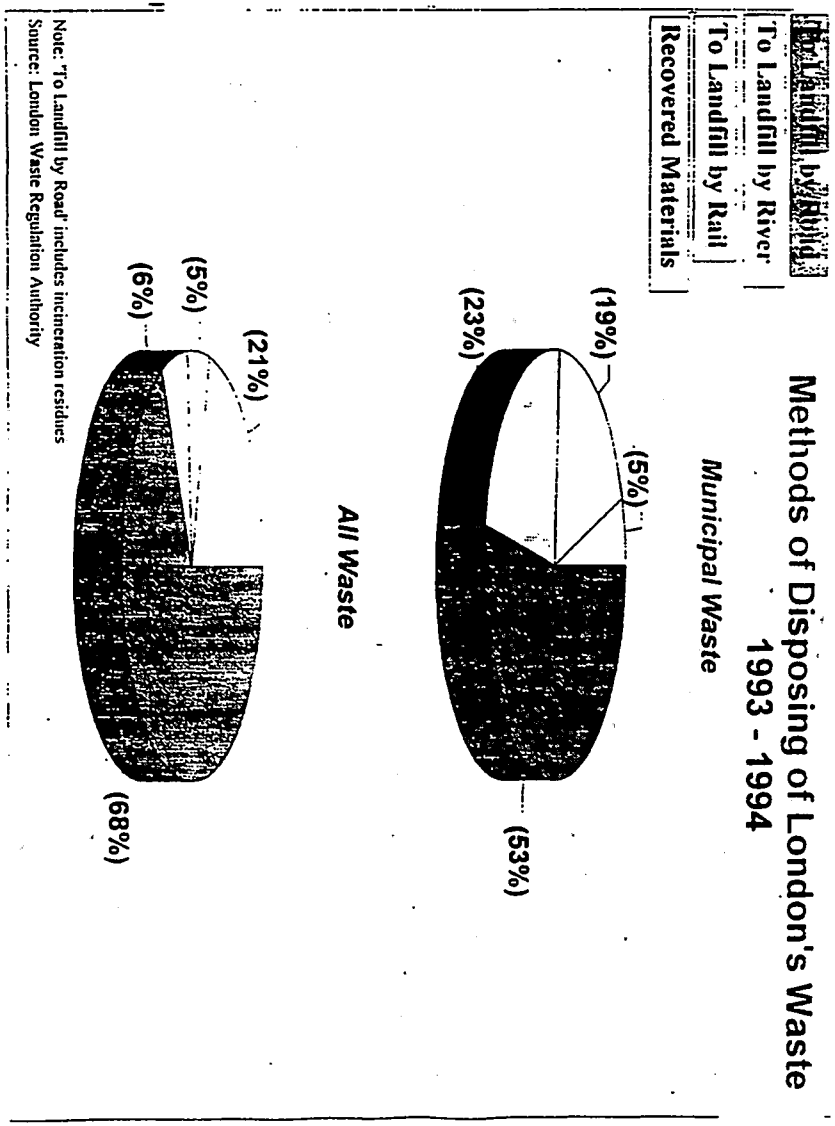
The 1995 population of Greater London, England is 6.8 million. The population density in the City of London is 10,429 people per square mile.

Households in London produce on average 1.2 tons of waste per year. The 33 London local authorities collect 3.7 million tons of household and commercial waste annually. The London Waste Regulation Authority (LWRA) is responsible for supervising four statutory waste disposal authorities and three voluntary groups. The LWRA is also responsible for supervising and licensing the disposal of an additional 8.8 million tons of waste handled by private waste disposal companies. The LWRA also has responsibility for regulating the annual disposal of 129,000 tons of hazardous waste. Figure D-1 shows that in 1993-94, 5 percent of the waste was recovered, with the remainder disposed of in landfills.

Approximately 90 percent of London's waste is placed in landfill sites outside of the City's boundaries. According to the LWRA's recently produced report, *Today's Waste, Tomorrow's Resources: The Waste Management Plan for Greater London 1995-2015*, waste disposal in London should be based on a hierarchy of waste management: waste prevention and re-use, waste recycling and energy recovery, and the safe disposal of non-recoverable residues. Increased emphasis is being placed on waste reduction and recycling.

By the year 2000, it is anticipated that 25 percent of all household waste in London will be recycled. However, only 20 percent of the total municipal solid waste stream is anticipated to be recycled in London by the year 2005.

Use of landfills will remain the most viable disposal option, but the Authority recommends that no new landfill sites accepting putrescible waste be permitted. The Authority recognizes that new landfill sites will be difficult to obtain and, therefore, recommends the reuse of existing sites.



Methods of Disposing of London's Waste
1993 - 1994

Fig. 8 G-1

For the last 20 years, London has had only one municipal waste combustion facility. A new waste-to-energy combined heat and power plant is under construction. It is anticipated that construction of additional waste-to-energy facilities will have a significant effect on the need for landfills by reducing each ton of raw waste to approximately 0.30 tons of ash.

B. HONG KONG

Hong Kong has experienced explosive growth in the past. This rate has slowed down, probably due to the impending transfer of government to mainland China in 1996. A population increase of only 5 percent is projected for the years 1991-2000. The 1995 population is 5.8 million, in a total area of 409 square miles (including the New Territories as well as the City of Hong Kong). The population density of the City of Hong Kong is the highest in the world. In 1994, about 3 million tons of municipal solid waste generated from homes, offices and factories ended up in garbage bins. The waste could grow to 4.8 million tons by the year 2006. Composition of Hong Kong MSW is shown in Figure D-2.

Three-quarters of the solid waste and nearly all of the hazardous chemical waste are generated by industry and commerce. Much of this is demolition debris, and the government has initiated a recycling program for this material. However, it is estimated that over half of the waste currently disposed of at landfills could be diverted for land reclamation purposes. Recovery and recycling of reusable materials will also become more attractive as waste producers seek to minimize their waste disposal bills.

The government has embarked on a program to recover costs of waste disposal services directly from the users. Until recently, there has been no fee for disposal at the landfills. The initial scheme for recovering costs, both for landfill disposal and for services provided by the Chemical Waste Treatment Center, is to create economic incentives for waste producers to practice waste management and to exploit waste recycling and reuse opportunities. In addition, Hong Kong is planning several waste-to-energy facilities to supplement their three landfills.

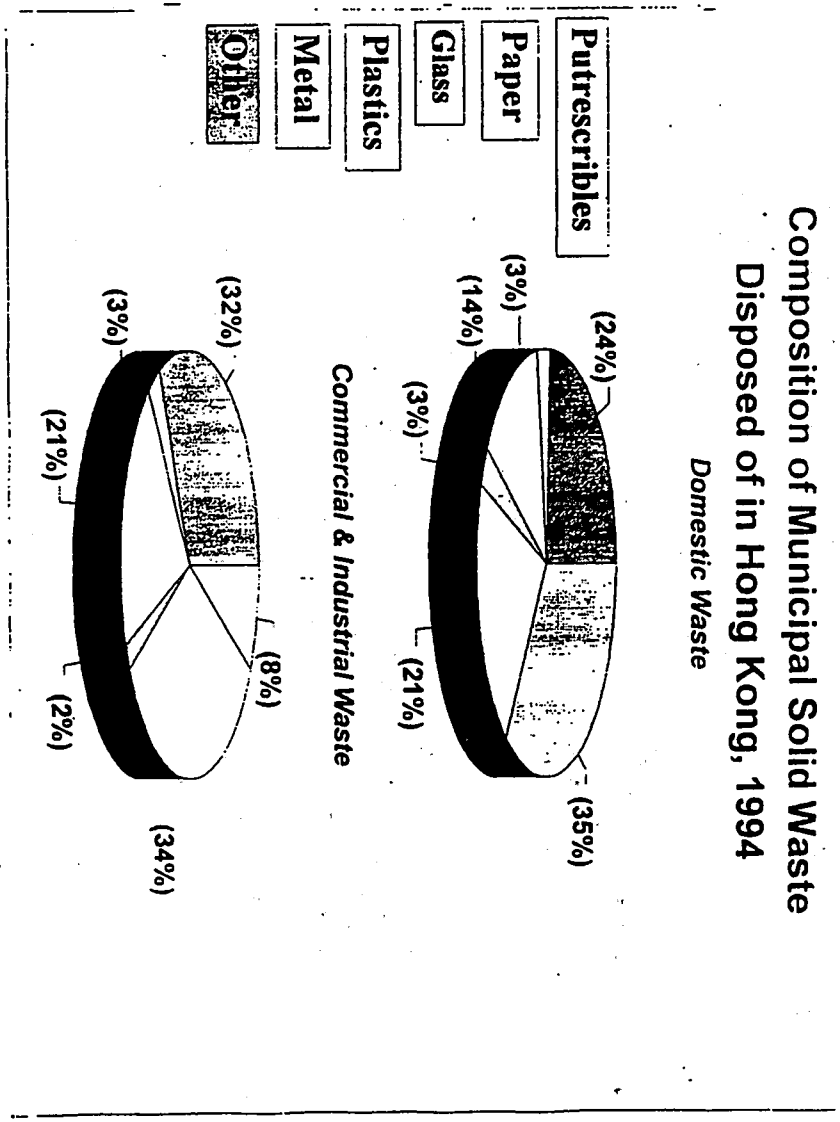


Figure G-2

Preliminary findings from a 1994 survey conducted by the Hong Kong Waste Disposal Authority indicates that current recovery and recycling activities in Hong Kong account for 53 percent of the total waste generated by commercial and industrial sectors. This suggests a very significant and robust level of recycling activity. However, the corresponding figure for the domestic sector is only 8 percent.

C. JAPAN

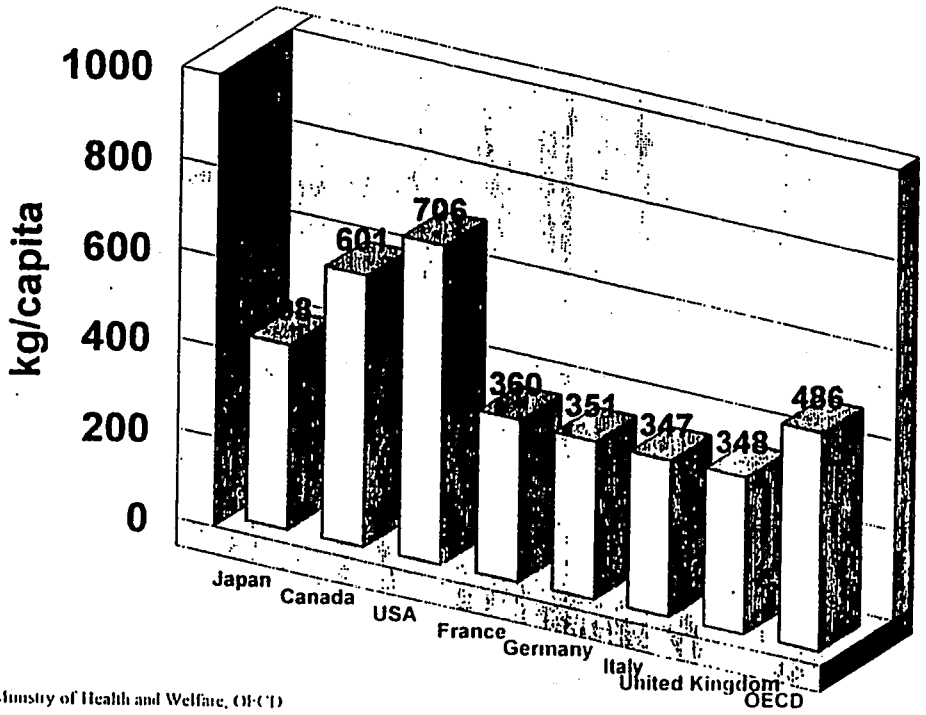
The islands of Japan comprise approximately 144,000 square miles, with a population density of 868 persons per square mile. The 1995 population is 125.1 million, of whom 77 percent are residents of urban areas. The amount of MSW generated in Japan increased at a rate of about one percent per year between 1975 and 1985. However, in the following four years, MSW grew nearly four percent annually to reach about 50.4 million tons in 1990. While no national data are available beyond 1990, the Tokyo metropolitan government reports that MSW decreased from a peak of 4.9 million tons in 1989 to 4.7 million tons in 1991. This annual two percent drop is attributed primarily to the economic downturn the country has experienced.

Japanese MSW generation levels per capita compare favorably with those of a number of other Organization for Economic Cooperation and Development (OECD) countries, but the rate of increase in the late 1980s was among the highest in the OECD. Figure D-3 shows per capita waste generation rates for OECD countries in 1990. Much of the growth in MSW generation since 1986 has been in the commercial sector, e.g., copier, telefax and office automation discards. The increase in waste generation from 1985 through 1990 is shown in Figure D-4.

The objectives of Japanese MSW management are:

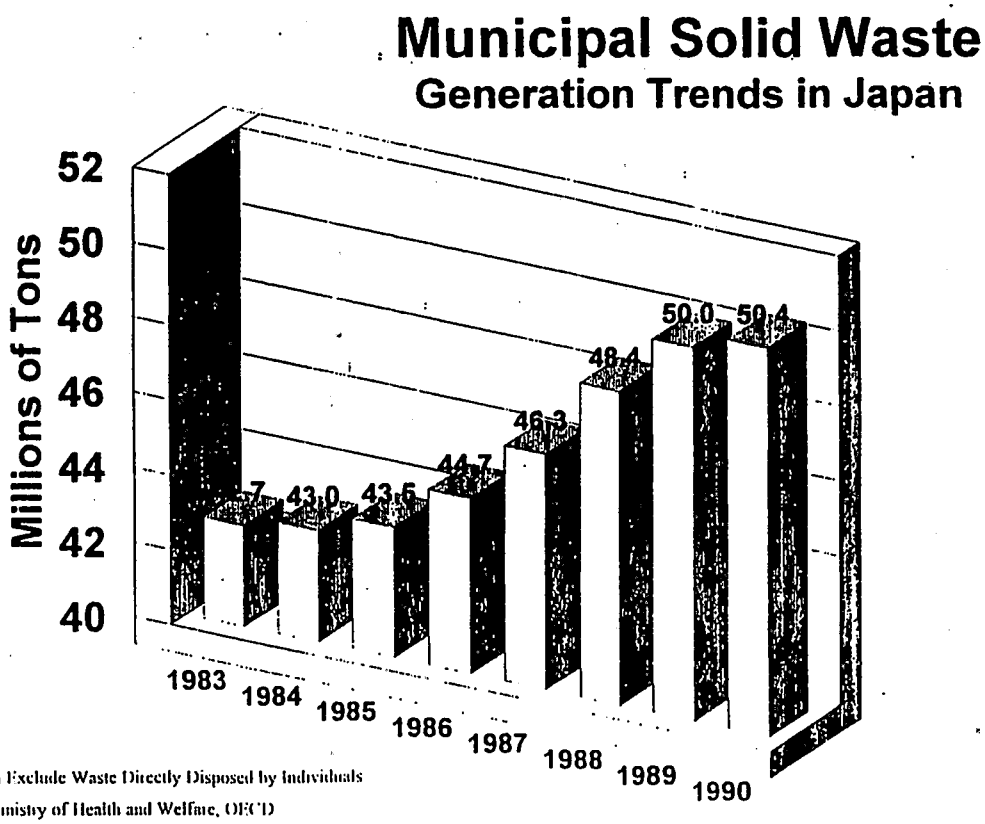
> "To control the discharge of waste, to perform appropriate waste sorting, storage, collection, transportation, recycling, disposal and so forth, and to cleanse the living environment in order to preserve it and improve public health."
>
> (Reference 1, OECD, p. 52)

Figure G-3. Municipal Solid Waste
State, 1990



Source: Ministry of Health and Welfare, OECD

Figure G-4



Note: Data Exclude Waste Directly Disposed by Individuals

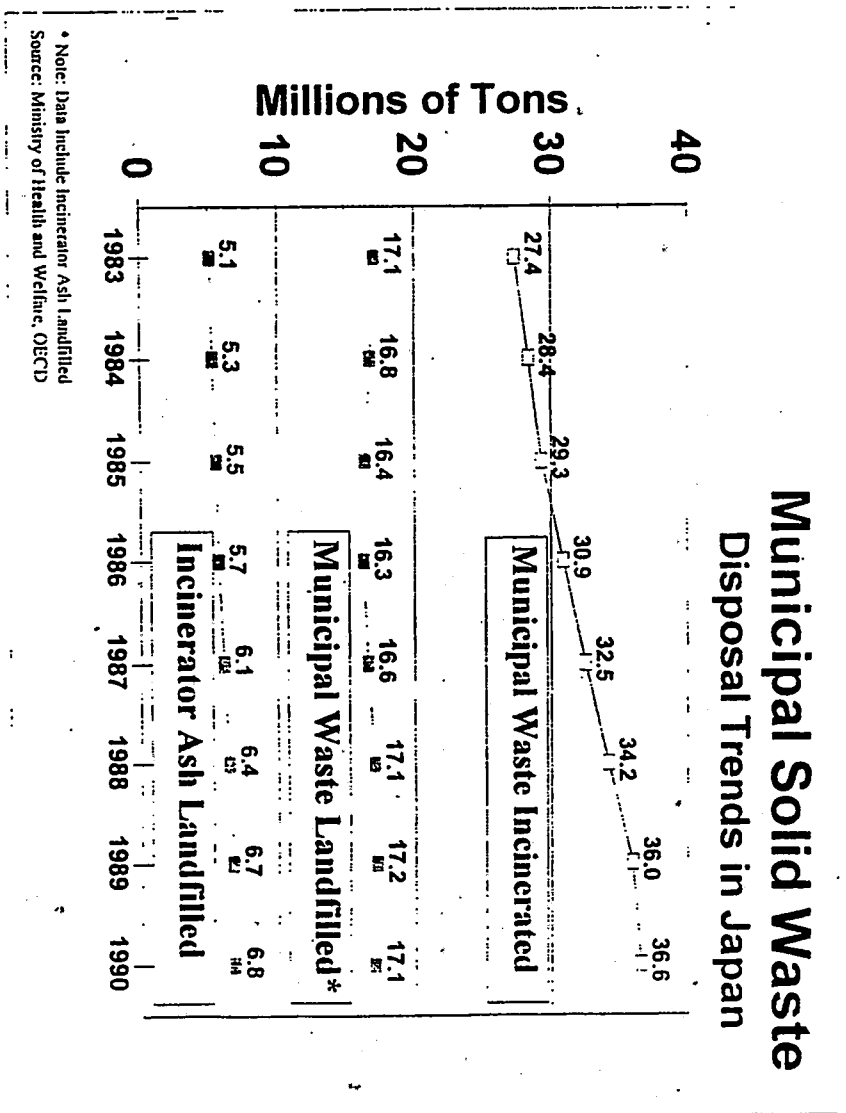
Source: Ministry of Health and Welfare, OECD

The Japanese concept of waste reduction is essentially to cut the amount of waste disposed of in or on the land. Waste separated at source for reuse or recycling counts as waste reduction. Since the shortage of landfill capacity is serious, the primary purpose of promoting resource recovery, recycling and reuse in Japan is not to conserve resources or to reduce imports but rather to reduce the amount of waste going to landfill. Disposal trends from 1983 through 1990 are shown on Figure G-5.

Japan's heavy reliance on waste-to-energy can be explained by its objective of avoiding landfill while assuring environmentally sound disposal. About 75 percent of MSW is combusted. Combustion reduces the mass of MSW by roughly 82 per cent and its volume by over 95 per cent. Since the ash is landfilled along with untreated MSW, and landfill life depends on volume, the ash represents a relatively small burden on national landfill capacity. Japan has addressed some of the issues related to siting by operating extremely clean facilities equipped with state-of-the-art emission controls. Also, the plants are aesthetically designed and co-located with desirable land uses such as recreation centers and swimming pools.

Current landfill capacity for MSW is expected to be exhausted before the turn of the century. Capacity shortage has led to illegal dumping of MSW and industrial waste. Because of this illegal dumping problem, Japan has decided that 84 percent of MSW must be processed for reduction through waste-to-energy or crushing by March 1996. This will mean adding seven million tons per year of waste-to-energy capacity over the next three years. In addition, the Japanese are building industrial waste treatment plants and night soil and septic tank sludge facilities.

Figure G-5



SOURCES

1. *OCED Environmental Performance Reviews*, JAPAN, Organization For Economic Co-Operation And Development, 1994.

2. *Environment Hong Kong 1995*, Environmental Protection Department, 1995.

3. *Today's Waste, Tomorrow's Resources The Waste Management Plan for Greater London 1995-2015*, London Waste Regulation Authority, January 1995.

4. *London 95*, London Research Centre, Volume I, 1995.

5. *World Almanac*, 1995 (for population data).

APPENDIX H

APPENDIX H: TABLES AND METHODOLOGY USED FOR DIVERSION RATE CALCULATIONS

The annual diversion rates for Los Angeles County were projected by identifying the composition of the waste stream and the individual diversion rate for each waste component. The waste steam composition for each generating sector (residential, commercial, and industrial), which is shown as Table H-2, was taken from the *Source Reduction and Recycling Element for Unincorporated Los Angeles County* (County of Los Angeles Department of Public Works, December 1991).

The anticipated diversion rate for each component of the waste stream is based on three levels of recycling effort. The diversion rates associated with each of the levels (and for each generating sector) is shown as Table HG-3. The various levels of recycling intensity are discussed in detail in Chapter VII. The current diversion rate, Level 1, is based on the current recycling effort. The individual diversion rates for each waste component are typical diversion rates experienced by other communities and are based on the overall diversion. Levels 2 and 3, which are anticipated to be reached in years 2000 and 2005 respectively, represent incremental increases in the intensity of recycling efforts. Similar to Level 1, Levels 2 and 3 represent typical diversion rates experienced by other communities at equivalent recycling levels of intensity.

Table H-1 shows the projected annual diversion rates for Los Angeles County. The first step in identifying the diversion rates is dividing the total waste stream into the three major generating sectors, residential, commercial, industrial. The percentages for each sector were taken from the *Source Reduction and Recycling Element for Unincorporated Los Angeles County* (SRRE). The SRRE includes a miscellaneous sector, which generates 3.2 percent of waste stream. This 3.2 percent was divided into prorated fractions and added to the residential, commercial, and industrial sectors. For the purpose of diversion rate estimates, the percentage of waste generation allocated to the residential, commercial, and industrial sector were 50.6, 32.3, and 17.0 respectively.

After the total waste stream is divided into the three generating sectors, which are shown as the third, fourth, and fifth column of Table H-1, the waste from each generating sector is multiplied by the composition percentages from Table H-2. The annual generation of each waste component (for each generating sector) are listed in Appendix Tables H-4 through G-18. Adjacent to each generation rate is the diversion rate, taken from Table H-3. The diversion rates are assumed to increase linearly between the different Levels of recycling intensity.

For each year in Tables H-4 through H-18, the generation of each waste component is multiplied by the respective diversion rate. The summation of these products is total amount of waste recovered from the generating sector. The annual amount of recovered waste is shown in the last column of Tables H-8 (residential), G-13 (commercial), and G-18 (industrial). These values are also included in Table H-1 and a corresponding diversion rate by generating sector is provided. The recovered wastes from each generating sector are added together in the second to last column in Table H-1. Dividing this value by the total waste generation rate provides the annual percent diversion rate.

TABLE H-1
COUNTY OF LOS ANGELES
PROJECTED WASTE GENERATION AND RECOVERY RATES BASED ON CITY OF LOS ANGELES WASTE COMPOSTITION DATA
(TPD—6)

Year	Total Waste Generation Rate	Residential Waste Generation Rate	Commercial Waste Generation Rate	Industrial Waste Generation Rate	Residential Waste Recovery Rate	Residential Percent Recovery Rate	Commercial Waste Recovery Rate	Commercial Percent Recovery Rate	Industrial Waste Recovery Rate	Industrial Percent Recovery Rate	Total Waste Recovery Rate	Total Perc Reco Rate
1995	49,677	21,461	22,355	5,812	5,138	23.94	3,575	15.99	1,385	23.83	10,097	20.33
1996	50,258	21,712	22,616	5,880	6,398	29.47	4,926	21.78	1,731	29.44	13,054	25.97
1997	50,762	21,929	22,843	5,939	7,673	34.99	6,297	27.57	2,082	35.05	16,052	31.62
1998	51,290	22,157	23,081	6,001	8,978	40.52	7,699	33.36	2 440	40.66	19,117	37.27
1999	51,793	22,375	23,307	6,060	10,302	46.04	9,124	39.15	2,804	46.27	22,230	42.92
2000	52,303	22,595	23,536	6,119	11,652	51.57	10,576	44.94	3,175	51.88	25,403	48.57
2001	52,756	22,790	23,740	6,172	12,080	53.00	10,939	46.08	3,288	53.27	26,307	49.87
2002	53,212	22,988	23,945	6,228	12,514	54.44	11,308	47.22	3,403	54.66	27,225	51.16
2003	53,652	23,178	24,144	6,277	12,950	55.87	11,678	48.37	3,518	56.04	28,146	52.46
2004	54,079	23,362	24,336	6,327	13,388	57.31	12,049	49.51	3,634	57.43	29,071	53.76
2005	54,494	23,542	24,523	6,376	13,829	58.74	12,422	50.65	3,750	58.82	30,001	55.05
2006	54,902	23,718	24,706	6,424	14,272	60.18	12,798	51.80	3,867	60.21	30,938	56.35
2007	55,308	23,893	24,889	6,471	14,720	61.61	13,178	52.95	3,986	61.59	31,884	57.65
2008	55,716	24,070	25,072	6,519	15,174	63.04	13,562	54.09	4,106	62.98	32,842	58.94
2009	56,129	24,248	25,258	6,567	15,635	64.48	13,952	55.24	4,227	64.37	33,813	60.24
2010	56,548	24,429	25,447	6,616	16,102	65.91	14,347	56.38	4,351	65.76	34,799	61.54
2011	56,975	24,613	25,639	6,666	16,576	67.35	14,748	57.52	4,476	67.15	35,801	62.84
2012	57,412	24,802	25,836	6,717	17,059	68.78	15,157	58.67	4,604	68.53	36,820	64.13
2013	57,863	24,997	26,038	6,770	17,552	70.22	15,574	59.81	4,734	69.92	37,860	65.43
2014	58,330	25,199	26,249	6,825	18,055	71.65	16,001	60.96	4,867	71.31	38,922	66.73
2015	58,802	25,403	26,461	6,880	18,565	73.08	16,433	62.10	5,001	72.70	40,000	68.02
2016	59,289	25,613	26,680	6,937	19,086	74.52	16,874	63.25	5,139	74.08	41,100	69.32
2017	59,785	25,827	26,903	6,996	19,616	75.96	17,323	64.39	5,279	75.47	42,219	70.62
2018	60,288	26,045	27,130	7,054	20,155	77.39	17,780	65.54	5,421	76.86	43,356	71.91
2019	60,799	26,265	27,360	7,114	20,702	78.82	18,244	66.68	5,566	78.25	44,512	73.21
2020	61,316	26,488	27,592	7,174	21,258	80.26	18,714	67.83	5,713	79.64	45,686	74.51
2021	61,835	26,713	27,826	7,235	21,438	80.26	18,873	67.83	5,761	79.64	46,073	74.51
2022	62,353	26,936	28,059	7,295	21,618	80.26	19,031	67.83	5,810	79.64	46,458	74.51
2023	62,869	27,159	28,291	7,356	21,797	80.26	19,188	67.83	5,858	79.64	46,843	74.51
2024	63,382	27,381	28,522	7,416	21,975	80.26	19,345	67.83	5,905	79.64	47,225	74.51
2025	63,892	27,601	28,751	7,475	22,151	80.26	19,501	67.83	5,953	79.64	47,605	74.51
2026	64,396	27,819	28,978	7,534	22,326	80.26	19,654	67.83	6,000	79.64	47,980	74.51
2027	64,890	28,033	29,201	7,592	22,498	80.26	19,805	67.83	6,046	79.64	48,349	7
2028	65,377	28,243	29,420	7,649	22,666	80.25	19,954	67.83	6,091	79.64	48,712	7
2029	65,855	28,449	29,635	7,705	22,832	80.26	20,100	67.83	6,136	79.64	49,068	74.51
2030	66,326	28,653	29,847	7,760	22,995	80.26	20,243	67.83	6,180	79.64	49,419	74.51
2031	66,788	28,852	30,054	7,814	23,155	80.25	20,384	67.83	6,223	79.64	49,763	74.51
2032	67,239	29,047	30,258	7,867	23,312	80.26	20,522	67 83	6,265	79.64	50,099	74.51
2033	67 682	29,239	30,457	7,919	23,466	80.26	20,657	67.83	6,306	79.64	50,429	74.51
2034	68 118	29,427	30,653	7,970	23,617	80.26	20,790	67.83	6,347	79.64	50,754	74.51
2035	68,547	29,612	30,846	8,020	23,765	80.26	20,921	67.83	6,387	79.64	51,074	74.51
2036	68,971	29,796	31,037	8,070	23,912	80.26	21,051	67.83	6,426	79.64	51,389	74.51
2037	69,390	29,977	31,226	8,119	24,058	80.26	21,179	67.83	6,465	79.64	51,702	74.51
2038	69,806	30,156	31,412	8,167	24,202	80.26	21,306	67.83	6,504	79.64	52,011	74.51
2039	70,218	30,334	31,598	8,215	24,345	80.26	21,431	67.83	6,542	79.64	52,318	74.51
2040	70,629	30,512	31,783	8,264	24,487	80.26	21,557	67.83	6,581	79.64	52,624	74.51
2041	71,015	30,679	31,957	8,309	24,621	80.26	21,675	67.83	6,617	79.64	52,913	74.51
2042	71 403	30,846	32,131	8,354	24,755	80.26	21,793	67.83	6,653	79.64	53,201	74.51
2043	71 791	31,014	32,306	8,400	24,890	80.25	21,911	67.83	6,689	79.64	53,491	74.51

TABLE H-2
COUNTY OF LOS ANELES
WASTE STREAM COMPOSITION BY GENERATING SECTOR

Waste Component	Pecent Composition by Weight		
	Residential	Commercial	Industrial
PAPER			
Corrugated Containers	5.9	11.3	11.6
Mixed Paper	16.2	12.4	21.3
Newspaper	7.5	2.5	1.0
High Grade Ledger	1.3	1.8	0.9
Computer Printouts	0.0	0.0	0.0
Other Paper	0.0	0.0	0.0
SUBTOTAL	30.9	28.0	34.8
PLASTIC			
PVC	0.0	0.0	0.0
PET Containers	0.6	0.1	0.1
HDPE Containers	1.3	1.2	0.1
Film Plastics	2.1	1.7	13.8
Polystyrene	0.0	0.0	0.0
Other Plastics	3.3	1.7	2.8
SUBTOTAL	7.3	4.7	16.8
GLASS			
Refillable Glass	0.4	0.0	0.0
CA Redemption Glass	1.6	0.7	1.0
Other Recyclable Glass	2.3	0.5	1.4
Non-recyclable Glass	1.0	0.1	0.2
SUBTOTAL	5.3	1.3	2.6
METALS			
Aluminum Cans	0.6	0.1	0.1
Ferrous/Tin Cans	3.1	5.0	1.6
Bimetal Containers	0.0	0.0	0.0
Non-ferrous Metals	1.2	0.8	1.4
White Goods	0.3	0.0	0.0
Other Metals	0.1	0.0	0.0
SUBTOTAL	5.3	5.9	3.1
YARD WASTE			
Yard Waste	19.0	6.9	3.9
SUBTOTAL	19.0	6.9	3.9
ORGANICS			
Food Waste	12.8	8.9	3.7
Wood Waste	3.5	19.1	13.1
Tires and Rubber	1.0	1.3	1.6
Crop Residue	0.0	0.0	0.0
Manure	0.2	0.0	0.0
Textiles and Leather	3.6	4.8	15.9
Other Organics	1.1	1.4	1.1
SUBTOTAL	22.2	35.5	35.4
OTHER WASTES			
Inert Solids	9.2	10.8	2.2
Hazardous Waste	0.6	0.3	0.3
SUBTOTAL	9.8	11.1	2.5
SPECIAL WASTE			
Ash	0.1	0.0	0.0
Industrial Sludge	0.0	0.0	0.0
Sewage Sludge	0.0	0.4	0.0
Asbestos	0.0	0.0	0.0
Auto Shredder	0.0	0.0	0.0
Auto Bodies	0.0	0.0	0.0
Other Special Waste	0.6	6.0	0.7
SUBTOTAL	0.7	6.4	0.7
TOTAL	100.0	100.0	100.0

"Source: "Phase IV Report: Solid Waste Management Policy Plan," City of Los Angeles Department of Public Works. October 1993.

TABLE H-3
COUNTY OF LOS ANGELES
CURRENT AND PROJECTED RECOVERY RATES FOR EACH WASTE COMPONENT BY GENERATING SECTOR

Waste Component	Residential				Commercial				Industrial			
	1990 Percent Recovery Rate	(1995) Level 1 Current Percent Recovery Rate	(2000) Level 2 Projected Percent Recovery Rate	(2020) Level 3 Projected Percent Recovery Rate	1990 Percent Recovery Rate	(1995) Level 1 Current Percent Recovery Rate	(2000) Level 2 Projected Percent Recovery Rate	(2020) Level 3 Projected Percent Recovery Rate	1990 Percent Recovery Rate	(1995) Level 1 Current Percent Recovery Rate	(2000) Level 2 Projected Percent Recovery Rate	(2020) Level 3 Projected Percent Recovery Rate
PAPER												
Corrugated Containers	3.92	20	75	95	15.28	50	70	85	11.79	55	70	85
Mixed Paper	1.35	20	60	95	7.05	30	55	85	2.81	30	55	85
Newspaper	23.21	55	85	95	8.16	30	55	85	8.33	25	50	80
High Grade Ledger	4.48	20	60	95	21.80	30	55	85	7.66	25	50	80
Computer Printouts	0.00	20	65	95	0.00	30	55	85	0.00	25	50	80
Other Paper	0.62	20	50	95	1.08	20	35	50	2.44	15	30	40
PLASTIC												
PVC	0.00	0	0	0	0.00	0	20	50	0.00	0	20	50
PET Containers	8.46	25	50	70	2.42	25	45	65	4.44	25	40	60
HDPE Containers	1.05	30	55	75	0.00	30	45	65	0.00	25	40	60
Film Plastics	0.00	0	25	50	0.00	10	40	50	0.00	25	50	75
Polystyrene	0.00	0	25	50	0.00	0	0	0	0.00	0	0	0
Other Plastics	0.37	10	25	50	100.00	10	20	50	0.15	10	20	50
GLASS												
Refillable Glass	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
CA Redemption Glass	28.29	70	80	85	4.72	20	50	80	8.02	20	40	70
Other Recyclable Glass	12.25	65	80	85	0.45	20	50	80	5.65	20	40	70
Non-recyclable Glass	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
METALS												
Aluminum Cans	56.63	65	75	85	6.24	65	75	90	10.39	65	65	80
Ferrous/Tin Cans	0.02	50	70	80	0.03	50	70	90	0.00	50	60	70
Bimetal Containers	0.58	10	25	50	0.42	10	25	50	7.23	20	50	70
Non-ferrous Metals	13.66	10	25	50	15.67	20	35	50	14.54	20	40	60
White Goods	35.44	25	60	90	0.00	0	0	0	0.00	0	0	0
Other Metals	2.67	15	30	50	0.00	15	30	50	0.00	15	30	50
YARD WASTE												
Yard Waste	4.17	50	75	90	9.91	20	75	90	16.30	35	75	90
ORGANICS												
Food Waste	0.00	0	0	95	0.53	0	45	80	0.00	0	45	[illegible]
Wood Waste	0.83	0	25	95	0.35	0	50	90	5.56	25	50	[illegible]
Tires and Rubber	13.79	0	25	50	11.97	20	50	90	6.38	20	50	90
Crop Residue	0.00	0	0	95	0.00	0	0	0	0.00	0	0	0
Manure	0.00	0	0	95	0.00	0	0	0	0.00	0	0	0
Textiles and Leather	0.30	0	50	80	0.00	0	50	80	0.00	0	50	80
Other Organics	0.00	0	0	95	0.00	0	0	0	0.00	0	0	0
OTHER WASTES												
Inert Solids	0.00	0	10	20	0.00	0	0	0	0.96	10	50	80
Hazardous Waste	0.00	0	0	90	0.00	0	0	0	0.00	0	0	0
SPECIAL WASTE												
Ash	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Industrial Sludge	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Sewage Sludge	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Asbestos	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Auto Shredder	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Auto Bodies	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0
Other Special Waste	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0

TABLE H 4
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS - RESIDENTIAL SECTOR

	Corrugated Containers		Mixed Paper		Newspaper		High Grade Ledger		Computer Printouts		Other Paper		PVC	
Year	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	1,266	20 0	3,477	20 0	1,610	55	279	20	0	20	0	20	0	0
1996	1,281	31 0	3,517	32 0	1,628	61	282	32	0	33	0	26	0	0
1997	1,294	42.0	3,553	44 0	1,645	67	285	44	0	46	0	32	0	0
1998	1,307	53 0	3,589	56 0	1,662	73	288	56	0	59	0	38	0	0
1999	1,320	64.0	3,625	68 0	1,678	79	291	68	0	72	0	44	0	0
2000	1,333	75.0	3,660	80.0	1,695	85	294	80	0	85	0	50	0	0
2001	1,345	76.0	3,692	80.8	1,709	86	296	81	0	86	0	52	0	0
2002	1,356	77.0	3,724	81.5	1,724	86	299	82	0	86	0	55	0	0
2003	1,367	78.0	3,755	82.3	1,738	87	301	82	0	87	0	57	0	0
2004	1,378	79.0	3,785	83.0	1,752	87	304	83	0	87	0	59	0	0
2005	1,389	80.0	3,814	83.8	1,766	88	306	84	0	88	0	61	0	0
2006	1,399	81.0	3,842	84.5	1,779	88	308	85	0	88	0	64	0	0
2007	1,410	82.0	3,871	85.3	1,792	89	311	85	0	89	0	66	0	0
2008	1,420	83.0	3,899	86.0	1,805	89	313	86	0	89	0	68	0	0
2009	1,431	84.0	3,928	86.8	1,819	90	315	87	0	90	0	70	0	0
2010	1,441	85.0	3,957	87.5	1,832	90	318	88	0	90	0	73	0	0
2011	1,452	86.0	3,987	88.3	1,846	91	320	88	0	91	0	75	0	0
2012	1,463	87.0	4,018	89.0	1,860	91	322	89	0	91	0	77	0	0
2013	1,475	88.0	4,049	89.8	1,875	92	325	90	0	92	0	79	0	0
2014	1,487	89.0	4,082	90.5	1,890	92	328	91	0	92	0	82	0	0
2015	1,499	90.0	4,115	91.3	1,905	93	330	91	0	93	0	84	0	0
2016	1,511	91.0	4,149	92.0	1,921	93	333	92	0	93	0	86	0	0
2017	1,524	92.0	4,184	92.8	1,937	94	336	93	0	94	0	88	0	0
2018	1,537	93.0	4,219	93.5	1,953	94	339	94	0	94	0	91	0	0
2019	1,550	94.0	4,255	94.3	1,970	95	341	94	0	95	0	93	0	0
2020	1,563	95.0	4,291	95.0	1,987	95	344	95	0	95	0	95	0	0
2021	1,576	95.0	4,327	95.0	2,003	95	347	95	0	95	0	95	0	0
2022	1,589	95.0	4,364	95.0	2,020	95	350	95	0	95	0	95	0	0
2023	1,602	95.0	4,400	95.0	2,037	95	353	95	0	95	0	95	0	0
2024	1,615	95.0	4,436	95.0	2,054	95	356	95	0	95	0	95	0	0
2025	1,628	95.0	4,471	95.0	2,070	95	359	95	0	95	0	95	0	0
2026	1,641	95.0	4,507	95.0	2,086	95	362	95	0	95	0	95	0	0
2027	1,654	95.0	4,541	95.0	2,102	95	364	95	0	95	0	95	0	0
2028	1,668	95.0	4,575	95.0	2,118	95	367	95	0	95	0	95	0	0
2029	1,679	95.0	4,609	95.0	2,134	95	370	95	0	95	0	95	0	0
2030	1,691	95.0	4,642	95.0	2,149	95	372	95	0	95	0	95	0	0
2031	1,702	95.0	4,674	95.0	2,164	95	375	95	0	95	0	95	0	0
2032	1,714	95.0	4,706	95.0	2,179	95	378	95	0	95	0	95	0	0
2033	1,725	95.0	4,737	95.0	2,193	95	380	95	0	95	0	95	0	0
2034	1,736	95.0	4,767	95.0	2,207	95	383	95	0	95	0	95	0	0
2035	1,747	95.0	4,797	95.0	2,221	95	385	95	0	95	0	95	0	0
2036	1,758	95.0	4,827	95.0	2,235	95	387	95	0	95	0	95	0	0
2037	1,769	95.0	4,856	95.0	2,248	95	390	95	0	95	0	95	0	0
2038	1,779	95.0	4,885	95.0	2,262	95	392	95	0	95	0	95	0	0
2039	1,790	95.0	4,914	95.0	2,275	95	394	95	0	95	0	95	0	0
2040	1,800	95.0	4,943	95.0	2,288	95	397	95	0	95	0	95	0	0
2041	1,810	95.0	4,970	95.0	2,301	95	399	95	0	95	0	95	0	0
2042	1,820	95.0	4,997	95.0	2,313	95	401	95	0	95	0	95	0	0
2043	1,830	95.0	5,024	95.0	2,326	95	403	95	0	95	0	95	0	0

TABLE H-5
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS -- RESIDENTIAL SECTOR (continued)

Year	PET Containers		HDPE Containers		Film Plastics		Polystyrene		Other Plastics		Refillable Glass		CA Redemption Glass	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	129	25	279	30	451	0	0	0	708	10	86	0	343	70
1996	130	30	282	35	456	5	0	5	716	13	87	0	347	72
1997	132	35	285	40	461	10	0	10	724	16	88	0	351	74
1998	133	40	288	45	465	15	0	15	731	19	89	0	355	76
1999	134	45	291	50	470	20	0	20	738	22	89	0	358	78
2000	136	50	294	55	474	25	0	25	746	25	90	0	362	80
2001	137	51	296	56	479	26	0	26	752	26	91	0	365	80
2002	138	52	299	57	483	28	0	28	759	28	92	0	368	81
2003	139	53	301	58	487	29	0	29	765	29	93	0	371	81
2004	140	54	304	59	491	30	0	30	771	30	93	0	374	81
2005	141	55	306	60	494	31	0	31	777	31	94	0	377	81
2006	142	56	308	61	498	33	0	33	783	33	95	0	379	82
2007	143	57	311	62	502	34	0	34	788	34	96	0	382	82
2008	144	58	313	63	505	35	0	35	794	35	96	0	385	82
2009	145	59	315	64	509	36	0	36	800	36	97	0	388	82
2010	147	60	318	65	513	38	0	38	806	38	98	0	391	83
2011	148	61	320	66	517	39	0	39	812	39	98	0	394	83
2012	149	62	322	67	521	40	0	40	818	40	99	0	397	83
2013	150	63	325	68	525	41	0	41	825	41	100	0	400	83
2014	151	64	328	69	529	43	0	43	832	43	101	0	403	84
2015	152	65	330	70	533	44	0	44	838	44	102	0	406	84
2016	154	66	333	71	538	45	0	45	845	45	102	0	410	84
2017	155	67	336	72	542	46	0	46	852	46	103	0	413	84
2018	156	68	339	73	547	48	0	48	859	48	104	0	417	85
2019	158	69	341	74	552	49	0	49	867	49	105	0	420	85
2020	159	70	344	75	556	50	0	50	874	50	106	0	424	85
2021	160	70	347	75	561	50	0	50	882	50	107	0	427	85
2022	162	70	350	75	566	50	0	50	889	50	108	0	431	85
2023	163	70	353	75	570	50	0	50	896	50	109	0	435	85
2024	164	70	356	75	575	50	0	50	904	50	110	0	438	85
2025	166	70	359	75	580	50	0	50	911	50	110	0	442	85
2026	167	70	362	75	584	50	0	50	918	50	111	0	445	85
2027	168	70	364	75	589	50	0	50	925	50	112	0	449	85
2028	169	70	367	75	593	50	0	50	932	50	113	0	452	85
2029	171	70	370	75	597	50	0	50	939	50	114	0	455	85
2030	172	70	372	75	602	50	0	50	946	50	115	0	458	85
2031	173	70	375	75	606	50	0	50	952	50	115	0	462	85
2032	174	70	378	75	610	50	0	50	959	50	116	0	465	85
2033	175	70	380	75	614	50	0	50	965	50	117	0	468	85
2034	177	70	383	75	618	50	0	50	971	50	118	0	471	85
2035	178	70	385	75	622	50	0	50	977	50	118	0	474	85
2036	179	70	387	75	626	50	0	50	983	50	119	0	477	85
2037	180	70	390	75	630	50	0	50	989	50	120	0	480	85
2038	181	70	392	75	633	50	0	50	995	50	121	0	482	85
2039	182	70	394	75	637	50	0	50	1,001	50	121	0	485	85
2040	183	70	397	75	641	50	0	50	1,007	50	122	0	488	85
2041	184	70	399	75	644	50	0	50	1,012	50	123	0	491	85
2042	185	70	401	75	648	50	0	50	1,018	50	123	0	494	85
2043	186	70	403	75	651	50	0	50	1,021	50	124	0	496	85

TABLE H-6
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS RESIDENTIAL SECTOR (continued)

Year	Other Recyclable Glass		Non-recyclable Glass		Aluminum Cans		Ferrous/Tin Cans		Bimetal Containers		Non-ferrous Metals		White Goods	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	494	65	215	0	129	65	665	50	0	10	258	10	64	25
1996	499	68	217	0	130	67	673	54	0	13	261	13	65	36
1997	504	71	219	0	132	69	680	58	0	16	263	16	66	47
1998	510	74	222	0	133	71	687	62	0	19	266	19	66	58
1999	515	77	224	0	134	73	694	66	0	22	268	22	67	69
2000	520	80	226	0	136	75	700	70	0	25	271	25	68	80
2001	524	80	228	0	137	76	707	71	0	26	273	26	68	81
2002	529	81	230	0	138	76	713	71	0	28	276	28	69	81
2003	533	81	232	0	139	77	719	72	0	29	278	29	70	82
2004	537	81	234	0	140	77	724	72	0	30	280	30	70	82
2005	541	81	235	0	141	78	730	73	0	31	282	31	71	83
2006	546	82	237	0	142	78	735	73	0	33	285	33	71	83
2007	550	82	239	0	143	79	741	74	0	34	287	34	72	84
2008	554	82	241	0	144	79	746	74	0	35	289	35	72	84
2009	558	82	242	0	145	80	752	75	0	36	291	36	73	85
2010	562	83	244	0	147	80	757	75	0	38	293	38	73	85
2011	566	83	246	0	148	81	763	76	0	39	295	39	74	86
2012	570	83	248	0	149	81	769	76	0	40	298	40	74	86
2013	575	83	250	0	150	82	775	77	0	41	300	41	75	87
2014	580	84	252	0	151	82	781	77	0	43	302	43	76	87
2015	584	84	254	0	152	83	787	78	0	44	305	44	76	88
2016	589	84	256	0	154	83	794	78	0	45	307	45	77	88
2017	594	84	258	0	155	84	801	79	0	46	310	46	77	89
2018	599	85	260	0	156	84	807	79	0	48	313	48	78	89
2019	604	85	263	0	158	85	814	80	0	49	315	49	79	90
2020	609	85	265	0	159	85	821	80	0	50	318	50	79	90
2021	614	85	267	0	160	85	828	80	0	50	321	50	80	90
2022	620	85	269	0	162	85	835	80	0	50	323	50	81	90
2023	625	85	272	0	163	85	842	80	0	50	326	50	81	90
2024	630	85	274	0	164	85	849	80	0	50	329	50	82	90
2025	635	85	276	0	166	85	856	80	0	50	331	50	83	90
2026	640	85	278	0	167	85	862	80	0	50	334	50	83	90
2027	645	85	280	0	168	85	869	80	0	50	336	50	84	90
2028	650	85	282	0	169	85	876	80	0	50	339	50	85	90
2029	654	85	284	0	171	85	882	80	0	50	341	50	85	90
2030	659	85	287	0	172	85	888	80	0	50	344	50	86	90
2031	664	85	289	0	173	85	894	80	0	50	346	50	87	90
2032	668	85	290	0	174	85	900	80	0	50	349	50	87	90
2033	672	85	292	0	175	85	906	80	0	50	351	50	88	90
2034	677	85	294	0	177	85	912	80	0	50	353	50	88	90
2035	681	85	296	0	178	85	918	80	0	50	355	50	89	90
2036	685	85	298	0	179	85	924	80	0	50	358	50	89	90
2037	689	85	300	0	180	85	929	80	0	50	360	50	90	90
2038	694	85	302	0	181	85	935	80	0	50	362	50	90	90
2039	698	85	303	0	182	85	940	80	0	50	364	50	91	90
2040	702	85	305	0	183	85	946	80	0	50	366	50	92	90
2041	706	85	307	0	184	85	951	80	0	50	368	50	92	90
2042	709	85	308	0	185	85	956	80	0	50	370	50	93	90
2043	713	85	310	0	186	85	961	80	0	50	372	50	93	90

TABLE H-7
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – RESIDENTIAL SECTOR (continued)

Year	Other Metals		Yard Waste		Food Waste		Wood Waste		Tires and Rubber		Crop Residue		Manure	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	21	15	4,077	50	2,747	0	751	0	215	0	0	0	43	0
1996	22	18	4,125	55	2,779	0	760	5	217	5	0	0	43	0
1997	22	21	4,167	60	2,807	0	768	10	219	10	0	0	44	0
1998	22	24	4,210	65	2,836	0	776	15	222	15	0	0	44	0
1999	22	27	4,251	70	2,864	0	783	20	224	20	0	0	45	0
2000	23	30	4,293	75	2,892	0	791	25	226	25	0	0	45	0
2001	23	31	4,330	76	2,917	5	798	29	228	26	0	5	46	5
2002	23	32	4,368	77	2,942	10	805	32	230	28	0	10	46	10
2003	23	33	4,404	77	2,967	14	811	36	232	29	0	14	46	14
2004	23	34	4,439	78	2,990	19	818	39	234	30	0	19	47	19
2005	24	35	4,473	79	3,013	24	824	43	235	31	0	24	47	24
2006	24	36	4,506	80	3,036	29	830	46	237	33	0	29	47	29
2007	24	37	4,540	80	3,058	33	836	50	239	34	0	33	48	33
2008	24	38	4,573	81	3,081	38	842	53	241	35	0	38	48	38
2009	24	39	4,607	82	3,104	43	849	57	242	36	0	43	48	43
2010	24	40	4,641	83	3,127	48	855	60	244	38	0	48	49	48
2011	25	41	4,676	83	3,150	52	861	64	246	39	0	52	49	52
2012	25	42	4,712	84	3,175	57	868	67	248	40	0	57	50	57
2013	25	43	4,749	85	3,200	62	875	71	250	41	0	62	50	62
2014	25	44	4,788	86	3,225	67	882	74	252	43	0	67	50	67
2015	25	45	4,826	86	3,252	71	889	78	254	44	0	71	51	71
2016	26	46	4,866	87	3,278	76	896	81	256	45	0	76	51	76
2017	26	47	4,907	88	3,306	81	904	85	258	46	0	81	52	81
2018	26	48	4,948	89	3,334	86	912	88	260	48	0	86	52	86
2019	26	49	4,990	89	3,362	90	919	92	263	49	0	90	53	90
2020	26	50	5,033	90	3,391	95	927	95	265	50	0	95	53	95
2021	27	50	5,075	90	3,419	95	935	95	267	50	0	95	53	95
2022	27	50	5,118	90	3,448	95	943	95	269	50	0	95	54	95
2023	27	50	5,160	90	3,476	95	951	95	272	50	0	95	54	95
2024	27	50	5,202	90	3,505	95	958	95	274	50	0	95	55	95
2025	28	50	5,244	90	3,533	95	966	95	276	50	0	95	55	95
2026	28	50	5,288	90	3,561	95	974	95	278	50	0	95	56	95
2027	28	50	5,326	90	3,588	95	981	95	280	50	0	95	56	95
2028	28	50	5,366	90	3,615	95	989	95	282	50	0	95	56	95
2029	28	50	5,405	90	3,642	95	996	95	284	50	0	95	57	95
2030	29	50	5,444	90	3,668	95	1,003	95	287	50	0	95	57	95
2031	29	50	5,482	90	3,693	95	1,010	95	289	50	0	95	58	95
2032	29	50	5,519	90	3,718	95	1,017	95	290	50	0	95	58	95
2033	29	50	5,555	90	3,743	95	1,023	95	292	50	0	95	58	95
2034	29	50	5,591	90	3,767	95	1,030	95	294	50	0	95	59	95
2035	30	50	5,626	90	3,790	95	1,036	95	296	50	0	95	59	95
2036	30	50	5,661	90	3,814	95	1,043	95	298	50	0	95	60	95
2037	30	50	5,696	90	3,837	95	1,049	95	300	50	0	95	60	95
2038	30	50	5,730	90	3,860	95	1,055	95	302	50	0	95	60	95
2039	30	50	5,763	90	3,883	95	1,062	95	303	50	0	95	61	95
2040	31	50	5,797	90	3,905	95	1,068	95	305	50	0	95	61	95
2041	31	50	5,829	90	3,927	95	1,074	95	307	50	0	95	61	95
[illegible]	31	50	5,861	90	3,948	95	1,080	95	308	50	0	95	62	95
[illegible]	31	50	5,893	90	3,970	95	1,085	95	310	50	0	95	62	95

TABLE H-8
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS -- RESIDENTIAL SECTOR (continued)

Year	Textiles and Leather		Other Organics		Inert Solids		Hazardous Waste		Special Waste		TOTAL
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	RECOVERED
1995	773	0	236	0	1,974	0	129	0	150	0	5,136
1996	782	10	239	0	1,997	2	130	0	152	0	6,398
1997	789	20	241	0	2,017	4	132	0	154	0	7,673
1998	798	30	244	0	2,038	6	133	0	155	0	8,978
1999	805	40	246	0	2,058	8	134	0	157	0	10,302
2000	813	50	249	0	2,079	10	136	0	158	0	11,652
2001	820	52	251	5	2,097	11	137	5	160	0	12,080
2002	828	53	253	10	2,115	11	138	9	161	0	12,514
2003	834	55	255	14	2,132	12	139	14	162	0	12,950
2004	841	56	257	19	2,149	12	140	18	164	0	13,388
2005	847	58	259	24	2,166	13	141	23	165	0	13,829
2006	854	59	261	29	2,182	13	142	27	166	0	14,272
2007	860	61	263	33	2,198	14	143	32	167	0	14,720
2008	867	62	265	38	2,214	14	144	36	168	0	15,174
2009	873	64	267	43	2,231	15	145	41	170	0	15,635
2010	879	65	269	48	2,247	15	147	45	171	0	16,102
2011	886	67	271	52	2,264	16	148	50	172	0	16,576
2012	893	68	273	57	2,282	16	149	54	174	0	17,059
2013	900	70	275	62	2,300	17	150	59	175	0	17,552
2014	907	71	277	67	2,318	17	151	63	176	0	18,055
2015	914	73	279	71	2,337	18	152	68	178	0	18,565
2016	922	74	282	76	2,356	18	154	72	179	0	19,088
2017	930	76	284	81	2,376	19	155	77	181	0	19,616
2018	938	77	286	86	2,396	19	156	81	182	0	20,155
2019	946	79	289	90	2,416	20	158	86	184	0	20,702
2020	954	80	291	95	2,437	20	159	90	185	0	21,258
2021	962	80	294	95	2,458	20	160	90	187	0	21,438
2022	970	80	296	95	2,478	20	162	90	189	0	21,618
2023	978	80	299	95	2,499	20	163	90	190	0	21,797
2024	986	80	301	95	2,519	20	164	90	192	0	21,975
2025	994	80	304	95	2,539	20	166	90	193	0	22,151
2026	1,001	80	306	95	2,559	20	167	90	195	0	22,326
2027	1,009	80	308	95	2,579	20	168	90	196	0	22,498
2028	1,017	80	311	95	2,598	20	169	90	198	0	22,666
2029	1,024	80	313	95	2,617	20	171	90	199	0	22,832
2030	1,031	80	315	95	2,636	20	172	90	201	0	22,995
2031	1,039	80	317	95	2,654	20	173	90	202	0	23,155
2032	1,046	80	320	95	2,672	20	174	90	203	0	23,312
2033	1,053	80	322	95	2,690	20	175	90	205	0	23,466
2034	1,059	80	324	95	2,707	20	177	90	206	0	23,617
2035	1,066	80	326	95	2,724	20	178	90	207	0	23,765
2036	1,073	80	328	95	2,741	20	179	90	209	0	23,912
2037	1,079	80	330	95	2,758	20	180	90	210	0	24,058
2038	1,086	80	332	95	2,774	20	181	90	211	0	24,202
2039	1,092	80	334	95	2,791	20	182	90	212	0	24,345
2040	1,098	80	336	95	2,807	20	183	90	214	0	24,487
2041	1,104	80	337	95	2,822	20	184	90	215	0	24,621
2042	1,110	80	339	95	2,838	20	185	90	216	0	24,755
2043	1,116	80	341	95	2,853	20	188	90	217	0	24,890

TABLE H-9
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS - COMMERCIAL SECTOR

Year	Corrugated Containers		Mixed Paper		Newspaper		High Grade Ledger		Computer Printouts		Other Paper		PVC	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	2,526	50	2,772	30	559	30	402	30	0	30	0	20	0	0
1996	2,556	54	2,804	35	565	35	407	35	0	35	0	23	0	4
1997	2,581	58	2,833	40	571	40	411	40	0	40	0	26	0	8
1998	2,608	62	2,862	45	577	45	415	45	0	45	0	29	0	12
1999	2,634	66	2,890	50	583	50	420	50	0	50	0	32	0	16
2000	2,660	70	2,918	55	588	55	424	55	0	55	0	35	0	20
2001	2,683	70.75	2,944	56.5	593	56.5	427	56.5	0	56.5	0	35.75	0	21.5
2002	2,706	71.5	2,969	58	599	58	431	58	0	58	0	36.5	0	23
2003	2,728	72.25	2,994	59.5	604	59.5	435	59.5	0	59.5	0	37.25	0	24.5
2004	2,750	73	3,018	61	608	61	438	61	0	61	0	38	0	26
2005	2,771	73.75	3,041	62.5	613	62.5	441	62.5	0	62.5	0	38.75	0	27.5
2006	2,792	74.5	3,064	64	618	64	445	64	0	64	0	39.5	0	29
2007	2,812	75.25	3,086	65.5	622	65.5	448	65.5	0	65.5	0	40.25	0	30.5
2008	2,833	76	3,109	67	627	67	451	67	0	67	0	41	0	32
2009	2,854	76.75	3,132	68.5	631	68.5	455	68.5	0	68.5	0	41.75	0	33.5
2010	2,875	77.5	3,155	70	636	70	458	70	0	70	0	42.5	0	35
2011	2,897	78.25	3,179	71.5	641	71.5	461	71.5	0	71.5	0	43.25	0	36.5
2012	2,919	79	3,204	73	646	73	465	73	0	73	0	44	0	38
2013	2,942	79.75	3,229	74.5	651	74.5	469	74.5	0	74.5	0	44.75	0	39.5
2014	2,966	80.5	3,255	76	656	76	472	76	0	76	0	45.5	0	41
2015	2,990	81.25	3,281	77.5	662	77.5	476	77.5	0	77.5	0	46.25	0	42.5
2016	3,015	82	3,308	79	667	79	480	79	0	79	0	47	0	44
2017	3,040	82.75	3,336	80.5	673	80.5	484	80.5	0	80.5	0	47.75	0	45.5
2018	3,066	83.5	3,364	82	678	82	488	82	0	82	0	48.5	0	47
2019	3,092	84.25	3,393	83.5	684	83.5	492	83.5	0	83.5	0	49.25	0	48.5
2020	3,118	85	3,421	85	690	85	497	85	0	85	0	50	0	50
2021	3,144	85	3,450	85	696	85	501	85	0	85	0	50	0	50
2022	3,171	85	3,479	85	701	85	505	85	0	85	0	50	0	50
2023	3,197	85	3,508	85	707	85	509	85	0	85	0	50	0	50
2024	3,223	85	3,537	85	713	85	513	85	0	85	0	50	0	50
2025	3,249	85	3,565	85	719	85	518	85	0	85	0	50	0	50
2026	3,275	85	3,593	85	724	85	522	85	0	85	0	50	0	50
2027	3,300	85	3,621	85	730	85	526	85	0	85	0	50	0	50
2028	3,324	85	3,648	85	735	85	530	85	0	85	0	50	0	50
2029	3,349	85	3,675	85	741	85	533	85	0	85	0	50	0	50
2030	3,373	85	3,701	85	746	85	537	85	0	85	0	50	0	50
2031	3,396	85	3,727	85	751	85	541	85	0	85	0	50	0	50
2032	3,419	85	3,752	85	756	85	545	85	0	85	0	50	0	50
2033	3,442	85	3,777	85	761	85	548	85	0	85	0	50	0	50
2034	3,464	85	3,801	85	766	85	552	85	0	85	0	50	0	50
2035	3,486	85	3,825	85	771	85	555	85	0	85	0	50	0	50
2036	3,507	85	3,849	85	776	85	559	85	0	85	0	50	0	50
2037	3,528	85	3,872	85	781	85	562	85	0	85	0	50	0	50
2038	3,550	85	3,895	85	785	85	565	85	0	85	0	50	0	50
2039	3,571	85	3,918	85	790	85	569	85	0	85	0	50	0	50
2040	3,591	85	3,941	85	795	85	572	85	0	85	0	50	0	50
2041	3,611	85	3,963	85	799	85	575	85	0	85	0	50	0	50
2042	3,631	85	3,984	85	803	85	578	85	0	85	0	50	0	50
2043	3,651	85	4,006	85	808	85	582	85	0	85	0	50	0	50

TABLE H-10
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS -- COMMERCIAL SECTOR (continued)

Year	PET Containers		HDPE Containers		Film Plastics		Polystyrene		Other Plastics		Refillable Glass		CA Redemption Glass	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	22	25	268	30	380	10	0	0	380	10	0	0	156	20
1996	23	29	271	33	384	16	0	0	384	12	0	0	158	26
1997	23	33	274	36	388	22	0	0	388	14	0	0	160	32
1998	23	37	277	39	392	28	0	0	392	16	0	0	162	38
1999	23	41	280	42	396	34	0	0	396	18	0	0	163	44
2000	24	45	282	45	400	40	0	0	400	20	0	0	165	50
2001	24	46	285	46	404	40.5	0	0	404	21.5	0	0	166	51.5
2002	24	47	287	47	407	41	0	0	407	23	0	0	168	53
2003	24	48	290	48	410	41.5	0	0	410	24.5	0	0	169	54.5
2004	24	49	292	49	414	42	0	0	414	26	0	0	170	56
2005	25	50	294	50	417	42.5	0	0	417	27.5	0	0	172	57.5
2006	25	51	296	51	420	43	0	0	420	29	0	0	173	59
2007	25	52	299	52	423	43.5	0	0	423	30.5	0	0	174	60.5
2008	25	53	301	53	426	44	0	0	426	32	0	0	176	62
2009	25	54	303	54	429	44.5	0	0	429	33.5	0	0	177	63.5
2010	25	55	305	55	433	45	0	0	433	35	0	0	178	65
2011	26	56	308	56	436	45.5	0	0	436	36.5	0	0	179	66.5
2012	26	57	310	57	439	46	0	0	439	38	0	0	181	68
2013	26	58	312	58	443	46.5	0	0	443	39.5	0	0	182	69.5
2014	26	59	315	59	446	47	0	0	446	41	0	0	184	71
2015	26	60	318	60	450	47.5	0	0	450	42.5	0	0	185	72.5
2016	27	61	320	61	454	48	0	0	454	44	0	0	187	74
2017	27	62	323	62	457	48.5	0	0	457	45.5	0	0	188	75.5
2018	27	63	326	63	461	49	0	0	461	47	0	0	190	77
2019	27	64	328	64	465	49.5	0	0	465	48.5	0	0	192	78.5
2020	28	65	331	65	469	50	0	0	469	50	0	0	193	80
2021	28	65	334	65	473	50	0	0	473	50	0	0	195	80
2022	28	65	337	65	477	50	0	0	477	50	0	0	196	80
2023	28	65	339	65	481	50	0	0	481	50	0	0	198	80
2024	29	65	342	65	485	50	0	0	485	50	0	0	200	80
2025	29	65	345	65	489	50	0	0	489	50	0	0	201	80
2026	29	65	348	65	493	50	0	0	493	50	0	0	203	80
2027	29	65	350	65	496	50	0	0	496	50	0	0	204	80
2028	29	65	353	65	500	50	0	0	500	50	0	0	206	80
2029	30	65	356	65	504	50	0	0	504	50	0	0	207	80
2030	30	65	358	65	507	50	0	0	507	50	0	0	209	80
2031	30	65	361	65	511	50	0	0	511	50	0	0	210	80
2032	30	65	363	65	514	50	0	0	514	50	0	0	212	80
2033	30	65	365	65	518	50	0	0	518	50	0	0	213	80
2034	31	65	368	65	521	50	0	0	521	50	0	0	215	80
2035	31	65	370	65	524	50	0	0	524	50	0	0	216	80
2036	31	65	372	65	528	50	0	0	528	50	0	0	217	80
2037	31	65	375	65	531	50	0	0	531	50	0	0	219	80
2038	31	65	377	65	534	50	0	0	534	50	0	0	220	80
2039	32	65	379	65	537	50	0	0	537	50	0	0	221	80
2040	32	65	381	65	540	50	0	0	540	50	0	0	222	80
2041	32	65	383	65	543	50	0	0	543	50	0	0	224	80
2042	32	65	386	65	546	50	0	0	546	50	0	0	225	80
2043	32	65	388	65	549	50	0	0	549	50	0	0	226	80

TABLE H-11
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS - COMMERCIAL SECTOR (continued)

Year	Other Recyclable Glass		Non-recyclable Glass		Aluminum Cans		Ferrous/Tin Cans		Bimetal Containers		Non-ferrous Metals		White Goods	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	112	20	22	0	22	65	1,118	50	0	10	179	20	0	0
1996	113	26	23	0	23	67	1,131	54	0	13	181	23	0	0
1997	114	32	23	0	23	69	1,142	58	0	16	183	26	0	0
1998	115	38	23	0	23	71	1,154	62	0	19	185	29	0	0
1999	117	44	23	0	23	73	1,165	66	0	22	186	32	0	0
2000	118	50	24	0	24	75	1,177	70	0	25	188	35	0	0
2001	119	51.5	24	0	24	75.75	1,187	71	0	26.25	190	35.75	0	0
2002	120	53	24	0	24	76.5	1,197	72	0	27.5	192	36.5	0	0
2003	121	54.5	24	0	24	77.25	1,207	73	0	28.75	193	37 25	0	0
2004	122	56	24	0	24	78	1,217	74	0	30	195	38	0	0
2005	123	57.5	25	0	25	78.75	1,226	75	0	31.25	196	38.75	0	0
2006	124	59	25	0	25	79.5	1,235	76	0	32.5	198	39.5	0	0
2007	124	60.5	25	0	25	80.25	1,244	77	0	33.75	199	40.25	0	0
2008	125	62	25	0	25	81	1,254	78	0	35	201	41	0	0
2009	126	63.5	25	0	25	81.75	1,263	79	0	36.25	202	41.75	0	0
2010	127	65	25	0	25	82.5	1,272	80	0	37.5	204	42.5	0	0
2011	128	66.5	26	0	26	83.25	1,282	81	0	38.75	205	43.25	0	0
2012	129	68	26	0	26	84	1,292	82	0	40	207	44	0	0
2013	130	69.5	26	0	26	84.75	1,302	83	0	41.25	208	44.75	0	0
2014	131	71	26	0	26	85.5	1,312	84	0	42.5	210	45.5	0	0
2015	132	72.5	26	0	26	86.25	1,323	85	0	43.75	212	46 25	0	0
2016	133	74	27	0	27	87	1,334	86	0	45	213	47	0	0
2017	135	75.5	27	0	27	87.75	1,345	87	0	46.25	215	47.75	0	0
2018	136	77	27	0	27	88.5	1,356	88	0	47.5	217	48.5	0	0
2019	137	78.5	27	0	27	89.25	1,368	89	0	48.75	219	49 25	0	0
2020	138	80	28	0	28	90	1,380	90	0	50	221	50	0	0
2021	139	80	28	0	28	90	1,391	90	0	50	223	50	0	0
2022	140	80	28	0	28	90	1,403	90	0	50	224	50	0	0
2023	141	80	28	0	28	90	1,415	90	0	50	226	50	0	0
2024	143	80	29	0	29	90	1,426	90	0	50	228	50	0	0
2025	144	80	29	0	29	90	1,438	90	0	50	230	50	0	0
2026	145	80	29	0	29	90	1,449	90	0	50	232	50	0	0
2027	146	80	29	0	29	90	1,460	90	0	50	234	50	0	0
2028	147	80	29	0	29	90	1,471	90	0	50	235	50	0	0
2029	148	80	30	0	30	90	1,482	90	0	50	237	50	0	0
2030	149	80	30	0	30	90	1,492	90	0	50	239	50	0	0
2031	150	80	30	0	30	90	1,503	90	0	50	240	50	0	0
2032	151	80	30	0	30	90	1,513	90	0	50	242	50	0	0
2033	152	80	30	0	30	90	1,523	90	0	50	244	50	0	0
2034	153	80	31	0	31	90	1,533	90	0	50	245	50	0	0
2035	154	80	31	0	31	90	1,542	90	0	50	247	50	0	0
2036	155	80	31	0	31	90	1,552	90	0	50	248	50	0	0
2037	156	80	31	0	31	90	1,561	90	0	50	250	50	0	0
2038	157	80	31	0	31	90	1,571	90	0	50	251	50	0	0
2039	158	80	32	0	32	90	1,580	90	0	50	253	50	0	0
2040	159	80	32	0	32	90	1,589	90	0	50	254	50	0	0
2041	160	80	32	0	32	90	1,598	90	0	50	256	50	0	0
2042	161	80	32	0	32	90	1,607	90	0	50	257	50	0	0
[illegible]	162	80	32	0	32	90	1,615	90	0	50	[illegible]	50	0	0

TABLE H-12
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS -- COMMERCIAL SECTOR (continued)

	Other Metals		Yard Waste		Food Waste		Wood Waste		Tires and Rubber		Crop Residue		Manure	
Year	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	0	15	1,542	20	1,990	0	4,270	0	291	20	0	0	0	0
1996	0	18	1,561	31	2,013	9	4,320	10	294	26	0	0	0	0
1997	0	21	1,576	42	2,033	18	4,363	20	297	32	0	0	0	0
1998	0	24	1,593	53	2,054	27	4,408	30	300	38	0	0	0	0
1999	0	27	1,608	64	2,074	36	4,452	40	303	44	0	0	0	0
2000	0	30	1,624	75	2,095	45	4,495	50	306	50	0	0	0	0
2001	0	31	1,638	75.75	2,113	46.75	4,534	52	309	52	0	0	0	0
2002	0	32	1,652	76.5	2,131	48.5	4,574	54	311	54	0	0	0	0
2003	0	33	1,666	77.25	2,149	50.25	4,611	56	314	56	0	0	0	0
2004	0	34	1,679	78	2,166	52	4,648	58	316	58	0	0	0	0
2005	0	35	1,692	78.75	2,183	53.75	4,684	60	319	60	0	0	0	0
2006	0	36	1,705	79.5	2,199	55.5	4,719	62	321	62	0	0	0	0
2007	0	37	1,717	80.25	2,215	57.25	4,754	64	324	64	0	0	0	0
2008	0	38	1,730	81	2,231	59	4,789	66	326	66	0	0	0	0
2009	0	39	1,743	81.75	2,248	60.75	4,824	68	328	68	0	0	0	0
2010	0	40	1,756	82.5	2,265	62.5	4,860	70	331	70	0	0	0	0
2011	0	41	1,769	83.25	2,282	64.25	4,897	72	333	72	0	0	0	0
2012	0	42	1,783	84	2,299	66	4,935	74	336	74	0	0	0	0
2013	0	43	1,797	84.75	2,317	67.75	4,973	76	338	76	0	0	0	0
2014	0	44	1,811	85.5	2,336	69.5	5,013	78	341	78	0	0	0	0
2015	0	45	1,826	86.25	2,355	71.25	5,054	80	344	80	0	0	0	0
2016	0	46	1,841	87	2,375	73	5,096	82	347	82	0	0	0	0
2017	0	47	1,856	87.75	2,394	74.75	5,138	84	350	84	0	0	0	0
2018	0	48	1,872	88.5	2,415	76.5	5,182	86	353	86	0	0	0	0
2019	0	49	1,888	89.25	2,435	78.25	5,226	88	356	88	0	0	0	0
2020	0	50	1,904	90	2,456	80	5,270	90	359	90	0	0	0	0
2021	0	50	1,920	90	2,477	80	5,315	90	362	90	0	0	0	0
2022	0	50	1,936	90	2,497	80	5,359	90	365	90	0	0	0	0
2023	0	50	1,952	90	2,518	80	5,404	90	368	90	0	0	0	0
2024	0	50	1,968	90	2,538	80	5,448	90	371	90	0	0	0	0
2025	0	50	1,984	90	2,559	80	5,491	90	374	90	0	0	0	0
2026	0	50	1,999	90	2,579	80	5,535	90	377	90	0	0	0	0
2027	0	50	2,015	90	2,599	80	5,577	90	380	90	0	0	0	0
2028	0	50	2,030	90	2,618	80	5,619	90	382	90	0	0	0	0
2029	0	50	2,045	90	2,638	80	5,660	90	385	90	0	0	0	0
2030	0	50	2,059	90	2,656	80	5,701	90	388	90	0	0	0	0
2031	0	50	2,074	90	2,675	80	5,740	90	391	90	0	0	0	0
2032	0	50	2,088	90	2,693	80	5,779	90	393	90	0	0	0	0
2033	0	50	2,102	90	2,711	80	5,817	90	396	90	0	0	0	0
2034	0	50	2,115	90	2,728	80	5,855	90	398	90	0	0	0	0
2035	0	50	2,128	90	2,745	80	5,892	90	401	90	0	0	0	0
2036	0	50	2,142	90	2,762	80	5,928	90	403	90	0	0	0	0
2037	0	50	2,155	90	2,779	80	5,964	90	406	90	0	0	0	0
2038	0	50	2,167	90	2,796	80	6,000	90	408	90	0	0	0	0
2039	0	50	2,180	90	2,812	80	6,035	90	411	90	0	0	0	0
2040	0	50	2,193	90	2,829	80	6,071	90	413	90	0	0	0	0
2041	0	50	2,205	90	2,844	80	6,104	90	415	90	0	0	0	0
2042	0	50	2,217	90	2,860	80	6,137	90	418	90	0	0	0	0
2043	0	50	2,229	90	2,875	80	6,170	90	420	90	0	0	0	0

TABLE H-13
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS COMMERCIAL SECTOR (continued)

Year	Textiles and Leather		Other Organics		Inert Solids		Hazardous Waste		Special Waste		TOTAL
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	RECOVERED
1995	1,073	0	313	0	2,414	0	67	0	1,431	0	3,575
1996	1,086	10	317	0	2,443	0	68	0	1,447	0	4,926
1997	1,096	20	320	0	2,467	0	69	0	1,462	0	6,297
1998	1,108	30	323	0	2,493	0	69	0	1,477	0	7,699
1999	1,119	40	326	0	2,517	0	70	0	1,492	0	9,124
2000	1,130	50	330	0	2,542	0	71	0	1,506	0	10,576
2001	1,140	51.5	332	0	2,564	0	71	0	1,519	0	10,939
2002	1,149	53	335	0	2,586	0	72	0	1,533	0	11,308
2003	1,159	54.5	338	0	2,608	0	72	0	1,545	0	11,678
2004	1,168	56	341	0	2,628	0	73	0	1,557	0	12,049
2005	1,177	57.5	343	0	2,648	0	74	0	1,569	0	12,422
2006	1,186	59	346	0	2,668	0	74	0	1,581	0	12,798
2007	1,195	60.5	348	0	2,688	0	75	0	1,593	0	13,178
2008	1,203	62	351	0	2,708	0	75	0	1,605	0	13,562
2009	1,212	63.5	354	0	2,728	0	76	0	1,617	0	13,952
2010	1,221	65	356	0	2,748	0	76	0	1,629	0	14,347
2011	1,231	66.5	359	0	2,769	0	77	0	1,641	0	14,748
2012	1,240	68	362	0	2,790	0	78	0	1,653	0	15,157
2013	1,250	69.5	365	0	2,812	0	78	0	1,666	0	15,574
2014	1,260	71	367	0	2,835	0	79	0	1,680	0	16,001
2015	1,270	72.5	370	0	2,858	0	79	0	1,694	0	16,433
2016	1,281	74	374	0	2,881	0	80	0	1,708	0	16,874
2017	1,291	75.5	377	0	2,906	0	81	0	1,722	0	17,323
2018	1,302	77	380	0	2,930	0	81	0	1,736	0	17,780
2019	1,313	78.5	383	0	2,955	0	82	0	1,751	0	18,244
2020	1,324	80	386	0	2,980	0	83	0	1,766	0	18,714
2021	1,336	80	390	0	3,005	0	83	0	1,781	0	18,873
2022	1,347	80	393	0	3,030	0	84	0	1,796	0	19,031
2023	1,358	80	396	0	3,055	0	85	0	1,811	0	19,188
2024	1,369	80	399	0	3,080	0	86	0	1,825	0	19,345
2025	1,380	80	403	0	3,105	0	86	0	1,840	0	19,501
2026	1,391	80	406	0	3,130	0	87	0	1,855	0	19,654
2027	1,402	80	409	0	3,154	0	88	0	1,869	0	19,805
2028	1,412	80	412	0	3,177	0	88	0	1,883	0	19,954
2029	1,422	80	415	0	3,201	0	89	0	1,897	0	20,100
2030	1,433	80	418	0	3,223	0	90	0	1,910	0	20,243
2031	1,443	80	421	0	3,246	0	90	0	1,923	0	20,384
2032	1,452	80	424	0	3,268	0	91	0	1,936	0	20,522
2033	1,462	80	426	0	3,289	0	91	0	1,949	0	20,657
2034	1,471	80	429	0	3,311	0	92	0	1,962	0	20,790
2035	1,481	80	432	0	3,331	0	93	0	1,974	0	20,921
2036	1,490	80	435	0	3,352	0	93	0	1,986	0	21,051
2037	1,499	80	437	0	3,372	0	94	0	1,998	0	21,179
2038	1,508	80	440	0	3,393	0	94	0	2,010	0	21,306
2039	1,517	80	442	0	3,413	0	95	0	2,022	0	21,431
2040	1,526	80	445	0	3,433	0	95	0	2,034	0	21,557
2041	1,534	80	447	0	3,451	0	96	0	2,045	0	21,675
2042	1,542	80	450	0	3,470	0	96	0	2,054	0	21,793
2043	1,551	80	452	0	3,489	0	97	0	[illegible]	[illegible]	21,911

TABLE H-14
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – INDUSTRIAL SECTOR

Year	Corrugated Containers		Mixed Paper		Newspaper		High Grade Ledger		Computer Printouts		Other Paper		PVC	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	674	55	1,238	30	58	25	52	25	0	25	0	15	0	0
1996	682	58	1,252	35	59	30	53	30	0	30	0	18	0	4
1997	689	61	1,265	40	59	35	53	35	0	35	0	21	0	8
1998	696	64	1,278	45	60	40	54	40	0	40	0	24	0	12
1999	703	67	1,291	50	61	45	55	45	0	45	0	27	0	16
2000	710	70	1,303	55	61	50	55	50	0	50	0	30	0	20
2001	716	70.75	1,315	56.5	62	51.5	56	51.5	0	51.5	0	30.5	0	21.5
2002	722	71.5	1,326	58	62	53	56	53	0	53	0	31	0	23
2003	728	72.25	1,337	59.5	63	54.5	56	54.5	0	54.5	0	31.5	0	24.5
2004	734	73	1,348	61	63	56	57	56	0	56	0	32	0	26
2005	740	73.75	1,358	62.5	64	57.5	57	57.5	0	57.5	0	32.5	0	27.5
2006	745	74.5	1,368	64	64	59	58	59	0	59	0	33	0	29
2007	751	75.25	1,378	65.5	65	60.5	58	60.5	0	60.5	0	33.5	0	30.5
2008	756	76	1,389	67	65	62	59	62	0	62	0	34	0	32
2009	762	76.75	1,399	68.5	66	63.5	59	63.5	0	63.5	0	34.5	0	33.5
2010	767	77.5	1,409	70	66	65	60	65	0	65	0	35	0	35
2011	773	78.25	1,420	71.5	67	66.5	60	66.5	0	66.5	0	35.5	0	36.5
2012	779	79	1,431	73	67	68	60	68	0	68	0	36	0	38
2013	785	79.75	1,442	74.5	68	69.5	61	69.5	0	69.5	0	36.5	0	39.5
2014	792	80.5	1,454	76	68	71	61	71	0	71	0	37	0	41
2015	798	81.25	1,465	77.5	69	72.5	62	72.5	0	72.5	0	37.5	0	42.5
2016	805	82	1,476	79	69	74	62	74	0	74	0	38	0	44
2017	811	82.75	1,490	80.5	70	75.5	63	75.5	0	75.5	0	38.5	0	45.5
2018	818	83.5	1,502	82	71	77	63	77	0	77	0	39	0	47
2019	825	84.25	1,515	83.5	71	78.5	64	78.5	0	78.5	0	39.5	0	48.5
2020	832	85	1,528	85	72	80	65	80	0	80	0	40	0	50
2021	839	85	1,541	85	72	80	65	80	0	80	0	40	0	50
2022	846	85	1,554	85	73	80	66	80	0	80	0	40	0	50
2023	853	85	1,567	85	74	80	66	80	0	80	0	40	0	50
2024	860	85	1,580	85	74	80	67	80	0	80	0	40	0	50
2025	867	85	1,592	85	75	80	67	80	0	80	0	40	0	50
2026	874	85	1,605	85	75	80	68	80	0	80	0	40	0	50
2027	881	85	1,617	85	76	80	68	80	0	80	0	40	0	50
2028	887	85	1,629	85	76	80	69	80	0	80	0	40	0	50
2029	894	85	1,641	85	77	80	69	80	0	80	0	40	0	50
2030	900	85	1,653	85	78	80	70	80	0	80	0	40	0	50
2031	906	85	1,664	85	78	80	70	80	0	80	0	40	0	50
2032	913	85	1,676	85	79	80	71	80	0	80	0	40	0	50
2033	919	85	1,687	85	79	80	71	80	0	80	0	40	0	50
2034	924	85	1,698	85	80	80	72	80	0	80	0	40	0	50
2035	930	85	1,708	85	80	80	72	80	0	80	0	40	0	50
2036	936	85	1,719	85	81	80	73	80	0	80	0	40	0	50
2037	942	85	1,729	85	81	80	73	80	0	80	0	40	0	50
2038	947	85	1,740	85	82	80	74	80	0	80	0	40	0	50
2039	953	85	1,750	85	82	80	74	80	0	80	0	40	0	50
2040	959	85	1,760	85	83	80	74	80	0	80	0	40	0	50
2041	964	85	1,770	85	83	80	75	80	0	80	0	40	0	50
2042	969	85	1,779	85	84	80	75	80	0	80	0	40	0	50
2043	974	85	1,789	85	84	80	76	80	0	80	0	40	0	50

TABLE H-15
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – INDUSTRIAL SECTOR (continued)

Year	PET Containers		HDPE Containers		Film Plastics		Polystyrene		Other Plastics		Refillable Glass		CA Redemption Glass	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	6	25	6	25	802	25	0	0	163	10	0	0	58	20
1996	6	28	6	28	811	30	0	0	165	12	0	0	59	24
1997	6	31	6	31	820	35	0	0	166	14	0	0	59	28
1998	6	34	6	34	828	40	0	0	168	16	0	0	60	32
1999	6	37	6	37	836	45	0	0	170	18	0	0	61	36
2000	6	40	6	40	844	50	0	0	171	20	0	0	61	40
2001	6	41	6	41	852	51.25	0	0	173	21.5	0	0	62	41.5
2002	6	42	6	42	859	52.5	0	0	174	23	0	0	62	43
2003	6	43	6	43	866	53.75	0	0	176	24.5	0	0	63	44.5
2004	6	44	6	44	873	55	0	0	177	26	0	0	63	46
2005	6	45	6	45	880	56.25	0	0	179	27.5	0	0	64	47.5
2006	6	46	6	46	886	57.5	0	0	180	29	0	0	64	49
2007	6	47	6	47	893	58.75	0	0	181	30.5	0	0	65	50.5
2008	7	48	7	48	900	60	0	0	183	32	0	0	65	52
2009	7	49	7	49	906	61.25	0	0	184	33.5	0	0	66	53.5
2010	7	50	7	50	913	62.5	0	0	185	35	0	0	66	55
2011	7	51	7	51	920	63.75	0	0	187	36.5	0	0	67	56.5
2012	7	52	7	52	927	65	0	0	188	38	0	0	67	58
2013	7	53	7	53	934	66.25	0	0	190	39.5	0	0	68	59.5
2014	7	54	7	54	942	67.5	0	0	191	41	0	0	68	61
2015	7	55	7	55	949	68.75	0	0	193	42.5	0	0	69	62.5
2016	7	56	7	56	957	70	0	0	194	44	0	0	69	64
2017	7	57	7	57	965	71.25	0	0	196	45.5	0	0	70	65.5
2018	7	58	7	58	973	72.5	0	0	198	47	0	0	71	67
2019	7	59	7	59	982	73.75	0	0	199	48.5	0	0	71	68.5
2020	7	60	7	60	990	75	0	0	201	50	0	0	72	70
2021	7	60	7	60	998	75	0	0	203	50	0	0	72	70
2022	7	60	7	60	1,007	75	0	0	204	50	0	0	73	70
2023	7	60	7	60	1,015	75	0	0	206	50	0	0	74	70
2024	7	60	7	60	1,023	75	0	0	208	50	0	0	74	70
2025	7	60	7	60	1,032	75	0	0	209	50	0	0	75	70
2026	8	60	8	60	1,040	75	0	0	211	50	0	0	75	70
2027	8	60	8	60	1,048	75	0	0	213	50	0	0	76	70
2028	8	60	8	60	1,056	75	0	0	214	50	0	0	76	70
2029	8	60	8	60	1,063	75	0	0	216	50	0	0	77	70
2030	8	60	8	60	1,071	75	0	0	217	50	0	0	78	70
2031	8	60	8	60	1,078	75	0	0	219	50	0	0	78	70
2032	8	60	8	60	1,086	75	0	0	220	50	0	0	79	70
2033	8	60	8	60	1,093	75	0	0	222	50	0	0	79	70
2034	8	60	8	60	1,100	75	0	0	223	50	0	0	80	70
2035	8	60	8	60	1,107	75	0	0	225	50	0	0	80	70
2036	8	60	8	60	1,114	75	0	0	226	50	0	0	81	70
2037	8	60	8	60	1,120	75	0	0	227	50	0	0	81	70
2038	8	60	8	60	1,127	75	0	0	229	50	0	0	82	70
2039	8	60	8	60	1,134	75	0	0	230	50	0	0	82	70
2040	8	60	8	60	1,140	75	0	0	231	50	0	0	83	70
2041	8	60	8	60	1,147	75	0	0	233	50	0	0	83	70
2042	8	60	8	60	1,153	75	0	0	234	50	0	0	84	70
	8	60	8	60	1,159	75	0	0	235	50	0	0	84	70

TABLE H-16
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS - INDUSTRIAL SECTOR (continued)

Year	Other Recyclable Glass		Non-recyclable Glass		Aluminum Cans		Ferrous/Tin Cans		Bimetal Containers		Non-ferrous Metals		White Goods	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	81	20	12	0	6	65	93	50	0	20	81	20	0	0
1996	82	24	12	0	6	69	94	52	0	26	82	24	0	0
1997	83	28	12	0	6	73	95	54	0	32	83	28	0	0
1998	84	32	12	0	6	77	96	56	0	38	84	32	0	0
1999	85	36	12	0	6	81	97	58	0	44	85	36	0	0
2000	86	40	12	0	6	85	98	60	0	50	86	40	0	0
2001	86	41.5	12	0	6	85.25	99	60.5	0	51	86	41	0	0
2002	87	43	12	0	6	85.5	100	61	0	52	87	42	0	0
2003	88	44.5	13	0	6	85.75	100	61.5	0	53	88	43	0	0
2004	89	46	13	0	6	86	101	62	0	54	89	44	0	0
2005	89	47.5	13	0	6	86.25	102	62.5	0	55	89	45	0	0
2006	90	49	13	0	6	86.5	103	63	0	56	90	46	0	0
2007	91	50.5	13	0	6	86.75	104	63.5	0	57	91	47	0	0
2008	91	52	13	0	7	87	104	64	0	58	91	48	0	0
2009	92	53.5	13	0	7	87.25	105	64.5	0	59	92	49	0	0
2010	93	55	13	0	7	87.5	106	65	0	60	93	50	0	0
2011	93	56.5	13	0	7	87.75	107	65.5	0	61	93	51	0	0
2012	94	58	13	0	7	88	107	66	0	62	94	52	0	0
2013	95	59.5	14	0	7	88.25	108	66.5	0	63	95	53	0	0
2014	96	61	14	0	7	88.5	109	67	0	64	96	54	0	0
2015	96	62.5	14	0	7	88.75	110	67.5	0	65	96	55	0	0
2016	97	64	14	0	7	89	111	68	0	66	97	56	0	0
2017	98	65.5	14	0	7	89.25	112	68.5	0	67	98	57	0	0
2018	99	67	14	0	7	89.5	113	69	0	68	99	58	0	0
2019	100	68.5	14	0	7	89.75	114	69.5	0	69	100	59	0	0
2020	100	70	14	0	7	90	115	70	0	70	100	60	0	0
2021	101	70	14	0	7	90	116	70	0	70	101	60	0	0
2022	102	70	15	0	7	90	117	70	0	70	102	60	0	0
2023	103	70	15	0	7	90	118	70	0	70	103	60	0	0
2024	104	70	15	0	7	90	119	70	0	70	104	60	0	0
2025	105	70	15	0	7	90	120	70	0	70	105	60	0	0
2026	105	70	15	0	8	90	121	70	0	70	105	60	0	0
2027	106	70	15	0	8	90	121	70	0	70	106	60	0	0
2028	107	70	15	0	8	90	122	70	0	70	107	60	0	0
2029	108	70	15	0	8	90	123	70	0	70	108	60	0	0
2030	109	70	16	0	8	90	124	70	0	70	109	60	0	0
2031	109	70	16	0	8	90	125	70	0	70	109	60	0	0
2032	110	70	16	0	8	90	126	70	0	70	110	60	0	0
2033	111	70	16	0	8	90	127	70	0	70	111	60	0	0
2034	112	70	16	0	8	90	128	70	0	70	112	60	0	0
2035	112	70	16	0	8	90	128	70	0	70	112	60	0	0
2036	113	70	16	0	8	90	129	70	0	70	113	60	0	0
2037	114	70	16	0	8	90	130	70	0	70	114	60	0	0
2038	114	70	16	0	8	90	131	70	0	70	114	60	0	0
2039	115	70	16	0	8	90	131	70	0	70	115	60	0	0
2040	116	70	17	0	8	90	132	70	0	70	116	60	0	0
2041	116	70	17	0	8	90	133	70	0	70	116	60	0	0
2042	117	70	17	0	8	90	134	70	0	70	117	60	0	0
2043	118	70	17	0	8	90	134	70	0	70	118	60	0	0

TABLE H-17
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – INDUSTRIAL SECTOR (continued)

Year	Other Metals		Yard Waste		Food Waste		Wood Waste		Tires and Rubber		Crop Residue		Manure	
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered
1995	0	15	227	35	215	0	761	25	93	20	0	0	0	0
1996	0	18	229	43	218	9	770	30	94	26	0	0	0	0
1997	0	21	232	51	220	18	778	35	95	32	0	0	0	0
1998	0	24	234	59	222	27	786	40	96	38	0	0	0	0
1999	0	27	236	67	224	36	794	45	97	44	0	0	0	0
2000	0	30	239	75	226	45	802	50	98	50	0	0	0	0
2001	0	31	241	75.75	228	47.25	809	52	99	52	0	0	0	0
2002	0	32	243	76.5	230	49.5	816	54	100	54	0	0	0	0
2003	0	33	245	77.25	232	51.75	822	56	100	56	0	0	0	0
2004	0	34	247	78	234	54	829	58	101	58	0	0	0	0
2005	0	35	249	78.75	236	56.25	835	60	102	60	0	0	0	0
2006	0	36	251	79.5	238	58.5	841	62	103	62	0	0	0	0
2007	0	37	252	80.25	239	60.75	848	64	104	64	0	0	0	0
2008	0	38	254	81	241	63	854	66	104	66	0	0	0	0
2009	0	39	256	81.75	243	65.25	860	68	105	68	0	0	0	0
2010	0	40	258	82.5	245	67.5	867	70	106	70	0	0	0	0
2011	0	41	260	83.25	247	69.75	873	72	107	72	0	0	0	0
2012	0	42	262	84	249	72	880	74	107	74	0	0	0	0
2013	0	43	264	84.75	250	74.25	887	76	108	76	0	0	0	0
2014	0	44	266	85.5	253	76.5	894	78	109	78	0	0	0	0
2015	0	45	268	86.25	255	78.75	901	80	110	80	0	0	0	0
2016	0	46	271	87	257	81	909	82	111	82	0	0	0	0
2017	0	47	273	87.75	259	83.25	916	84	112	84	0	0	0	0
2018	0	48	275	88.5	261	85.5	924	86	113	86	0	0	0	0
2019	0	49	277	89.25	263	87.75	932	88	114	88	0	0	0	0
2020	0	50	280	90	265	90	940	90	115	90	0	0	0	0
2021	0	50	282	90	268	90	948	90	116	90	0	0	0	0
2022	0	50	285	90	270	90	956	90	117	90	0	0	0	0
2023	0	50	287	90	272	90	964	90	118	90	0	0	0	0
2024	0	50	289	90	274	90	971	90	119	90	0	0	0	0
2025	0	50	292	90	277	90	979	90	120	90	0	0	0	0
2026	0	50	294	90	279	90	987	90	121	90	0	0	0	0
2027	0	50	296	90	281	90	995	90	121	90	0	0	0	0
2028	0	50	298	90	283	90	1,002	90	122	90	0	0	0	0
2029	0	50	300	90	285	90	1,009	90	123	90	0	0	0	0
2030	0	50	303	90	287	90	1,017	90	124	90	0	0	0	0
2031	0	50	305	90	289	90	1,024	90	125	90	0	0	0	0
2032	0	50	307	90	291	90	1,031	90	126	90	0	0	0	0
2033	0	50	309	90	293	90	1,037	90	127	90	0	0	0	0
2034	0	50	311	90	295	90	1,044	90	128	90	0	0	0	0
2035	0	50	313	90	297	90	1,051	90	128	90	0	0	0	0
2036	0	50	315	90	299	90	1,057	90	129	90	0	0	0	0
2037	0	50	317	90	300	90	1,064	90	130	90	0	0	0	0
2038	0	50	319	90	302	90	1,070	90	131	90	0	0	0	0
2039	0	50	320	90	304	90	1,076	90	131	90	0	0	0	0
2040	0	50	322	90	306	90	1,083	90	132	90	0	0	0	0
2041	0	50	324	90	307	90	1,088	90	133	90	0	0	0	0
[redacted]	0	50	326	90	309	90	1,094	90	134	90	0	0	0	0
[redacted]	0	50	328	90	311	9[redacted]	1,100	90	134	90	0	0	[redacted]	0

TABLE H-18
COUNTY OF LOS ANGELES
ANNUAL WASTE GENERATION AND RECOVERY RATES BY WASTE COMPONENTS – INDUSTRIAL SECTOR (continued)

Year	Textiles and Leather		Other Organics		Inert Solids		Hazardous Waste		Special Waste		TOTAL
	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	Generated	% Recovered	RECOVERED
1995	924	0	64	0	128	10	17	0	41	0	1,385
1996	935	10	65	0	129	18	18	0	41	0	1,731
1997	944	20	65	0	131	26	18	0	42	0	2,082
1998	954	30	66	0	132	34	18	0	42	0	2,440
1999	964	40	67	0	133	42	18	0	42	0	2,804
2000	973	50	67	0	135	50	18	0	43	0	3,175
2001	981	51.5	68	0	136	51.5	19	0	43	0	3,288
2002	990	53	68	0	137	53	19	0	44	0	3,403
2003	998	54.5	69	0	138	54.5	19	0	44	0	3,518
2004	1,006	56	70	0	139	56	19	0	44	0	3,634
2005	1,014	57.5	70	0	140	57.5	19	0	45	0	3,750
2006	1,021	59	71	0	141	59	19	0	45	0	3,867
2007	1,029	60.5	71	0	142	60.5	19	0	45	0	3,986
2008	1,038	62	72	0	143	62	20	0	46	0	4,106
2009	1,044	63.5	72	0	144	63.5	20	0	46	0	4,227
2010	1,052	65	73	0	146	65	20	0	46	0	4,351
2011	1,060	66.5	73	0	147	66.5	20	0	47	0	4,476
2012	1,068	68	74	0	148	68	20	0	47	0	4,604
2013	1,076	69.5	74	0	149	69.5	20	0	47	0	4,734
2014	1,085	71	75	0	150	71	20	0	48	0	4,867
2015	1,094	72.5	76	0	151	72.5	21	0	48	0	5,001
2016	1,103	74	76	0	153	74	21	0	49	0	5,139
2017	1,112	75.5	77	0	154	75.5	21	0	49	0	5,279
2018	1,122	77	78	0	155	77	21	0	49	0	5,421
2019	1,131	78.5	78	0	156	78.5	21	0	50	0	5,566
2020	1,141	80	79	0	158	80	22	0	50	0	5,713
2021	1,150	80	80	0	159	80	22	0	51	0	5,761
2022	1,160	80	80	0	160	80	22	0	51	0	5,810
2023	1,170	80	81	0	162	80	22	0	51	0	5,858
2024	1,179	80	82	0	163	80	22	0	52	0	5,905
2025	1,189	80	82	0	164	80	22	0	52	0	5,953
2026	1,198	80	83	0	166	80	23	0	53	0	6,000
2027	1,207	80	84	0	167	80	23	0	53	0	6,048
2028	1,216	80	84	0	168	80	23	0	54	0	6,091
2029	1,225	80	85	0	170	80	23	0	54	0	6,138
2030	1,234	80	85	0	171	80	23	0	54	0	6,180
2031	1,242	80	86	0	172	80	23	0	55	0	6,223
2032	1,251	80	87	0	173	80	24	0	55	0	6,265
2033	1,259	80	87	0	174	80	24	0	55	0	6,308
2034	1,267	80	88	0	175	80	24	0	56	0	6,347
2035	1,275	80	88	0	176	80	24	0	56	0	6,387
2036	1,283	80	89	0	178	80	24	0	56	0	6,426
2037	1,291	80	89	0	179	80	24	0	57	0	6,465
2038	1,299	80	90	0	180	80	25	0	57	0	6,504
2039	1,306	80	90	0	181	80	25	0	58	0	6,542
2040	1,314	80	91	0	182	80	25	0	58	0	6,581
2041	1,321	80	91	0	183	80	25	0	58	0	6,617
2042	1,328	80	92	0	184	80	25	0	58	0	6,653
2043	1,336	80	92	0	185	80	25	0	59	0	6,689

TABLE H-19
COUNTY OF LOS ANGELES
PROJECTED WASTE GENERATION AND RECOVERY RATES
BASED ON WASTE COMPOSITION DATA FROM UNINCORPORATED AREAS
(TPD–6)

	Total	Residential	Commercial	Industrial	Residential		Commercial		Industrial		Total	
	Waste	Waste	Waste	Waste	Waste	Percent	Waste	Percent	Waste	Percent	Waste	Percent
	Generation	Generation	Generation	Generation	Recovery	Recovery	Recovery	Recovery	Recovery	Recovery	Recovery	Recovery
Year	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate
1995	49,677	25,147	16,065	8,466	5,833	23.20	2,928	18.23	1,862	21.99	10,624	21.39
1996	50,258	25,441	16,253	8,567	7,121	27.99	3,877	23.86	2,350	27.43	13,348	26.56
1997	50,762	25,696	16,416	8,653	8,424	32.78	4,840	29.49	2,843	32.86	16,107	31.73
1998	51,290	25,964	16,586	8,743	9,756	37.57	5,824	35.12	3,348	38.29	18,928	36.90
1999	51,793	26,218	16,749	8,829	11,108	42.37	6,824	40.74	3,861	43.73	21,793	42.08
2000	52,303	26,476	16,914	8,916	12,486	47.16	7,844	46.37	4,383	49.16	24,713	47.25
2001	52,756	26,706	17,060	8,993	13,675	48.96	8,110	47.54	4,536	50.46	25,724	48.76
2002	53,212	26,937	17,206	9,071	13,674	50.76	8,381	48.71	4,695	51.76	26,750	50.27
2003	53,652	27,160	17,350	9,146	14,276	52.56	8,653	49.87	4,853	53.06	27,782	51.78
2004	54,079	27,376	17,486	9,218	14,883	54.37	8,926	51.04	5,012	54.36	28,820	53.29
2005	54,494	27,586	17,623	9,289	15,494	56.17	9,200	52.20	5,171	55.67	29,865	54.80
2006	54,902	27,792	17,755	9,359	16,111	57.97	9,476	53.37	5,331	56.97	30,918	56.31
2007	55,308	27,998	17,886	9,428	16,734	59.77	9,754	54.54	5,493	58.27	31,982	57.82
2008	55,716	28,205	18,018	9,497	17,366	61.57	10,037	55.70	5,657	59.57	33,060	59.34
2009	56,129	28,414	18,151	9,566	18,006	63.37	10,323	56.87	5,824	60.87	34,153	60.85
2010	56,548	28,626	18,287	9,639	18,656	65.17	10,613	58.04	5,993	62.17	35,262	62.36
2011	56,975	28,841	18,425	9,712	19,317	66.96	10,906	59.20	6,164	63.47	36,389	63.87
2012	57,412	29,063	18,566	9,787	19,989	68.76	11,208	60.37	6,339	64.77	37,535	65.38
2013	57,863	29,291	18,712	9,863	20,673	70.58	11,514	61.53	6,517	66.07	38,704	66.89
2014	58,330	29,528	18,863	9,943	21,372	72.38	11,827	62.70	6,699	67.37	39,898	68.40
2015	58,802	29,767	19,016	10,023	22,081	74.18	12,145	63.87	6,883	68.67	41,109	69.91
2016	59,269	30,013	19,173	10,106	22,805	75.98	12,469	65.03	7,072	69.97	42,345	71.42
2017	59,785	30,264	19,333	10,191	23,541	77.78	12,799	66.20	7,263	71.27	43,602	72.93
2018	60,288	30,519	19,496	10,277	24,289	79.59	13,134	67.37	7,458	72.57	44,881	74.44
2019	60,799	30,777	19,661	10,364	25,049	81.39	13,475	68.53	7,656	73.87	46,179	75.95
2020	61,316	31,039	19,829	10,452	25,821	83.19	13,820	69.70	7,857	75.17	47,498	77.46
2021	61,835	31,302	19,997	10,540	26,040	83.19	13,937	69.70	7,924	75.17	47,901	77.46
2022	62,353	31,564	20,164	10,629	26,258	83.19	14,054	69.70	7,990	75.17	48,302	77.46
2023	62,869	31,825	20,331	10,717	26,475	83.19	14,170	69.70	8,056	75.17	48,701	77.46
2024	63,382	32,085	20,497	10,804	26,691	83.19	14,286	69.70	8,122	75.17	49,099	77.46
2025	63,892	32,343	20,662	10,891	26,906	83.19	14,401	69.70	8,187	75.17	49,494	77.46
2026	64,396	32,598	20,825	10,977	27,118	83.19	14,515	69.70	8,252	75.17	49,884	77.46
2027	64,890	32,848	20,985	11,061	27,326	83.19	14,626	69.70	8,315	75.17	50,267	77.46
2028	65,377	33,095	21,142	11,144	27,531	83.19	14,736	69.70	8,377	75.17	50,644	77.46
2029	65,855	33,337	21,297	11,226	27,733	83.19	14,843	69.70	8,439	75.17	51,015	77.46
2030	66,326	33,575	21,449	11,306	27,931	83.19	14,950	69.70	8,499	75.17	51,379	77.46
2031	66,788	33,809	21,598	11,385	28,125	83.19	15,054	69.70	8,558	75.17	51,737	77.46
2032	67,239	34,037	21,744	11,462	28,315	83.19	15,155	69.70	8,616	75.17	52,087	77.46
2033	67,682	34,262	21,887	11,537	28,502	83.19	15,255	69.70	8,673	75.17	52,430	77.46
2034	68,118	34,482	22,028	11,611	28,685	83.19	15,353	69.70	8,729	75.17	52,767	77.46
2035	68,547	34,700	22,167	11,685	28,866	83.19	15,450	69.70	8,784	75.17	53,100	77.46
2036	68,971	34,914	22,304	11,757	29,045	83.19	15,546	69.70	8,838	75.17	53,428	77.46
2037	69,390	35,126	22,440	11,828	29,221	83.19	15,640	69.70	8,892	75.17	53,753	77.46
2038	69,806	35,337	22,574	11,899	29,396	83.19	15,734	69.70	8,945	75.17	54,075	77.46
2039	70,218	35,545	22,707	11,969	29,570	83.19	15,827	69.70	8,998	75.17	54,394	77.46
2040	70,629	35,753	22,840	12,039	29,743	83.19	15,919	69.70	9,050	75.17	54,712	77.46
2041	71,015	35,949	22,965	12,105	29,906	83.19	16,007	69.70	9,100	75.17	55,012	77.46
2042	71,403	36,145	23,091	12,171	30,069	83.19	16,094	69.70	9,150	75.17	55,312	77.46
2043	71,791	36,342	23,216	12,237	30,232	83.19	16,181	69.70	9,199	75.17	55,613	77.46

TABLE H-20
COUNTY OF LOS ANELES
WASTE STREAM COMPOSITION BY GENERATING SECTOR

Waste Component	Pecent Compostion by Weight		
	Residential	Commercial	Industrial
PAPER			
Corrugated Containers	3.6	13.6	11.1
Mixed Paper	7.8	9.3	6.7
Newspaper	6.8	3.8	3.1
High Grade Ledger	0.8	6.0	2.6
Computer Printouts	0.0	0.0	0.0
Other Paper	7.4	7.8	2.8
SUBTOTAL	26.5	40.6	26.3
PLASTIC			
PVC	0.0	1.6	0.7
PET Containers	0.3	0.2	0.1
HDPE Containers	1.1	1.0	0.6
Film Plastics	2.6	4.4	2.6
Polystyrene	2.0	2.2	3.8
Other Plastics	1.2	0.0	0.4
SUBTOTAL	7.2	9.4	8.1
GLASS			
Refillable Glass	0.0	0.0	0.0
CA Redemption Glass	1.9	0.8	0.4
Other Recyclable Glass	3.3	0.9	1.0
Non-recyclable Glass	0.6	0.9	1.4
SUBTOTAL	5.7	2.6	2.9
METALS			
Aluminum Cans	0.5	0.4	0.2
Tin Cans	1.0	0.9	1.0
Ferrous Metals	1.8	4.6	3.6
Non-ferrous Metals	0.3	0.4	0.8
White Goods	0.1	0.0	0.0
Other Metals	0.8	2.4	1.0
SUBTOTAL	4.5	8.7	6.6
YARD WASTE			
Yard Waste	20.8	5.0	5.9
SUBTOTAL	20.8	5.0	5.9
ORGANICS			
Food Waste	14.6	13.4	1.9
Wood Waste	2.6	7.5	16.6
Tires and Rubber	1.0	1.7	3.0
Crop Residue	0.0	0.0	0.0
Manure	0.3	0.8	0.0
Diapers	4.5	0.5	0.0
Textiles and Leather	3.3	5.5	2.6
Other Organics	2.5	2.1	1.0
SUBTOTAL	28.7	31.4	25.2
OTHER WASTES			
Inert Solids	5.7	1.6	24.2
Hazardous Waste	0.9	0.7	0.9
SUBTOTAL	6.6	2.3	25.1
SPECIAL WASTE			
Ash	0.0	0.0	0.0
Industrial Sludge	0.0	0.0	0.0
Sewage Sludge	0.0	0.0	0.0
Asbestos	0.0	0.0	0.0
Auto Shredder	0.0	0.0	0.0
Auto Bodies	0.0	0.0	0.0
Other Special Waste	0.0	0.0	0.0
SUBTOTAL	0.0	0.0	0.0
TOTAL	100.0	100.0	100.0

Source: "Source Reduction and Recycling Element for Unincorporated Los Angeles County," County of Los Angeles Department of Public Works, December, 1991.

APPENDIX I

APPENDIX I: COST ISSUES

This Appendix discusses some of the cost issues relevant to integrated solid waste management planning. It is not possible to develop a detailed cost plan for the recommendations made in the report. To do so would require obtaining present cost data from the County and the County Sanitation Districts of Los Angeles County, as well as from each of the Cities in the County.

Determining the actual cost of solid waste management is one of the most difficult tasks encountered by communities developing integrated solid waste management plans. Many costs, particularly overhead costs such as personnel management, are handled by separate departments. The amount of time allocated to management of solid waste personnel must be estimated as part of the overall cost of solid waste. In addition, divisions often share equipment, marshalling yards or supervisory personnel, or pitch in together to provide emergency services, making it difficult to identify solid waste-specific costs.

The objective in this Appendix is to get the County thinking about how to develop a coherent integrated solid waste management system and help communities control costs. The County can function in a key coordinating role. This does not mean that the County shoulders all costs or manages all facilities; it means that the County actively supports the Cities and facilitates their operations. Elaborate solid waste systems can be very costly if program components are added piecemeal. County leadership can be critical in this area through:

- preparing the County Comprehensive Plan to coordinate efforts between the various County jurisdictions or provides joint City/County-sponsored facilities;
- developing facilities that serve multiple jurisdictions (e.g., transfer stations) that, through economies of scale, keep costs down despite possible longer haul distances;
- developing County model programs, including a variable rate fee system for County-collected areas and technology demonstration programs for landfill operations (see Chapter IX.F); and

- maintaining the economic viability of existing facilities, for example, through waste transfer to the WTE facilities (Chapter IX.H) or developing a policy of purchasing supplies from recycling enterprises ("Buy Recycled") that utilize recyclables collected in Los Angeles County.

In addition to the coordinating role, the County can pioneer some innovative ways of financing solid waste management programs that also foster diversion of waste from disposal, including: enterprise fund accounting, and variable rate fees ("unit pricing"). Also discussed in this Appendix are the relative share of the solid waste dollar cost for different system components, and factors influencing costs. These two topics provide background for Report discussions.

A. ENTERPRISE FUNDS

Operating an integrated solid waste management system as an enterprise fund allows communities to track the true cost of service, and keeps the funding for services separate from the political vagaries of the government budgeting process. In an enterprise fund, all revenues and costs go to a cost center. Revenues do not go to the General Fund, debt service is not paid for by Finance, benefits by Personnel, or fuel by the Transportation Department, etc., which is often the case when solid waste is part of a jurisdiction's operation. Future post-closure costs and sinking funds are established in enterprise accounting, and it possible to tell the cost for solid waste service and charge for it -- by the ton, by the household, by the business address, etc.

B. VARIABLE RATES

Local governments need to find ways to charge the generator for the service received in order to get solid waste costs out of the General Fund. Direct billing of customers for the solid waste service received is a key component of enterprise fund accounting. These fees, plus other revenues such as from the sale of recovered materials, make up the funds used to pay costs. Generator billing should be done in a way that encourages source reduction as well as maximizes diversion. A variable rate system (also called "unit pricing") goes far to accomplish this and

is also an important part of enterprise accounting for solid waste management. Variable rate pricing has been the norm in commercial collection for years -- the generator is billed based either on the weight of the material collected by the hauler, or by the size of the waste storage container used by the generator. For the residential customer, it can mean higher costs for more waste, or lower costs for less waste and more recycling. For the commercial generator, it can mean differential fees (or no fee) for loads that can be recycled. As consumerism is applied to solid waste services, the generator will have incentive to dispose of less and to set aside more materials for recycling. An example of a variable rate fee system is provided in Appendix A, Case Study of the City of Seattle.

C. COSTS FOR SOLID WASTE SERVICES

The solid waste dollar goes to many functions, depending upon the make-up of the specific system. Shown in Figure I-1 is a pie chart, developed from data from several cities, that graphically portrays how the solid waste dollar is split up. Administrative costs for each of the components are included in each portion of the pie. As can be seen, collection-related costs comprise over 60 percent of the pie, followed by disposal at 30 percent, and lastly by processing at 8 percent. It should be noted that solid waste collection includes bulk waste and special collections (such as post-special event collections and disaster debris), while recycling collection costs include yard waste collection as well as curbside service for materials. The pie chart shows recycling-related collection costs at 20 percent -- or almost one-third of the collection expenditures. Recycling costs overall can represent over one-quarter of the way the solid waste dollar is spent.

In addition to the above service-related and direct administrative costs, a community can expend considerable funds on specialized services, such as Household Hazardous Waste (HHW) collection and public information campaigns to encourage recycling and HHW diversion. Many communities have turned to surcharges on landfill or transfer station tipping fees as a means of funding new diversion programs, particularly for programs such as HHW that have a high unit cost and do not produce revenues to help pay for the program. Monies collected through surcharges can "get lost" in the General Fund; enterprise fund accounting can keep these

resources dedicated to solid waste management programs.

D. FACTORS INFLUENCING COSTS

Trends that influence recycling and solid waste disposal costs are discussed in various Report Chapters, and are summarized here by the service component. Overall, the cost of solid waste management is rising, but offsetting trends are discussed as well.

1. Collection

Two factors are driving the cost of solid waste collection. First, obtaining high-quality recyclables from the waste stream often means curbside collection of source-separated designated materials. This adds specialized recycling collection trucks and personnel routed through the same neighborhoods as the solid waste collection packer trucks. Yard wastes are also collected through a separate route system. Bulk wastes may also be collected separately using open-bed trucks equipped with a grapple. Each additional collection system will increase the number of trucks and personnel needed to get the job done.

Second, as the solid waste management system has evolved, the equipment industry has been evolving along with it. Automated collection equipment allows a single driver to complete a route, rather than the two- or three-man crews required for traditional packer trucks. Sophisticated routing software and GIS mapping allow a jurisdiction to consolidate routes, so that as recycling collection expands, solid waste collection routes can be adjusted proportionally, and optimum routes (i.e., the most material in the least time) can be devised for each type of collection. Other equipment features, such as split packers, allow a single truck to perform double duty while on a route. These options can be used to reduce the cost of collection.

Communities are innovating to contain the costs resulting from these trends. Automated collection has been applied to recyclable materials as well as refuse. Rebanco in Seattle has utilized authomated recycling collection in 96 gallon carts and reduced the collection frequency to once per month. Guelph, Ontario is implementing wet/dry collection citywide in the city,

with a population of 80,000. This followed an extensive pilot program to establish the cost and effectiveness of the program. Because the collection function represents a majority of the solid waste management cost, efficiency in this area has the largest reduction in overall cost for the investment.

2. Transfer

Collection costs can also be contained by adding transfer station(s) to the system. As discussed in Chapter IX, transfer stations can reduce collection costs by keeping collection packer truck routes as short as possible (less than 30 miles). A transfer trailer can carry three times the amount of waste as a packer truck and rail cars can carry six times the amount. Shifting the waste to larger-capacity, more efficient transfer vehicles for transport to the disposal site reduces the number of personnel and vehicles needed.

Even though transfer operations add capital and operations costs for transfer stations and vehicles, they have the potential to significantly reduce the overall cost. The reduction in the non-productive time for the route collection trucks has a double pay-off. First, the cost per collection route is reduced and second, the route collection trucks can collect from additional routes. This lowers the investment in trucks and crews.

3. Solid Waste Disposal

Class III Sanitary Landfills are still the primary method of managing solid waste in Los Angeles County. The cost of landfill disposal is a political issue as well as a technical one. The true cost of local landfill disposal is not reflected in $20.00 per ton tipping fees. Some long-term costs of landfill disposal can be deferred (rather than paid out of tipping fees), particularly closure, post-closure, and Title V Remediation Funds, plus, for existing landfills, the cost of the site may have already been paid for and does not reflect current land values. However, a jurisdiction may choose to keep landfill prices low in order to keep waste from leaving to lower-cost disposal sites in order to maintain cash flow at the landfill, or (as in the

case of Orange or Riverside Counties) may reduce the price to attract waste from outside the jurisdiction and thus increase cash flow in the short term.

The actual cost of landfill disposal is driven by the cost of the land, pre-development costs for planning and permitting, plus the construction and operation costs of the facility over its life. The U.S. EPA promulgated new rules for landfill management on October 9, 1991. These rules, as subsequently adopted by the State of California, set standards for:

- Location. Includes limits on proximity to airports, 100-year floodplains, wetlands, fault areas, seismic impact areas, and unstable areas.
- Design. Requires composite liner and leachate collection systems to maintain less than 30-cm depth of leachate over liner. Liner systems combine compacted clay and synthetic membranes. Leachate collection piping is sandwiched in a porous layer between liners.
- Operations. Requires exclusion of Hazardous Wastes and bulk or uncontainerized liquid wastes, daily cover and control of disease vectors, methane gas monitoring and control and other air emissions control (i.e., no open burning), access restrictions to prevent illegal dumping, control of precipitation run-on and runoff, and recordkeeping for groundwater monitoring, methane gas, inspection reports, and closure/post-closure plans. No discharges to surface water are permitted.
- Groundwater Monitoring. Monitoring wells required within compliance area. Testing required for 62 pollutants (15 heavy metals and 47 volatile organic chemicals). If pollutants exceed background levels, testing must be conducted for another 245 hazardous inorganic and organic constituents. If specified levels of pollutants found, a corrective action procedure must be initiated.
- Closure and Care. Written closure plan required. Closure include a cap designed to minimize infiltration and erosion, including infiltration layer minimum of 18 inches and permeability no greater than $1x10^{-5}$ cm/sec of material. Care of the facility required for 30 years after closure, including regular inspections for cap integrity and well monitoring.
- Financial Assurance. Must provide detailed estimates of costs for closure and post-closure and to perform corrective action as required; must provide an acceptable mechanism to guarantee funding for these future activities.

In addition to the cost of the modern sanitary landfill, the State of California requires landfills to fund Article V Remediation Costs. Article V regulations require establishment of a fund to cover potential remediation of contaminated groundwater caused by landfills.

The impact of these rules has been to increase the cost per acre of constructing landfills: this, in turn, has resulted in a trend toward development of very large landfills that can keep costs down through the larger volume of waste that can be disposed of at the site. Given the size of these new landfills, there is a parallel trend toward developing new facilities in remote areas with rail or highway access where land is cheaper and large tracts available.

4. Processing

Through the 1970s and 1980s, transformation, or waste-to-energy, facilities were seen as a preferred alternative to increasingly scarce and costly landfill disposal. Facilities financed and built during that period have tip fees in the $30.00 per ton range. As a result of changes in tax law as well as increased air pollution control requirements, tip fees for new facilities would be close to $100.00 per ton.

Trends in recycling markets are discussed in detail in Chapter VII, Section B. There is a present downturn in markets following on the heels of a rapid expansion. As in the case of other commodities, market prices and opportunities for recovered materials will fluctuate; however, it is expected that markets will remain strong as a result of new final market and export market development. The processing costs of materials recovery facilities (MRF) vary among communities and average $50 per ton according to a recent NSWMA study. This includes both the capital costs and the operations and maintenance costs. Revenues from the sale of materials can off-set these costs, depending on the markets.

Unlike other recyclable materials, the markets for yard waste compost products have yet to expand. Processors are producing good material; the problem lies more in learning to present the product in a manner acceptable to the potential major markets (farmers, horticultural firms, etc.). These markets have specific needs and require a proven product. The specifications for

compost products derived from waste materials need to reflect the traditional soil amendments used by these markets (e.g., peat moss), so that the user can understand how the compost can be applied to their needs.

APPENDIX J

APPENDIX J: RECYCLING MARKETS

There are two types of markets available for all classes of recyclable materials: intermediate and final markets. The category of intermediate markets includes processors of scrap material and brokers of recyclable materials. Final markets (also called end-users) encompass the utilization of materials in the manufacture of new products in industrial plants or mills. Final markets are the last step in the recycling process. As described below, there is a lot of overlap in the functions performed by these markets.

Materials recovered from the municipal solid waste stream need upgrading in order to be marketed as raw materials to manufacturing industries. This upgrade processing step is usually carried out by an intermediate at the local level. Intermediate markets include scrap processors, materials recovery facilities (MRFs) and brokers. Materials recovery facilities may be publicly or privately owned, and generally accept source separated recyclables collected from households through drop-off or curbside collection programs. A scrap processor generally purchases a wide variety of scrap materials from industrial, commercial, and private sources. These two types of processing facilities are collectively referred to as scrap processors in this discussion. When a processor has enough of a particular material, the material is processed to final market specifications and then is transported to market. By contrast, a scrap broker arranges the final market destination of the processed goods -- a scrap broker may never see the material that is bought and sold. A scrap processor may serve as both processor and broker. The materials upgrade is but one service that the intermediate markets provide; they may also furnish storage containers, pickup for filled containers, and provide delivery of processed materials to the final market. The cost of these intermediate services is included in the price that is charged to the final market for the goods.

The final market manufactures products from the purchased recyclable materials. Usually a final market will accept only one type of material, but some final markets are now purchasing multiple materials -- processing some for their own use and acting as intermediate markets for others. Final markets generally pay higher prices for recyclable materials than do intermediate markets because final markets often rely on intermediate markets to process needed materials

for conformity to higher standards of acceptability. Although one cannot overlook the services that the intermediate market can provide, the price paid for goods by the final market is often sufficiently higher than that paid by the intermediate market to warrant bypassing the latter and selling recyclables directly to the final market. Also, in some situations, final markets are more easily accessed than intermediate markets.

1. Specifications and Agreements

Each material marketed or sold has a description or specification so that the buyer knows what is to be received. While many markets or firms have their own specifications, industry groups such as the Institute of Scrap Recycling Industries (ISRI) publish specifications that are widely accepted. Specifications address issues such as (1) allowable levels of contaminants, (2) moisture content, and (3) shipping preparation (for example, baled with a specific density). Specifications, when utilized in good faith, allow both the buyer and seller to agree on the quality of the commodity without a detailed inspection of every shipment.

The development of specifications for recovered materials has paralleled the expansion of the recycling industry. Secondary or recovered materials have grown into major domestic and international trade elements. This growth makes it impractical, if not impossible, for buyer and seller to do business on a personal basis. In the last 20 years, the amount of secondary paper consumed has doubled, resulting in more paper recovered in 1993 than was landfilled. The volume of market purchases and the standardization of these purchases, through specifications and contracts, has routinized transactions. This maturation of the secondary materials market encouraged the Chicago Board of Trade to establish trading in 1995 of recovered materials in a manner similar to virgin materials commodity trading. At the same time, procedures and protocols to deal with discrepancies in weight, quality and schedule have developed. ISRI and the Chicago Board of Trade through the American Arbitration Association, offer arbitration services to resolve disputes, as do other entities.

To avoid the fluctuations of commodities markets and the costs of small lot trading, many communities or their private recycler enter into contracts for the sale of materials over several

years. The terms of these agreements vary from one to twenty years; however, five-year contracts are common. When a contract requires one party to construct a facility to process material (such as a publicly-procured materials recovery facility), the contract term is tied to the facility life or amortization period, usually 15 to 20 years.

The price in these long-term contracts is usually adjusted using one of the recognized publishers of price data. *Official Board Markets* and *Recycling Times* are two major publishers of price data. In the last several years, the number of materials recovered from MSW quoted in these publications have grown along with the markets.

2. Processing Facilities

Whether source separated or not, material collected from waste generators needs to be processed to meet market specifications. The functions a processing facility performs are: (1) receiving, (2) storage, (3) separation, (4) cleaning, (5) size reduction, (6) densification, and (7) shipping preparation. These functions usually are contained in an industrial/warehouse type of building and include both mechanical and manual techniques. The choice of processing depends upon: materials processed, amount of material, and specifications or requirements of the markets.

The sponsorship, ownership, and operation of processing facilities can be either public or private, depending upon community situations. Prior to the recent push for recycling, processing was primarily done by private firms in the traditional secondary materials industry. These firms performed the processing necessary to prepare materials such as glass, paper, aluminum, and steel for use by industry.

When the aluminum can was introduced as a beverage container almost 20 years ago, the aluminum industry made a commitment to recycle these cans. The industry built a separate infrastructure, including: (1) collection points, (2) trucks, (3) processing facilities and (4) smelter modifications. This infrastructure cost of millions of dollars, and resulted in a current recycling rate of 65 percent.

Traditional scrap processors and the aluminum can recycling industry are only a part of the overall recycling business. The infrastructure necessary to recycle greater quantities and types of materials will require billions of dollars of investment. Processing facilities for 50 percent of the solid waste generated in Los Angeles County in 1994 (not counting yard waste) would process approximately seven million tons of material. A facility processing materials at the rate of 200 tons per day would cost about $2 to $8 million in the Los Angeles region. To have sufficient capacity using 200 TPD plants operating six days per week, 112 plants would be required. This requirement, based upon the $6 million capital cost, would involve an investment of $225 to $900 million. This is a lot of recycling infrastructure; some of which has been constructed. Sufficient capacity does not yet exist in Los Angeles County.

In addition to general processing facilities, infrastructure investment is needed for each of the recovered materials discussed below.

3. Recyclable Materials

a. Paper

Five types of paper are considered in this section: (1) old newsprint (ONP), (2) old corrugated containers (OCC), (3) printing and office paper (POP), (4) old magazines (OMG) and (5) mixed papers.

According to the American Forest & Paper Association, in 1995 more than 42 million tons of paper were recovered in the United States, with almost 33 million tons of that total recycled into new products in the U.S. Another 10 million tons was exported. Recovery has risen every year since 1985, doubling in this decade.

The major source of ONP is individual homes. ONP is used primarily in the manufacture of newsprint and paperboard. These represent 34 and 22 percent demand respectively. A small percentage of ONP is used in making tissue, cellulose insulation, and other products. Seventeen percent of ONP is exported. Demand has slackened in the last six

months due to high inventories and lower exports. A level period is expected in the immediate future.

The majority of old corrugated cardboard (OCC) ends its useful life at retail, wholesale, and industrial establishments, with a lesser portion discarded in individual homes. OCC is the most commonly recycled paper product, with 78 percent used in the manufacture of new containerboard and paperboard products. Fifteen percent of OCC is exported.

Printing and Office Paper (POP), which has the highest value of all postconsumer paper, is generated primarily in commercial offices such as financial institutions and large insurance groups. Government offices also generate considerable amounts of POP. While POP is present in the home, it is usually generated in much smaller quantities and is difficult to separate from lower value paper, such as envelopes. Twenty-eight percent of recycled POP is used in the manufacture of tissue paper (i.e., bathroom and facial tissue, towels, and napkins), with 26 percent used for writing, duplicating, and computer papers. Twenty percent of POP is exported.

The demand for the lower grades of paper -- ONP and OCC -- has historically fluctuated widely. Because so much recycled paper is used in paperboard production and construction (i.e., wallboard and insulation), when the construction industry declines or the economy is weak, the demand for and price of low-grade paper falls. Conversely, when housing construction improves and the economy is sound, demand and prices for lower grades of paper typically are strong. Because its primary end use is in basic consumer products (e.g., writing paper and tissue) the demand and price for POP is steadier and higher than for the lower grades.

As discussed below, paper manufacturers have added pulping capacity to utilize recovered paper as feedstock. This increased capacity for utilizing recovered paper has increased demand; domestic mill consumption of recovered paper rose 8 percent in 1995. Mixed paper can be recovered from both residential and commercial generators. In the last two years, there has been a trend toward recovering mixed paper from residences. In addition, the newest technology for de-inking ONP requires the use of up to 20 percent coated papers (i.e., old magazines or OMG), which has, in turn, created a market for this type of recovered paper.

Along with the growth in paper recycling has been an investment by the paper industry in plants to process recovered paper. Currently, more than 200 paper plants in the U.S. use 100 percent recovered paper as their feedstock. Another 175 plants depend upon recovered paper for a portion of their feed. Development of pulping facilities for recovered paper feedstock has involved a multi-billion investment in industrial infrastructure to date; this investment is continuing. The prices for all grades of paper rose sharply in 1995 as the result of the demand created by these new pulping plants. These prices peaked in mid-summer, then dropped due to high inventories and poor demand. The investment in new plants will prevent demand and prices from falling to 1990 levels.

b. Glass

Glass is manufactured primarily from sand and silicon dioxide. Other materials used in glass manufacturing include sodium, soda ash, and calcium from limestone. Glass manufacturers produce three categories of products: containers, flat glass, and pressed/blown glass. Glass containers account for 70 percent of all the glass manufactured and make up approximately 90 percent of the glass in municipal solid waste (MSW). Flat glass is used mainly for windows. Pressed and blown glass includes ornamental and decorative glass and other glass products such as light bulbs. These three types of glass have different chemistries and cannot be melted together to make new products. Only container glass is pertinent to this discussion. Container glass represented approximately 3.0 percent of the waste stream in Los Angeles in 1990.

Glass containers are manufactured primarily in three colors: clear (flint), brown (amber), and green. Nationally, approximately 65 to 70 percent of all containers are flint, and roughly equal amounts (15 to 18 percent) of glass containers are amber or green. Thus, the demand for recovered flint container glass is greater than the demand for either amber or green.

The glass industry uses waste glass (known as cullet) as an alternative to raw materials. Before 1970, almost all cullet used in the manufacturing process was from "in house" sources. Since 1970, when only 24,000 tons of cullet were purchased by the glass industry, cullet use from private and municipal recycling has increased to more than one million tons annually. In

1981, the price paid for cullet was generally consistent around the country, averaging about $30 per ton. By 1983, the price rose to $40 per ton and remained steady until the latter half of 1988. Since then, the price has varied with more differences among regions and by glass color. In 1995, the prices were approximately $50 per ton for flint, $40 per ton for brown, and $20 per ton for green glass. Glass prices dropped somewhat over the course of 1995, due to lagging demand.

With today's glass-processing technology, it is possible to use nearly 100 percent cullet in glass furnaces. This increased use of cullet is advantageous because cullet melts at a lower temperature than the raw materials, allowing the glass manufacturer to save energy. Also, lower furnace temperatures prolong furnace refractory life. However, while glass container recycling has been increasing, the recycling rate for 1994 was only 37 percent.

Glass has been declining as a fraction of the waste stream due to its replacement by plastic, aluminum and other containers. Low prices, low market demand for green glass in particular, and problems with glass contamination of other recyclables during collection, coupled with stringent specifications for furnace-ready cullet caused some communities to drop glass from their recycling programs. Other communities have maintained glass recycling and are marketing a mixed broken glass for lower-value uses such as aggregate and filter sands.

c. Ferrous Metals

In recent years, the market demand for ferrous metals (i.e., steel and iron) scrap has fluctuated, but has generally been rising. However, prices have fluctuated with no real pattern. The problems in steel scrap markets are linked to the decline in U.S. steel-production capacity. According to *Phoenix Quarterly*, U.S. steel production capacity peaked in 1977 at 160 million net tons. Production capacity dropped to 110 million metric tons in the mid-1980s. The Institute of Scrap Recycling Industries (ISRI) believes several factors contributed to the elimination of U.S. steel production capacity, including an oversupply of the market by foreign government-controlled steel producers and decreased demand for steel products. Offsetting this market decline to some extent is increased application of electric furnace technology and the

"mini mill" in the U.S. These smelters use a higher percentage (up to 100 percent) steel scrap as feedstock. Also, the export market has been strong.

Most of the ferrous metal in residential MSW falls into two categories: bulky ferrous (e.g., appliances) and container ferrous (e.g., food and beverage cans). There are actually two types of steel cans in residential MSW: bi-metal cans, made of a steel body and aluminum top; and "all" steel cans. The all steel cans also have two types: "tin" cans that are steel coated with a layer of tin to retard rusting, and tin-free cans. Bi-metal cans used in beverage applications largely have been replaced by aluminum cans. In the past, container ferrous was regarded as a low-quality product, and was not a primary target for recycling programs. However, the Steel Recycling Institute recently began promoting the recyclability of bi-metal and steel cans (including aerosol and paint cans), noting that the cans may go directly into existing furnaces with no special pre-processing.

The detinning industry processes "tin" cans and other tin-plated scrap to chemically remove the tin, then selling both the tin and steel to end-user markets. In the past, this industry was a major market for ferrous cans. Today, only one detinning processor remains in the U.S. and the long-term outlook is pessimistic due to the declining use of tin.

Ferrous metals, except major appliances, represent about 3.3 percent of the Los Angeles County waste stream in 1990. Prices recorded for steel cans from January through October 1995 were steady between $63 and $65 per ton. Note that steel is traded in long tons which weigh 2,240 pounds.

Appliances and other large steel items in municipal waste are referred to as white goods. These can be shredded along with automobiles to produce a high quality scrap. The market, therefore, is the traditional scrap processor with large-scale shredding equipment. Some white goods made prior to 1979 have capacitors containing PCBs. Most scrap processors insist that these capacitors be removed prior to their acceptance at processing facilities. Additionally, chlorofluorocarbons (such as freon) used as refrigerants in some appliances need to be removed and recycled or disposed of properly, rather than vented to the atmosphere. Some jurisdictions

have contracted for removal of PCBs and chlorofluorocarbons, processing and marketing with a single contractor. When white goods are shredded along with automobiles, the resulting scrap sells for $40.00 to 60.00 per ton more than ferrous can scrap on the west coast.

d. Aluminum

Aluminum, found in a variety of mineral structures, is recovered primarily from bauxite, an ore found principally in South America, Africa, and the Caribbean. Sources of bauxite within the United States are found in Alabama, Arkansas, and Georgia. Extraction of aluminum from bauxite requires a large amount of electricity. Aluminum in municipal waste is found in several forms or alloys: food container aluminum (cans and foil); aluminum housewares (e.g., pots, pans, and appliances); extrusions (e.g., lawn furniture); and castings (e.g., auto parts and more expensive cooking equipment). Food container aluminum, particularly aluminum cans, has the highest market value because the alloy from which it is made is almost pure aluminum.

Aluminum has a high value for its weight. However, it represents only a minor fraction of MSW. The 1990 solid waste composition in Los Angeles County indicates that aluminum cans were 0.6 percent of the waste stream.

In the 1970s, the U.S. aluminum industry turned to recycling as a major source of material. According to the Aluminum Association, almost 25 percent of all the aluminum used in the United States in 1988 came from recycled aluminum. The recycling rate of aluminum cans in 1990 was 61 percent, and the rate rose to 65.4 percent in 1994. The U.S. aluminum industry, particularly corporations such as Alcoa, Reynolds Metals, Alcan, and Kaiser, strongly supports aluminum recycling and has made significant investment in recycling infrastructure over the last two decades. It is estimated that there are 10,000 individual aluminum recycling facilities in the U.S. Firms in the industry actively are seeking other aluminum alloys in addition to cans in order to increase recycling.

There have been recent variations in prices paid in the Western states by processors and end-users for aluminum used beverage containers since 1990. The drop in price between 1992

and 1995 reflects the dumping of aluminum on the world market by the Russians in an effort to gain hard currency. This highlights the impact of international events upon U.S. recycling markets. These events are both normal and unpredictable. The price at the end users peaked in January 1995 at over $1.400 per ton and dropped to approximately $1.200 on the west coast in December.

e. Plastics

There are six plastic resin types typically found in MSW: high density polyethylene (HDPE), low-density polyethylene (LDPE), polyethylene terephthalate (PET), polyvinyl chloride (PVC), polypropylene (PP), and polystyrene (PE). These and other resin types can be recycled into a variety of products, including fiberfill for pillows, sleeping bags, jackets, etc.; molded products such as tubs, bins and shower stalls; and lumber-like products for vehicle stops, park benches, dock pilings, etc.

In Los Angeles County, plastic was a small, but increasing, portion of the 1990 solid waste stream. Nationally, plastic rose from less than one percent of MSW in 1960 to 6.9 percent in 1990 by weight. By volume, plastics are a higher proportion of the waste stream, esumated at roughly 10 percent. Because recovered plastic is a lightweight, high-volume material, it requires more storage space and has higher transportation costs than higher-density recyclable commodities. For example, two-liter PET soda bottles contain entrapped air; as a result, they take up a great amount of space (the density is 1.3 pounds per cubic foot) and are difficult to compact. Plastic that has been shredded or punctured and baled can be transported much more economically; for example, shredded PET density is 25 pounds per cubic foot. In 1990, approximately 1.2 percent of the Los Angeles County solid waste stream was composed of recoverable HDPE or PET containers. These two resins most commonly are included in recycling programs and have been increasingly recycled. PET soft drink container and HDPE natural containers were recycled at 48.6 and 25.9 percent respectively in 1994. Other plastics are recycled significantly less.

HDPE prices have fluctuated widely in the past two years, peaking in March 1995 at $0.28 per pound. The recent trend has been downward, due to rising inventories and weak worldwide demand resulting from reductions in the use of recycled HDPE in products. HDPE prices were approximately $0.12 per pound in December 1995. PET prices have risen in 1995 from about $0.08 to $0.25 per pound. PET prices have been much more stable, in major part because of demand in the Far East market and due to increased use of PET in food packaging. Poor cotton harvests have contributed to this demand (PET competes with cotton in many fiber applications).

In spite of the constraints in collecting postconsumer plastics from the residential waste stream, there is a growing interest in recycling this material for social and environmental reasons. Fueled by this trend, the opportunities to recycle plastics are increasing.

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EXH. 63

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News

New landfill finicky about trash

James R. Langford The Herald

YORK - The newest addition to the York County landfill won't take just any garbage.

It's designed exclusively for construction and demolition debris.

The eight-acre addition, located at the county landfill operation on S.C. 5 near York, opened a little more than a week ago and should last about five years, said landfill supervisor Rodney Smith.

It will accept non-volatile, non-toxic waste such as scrap building material, old concrete and bricks, sheetrock, shingles and lumber.

Separating construction and demolition debris from household - a rarity now that the county's main landfill is nearing capacity, explained Public Works Director Ron Lilly.

Dumping construction debris at a separate landfill means the household waste landfill, which costs more to build, will last longer.

"We should be able to divert 20 percent or 60 to 80 tons of trash daily from the regular landfill to here, where it's more suitable," Lilly said.

Additionally, a construction and demolition landfill is cheaper to operate than a regular landfill because construction-related debris does not pose an environmental hazard when it decomposes, county officials said. The debris can be safely buried in the ground and covered with dirt.

Under new regulations, handling household waste is both more costly and more complicated than disposing of construction debris.

State law requires household waste landfills built after 1991 to have plastic ground covers, drainage systems and gas monitors to prevent groundwater or air contamination. These and other mandates boost construction costs to $300,000 per acre, compared to $20,000 per acre for a construction debris landfill.

Tipping fees for a commercial debris landfill are less, too, at $20 per ton with a $5 minimum fee compared to $31.45 at the regular landfill.

Most of the debris dumped at the landfill addition comes from builders and related industries, Smith said. For example, he said, "we have a lot of roofing contractors that go in and re-roof houses and they can dump old shingles."

York County's current landfill operation has room for two additional construction debris sites, the same size as the existing one, and they've already been designed, Smith noted.

The landfill is using existing employees to staff the new operation, Smith said.

Caption: Rodney Smith, York County landfill supervisor, stands near one week's accumulation of construction debris.; Credit: Jim Stratakos / The Herald

LANDFILL GAS EMISSIONS:

A STUDY OF TWO LANDFILLS IN

PRINCE GEORGE'S COUNTY, MARYLAND

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EXH. 64

EXECUTIVE SUMMARY

The environmental effects and health hazards of landfill gas emissions have been largely ignored as concerns have focused instead on groundwater and surface water contamination, methane migration, odor and nuisance effects of landfills. It has become clear from recent studies that municipal landfills are a significant source of smog-forming and hazardous gaseous emissions, including many volatile organic compounds (VOCs) and a number of hazardous air pollutants (HAPs). Many of the emitted compounds are responsible for formation of ozone in the breathable atmosphere. Ozone, even at extremely low levels, presents a serious health hazard, inducing severe effects on pulmonary function, greater susceptibility to respiratory infection, major aggravation of pre-existing respiratory disorders, and alteration in the function of other tissues including blood cells, neural tissues, and endocrine organs. Landfill gas emissions also contain over 30 different HAPs that are identified as toxic under the 1990 Clean Air Act (CAA). These contain not only suspected carcinogens, but also other toxic air pollutants which can induce significant adverse effects on kidney, liver, and central nervous system function. Landfills also emit vast quantities of methane; this is not only a major "greenhouse" gas, but in the quantities produced by landfills also acts as a carrier and dispersant for the other pollutants.

A 1994 study of the 14,000 ton per day (TPD) Fresh Kills landfill in New York City estimated that in 1993 this landfill emitted 4,610 tons of smog-forming emissions; moreover, the landfill will continue to emit approximately 500 tons per year of these emissions 30 years after closure even with the placement of a final cap. The Fresh Kills emissions exceed by a wide margin virtually every regulatory threshold established under the Clean Air Act (CAA) Amendments of 1990. However, Fresh Kills is an exceptional landfill with respect to both size and location. Thus the purpose of the current report was to consider the amounts and the impact of gaseous emissions from more typically sized (500-2,000 TPD) and located landfills.

This study examines emissions from two 1,000-2,000 TPD landfills located in Metropolitan Washington, D.C. — the Sandy Hill and Brown Station Road facilities within Prince George's County, Maryland. The county falls within a "serious" nonattainment area for ozone levels as classified under the 1990 CAA. Both landfills are located in localities which have experienced significant population increases since 1985; during the same period both landfills have been substantially expanded.

The results of the study on Prince George's County landfill gas emissions can be summarized as follows:

1. The two landfills are the largest stationary sources of VOC emissions in Prince George's County. In 1994, the estimated VOC emission rates were 52.5 and 25.0 pounds per hour (230 and 109 tons per year) for Brown Station Road and Sandy Hill landfills, respectively.

2. Brown Station Road is the highest VOC emitter in Prince George's County — 50% higher even than the 2,450 megawatt Chalk Point power plant operated by PEPCO. The emission rates from either landfill clearly would trigger the regulatory threshold of 50 TPY established by the 1990 CAA for "new major sources" of air emissions. Even after planned gas collection and control devices are in place, each landfill will continue to emit VOCs exceeding that threshold until at least the year 2020.

3. For HAPs defined under the 1990 CAA, each landfill exceeds both the 10 TPY single HAP threshold and the 25 TPY combined HAP threshold in 1994. In 1994 combined HAPs emissions from Sandy Hill are estimated at 41 TPY; for Brown Station Road combined HAPs emissions are estimated at

33 TPY. Even after planned collection systems are installed, it is estimated that Sandy Hill will continue to emit tetrachloroethylene (an EPA-defined probable carcinogen) in amounts exceeding 10 TPY beyond the year 2000. Because of its continuing expansion and operation, the Brown Station Road landfill is estimated to emit 26.7 TPY of HAPs in 2017.

4. The control devices (flare and energy recovery system) at both landfills themselves generate significant quantities of air pollutants. Combined, the two landfills contribute over 80 TPY of carbon monoxide (CO) emissions and this within an area already suffering from high urban-related CO emissions. The same control devices also generate significant emissions of dioxin, a highly potent and toxic compound. Estimates for Sandy Hill and Brown Station Road indicate that dioxin emissions may be significantly increasing the quantity of ambient dioxin and dioxin exposure in the areas immediately surrounding both landfills.

5. Both landfills are expanding in areas experiencing significant increases in population. The health risks of landfill gas emissions on local populations or, in the case of Sandy Hill, on the adjoining 12,750-acre Patuxent Wildlife Refuge/Research Center, have not been adequately assessed.

Neither the State of Maryland nor the EPA currently regulates landfill gas emissions. Although the EPA proposed minimum gas controls and control standards for landfill emissions in 1991, those regulations are not expected to be final and binding until into 1995. When they do become final, compliance with gas collection and control standards will not be required for four years. This postponement of landfill gas emission control may significantly impair Maryland's ability to meet the 1996 CAA deadline for net overall reduction of smog-forming emissions by 15%. Most importantly, postponement of implementation of effective collection and control systems for landfill gases until the year 2000 or beyond may have a serious detrimental effect on expanding populations adjacent to the two facilities under study.

LANDFILL GAS EMISSIONS: A STUDY OF TWO LANDFILLS IN PRINCE GEORGE'S COUNTY, MARYLAND

I. Introduction

Recent studies reveal that municipal solid waste (MSW) landfills are a significant source of hazardous and environmentally destructive air emissions.[1] As solid waste decomposes within landfills, gases are produced comprising approximately 50% methane, 50% carbon dioxide, and approximately 1% of non-methane organic compounds (NMOC).[2] Because United States landfill gas emissions are immense — amounting to approximately 60 million tons per year (TPY) — this 1% approaches a total of 600,000 TPY.[3] This is a very significant quantity; thus, by comparison, organic chemical manufacturing and petroleum refining industries are estimated to emit approximately 680,000 and 640,000 TPY, respectively.[4]

The EPA has concluded that the NMOC's generated by landfills are primarily volatile organic compounds (VOC's) most of which contribute to the ambient ozone problem.[5] Among these NMOCs are over 30 identified Hazardous Air Pollutants (HAPs), including approximately one sixth of the entire list of toxic and other hazardous pollutants included by Congress in the 1990 Clean Air Act (CAA) amendments.[6] Several of these HAPs are proven or suspected carcinogens at low levels. Many induce other deleterious health effects including adverse effects on diverse cell types within the body including those of the kidney, liver and central nervous system.[7] Landfills also emit enormous quantities of methane, an explosive gas which not only acts as a carrier and dispersant for NMOC's, but is now considered to be a potent "greenhouse" gas contributing to global climatic change; landfills are one of the principal sources of U.S. methane emissions.

Many landfill-derived NMOC's induce formation of ozone in the breathable atmosphere which

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[1] 56 Fed. Reg. 24468 (May 30, 1991).

[2] US EPA. "Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines," US EPA/450/3-90-011a, p.2-1, March 1991. (Hereafter "NSPS" Background Document").

[3] Reference 2, p. 3-30. This estimate is for 1997, the assumed date that collection and control systems are required to be installed under the EPA proposed rulemaking establishing New Source Performance Standards for landfills.

[4] US EPA, "National Air Pollutant Emission Trends, 1900-1992," US EPA-454/R-93-032 (October 1993), Table A-9.

[5] 56 Fed. Reg. at 24473. VOCs comprise 92.3% of NMOC's. US EPA, "VOC/PM Speciation Data System Documentation and User's Guide," Version 1.23A, EPA-450/4/91-027.

[6] CAA 1990 § 112.

[7] 56 Fed. Reg. at 24474.

even at very low levels has a spectrum of health manifestations ranging from mild respiratory irritation to induction of severe effects on pulmonary function, greater susceptibility to respiratory infection, aggravation of pre-existing respiratory disorders, and alteration of the function of blood cells, neural tissues, and endocrine organs.[8] Unlike most air pollutant sources which discharge at some height above the ground, landfill emissions occur at ground level where they are not readily dispersed and where humans can be exposed to the emanating gases at relatively high concentrations. At these levels they also have serious detrimental effects on crops and animals.[9] Most significantly, unlike most sources of industrial air emissions which are periodic and which can be controlled or eliminated, landfill emissions occur continuously and cannot be adjusted.

The EPA has estimated that landfills contribute over 1% of all NMOC emissions from stationary sources nationwide.[10] Landfills contribute almost half as much volatile organic compounds as all industrial sources combined, with the exclusion only of chemical manufacturing and solvent-related industries.[11] Moreover, these landfill emissions continue more than 35 years after a landfill is closed.[12]

Until recently, landfill emissions have been largely ignored. While landfills emit air pollutants which, when released from other sources are stringently regulated under the Clean Air Act, landfill emissions have not been systematically regulated by the EPA. Similarly, states, with the exception of California, have not regulated landfill emissions other than to minimize methane migration, risks of explosion, and odor problems.[13] In May 1991, the EPA proposed regulations imposing minimum

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[8] Maryland Department of Environment, Proposed SIP Revision for Meeting 15 Percent Rate of Progress Requirement Under Clean Air Act (hereafter "1993 Maryland SIP Revision"), October 3, 1993, Vol. 1 at 1-1. These effects have long been identified in justifying the current ozone national health standard of 0.12 ppm (parts per million). COMAR 26.11.03.05.

[9] The EPA in the proposed NSPS rulemaking for landfills stated: Ozone also warrants control due to its welfare effects, specifically, reduced plant growth, decreased crop yield, necrosis of plant tissue, and deterioration of certain synthetic materials such as rubber.
56 Fed. Reg. at 24474.

[10] 56 Fed. Reg. at 24473. Individual state estimates vary. California in 1991 collected data which indicated that landfills contributed over 2% of the VOCs emitted in that State which has serious smog problems. "Emissions Inventory 1991", California Environmental Protection Agency, Air Resources Board (January 1994).

[11] Reference 4, Table 2-10.

[12] Reference 2, Appendix D.

[13] Twenty-seven states regulate landfill emissions through solid waste regulations controlling methane migration, explosion potential and odor/nuisance. Reference 2, p. 3-38. California is one of the very few states which have adopted air quality-related regulations to control emissions from landfills. Most air pollution districts in California, however, regulate only landfill flare emissions, not uncollected emissions from the landfill. Thus, landfill operators who do not have a flare or apply for a flare permit, escape control obligations.

controls on emissions from large new and existing landfills accepting MSW.[14] These New Source Performance Standards (NSPS) impose minimum standards that large new and existing MSW landfills must meet. The NSPS regulations are the regulatory center-piece of the Administration's 1993 Climate Change Action Plan in response to the 1992 Rio de Janeiro Earth Summit.[15] However, as of the date of this study, final landfill gas emission rules are not expected until Spring 1995. In November 1993, Maryland submitted its State Implementation Plan to meet the 15% rate-of-progress reductions in smog-forming emissions mandated by the CAA. Maryland committed to impose landfill controls based on the federal rules,[16] however, to date, Maryland has not proposed specific regulations.

In October 1994, the EPA issued guidance clarifying that uncontrolled landfill gas emissions must be considered in determining whether a new proposed landfill's potential emissions were subject to the CAA new source review requirements.[17] The rationale underlying that guidance also should lead to imposition of "Reasonably Available Control Technology" (RACT) emission controls[18] for each existing landfill with potential emissions deemed as "major." In areas of "serious" non-attainment of air pollution standards, which includes Prince George's County, Maryland, "major" is defined as potential VOCs of 50 TPY, whether or not a collection system has been installed.

Recent studies have examined air emissions from large existing landfills such as the Fresh Kills Landfill, which serves as New York City's only municipal landfilling facility.[19] Fresh Kills is a 14,000 TPD landfill, first opened in 1948, with 90,000,000 tons of solid waste now in place. In addition to creating the traditionally considered gas migration and odor problems, Fresh Kills is a major source of VOC's, nitrogen oxides (NO_x), and carbon monoxide CO, exceeding the regulatory thresholds of the 1990 CAA by very wide margins.[20] Fresh Kills is estimated to have emitted 4,610 tons of VOCs in the year 1993. It will continue to emit hundreds of tons of VOCs per year even in 2046, 30 years after anticipated closure.

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[14] 56 Fed. Reg. 24468. (May 30, 1991).

[15] The Climate Change Action Plan, October 1993, pp. 23-24, 37. The Plan on page 23 states that the regulations "will be completed this year [1993]".

[16] Reference 8, p. 6-29.

[17] "Classification of Emissions from Landfills for NSR Applicability Purposes," John S. Seitz, Director, Office of Air Quality Planning and Standards, to EPA Regions (October 21, 1994).

[18] RACT is a site-specific determination; the EPA defines it as: "the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility". 44 Fed. Reg. 53761 (September 17, 1979).

[19] Minott, David H., "Landfill Environmental Emissions - Regulatory Progress and Gaps", 1994 Annual Conference of the Solid Waste Association of North America (SWANA), New York State Chapter, Rochester, New York, June 13-17, 1994, at 19.

[20] Reference 19, p. 19.

These emissions are alarming since they exceed by a wide margin virtually every regulatory threshold established under the Clean Air Act Amendments of 1990.[21] They raise the question of what amounts of atmospheric pollutants are currently being emitted from smaller, more typical-capacity landfills, that is in the 500-2000 TPD range. About 1650 such landfills and 5,580 landfills of smaller size, are currently operating in the US.[22]

The current study examines emissions from two fairly typically sized and operated landfills (1,000-2,000 TPD) in Metropolitan Washington, D.C. These are the Sandy Hill Landfill and Brown Station Road Landfill both located in Prince George's County, Maryland. This study documents the emissions and potential health effects that can be expected from landfills of this size. It is the first comprehensive study of these two landfills.[23]

II. Landfill Gas Control Technology

Emissions and offsite gas migration from landfills can be reduced by landfill gas control systems comprising networks of porous pipes installed to collect gases produced by decomposing solid waste. Negative pressure within the system produced using blowers and/or compressors is used to collect and direct gases to vents or control devices. Impervious landfill caps reduce uncollected emissions of gas to the air.

The three main types of gas control devices are: (1) combustion of landfill emission gases in turbines or reciprocating engines to utilize the energy potential of methane and other combustible gases present; (2) gas purification or "cleaning" to remove certain contaminants and impurities before sale to local gas utilities, and (3) burning of high methane-containing landfill gases in flare devices prior to release into the atmosphere. Although the most convenient, from environmental and health perspectives flares have significant problems. For example, they may only partially control VOC and other toxic constituents, and combustion may itself cause formation of other toxic agents (see below).

One of the most significant problems of gas collection systems is their inefficiency. The efficiency of landfill gas control depends on the fraction of gas collected by the gas collection system and, for that portion which is collected, on the destruction efficiency of the flare or engine. While the EPA has stated that the efficiency of landfill gas collection systems has not been directly measured,[24]

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[21] Reference 19, p. 15.

[22] Reference 2, p.3-2.

[23] For purposes of the 1990 ozone emission inventory, the State has estimated VOC emissions from the two landfills in 1990 at about 1.08 tons per day. MDE, The 1990 Base Year Inventory for Precursors of Ozone, Final Draft (Sept. 30, 1993), Vol.1A, p. 3-92. This figure is higher than the estimates of this study because it did not take into account collection and control systems which have been installed at the two landfills.

[24] Reference 2, p. 4-9. Estimates for landfill gas typically reflect general formulas based on quantities of solid waste deposited plus an assumed "decomposition rate."

it has indicated that a 50-60% efficiency is achievable for a well-designed system,[25] and that a collection efficiency of 60-85% may be possible as an upper limit of effectiveness in collecting total landfill gases emitted.[26] With such efficiencies, about one-quarter to one-half of the gas generated by a landfill is not collected and is emitted to the ambient air. For the fraction of gas collected, the EPA believes that control devices can achieve 98% destruction of NMOCs.[27] However, of the 27 states identified by the EPA as regulating emissions from MSW landfills for safety purposes, only California requires periodic testing of the efficiency of controls.[28] Moreover, when control devices are operating correctly, approximately 2% or more of collected gases (including significant proportions of the more hazardous NMOCs) pass through the control device without being destroyed.[29]

In addition, combustion type "control" devices such as flares, engines and turbines, themselves form and emit air pollutants. These include nitrogen oxides (NOx), carbon monoxide, sulfur dioxide, hydrogen chloride, carbon dioxide, particulate matter and VOCs. These combustion devices also generate and emit significant quantities of highly toxic dioxin.[30] Indeed, as the destruction efficiency for VOCs increases, the emission rates of NOx and dioxin also increase.

III. The Landfills

A. Background

The Sandy Hill and Brown Station Road Landfills in Prince George's County, Maryland, are both located within residential regions with sizable local populations existing in areas into which prevailing winds permit migration of gases (Figs. A and B). Since 1985 the population surrounding each landfill has increased significantly. However, the Prince George's County Ten-Year Solid Waste Management Plan relies on both landfills as the only disposal sites for the County; therefore, without other waste disposal options, emissions from these landfills will continue to increase.[31] To

[25] Reference 2, p.4-9.

[26] "Emission Factor Documentation for AP-42 Section 2.1, Refuse Combustion", US EPA, Office of Air Quality Planning and Standards, September 1992, page 4-71.

[27] 56 Fed. Reg. at 24492.

[28] Reference 2, Table 3-9.

[29] Taylor, Phillip H., Dellinger, Barry and Lee, C.C., "Emission Factor Documentation for AP-42 Section 2.1, Refuse Combustion", US EPA Office of Air Quality Planning and Standards, September 1992, Table4-7. See also, "Development of a Thermal Stability Based Ranking of Hazardous Organic Compound Incinerability," Environ. Sci. Tech. 1994, pp. 24, 314-328.

[30] Lahl, Uwe, et al, "PCDD/PCDF Balance of Different Municipal Waste Management Methods," Chemosphere, Vol. 23, Nos. 8-10, pp. 1481-1489, 1991.

[31] FY 1994-2003 Comprehensive Ten Year Solid Waste Management Plan, Prince George's County Maryland (hereafter "County 10-Year Plan"), p. 5-1 - 5-2.

accommodate the disposal needs posed by its expanding population, the County is conducting substantial expansions of both landfills, both vertically and horizontally, so each may continue to accept waste well into the next century.[32]

B. Sandy Hill

The Sandy Hill landfill is a municipal solid waste disposal facility of about 220 acres serving the northern sector of Prince George's County.[33] It is located on the Laurel-Bowie Road about two miles northwest of the town of Bowie directly adjacent to the Federal Patuxent Wildlife Research Center and a growing residential community (Fig. A).

From 1978 through 1993, over 5.9 million tons of refuse (averaging more than 1,000 TPD) were deposited in the landfill.[34] This solid waste comprises approximately 30% residential waste, 55% commercial waste, and 15% demolition debris.[35] The landfill site was originally acquired in 1977 by the Maryland National Capital Park and Planning Commission and leased to the County which is responsible for the landfill's operation and maintenance; the County contracted this responsibility to the solid waste disposal operator, Waste Management, Inc. of Prince George's County.[36] At the time of opening the landfill in 1978, the County planned to close the landfill in 1992. However, in the late 1980's the County reversed this plan and opted for expansion of the landfill both vertically and horizontally. If the horizontal expansion is approved by the Maryland Department of the Environment (MDE), the landfill will be accepting MSW at least until the year 2004.[37] Upon closure of the landfill, the County plans to use it as a public recreational facility containing soccer fields, an amphitheater and

[32] Reference 31, Ch. 3, Section XI.

[33] Reference 31, p. 3-14. The landfill is officially known as the Sandy Hill Creative Disposal Project.

[34] Sandy Hill 1992-1993 Annual Report, p.13.

[35] "Estimates of Gas Recoverability, Sandy Hill Landfill, Prince George's County, Maryland", prepared by EMCON for Waste Management of Prince George's County, Inc. (Dec. 4, 1985).

[36] Reference 31, p. 3-14 - 3-15.

[37] Based on the County's 10-Year Solid Waste Management Plan, the Sandy Hill landfill will likely be used to dispose MSW well after 2004. First, the County lists as disposal sites for its 10-year planning period only Brown Station Road and Sandy Hill. No other disposal alternative is identified, although the County does plan to increase recycling and reduction sources. Permitting of an additional facility is a process requiring several years to complete, even after that facility is identified and approved by the County Council. Second, the County's record of operation, as exhibited at both Sandy Hill and Brown Station Road landfills, has been first to horizontally expand an area, then to vertically expand it. Thus, it is very conceivable after the horizontal expansion is permitted, the County will apply for a vertical expansion. For these reasons, the expected closure dates in this study are conservative.

a running track, as well as access roads and parking areas.[38]

Areas of residential housing directly adjoin both the existing landfill and the planned area of expansion (Fig. A). A predominantly African-American community has resided along the nearby Duckettsville Road area since the turn of the century. Moreover, the residential population adjacent to the landfill has increased significantly. The 1990 Census reported 3,135 residents within a 0.5-mile radius of the landfill, increasing to 122,344 residents within a 5-mile radius of the site.[39] Between 1985 and 1990, the number of families near the landfill grew significantly: approximately one quarter of the housing units within a 0.5 to 1.0-mile of the Sandy Hill facility were constructed after 1985.[40]

The Sandy Hill landfill additionally borders the federal Patuxent Wildlife Research Center, an extensive forest, meadow and wetland animal and plant habitat of 12,750 acres managed by the U.S. Fish and Wildlife Service.[41] Research at the Center focuses on evaluation of environmental contaminants, assessment of populations and habitats of migratory birds, and restoration of endangered species. It was the site at which Rachel Carson obtained much of the material for the wildlife portions for The Silent Spring, which warned of the dangers of DDT and other pesticides.[42] In October 1994, the National Wildlife Visitor Center opened; built with $15 million of federal funds, the Visitor Center is the Department of the Interior's largest science and environmental educational facility. Designed to accommodate one million visitors a year, the Center offers hiking trails, wildlife management demonstration areas, outdoor education sites for school classes, and a tram tour of surrounding habitats.[43]

In 1990, the County applied to the MDE for a 134-acre horizontal expansion to the area west of Duckettsville Road and southwest of the Patuxent Wildlife Research Center. Fig. A shows that the proposed expansion areas not only increase the landfill's border with the Wildlife Center, but also adjoin additional population areas west of the existing landfill. According to the revised application, the annual disposal rate would be 495,000 to 536,000 tons per year of waste in the 72 acres which comprise the requested horizontal expansion fill-area.

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[38] "Phase III Permit Modification Closure Plan--Sandy Hill Creative Disposal Project Expansion," Waste Management of Prince Georges County, Inc. (August 1993). See also, Public Meeting Announcement and Briefing, Sandy Hill Closure and Interim Use Plans, July 14, 1992.

[39] Maryland Office of State Planning, "Sandy Hill Landfill 1/2, 1, and 5 mile Radius Summary, 1990 Census Profile - Population and Housing Characteristics," Summary Tape File 1B, 3A, prepared October 4, 1994 (hereafter 1990 Census). These data are subject to sampling variability and other limitations.

[40] Id.

[41] Reference 31, p. 4-13, classifies the Wildlife Center as an "area of critical concern" designated "for the benefit and protection of the public and natural habitats." Id. , p. 4-11

[42] Fish and Wildlife News, "Patuxent Wildlife Research Center - 50th Anniversary" (February-March 1989), p.5.

[43] U.S. Department of Interior, National Biological Survey, October 1994.

By Spring 1992 the proposed horizontal expansion plan had not been approved by the MDE nor was it close to receiving approval. Instead, the proposal for expansion was still in its Phase II, an information-gathering phase in which various environmental studies are performed.[44] In April 1992 the County applied for a vertical expansion of the original site plan since the existing landfill was exhausting its capacity. In October 1992 the PGC Director of Environmental Resources asked the MDE to authorize the vertical expansion by issuing a Consent Order which would allow the County to begin using the vertical expansion in January 1993.

In January 1993 the MDE issued a final Consent Order authorizing the vertical expansion until either the horizontal expansion is permitted or the vertical expansion is filled to capacity.[45] As of the date of this study, the vertical expansion continues to be filled at approximately 1,150 TPD.[46] It is expected to be filled to capacity in 1996. The horizontal expansion application has still not advanced beyond its Phase II status. The County anticipates the horizontal expansion to be operational beginning in 1997 and to reach capacity by 2004.[47]

The original Sandy Hill Solid Waste permit required installation of a gas collection system and flare to control methane gas levels for explosion-prevention purposes but only after the originally permitted area was filled to capacity and capped. In the late 1980's, after explosive levels of methane were detected near residences on Duckettsville Road, the MDE amended this permit and ordered immediate installation of gas collection wells exhausted via pipes leading to an enclosed flare. In 1992, the MDE found high levels of VOC's in groundwater monitoring wells in the eastern portion of the landfill near the Duckettsville Road residences. In the Consent Order authorizing the vertical expansion, the MDE required the landfill operator to investigate the source of these VOCs and evaluate whether remediation was necessary. The resulting Groundwater Investigation Report, released in 1994, concluded that landfill gas migration was the source of the elevated levels of VOCs in the groundwater.[48] It recommended accelerating installation of gas collection wells. The report also

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[44] In Maryland, solid waste permitting has 5 phases: Phase I - preliminary phase when the State determines if it is feasible to build a landfill on a proposed site; Phase II - information gathering when hydrogeological, geographical and other studies are undertaken; Phase III - design; Phase IV - internal MDE review for permitting requirements; Phase V - public comment, public hearing, notice of decision to issue a permit, and "contested case" hearings if requested. COMAR 26.04.07.

[45] Maryland Department of Environment v. Prince George's County, Waste Management Adm., Case No. CO-93-SWE-097, Jan. 4, 1993 (hereafter "Consent Order").

[46] 1993 Annual Report for Sandy Hill Landfill filed with MDE.

[47] This assumes horizontal expansion is permitted and commences operation in 1997. The County estimates a 7-year operational life for the horizontal expansion. Phase II Permit Application for the Solid Waste Disposal Project Expansion (August 1990; revised January 1991). The history of the two landfills in Prince George's County described in this study as well as those of other Maryland counties, indicates that the facilities will continue operation well beyond projected closure dates due to expansions.

[48] RUST Environmental & Infrastructure, Ground Water Investigation Report, Vol. I, 1994.

suggested excavation of trenches where VOC concentrations were the highest.

Currently, the landfill operator has installed gas collection wells and controls in only a limited portion of the geographical footprint of the fill area. These installations comprise 14 perimeter gas wells used to reduce gas migration toward the Ducketts ville Road residences, and 40 wells located directly into the compacted solid waste in place.[49] The operator plans to install another 42 remaining gas collection wells only when the vertical expansion reaches final capacity, now predicted for 1996.[50] In addition, the operator has installed a final cap on only 39 of the 72 originally filled acres on which the vertical expansion rests, stating it cannot go further until the MDE reaches a regulatory determination on the composition of the final cap. The lack of installation of an effective gas collection and control system, including a final cap on areas already filled to capacity, results obviously in increased VOC emissions from the landfill (see Table 1, discussed below).

Similarly, the Sandy Hill landfill permit plans for the horizontal expansion do not include any provision for gas collection and control on the 72-acre footprint until after that horizontal expansion area is also filled to capacity, now projected for 2004. This will result in no landfill gas controls being in place in the horizontal expansion area for at least seven years.

C. Brown Station Road Landfill

The Brown Station Road landfill is located approximately two miles northwest of Upper Marlboro (see Fig. B-1). It is operated directly by Prince George's County and is the primary municipal solid waste landfill for the central and southern portions of the County.[51] The landfill began accepting waste in 1968. Between 1968 and 1993, it received 7,818,000 tons of refuse, an average of 1,108 TPD. In 1990, the MDE authorized a horizontal expansion of the facility. By 1993 the first section of the landfill (Area A) had been filled, and refuse was being deposited exclusively in the horizontal expansion area, designated Area B. (See Fig. B-2). At current fill rates, the landfill is anticipated to close in 2015. As with the Sandy Hill facility, the County currently plans to use the area as a public recreation facility after landfilling ceases and closure is complete.[52]

The 1990 Census reported that 6,409 individuals were living within 0.5 miles of the landfill, 10,556 within a mile, and 103,224 within 5 miles of the facility.[53] Like Sandy Hill, the Brown Station Road area has experienced significant residential growth since 1985. Between 1985 and 1990, the number of housing units within a half-mile of the landfill increased by almost 25%. Within a mile

[49] Id., p. 2-3.

[50] Id.

[51] Reference 31, p. 3-14.

[52] Id.

[53] Maryland Office of Planning, "Brown Station Landfill 1/2, 1, and 5 Mile Radius Summary, 1990 Census Profile - Population and Housing Characteristics," Summary Tape File 1B, 3A, prepared October 4, 1994. These data are subject to sampling variations and other limitations.

there was a 41% increase in housing units.[54] These numbers do not reflect residential growth that has occurred since 1990.

Area A (Fig. B-2) predominantly comprises two vertical fill areas occupying 150 acres. Between 1968 and 1993, this area received more than 7.4 million tons of solid waste. Due to the age of this section, no clay or synthetic liner was installed prior to the start of operations, and solid waste has been deposited directly on preexisting soil since the landfill's inception. A total of 29 gas collection wells have been installed over a limited extent of the initial site, that is, approximately 25 acres of Area A1 (Fig. B-2); these wells collect only approximately 10% of the total gas generated from the initial fill area. The collected gas is pumped to an on-site compressor building where it is dried and cleaned. The residual gas (predominantly methane and CO_2) is then piped to the Prince George's County Detention Center approximately 1 mile away, where it is used to power generators and boilers which supply electricity, heat and hot water to the Detention Center. The 10-Year Plan states that the County anticipates expanding this service to a nearby County Office Building, but no funds have been allocated for that purpose.[55]

Currently there are no other gas collection wells at the landfill. An upper synthetic liner is planned to cap all of Area A before 1997. At that time, installation of 150 gas collection wells leading to the compressor building is planned in Area A. Gas not consumed by the correctional facility will be flared to the open air.

The horizontal expansion (Area B) has an actual fill area of about 120 acres and began accepting waste in 1993.[56] When complete, Area B will consist of eleven cells forming an integrated disposal area. The County expects that approximately one cell will be filled per year. thus, Brown Station Road landfill is currently planned to remain open until at least 2015. Each cell will have both a clay and a synthetic bottom liner. Once Area B is closed, a synthetic cap will be installed covering the entire sector. In addition, it is expected that a gas collection system will be installed at closure and that gas will be piped to the compressor building and flared if it is not needed by the Detention Center generators. There are no plans to install any gas collection system prior to closure and capping of Area B unless regulatory requirements change.

IV. Landfill Gas Emission Estimates

A. Introduction

Currently only very limited landfill gas collection and control systems have been installed in either landfill; no more than 25% and 10% of gas emissions are currently collected at the Sandy Hill

[54] Id.

[55] Reference 31, p. 4-17. No capital funds for expansion of power generation to any facility have been allocated by the County to date. Therefore, only about 10% of the gas produced by Brown Station Road landfill will be used in energy recovery. Tables 1-2 are based on the latter assumption.

[56] Id., p.3-14.

and Brown Station landfills, respectively. As of the time of the present study, permits issued by the MDE do not require installation of any additional collection systems or gas controls, other than those already in place, until operational areas are filled to capacity and capped.[57] Until the time of closure, both facilities will continue to emit large quantities of landfill gases into increasingly populated areas; moreover, these areas already exist within a "serious ozone non-attainment region". In the case of Sandy Hill, emissions will also affect a sensitive, 12,700-acre federal wildlife refuge/research center.

The landfill gas emission estimates for both landfills indicate that each of the two sites are among the highest-emitting stationary VOC sources in the County. Because Prince George's County is within a "serious" nonattainment area for ozone, the 1990 CAA requires Maryland to implement additional control measures designed to reduce County levels of smog-forming emissions by substantial amounts while offsetting the considerable growth in VOC emissions since 1990. Currently, Maryland, like most other states, does not regulate landfill gas emissions except for traditional controls to minimize the potential for methane explosion and flare emissions. Maryland has not applied CAA new source review principles to emissions at either landfill, although the emission rates far exceed applicable regulatory thresholds. Neither the federal, State or County governments have addressed the effects of these emissions on the growing residential population, on the critical federal wildlife refuge adjoining Sandy Hill, or on the State's ability to meet the smog-reduction goals of the CAA.[58]

Table 1 estimates the air emissions from the Sandy Hill and Brown Station Road landfills, based on widely-accepted EPA emission factors and procedures for calculating landfill emissions. The data reveal that emissions of VOCs and HAPS exceed by a wide margin the regulatory thresholds of the Clean Air Act Amendments of 1990. The emissions for the two Prince George's County landfills include (1) "uncollected VOC emissions," that is, the quantity of gas generated but not captured by current collection systems; (2) "residual VOC emissions," that is, the amount not destroyed by flare; and (3) non-VOC emissions from the control device which are byproducts of landfill gas combustion.[59]

"Uncollected" and "residual" emissions were estimated by applying the U.S. EPA Landfill Air Emissions Estimation Model.[60] The emissions of HAPs were estimated using a combination of site-specific data and EPA emission factors.[61] "Non-VOC emissions" from the control device were estimated using data from the NSPS Background Document[62] except for dioxin which was derived from actual test data reported in the published literature.[63]

B. VOC Emissions

For 1994, the estimated VOC emission rates for Sandy Hill and Brown Station Road landfills are:

Landfill	Pounds Per Hour	Tons Per Year
Brown Station Road	52.5	230
Sandy Hill	25.0	109

These numbers indicate that Brown Station Road landfill is the highest stationary VOC emission source in Prince George's County — 50% higher even than the 2,450-megawatt power plant at Chalk Point operated by Potomac Electric Power Co. The VOC emissions from Brown Station Road exceed by 4-fold the 50-TPY threshold established under the CAA. The VOC emissions from Sandy Hill are more than double that threshold. By comparison, the following are the 5 highest point sources of VOC emissions in Prince George's County, based on MDE data:[64]

Potomac Electric Power - Chalk Point Power Plant	35.50 lbs/hr	155.5 TPY
Safeway Co. Bread Bakery	20.25 lbs/hr	88.7 TPY
Hollady Tyler Printing	20.25 lbs/hr	88.7 TPY
Andrews Air Force Base	19.91 lbs/hr	87.2 TPY
Duron Paint plant	18.25 lbs/hr	79.9 TPY

[57] See, for example, Phase 1A Landfill Gas Extraction Wells and Condensate Traps" Bidders documents for Gas Collection at the closed portion of the Brown Station Landfill, Mary 26, 1994. See also, "Application for a Landfill Gas Management and Enclosed Ground Flare System," Sandy Hill Creative Disposal Project Bowie Md., (Sept. 1990), Prepared for Waste Management of Prince George's County, Inc., Maryland National Capital Parks and Planning Commission.

[58] For example, while the County 10-Year Plan addresses potential ground and surface water contamination, wetlands, soils, and sensitive environmental areas, it does not discuss the EPA landfill gas regulations proposed in 1991 or otherwise address such ambient emission issues. See Reference 31, Ch. 4.

[59] As noted above, the latter includes dioxin.

[60] US EPA, "Landfill Air Emissions Estimation Model Users Manual," Radian Corp., US EPA-600/8-90-85a (April 1991).

[61] These estimates were based upon actual inlet gas data from the Sandy Hill landfill (original and vertical expansion), as included in Appendix F to the Permit Application to Operate an enclosed landfill gas flare. The application was originally received by the State October 9,1990. For Brown Station and the Sandy Hill Horizontal Expansion, VOC emission factors were derived from "Emission Factor Documentation for AP-42 Section 2.1, Refuse Combustion," USEPAOAQPS (September 1992). These data then served as the inputs to the EPA Landfill Gas Estimation model.

[62] Reference 2, Table 4-4.

[63] Reference 30.

[64] Maryland Department of Environment, 1990 Base Year Inventory For Precursors of Ozone (September 30, 1993).

Table 1 shows that both landfills will continue to emit VOCs exceeding the 50 TPY threshold until at least 2020, even after installation of the controls now planned by the County. This table assumes that Sandy Hill will cease accepting solid waste in 2004 and Brown Station in 2015, as planned.[65] Gaseous emissions will continue far beyond these dates because of the continuous nature of waste degradation. These estimates are likely to be significantly below actual levels emanating from each landfill since further expansions of both facilities are likely to be sought and permitted.

The Sandy Hill and Brown Station Road emissions rates clearly would trigger the regulatory thresholds established by the 1990 CAA for "new major sources". The CAA requires that in areas of "serious" nonattainment which includes Prince George's County, "new source review" is required before any construction of a facility may commence if potential emissions of VOC and/or NOx would exceed 50 TPY at any time. Under the New Source Review, both landfills would be required to:

1. Install Lowest Achievable Emission Rate (LAER) controls;
2. Secure emissions "offsets" for any remaining emissions;
3. Conduct health risk and siting assessments demonstrating that their benefits "significantly outweigh" the environmental and social costs;
4. Show all other in-state facilities controlled by the owner/operator comply with applicable air quality mandates.

Neither landfill is new; each is an "existing" facility. However, under the CAA, if a "modification" of an existing source exceeds the pertinent threshold, New Source Review would independently also apply to that modification. A landfill expansion would be considered just such a modification. Indeed, each of the planned landfill expansions by themselves would exceed the 50 TPY threshold and therefore be sufficient to trigger new source review under the CAA (Table 1).[66]

Even if neither landfill is subject to New Source Review, the rationale for EPA's October, 1994 Guidance should require prompt imposition (on "major" existing landfills) of "reasonably available control technologies" (RACT), which historically has meant at least 90% collection and 90% removal. For similar reasons, this guidance should require the landfills to apply promptly for comprehensive CAA operating permits with public hearings on the acceptability of proposed emission limits and other requirements. In the 1990 CAA Amendments, Congress directed the EPA to require these permits because it believed they would promote more consistent emission controls as well as better compliance and enforcement.

[65] The magnitude of estimated VOC emissions for Sandy Hill is confirmed by data in the Ground Water Investigation Report ordered by the MDE which have been conclusively interpreted to indicate that the high levels of VOCs in groundwater around the fill area actually result from migrating landfill gases dissolving in groundwater. See Reference 48.

[66] These numbers are conservative. Under the CAA, a new "modification" does not have to possess potential emissions large enough to make it a "new source" by itself. It need only have potential emissions sufficient to represent a "significant" increase over previous emissions at the facility. For VOCs and NO_x, this smaller "significance" threshold is 40 TPY. For "listed" HAPs such as vinyl chloride, that rate is 0.1 TPY or less. For HAPs such as dioxin or polycyclic aromatic hydrocarbons (PAHs), any increase is "significant." See, 40 CFR § 52.21(b)(23)(1993).

In summary, the Sandy Hill and Brown Station Road landfills are the largest stationary sources of VOC emissions in Prince George's County. They will continue to emit VOCs exceeding the CAA thresholds for the next 25 years, even after planned gas collection and control devices are in place. These landfills are being expanded in increasingly populated areas without health risk or siting analysis demonstrating that the benefits "significantly outweigh" the environmental and social costs. Indeed, County and State landfill planning has proceeded with little regard to landfill gas emissions.

C. Hazardous Air Pollutant (HAP) Emissions

The CAA listed 189 compounds as Hazardous Air Pollutants (HAPs) and classified as a "major source" for toxic regulatory purposes, any facility with potential emissions of 10 tons per year for any single HAP or 25 tons per year for two or more listed HAPs.[67] If a source exceeds these thresholds, Maximum Control Technology (MACT) must initially be installed.[68] The CAA defines MACT to include "a prohibition on (HAP) emissions, where achievable", as well as any combination of control devices, process changes, work practice, and total enclosure of emitting activities. While the EPA is not scheduled to issue national MACT standards for MSW landfills until the year 2,000,[69] it has already included MSW landfills on that MACT schedule as a significant emission source of HAPs. Moreover, Congress also directed that MACT individually be applied to any new HAP source or any significant modification of an existing HAP source, after approximately mid-1995.[70] MACT for new major HAP sources cannot be less stringent than control levels achieved at the best controlled similar facility anywhere in the country. MACT for existing major HAP sources cannot be less stringent than the average control by the best controlled 12% of such facilities.

In its 1991 proposed NSPS rulemaking, the EPA expressed substantial concern about cancer risks from landfill gas emissions. In reviewing landfill emissions data, that Agency has identified over 30 known and suspected carcinogens including tetrachloroethylene, benzene, vinyl chloride, and trichloroethylene, in landfill gas emissions.

Table 2 estimates emissions rates of HAPs for both landfills. Specific carcinogens are noted. In 1994, combined HAP emissions from Sandy Hill were approximately 41 tons per year. In 2000, HAP emissions are about 37 tons per year, even with planned gas collection and controls in place. At Sandy Hill, the single HAP tetrachloroethylene, identified by EPA as a probable carcinogen, exceeds 16 tons per year through the year 2000. At Brown Station Road, combined HAPs exceed 32 TPY in 1994 alone, with toluene exceeding the 10 TPY single HAP threshold. Because of its continuing expansion and operation, the Brown Station Road landfill is estimated to emit 26.7 TPY of HAPs in 2017.

Within the spectrum of emissions emanating from the landfills are a considerable number of compounds which have been identified as probable human carcinogens. For example, the estimated

[67] CAA 1990, § 112(a)(1).

[68] CAA 1990, § 112(d).

[69] 58 Fed. Reg. 63941 (Dec. 3, 1993).

[70] CAA § 112(d), 112(g).

emissions for Sandy Hill in 1994 include compounds such as methylene chloride (7.6 TPY), tetrachloroethylene (18.7 TPY), vinyl chloride (0.4 TPY), benzene (0.9 TPY), trichloroethylene (2.1 TPY), and 1,1-dichloroethane (1.4 TPY). Each of these compounds has been recognized as increasing the incidence of cancer in laboratory animals when administered at low concentrations; for example, it is considered that ingestion of water containing tetrachloroethylene or methylene chloride at or above 5 parts per billion (ppb) would significantly increase the incidence of cancer. This extremely low level therefore defines the upper limit permitted within water for consumption. Each of these compounds can be ingested either through air or drinking water. It is likely that the levels that are being emitted into the ambient air from each of the landfills would result in significant ingestion or inhalation by humans or animals within the vicinity of the facilities. The high population density within the areas adjoining the two facilities would provide a greatly increased risk of long-term exposure of humans to these HAPs.

D. Carbon Monoxide/Dioxin Emissions

In the process of "controlling" collected landfill gases, devices such as flares, engines and turbines themselves generate air pollutant emissions, called "secondary emissions."[71] Pollutants generated by these control devices include nitrogen oxides, carbon monoxide, sulfur dioxide, hydrogen chloride, carbon dioxide, and particulate matter. There is also specific evidence that these combustion devices produce and emit dioxin,[72] which is considered to be one of the most potent hazardous emissions.

Table 3 shows the CO emissions generated by the installed flare at Sandy Hill and the generator and flares at Brown Station Road. The two landfills contribute over 80 tons per year of CO emissions to Prince George's County, which is listed as a non-attainment area for this pollutant.[73] The same devices are known to generate dioxin emissions.[74] The EPA has been engaged in a reassessment of the health effects of dioxin and related compounds since 1991. In the first half of 1994 the EPA released "review drafts" which preliminarily concluded that exposure to dioxin results in a broad range of biochemical and biological effects in animals and, probably, in humans.[75] These effects are likely to range from possibly adverse adaptive changes at or near background levels to increasingly severe adverse effects as exposures increase above background. While it is not possible to identify the levels

[71] Reference 2, p. 4-47; Reference 30.

[72] Reference 30.

[73] COMAR 26.11.06.04.

[74] Reference 30.

[75] "Estimating Exposure to Dioxin-Like Compounds--Review Draft" (Volumes I-III) EPA/600/6-88/005Ca (June 1994). The EPA stated in these draft documents that the reports should not be cited or quoted until they are fully reviewed by the public and EPA's Science Advisory Board. However, since they represent the most recent and comprehensive analysis of dioxins currently available and much of the factual data has been peer reviewed, some of the conclusions in the documents are noted here. The reader is cautioned that the conclusions in the cited documents have not been finalized.

at which humans undergo detectable deleterious effects, the EPA suggests that the margin between background levels and levels at which effects are detectable is much smaller than previously estimated.[76] A recent risk study estimated that with multiple exposure (i.e., through inhalation, food consumption, and air deposition) increased cancer risk from a 1,500 ton per day landfill with a flare to would 0.25 chances per million.[77]

Table 4 provides dioxin estimates for both Prince George's County landfills based on currently planned gas controls. While the numbers appear small, comparison to EPA's assumed background levels indicates that dioxin emissions from the Sandy Hill and Brown Station Road landfills may be significantly increasing the amount of ambient dioxin and dioxin exposure in the areas surrounding the landfills. In its draft Health Assessment for Dioxin and Related Compounds, the EPA assumed a background exposure of 120 pg TEQ/day.[78] For 1994, the Brown Station Road estimate of 6.0×10^6 pg TEQ/day and the Sandy Hill estimate of 2.6×10^7 pg TEQ/day indicate increased ambient exposures to dioxin that are 50 to 216 thousand times the EPA assumed background exposure for individuals living in the area adjoining the landfills. Due to the proximity of residential housing as well as the environmentally-sensitive Patuxent Wildlife Refuge and Visitor's Center nearby, these data warrant closer examination of potential dioxin emissions.

V. CONCLUSIONS

The Brown Station Road and Sandy Hill landfills are both located in an area classified as a "serious" ozone non-attainment area by the CAA. This area is increasingly being populated; for example, over 10,000 people live within one mile of the Brown Station Road facility. Sandy Hill also has experienced substantial increases in its adjacent population. Moreover, it borders an environmentally-sensitive federal wildlife refuge/research center with an expected 1 million visitors a year.

Both landfills are the largest stationary emitters of VOCs in the County, exceeding the CAA threshold of 50 TPY by a wide margin. Both landfills, even after planned closure and the installation of planned gas collection and control devices, will continue to emit VOCs exceeding these thresholds

[76] "Health Assessment for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD-and Related Compounds-Review Draft"), Vol. III, EPA/600/BP/-92/001c, (August 1994), at Section 9-11. The EPA stated in these draft documents that the reports should not be cited or quoted until they are fully reviewed by the public and the EPA's Science Advisory Board. However, since they represent the most recent analysis of dioxins currently available and much of the factual data has been peer reviewed, some of the conclusions are noted here. The reader is cautioned that the cited documents have not been finalized.

[77] Jones, Kay H., "Comparing Air Emissions from Landfills and WTE Plants," Solid Waste Technologies (March/April 1994).

[78] Reference 76, p. 9-15, footnote 2. The EPA's assumed background exposure rate to dioxin and related compounds (120 pg TEQ/day) appears reliable since this number is comparable to estimates for several other countries which range from 79 (Germany) to 118-290 (Canada) pg TEQ/day. Id..

well after 2020.

The landfills also emit hazardous air pollutants into the air in amounts exceeding both the CAA-defined limits of 10 TPY for single hazardous agents and the 25 TPY for combined hazardous agents. Even after planned collection systems are installed, Sandy Hill will emit tetrachloroethylene, an EPA-defined probable carcinogen, in amounts exceeding 10 TPY in the year 2000.

The County plans to continue to rely on the two landfills for disposal of municipal solid waste into the 21st Century. However, emissions from these landfills are currently and appear likely to remain essentially unregulated for a substantial period of time. Although minimum federal regulatory efforts have been initiated, those regulations are still preliminary and are not expected to be final until Spring 1995. When the regulations do become final, they will not require compliance for gas collection and control standards for almost four years thereafter. Thus, assuming the EPA issues final regulations in 1995, landfills would not have to comply until 1999. Postponement of landfill gas emissions controls until the new millennium will significantly impair the ability of Maryland to meet the 1996 CAA deadline for reduction of smog-forming VOC emissions by 15% from 1990 levels. Not only will the VOCs from landfills, which contribute significantly to total VOC emissions, remain unregulated, but VOC emissions from other stationary and area sources which are already stringently controlled will have to compensate for this deficiency.

Perhaps more important, however, the sizable populations living in close proximity to the Sandy Hill and Brown Station Road landfills must await a further 4 years or more before landfill gas emissions affecting their neighborhoods will be aggressively and effectively controlled.

TABLE A. 1990 Census Data for Sandy Hill[79] and Brown Station Road[80]

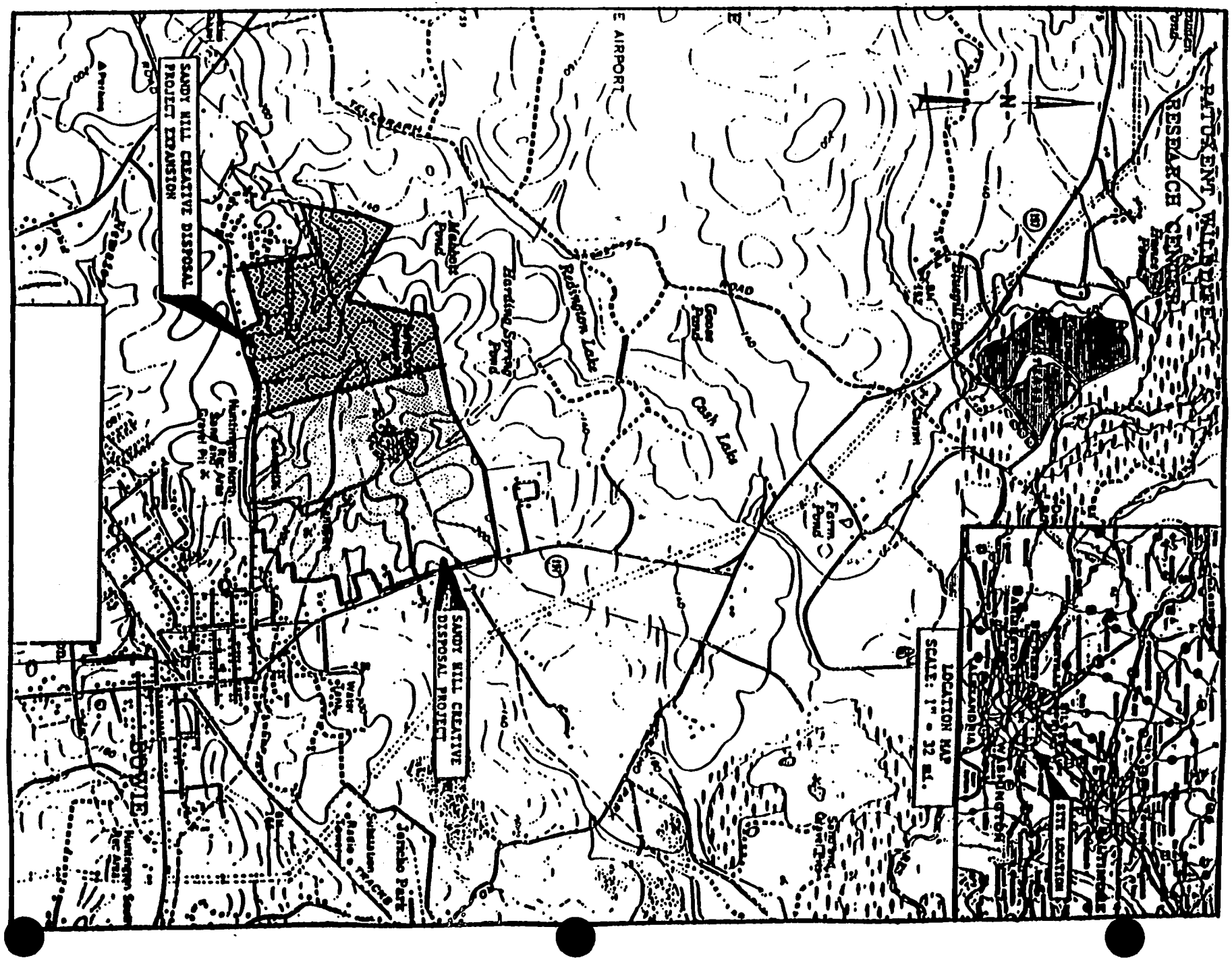
Sandy Hill			
	Radius in Miles		
	0.50 miles	1 mile	5 miles
Population	3135	4822	122,544
Racial Composition: a. Non-White (%) b. White (%)	 35% 65%	 39.4% 60.5%	 27% 73%
Population 62+ yrs (%)	7%	6%	8%

Brown Station Road			
	Radius in Miles		
	0.50 mile	1 mile	5 miles
Population	6409	10,556	103,224
Racial Composition: a. Non-White (%) b. White (%)	 55% 45%	 48% 52%	 58% 42%
Population 62+ yrs (%)	11%	9%	6%

[79] Maryland Office of State Planning, "Sandy Hill Landfill 1/2, 1 and 5 mile Radius Summary, 1990 Census Profile - Population and Housing Characteristics," Summary Tape Files 1B, 3A, prepared October 4, 1994.

[80] Maryland Office of Planning," Brown Station Landfill 1/2, 1 and 5 Mile Radius Summary, 1990 Census Profile - Population and Housing Characteristics," Summary Tape File 1B, 3A, prepared October 4, 1994.

FIGURE A - Sandy Hill Landfill Vicinity Map
& Expansion Areas



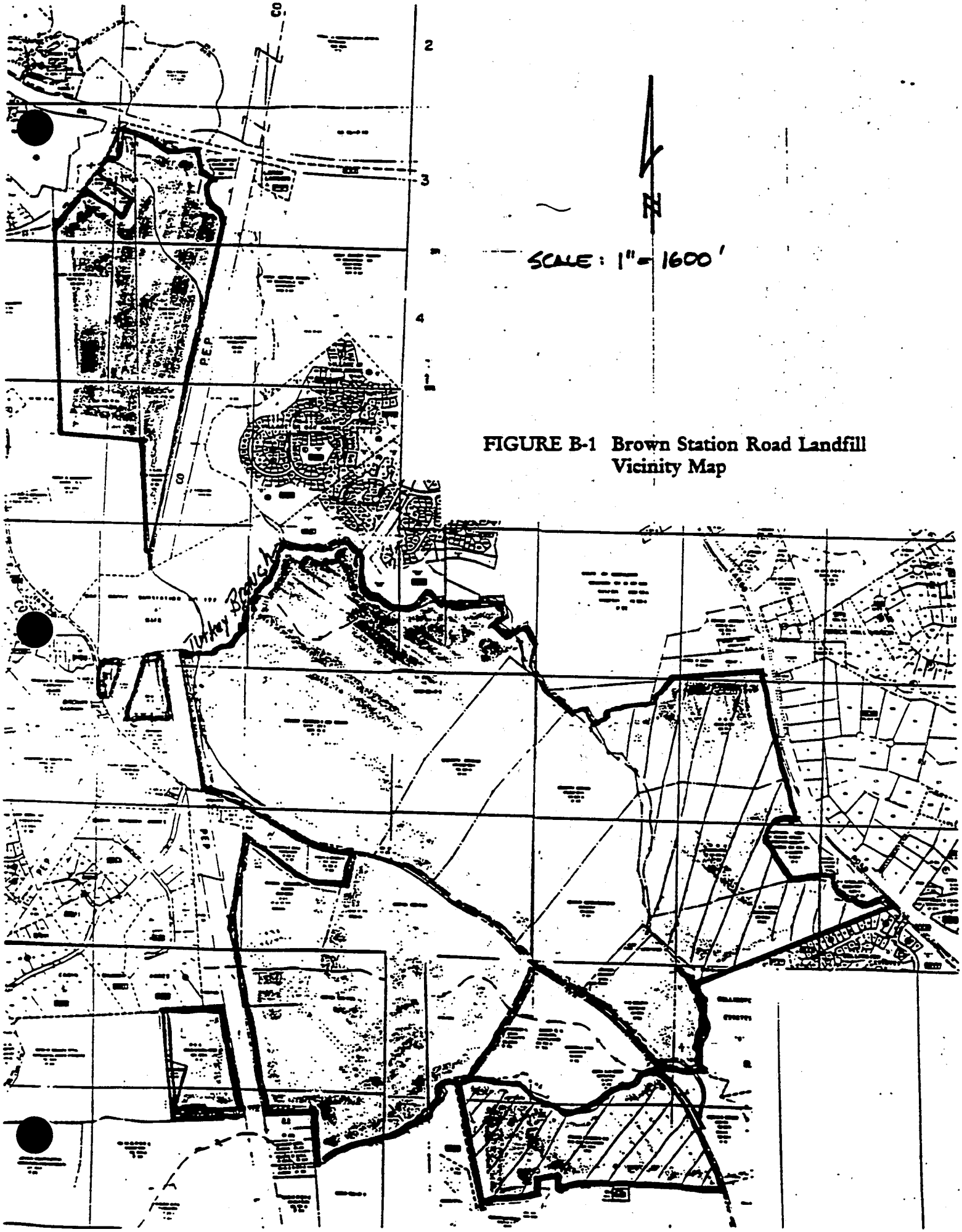
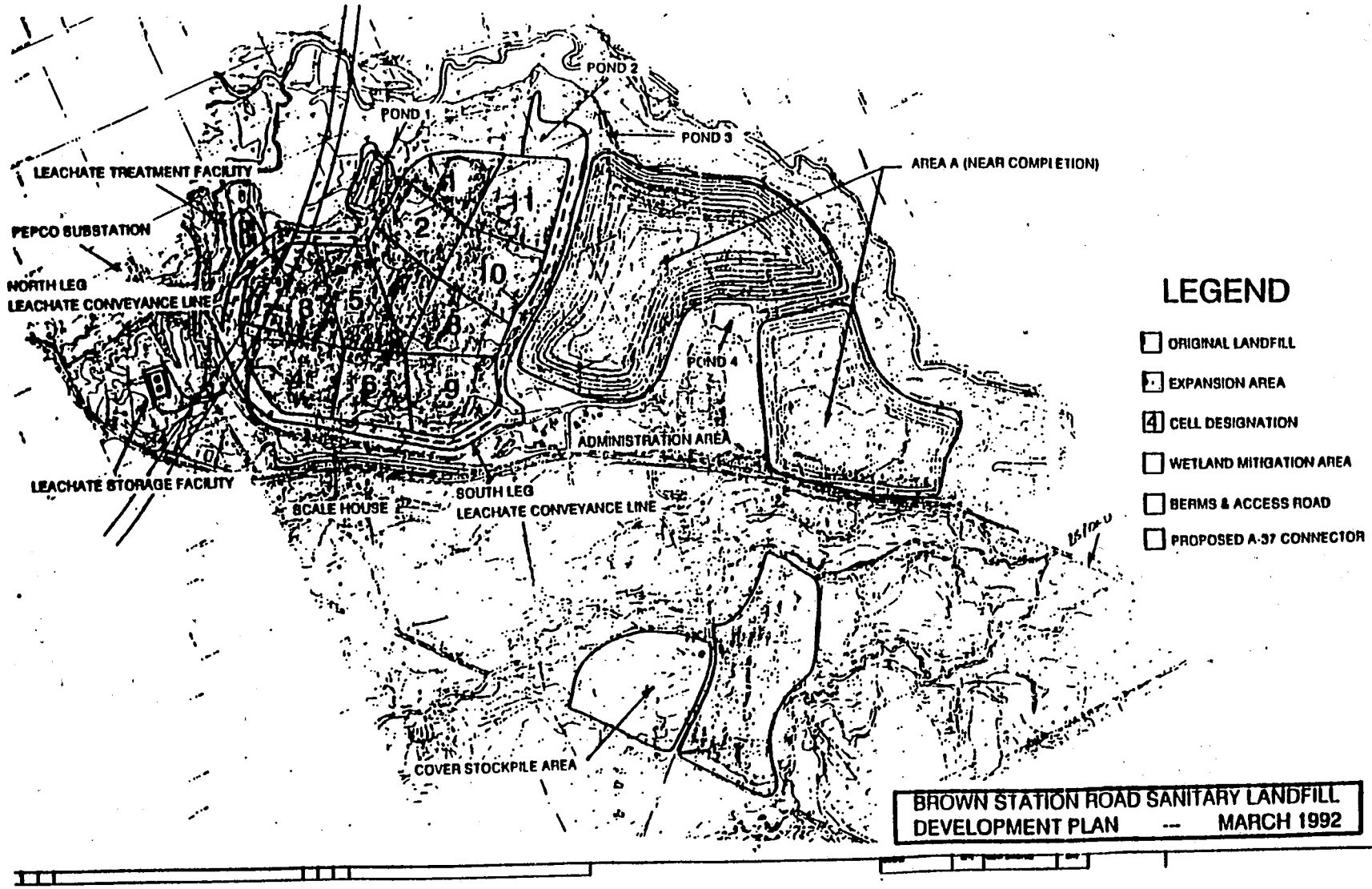


FIGURE B-1 Brown Station Road Landfill
Vicinity Map

FIGURE B-2 Brown Station Road Landfill Expansion Areas



E 1

Landfill VOC Emissions E[illegible]les - Prince George's County[1]

Location	Year[2]	VOCs Generated Tons/Year	VOCs Generated Lbs/Hour	Uncollected Emissions[3]	VOCs			
					Residual Emissions[4]	Combined Emissions[5]		
						Tons/Year	Tons/Day	Lbs/Hour
Sandy Hill[6]	1994	214 47	49 17	107.24	2 14	109.38	0.30	0.01
	2000	263 52	60 00	120 50	2 86	123.37	0.34	0.01
	2004	291 49	66 67	165 01	2 53	167.54	0.46	0.02
	2010	247.34	56 67	65 06	3.65	68.71	0.19	0.008
	2020	182.12	41.67	47.90	2.68	50.59	0.14	0.006
	2030	134.20	30.83	35.30	1.98	37.28	0.10	0.004
	2040	98.39	22.30	25.86	1.45	27.31	0.07	0.003
	2050	72.44	16.67	19.05	1.07	20.11	0.06	0.002
Brown Station[7]	1994	254.31	58.33	229.91	0.49	230.40	0.63	0.03
	2000	269.02	61.67	126.93	2.84	129.78	0.36	0.01
	2010	288.14	65.83	183.66	2.09	185.75	0.51	0.02
	2017	298.50	68.33	214.26	1.68	215.94	0.59	0.02
	2020	271.47	61.67	49.10	4.45	53.55	0.15	0.006
	2030	200.32	45.83	36.19	3.28	39.47	0.11	0.005
	2040	147.49	33.33	26.63	2.42	29.05	0.08	0.003
	2050	108.61	25.00	19.59	1.78	21.37	0.06	0.002
Prince George's County Total (Sandy Hill plus Brown Station Road)[8]	1994	468.78	107.50	337.15	2.63	339.78	0.93	0.04
	2000	559.50	121.67	247.44	5.70	253.14	0.69	0.03
	2010	560.78	122.50	248.72	5.74	254.46	0.70	0.03
	2020	472.23	103.34	97.00	7.13	104.14	0.29	0.01
	2030	348.25	76.66	71.49	5.26	76.75	0.21	0.009
	2040	255.94	55.83	52.50	3.87	56.36	0.15	0.006
	2050	188.46	41.67	38.64	2.85	41.49	0.11	0.005

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[1] Based upon EPA Landfill Air Emissions Estimation Model Version 1.1, using default values published in 58 Fed. Reg. 33791 (June 21, 1993) and tonnage/capacity data in annual reports filed with MDE for both landfills.

[2] 1994 is present year; nominally assumed dates of closure for Sandy Hill is 2004 and 2017 for Brown Station Road.

[3] Quantity of gas not captured by collection system.

[4] Quantity of gas not destroyed by control device.

[5] Uncollected plus residual emissions.

[6] Based on existing Sandy Hill landfill (including the vertical expansion begun in 1994 and planned for closure in 1996) combined with the horizontal expansion (which has not been approved by MDE) which is assumed to commence in 1997 and close in 2004.

[7] Based on Section A, which is no longer accepting waste and which is scheduled to be capped by 1997, and Section B, the horizontal expansion, anticipated to close in 2017.

[8] Totals exclude closed landfills and existing private landfills.

Table 2-1
Estimated Emissions for Selected HAPs[1] (Tons/Year)

Landfill	Year	HAP[2]	Total Generated[3]	Uncollected Emissions[4]	Residual Emissions[5]	Total Emissions[6]
ndy Hill[7]	1994	Toluene	9.1	4.5	0.5	5.1
		Xylene	5.1	2.6	0.01	[redacted]
		Methylene chloride	13.9	6.9	0.7	7.[redacted]
		Tetrachloroethylene	27.7	13.9	4.9	18.7
		Vinyl chloride	0.7	0.3	0.03	0.4
		Benzene	1.3	0.7	0.2	0.9
		Ethyl benzene	1.8	0.9	0.01	0.9
		Trichloroethylene	3.8	1.9	0.2	2.1
		Chloroform	0.0	0.0	0.0	0.0
		Chloroethane	0.1	0.1	0.0007	0.07
		Chloromethane	1.7	0.9	0.02	0.9
		1,1-Dichloroethane	2.8	1.4	0.01	1.4
		1,2-Dichloroethane	*0.05*	*0.02*	*0.0002*	*0.02*
		1,1,1-Trichloroethane	*0.3*	*0.1*	*0.001*	*0.1*
		Carbon tetrachloride	0.0	0.0	0.0	0.0
		TOTAL	68.3	34.1	6.6	40.8
	2000	Toluene	12.1	6.1	0.7	6.8
		Xylene	6.6	3.2	0.01	3.2
		Methylene chloride	14.2	5.0	0.9	5.9
		Tetrachloroethylene	27.4	8.9	6.5	15.3
		Vinyl chloride	1.2	0.7	0.05	0.8
		Benzene	1.8	0.9	0.3	1.2
		Ethyl benzene	1.7	0.5	0.02	0.5
		Trichloroethylene	3.9	1.4	0.3	1.7
		Chloroform	0.1	0.1	0.0	0.09
		Chloroethane	0.1	0.04	0.001	0.04
		Chloromethane	1.6	0.5	0.02	[redacted]
		1,1-Dichloroethane	2.6	0.8	0.02	[redacted]
		1,2-Dichloroethane	0.05	0.01	0.0003	0.01
		1,1,1-Trichloroethane	0.2	0.07	0.002	0.07
		Carbon tetrachloride	0.005	0.005	0.0	0.005
		TOTAL	73.6	28.1	8.8	36.9

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1 Emissions estimate using EPA Landfill Air Emissions Estimation Model Version 1.1. Individual HAPs and their concentrations were selected for the Vertical Expansion based upon the flare air permit application (revised version received by MDE on 1/14/91); horizontal based upon EPA Model default values. Results rounded to one decimal place or first non-zero.

2 Hazardous Air Pollutant as listed in § 112(b) CAA (1990). ***BOLD Italics*** indicates suspected or confirmed animal or human carcinogen based upon Sax & Lewis, Dangerous Properties of Industrial Materials, 7th edition.

3 Quantity of HAP generated within landfill.

4 Quantity of HAP not captured by collection system.

5 Quantity of HAP not destroyed by control device.

6 Uncollected plus residual emissions. BOLD exceeds pertinent HAP threshold under 1990 CAA. Single HAP threshold is 10 TPY and com[redacted] HAP threshold is 25 TPY.

7 Based on existing Sandy Hill landfill including the vertical expansion begun in 1994 and planned for closure in 1996 combined with the horizontal expansion (which has not been approved by MDE) which is assumed to commence in 1997 and close in 2004.

Landfill	Year	HAP[1]	Total Generated[2]	Uncollected Emissions[3]	Residual Emissions[4]	Total Emissions[5]
	2004[6]	Toluene	14.1	8.8	0.6	9.4
		Xylene	7.5	4.5	0.01	4.5
		Methylene chloride	13.6	5.4	0.8	6.2
		Tetrachloroethylene	25.1	8.8	5.7	14.5
		Vinyl chloride	1.6	1.2	0.04	1.2
		Benzene	2.0	1.2	0.3	1.5
		Ethyl benzene	1.5	0.4	0.02	0.5
		Trichloroethylene	3.8	1.6	0.2	1.8
		Chloroform	0.2	0.2	0.0	0.2
		Chloroethane	0.1	0.03	0.001	0.04
		Chloromethane	1.5	0.4	0.02	0.5
		1,1-Dichloroethane	2.3	0.7	0.02	0.7
		1,2-Dichloroethane	0.04	0.01	0.0003	0.01
		1,1,1-Trichloroethane	0.2	0.06	0.002	0.07
		Carbon tetrachloride	0.01	0.01	0.0	0.01
		TOTAL	73.5	31.7	7.8	41.1

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1 Hazardous Air Pollutant as listed in § 112(b) CAA (1990). ***BOLD Italics*** indicates suspected or confirmed animal or human carcinogen based upon Sax & Lewis, Dangerous Properties of Industrial Materials, 7th edition.

2 Quantity of HAP generated within landfill.

3 Quantity of HAP generated within landfill.

4 Quantity of HAP not captured by collection system.

5 Quantity of HAP not destroyed by control device.

6 Year of Sandy Hill Horizontal Expansion expected closure.

Table 2-2
Estimated Emissions for Selected HAPs[1] (Tons/Year)

Landfill	Year	HAP[2]	Total Generated[3]	Uncollected Emissions[4]	Residual Emissions[5]	Total Emissions[6]
Brown Station Road[7]	1994	Toluene	13.6	12.3	0.3	12.6
		Xylene	6.8	6.1	0.01	6.1
		Methylene chloride	4.0	3.6	0.04	3.7
		Tetrachloroethylene	3.7	3.4	0.04	3.4
		Vinyl chloride	2.1	1.9	0.02	1.9
		Benzene	1.9	1.7	0.03	1.7
		Ethylene dichloride	1.8	1.6	0.003	1.6
		Trichloroethylene	1.3	1.2	0.01	1.2
		Chloroform	0.4	0.3	0.0007	0.3
		Carbon tetrachloride	0.019	0.018	0.00004	0.02
		TOTAL	35.6	32.2	0.4	32.6
	1996	Toluene	14.0	12.8	0.4	13.0
		Xylene	6.9	6.3	0.3	6.3
		Methylene chloride	4.1	3.7	0.01	3.8
		Tetrachloroethylene	3.8	3.5	0.04	3.5
		Vinyl chloride	2.2	2.0	0.04	2.0
		Benzene	1.9	1.8	0.02	1.8
		Ethylene dichloride	1.9	1.7	0.03	1.7
		Trichloroethylene	1.3	1.2	0.003	1.2
		Chloroform	0.4	0.3	0.01	0.3
		Carbon tetrachloride	0.02	0.019	0.00004	0.02
		TOTAL	36.6	33.3	0.4	33.7
	2000	Toluene	13.03	7.1	1.1	8.2
		Xylene	6.5	3.5	0.08	3.6
		Methylene chloride	3.8	2.1	0.2	2.3
		Tetrachloroethylene	3.4	1.9	0.6	2.6
		Vinyl chloride	2.0	1.1	0.1	1.2
		Benzene	1.8	1.0	0.2	1.2
		Ethylene dichloride	1.7	0.9	0.02	1.0
		Trichloroethylene	1.2	0.7	0.08	0.7
		Chloroform	0.3	0.1	0.0004	0.1
		Carbon tetrachloride	0.02	0.01	0.0002	0.01
		Total	10.1	18.5	2.4	20.9
	2017	Toluene	16.4	9.9	0.6	10.5
		Xylene	7.8	4.8	0.04	4.8
		Methylene chloride	5.0	3.0	0.1	3.1
		Tetrachloroethylene	3.2	2.3	0.1	2.4
		Vinyl chloride	3.0	1.7	0.1	1.8
		Benzene	2.4	1.4	0.1	1.5
		Ethylene dichloride	2.1	1.3	0.01	1.3
		Trichloroethylene	1.4	0.9	0.03	0.9
		Chloroform	0.4	0.2	0.002	0.2
		Carbon tetrachloride	0.02	0.01	0.0001	0.01
		TOTAL	41.7	25.6	1.1	26.7

1 Emissions estimated using EPA Landfill Air Emissions Estimation Model Version 1.1. Individual HAPs and their concentrations are based upon based upon AP-42 values. Results rounded to one decimal place or first non-zero.

2 Hazardous Air Pollutant as defined in § 112(b) CAA (1990). *BOLD Italics* indicates suspected or confirmed animal or human carcinogen based on Sax & Lewis, Dangerous Properties of Industrial Materials, 7th edition.

3 Quantity of HAP generated within landfill.

4 Quantity of HAP not collected by collection system.

5 Quantity of HAP not destroyed by control device.

6 Uncollected plus residual HAP emissions. BOLD exceeds pertinent HAP threshold under 1990 CAA. Single HAP threshold is 10 TPY and combined HAP threshold is 25 TPY.

7 Based on Section A which is no longer accepting waste and which is scheduled to be capped by 1997, and Section B, the horizontal expansion, which is anticipated to close in 2017.

1 Hazardous Air Pollutant as defined in § 112(b) CAA (1990).

2 Quantity of HAP generated within landfill.

3 Quantity of HAP not collected by collection system.

4 Quantity of HAP not destroyed by control device.

5 Uncollected plus residual emissions.

Table 3
Estimate of CO Emissions from Control Devices - Prince George's County[1]

	Sandy Hill[2]	Brown Station[3]	PGC[4]
Year	Total (tpy)	Total (tpy)	Total (tpy)
1994	19.7	61.0	80.7
2000	26.2	82.6	108.8
2010	34.8	75.7	110.5
2020	25.6	99.8	125.4
2030	18.8	88.5	107.3
2040	13.8	80.1	93.9
2050	10.2	73.9	84.1

[1] EPA Landfill Air estimation model version 1.1 used; Table 4-4 EPA NSPS Background Document used to calculate CO emissions.

[2] Based on existing Sandy Hill landfill (including the vertical expansion begun in 1994 and planned for closure in 1998) combined with the Horizontal Expansion (which has not been approved by MDE) which is assumed to commence in 1997 and close in 2004.

[3] Based on Section A, which is no longer accepting wastes and which is scheduled to be capped by 1997, and Section B, the horizontal expansion, anticipated to be closed in 2017. Emissions from that fraction of gas which is currently passing through the internal combustion engine are based upon the engine manufacturer's estimate, the remainder based upon Table 4-4 EPA NSPS Background Document.

[4] Sandy Hill plus Brown Station Road; excludes closed and private landfills.

Table 4
Estimate of Dioxin Emissions from Control Devices - Prince George's County[1]

	Total-Brown Station[2]		Total-Sandy Hill[3]		Total PGC[4]	
YEAR	dioxin(pg/yr TE)[5]	tons/yr	dioxin(pg/yr TE)	tons/yr	dioxin(pg/yr TE)	tons/yr
1994	$2.2x10^{9}$	$2.4x10^{-6}$	$9.6x10^{9}$	$1.1x10^{-6}$	$1.18x10^{10}$	$1.3x10^{-6}$
2000	$1.27x10^{10}$	$1.4x10^{-6}$	$1.28x10^{10}$	$1.4x10^{-6}$	$2.55x10^{10}$	$2.8x10^{-6}$
2010	$9.4x10^{9}$	$1.0x10^{-6}$	$1.70x10^{10}$	$1.9x10^{-6}$	$2.64x10^{10}$	$2.9x10^{-6}$
2020	$1.12x10^{10}$	$2.3x10^{-6}$	$1.25x10^{10}$	$1.4x10^{-6}$	$3.37x10^{10}$	$3.7x10^{-6}$
2030	$1.56x10^{10}$	$1.7x10^{-6}$	$9.2x10^{9}$	$1.0x10^{-6}$	$2.48x10^{10}$	$2.7x10^{-6}$
2040	$1.15x10^{10}$	$1.3x10^{-6}$	$6.7x10^{9}$	$7.4x10^{-6}$	$1.82x10^{10}$	$2.0x10^{-6}$
2050	$8.5x10^{9}$	$9.3x10^{-6}$	$5.5x10^{9}$	$5.0x10^{-6}$	$1.34x10^{10}$	$1.5x10^{-6}$

---

1 EPA Landfill Air Estimation model version 1.1 used to estimate landfill gas generation. Lahl, Uwe, et al., "PCDD/PCDF Balance of Different Municipal Waste Mangement Methods," Chemosphere Vol. 23, Nos. 8-10, pp. 1481-1489 (1991) used to estimate dioxin emissions.

2 Based on Section A, which is no longer accepting wastes and which is scheduled to be capped by 1997; and Section B, the horizontal expansion anticpated to close in 2017.

3 Based on existing Sandy Hill Landfill (including the vertical expansion begun in 1994 and planned for closure in 1996) combined with the Horizontal Expansion (which has not been approved by MDE) which is assumed to commence in 1997 and close in 2004.

4 Sandy Hill plus Brown Station Road, excludes closed and private landfills.

5 Expressed as International Toxic Equivalents ("TE").

5/18/91 S.F. Chron. C10

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Saturday, May 18, 1991

NEWS

WASHINGTON REPORT
Chronicle Wire Services

. EPA PROPOSES CONTROLS OF LANDFILL GAS The Environmental Protection Agency proposed rules yesterday that would control emissions of air pollutants from large landfills that cause smog and could be contributing to global warming.

The standards and guidelines, which would be administered by the states, would apply to landfills that are designed to handle at least 100,000 metric tons of solid waste and that emit 150 metric tons or more of such organic compounds as benzene and vinyl chloride.

Those landfills would have to install gas collection and control systems.

The rules would control more than three-fourths of the 255,000 metric tons of nonmethane organic compounds emitted each year from landfills, the EPA said. Methane is not directly targeted, but the regulations would have the effect of controlling more than half the 10.5 million metric tons of methane emitted each year.

Methane is among the ""greenhouse" gases that many scientists believe may cause the Earth's climate to become much warmer during the next century.

EXH. 65

Developments to Watch

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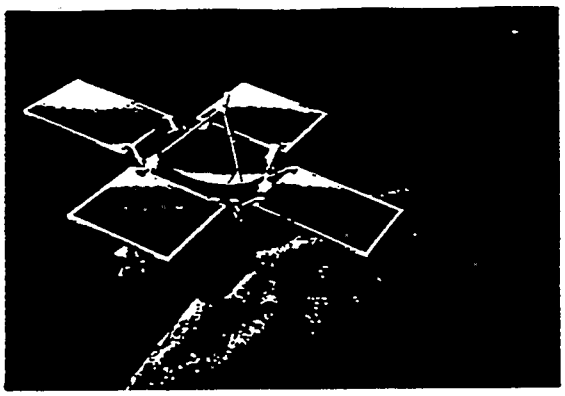
DRAM CHIPS ARE GETTING EVEN SMARTER

A CHIP-DESIGN WIZARD WHO left Toshiba Corp. six years ago has figured out how to cram 6 to 10 times more information into memory-chip cells. The advance could slash the cost of DRAM (dynamic random-access memory) chips by two-thirds or more, says the inventor, Tamio Saito, who is co-founder, president, and CEO of Solidas Corp., based in San Jose, Calif.

Ordinary memory cells store just one bit of data. A high voltage in the memory cell's charge-storing capacitor means the bit is a one; a low voltage means it's a zero. But Saito's so-called ZRAM memory cells are sensitive enough to distinguish tiny differences in voltage—up to 1,000 increments from zero to five volts. Each of those voltage levels stands for a different string of bits—for instance, 0000000000 or 1010101010.

Saito succeeded in using multiple voltage levels by fixing a problem that plagued Toshiba, Hitachi, IBM, and others that have tried multilevel DRAMs—namely, electrical "noise" that distorts the voltage levels. Much of the noise comes from the slamming of the memory cell's transistor gate. So Saito gave each cell a second transistor that works in an opposite way, canceling the noise.

While Saito has achieved ... bits per cell in the lab, DRAM makers might settle for only six bits per cell in the first generation of mass production. That could be handled with just 64 different voltage levels. Memory access is slightly slower than in a conventional DRAM but fast enough for things such as video buffers and hard-disk controllers. Saito says Solidas is negotiating with five major DRAM makers interested in obtaining manufacturing licenses.



SURFING THE SKIES ON THE INTERNET

ASTRONOMERS PEERING INTO THE HEAVENS ARE GETTING a boost from another kind of space—cyberspace. At Lawrence Livermore National Laboratory, researchers capture images of mysterious, short-lived bursts of gamma rays in space. Their telescope takes good pictures but may not be looking where bursts are likely to occur. So astronomers rely on an orbiting observatory. It finds the bursts and alerts a ground station in Maryland, where computers calculate the coordinates and relay them to Livermore over the Net.

Livermore isn't alone. In October, responding to a tip on the Internet, scientists at the University of California's Lick Observatory made the first confirmed spotting of a planet outside our own solar system. And next year, scientists at the Johns Hopkins University Applied Physics Laboratory in Laurel, Md., will use a linked constellation of home pages on the World Wide Web to keep scientists around the world posted on its Near Earth Asteroid Rendezvous (NEAR), a collaboration with NASA. At the rendezvous, expected in June, 1997, NEAR will make the first comprehensive measurements of an asteroid's composition and structure (artist's concept above).

A VIRTUAL LAB THAT TURNS UP REAL-LIFE DRUGS

IN THEIR NEVER ENDING search for new drug candidates, pharmaceutical companies are increasingly turning to "combinatorial" chemistry. The idea is to combine molecular building blocks in different ways, thus synthesizing thousands of new chemicals. Each molecule can then be tested for drug-like effects.

Unfortunately, this shotgun approach doesn't always result in a drug candidate. That's why Exton (Pa.) startup 3-Dimensional Pharmaceuticals Inc. has come up with a new twist. In its approach, which just won a broad patent, computers first make "virtual chemicals," then search for those that have simulated biological effects. Since the computer isn't always right, the company then actually makes those promising chemicals. Tests of these substances, in turn, offer new data about the relationship between structure and biological activity, which can be used to fine-tune the chemicals in later rounds of synthesis.

3-D has used the method to find a promising anticlotting compound and now hopes to forge alliances with pharmaceutical partners.

HOW TO MAKE LANDFILLS LESS FUNKY

FOUL-SMELLING GASES from municipal landfills or composting operations aren't just a nuisance for people nearby. They can also cost operators a fortune to control. The solution, according to Cornell University researchers, is to use signature gases that form before the noxious fumes are released as an alarm system.

In most cases, the stench comes from bacteria that break down buried proteins, emitting culprits such as methanol and dimethylsulfide. Before this happens, however, carbohydrates in the mix tend to ferment, releasing odorless gases such as hydrogen and carbon monoxide. So the Cornell team built a pilot composter fitted with a gas-measuring device and studied the timing of different emissions. Using their observations, compost operators can pump air into the mix as soon as the odorless gases appear and reduce bacterial activity before bad fumes form.



[BOTTOM] ILLUSTRATION BY PHILIP ANDERSON

EP4.2:Ai 7/19

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Air

EPA

Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines

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2. HEALTH AND WELFARE EFFECTS OF AIR EMISSIONS FROM MUNICIPAL SOLID WASTE LANDFILLS

2.1 INTRODUCTION

This chapter presents a summary of the potential adverse health and welfare effects of air emissions from municipal solid waste (MSW) landfills. The five major effects of MSW landfill air emissions are (1) human health and vegetation effects caused by ozone formed from nonmethane organic compound (NMOC) emissions, (2) carcinogenicity and other possible noncancer health effects associated with specific MSW landfill emission constituents, (3) global warming effects from methane emissions, (4) explosion hazards, and (5) odor nuisance. In addition, soils and vegetation on or near the landfills are adversely affected by MSW landfill emissions migrating through the soil. The above effects are briefly summarized below and in Table 2-1.

A variety of different NMOCs have been detected in air emissions from MSW landfills. In the atmosphere, NMOCs can contribute to formation of ozone through a series of photochemical reactions. The ozone formed through these reactions can exert adverse effects on human health and on vegetation. The effects ozone exerts on both human health and vegetation are discussed in greater detail in Section 2.2.

There are potential acute and chronic health hazards associated with several chemical species in MSW landfill emissions. The potential cancer risks associated with exposure to MSW landfill emissions have been considered by EPA (see Section 2.3). There are also other chronic noncancer health effects associated with some of the individual chemicals found in MSW landfill air emissions. Qualitative descriptions of both the cancer and noncancer health effects are also included in Section 2.3.

The landfill gas that is generated from the decomposition of municipal solid waste in a landfill consists of approximately 50 percent methane and 50 percent carbon dioxide, and less than 1 percent NMOCs. The methane emissions are of concern for two reasons: 1) methane, one of the "greenhouse gases", contributes to the phenomenon of global warming

TABLE 2-1. SUMMARY OF THE HEALTH AND WELFARE EFFECTS ASSOCIATED WITH MSW LANDFILL EMISSIONS AND COMPONENTS

Component	Health and welfare effects
Ozone	Alterations in pulmonary function, aggravation of pre-existing respiratory disease, damage to lung structure; foliar injury, such as stippling or flecking, reduced growth, decreased yield
Toxics	Leukemia, aplastic anemia, multiple myeloma, cytogenic changes, damage to liver, lung, kidney, central nervous system, possible embryotoxicity, brain, liver and lung cancer, possible teratogenicity
Methane	Death, burns, dismemberment due to explosions and fires; property damage; contribution to phenomenon of global warming; MSW landfill emissions migrating through the soil on or near the landfill inhibits revegetation, causing deep root death
Odor	Odor nuisance, leading to annoyance, irritability, tension, reduction in outdoor activities, reduction in property values, decreased commercial investment leading to decreased sales, tax revenue

(Section 2.4; and 2) the accumulation of methane gas in structures both within and beyond the landfill boundary has resulted in explosions, fires, and subsequent loss of property (Section 2.5).

Pollutants that exert effects on human welfare are pollutants that affect the quality of life, cause damage to structures, or result in a loss of vegetation. The welfare effects of concern associated with MSW landfill air emissions include, in addition to destruction of property by explosions, emanation of odors and effects on soil and vegetation. Although odor perception is extremely variable and subjective, sociological studies have shown extreme annoyance and emotional disturbances in individuals residing in areas where objectionable odors are present. Property values may decrease and economic disadvantages may result in communities in or near a source of perceived malodorous emissions such as those from MSW landfills. Section 2.6 discusses odor generation by MSW landfills and some of the studies and surveys that have been done about the problem of odor nuisance. Also, revegetation of uncontrolled landfills after closure is often unsuccessful because the landfill gases affect plant root structure. This effect is discussed in Section 2.7.

2.2 EFFECTS ON HUMAN HEALTH AND VEGETATION CAUSED BY AMBIENT OZONE FORMED FROM NONMETHANE ORGANIC EMISSIONS

2.2.1 Health Effects Associated with Exposure to Ozone

Ozone and other oxidants found in ambient air are formed as the result of atmospheric physical and chemical processes involving two classes of precursor pollutants, NMOCs and nitrogen oxides (NO_x). NMOCs are constituents of the air emissions from MSW landfills. Therefore, emissions of NMOCs from landfills also contribute to ozone formation. The effects of ozone on human health are well documented. There are several different mechanisms through which ozone can exert adverse effects on human health. Ozone can penetrate into different regions of the respiratory tract and be absorbed through the respiratory system. Indirect effects of ozone are those such as adverse effects on the pulmonary system resulting from chemical interactions of ozone as it progresses through the system. Finally there may be adverse effects on other body organs and tissues caused indirectly by reactions of ozone in the lungs.

Specific adverse human health effects associated with exposure to ozone include:[2]

- changes in pulmonary function;
- symptomatic effects;
- aggravation of pre-existing respiratory disease;
- damage to the lung structure;
- increases in susceptibility to respiratory infections; and
- adverse effects on blood enzymes, central nervous system, liver and endocrine system.

Pulmonary function decreases have been reported in healthy adult subjects after one to three hours of exposure to ozone. Subjects at rest (not exercising) have shown decreases in lung function at concentrations of about 0.5 ppm ozone.[3] Persons that are heavily exercising have experienced decreases in lung function at about 0.1 ppm ozone.[4]

Symptomatic effects, such as cough, shortness of breath, general trouble in breathing and pain when breathing have been reported in controlled human exposure studies. These effects reportedly occurred when exposure levels exceeded an ozone concentration of 0.12 ppm.[5]

There is some indication from a group of epidemiological studies that persons with existing respiratory diseases may experience aggravation of their conditions when exposed to ozone. Definitive data correlating increased rates of asthma attacks to ozone exposure do not exist, however.[6]

Another possible effect of ozone exposure is damage to the lung structure. Laboratory studies of rats and monkeys have shown inflammation and damage to lung cells following exposure to ozone. Studies on rats, mice, and rabbits have shown increased susceptibility of the animals to bacterial respiratory infections following ozone exposure.[7] Considering the differences in human and animal physiology and immune defenses, it is still reasonable to hypothesize that humans exposed to ozone could experience increased susceptibility to respiratory infections.[8]

Finally, some animal studies have indicated that exposure to ozone exerts adverse effects on the cardiovascular, liver and endocrine systems. Definitive data on humans to substantiate these occurrences are not available. However, the body of evidence from the animal studies suggests that ozone can cause effects in tissues and organs other than the lung.[9]

2.2.2 Adverse Effects of Ozone on Vegetation

Foliar injury on vegetation is one of the earliest and most obvious manifestations of ozone impacts. The specific effects can range from reduced plant growth and decreased yield, to changes in crop quality and alterations in susceptibility to abiotic and biotic stresses. The plant foliage is the primary site of ozone effects, although significant secondary effects, including reduced growth and yield, can occur. Ozone injury to foliage is identified as a stippling or flecking. Such injury has occurred experimentally in various plant species after exposure to 60 $\mu g/m^3$ (0.03 ppm) ozone for 8 hours.[10] Studies with tobacco and other crops confirmed that ozone injures vegetation at sites near urban centers.[11] It is now recognized that vegetation at rural sites may be injured by ozone that has been transported long distances from urban centers.[12] Studies of the effect of ozone on plant growth and crop yield indicate occurrences of detrimental effects. For example, field studies in the San Bernatino forest during the last 30 years show that ambient ozone has reduced the height growth of Ponderosa pine by 25 percent and has reduced the total volume of wood produced by 84 percent.[13]

2.3 CANCER AND NONCANCER HEALTH EFFECTS

The adverse human health effects associated with MSW landfill emissions have not been directly determined by human or animal studies. In the absence of such data, EPA has evaluated some of the individual chemical constituents of MSW landfill emissions. Over 100 chemical constituents have been detected in MSW landfill emissions, as shown in Table C-1 of Appendix C. Exposure to the several of the landfill constituents has been associated with cancer and noncancer health effects. Both cancer and noncancer health effects have not been quantified in a national study, due to limitations in the emissions data. However, these adverse effects can be discussed qualitatively. Adverse effects on target organ systems such as the kidney, liver, pulmonary, and central nervous systems have been

associated with various components of air emissions from MSW landfills. A detailed summary of the health effects is given in in Section 2.3.1.2.

2.3.1 Hazard Identification

Hazard identification is a qualitative step for determining whether or not exposure to a given substance is associated with any adverse health effect. Because epidemiological and animal studies of the health effects of MSW landfill emissions, which are mixtures of many chemicals, have not been found, the hazard identification process was based on a review of the health data of the MSW components. This review focused on nine carcinogenic constituents known to be present in MSW landfill air emissions (benzene, carbon tetrachloride, chloroform, ethylene dichloride, methylene chloride, perchloroethylene, trichloroethylene, vinyl chloride, and vinylidene chloride--Table 2-2). There were other carcinogenic compounds emitted, but these nine pollutants have been repeatedly measured in the air emissions from various MSW landfills.

One of the initial steps that EPA takes in addressing the potential for health effects is to consider the quality of the available data for each MSW landfill gas constituent. The EPA has developed a classification scheme for characterizing the weight-of-evidence for human carcinogenicity. Evidence of possible carcinogenicity in humans comes primarily from two sources: long-term animals tests and epidemiologic investigations. Results from these studies are supplemented with available information from other relevant toxicologic studies. The question of how likely an agent is to be a human carcinogen is answered in the framework of a weight-of-evidence judgment. Judgments about the weight of evidence involve considerations of the quality and adequacy of the data and the kinds and consistency of responses induced by a suspect carcinogen. There are three major steps to characterizing the weight-of-evidence for carcinogenicity in humans: (1) characterization of the evidence from human studies and from animal studies individually, (2) combination of the characterizations of these two types of data into an indication of the overall weight-of-evidence for human carcinogenicity, and (3) evaluation of all supporting information to determine if the overall weight-of-evidence should be modified.

TABLE 2-2. SUMMARY OF THE HEALTH EFFECTS ASSOCIATED WITH TOXIC MSW LANDFILL EMISSIONS COMPONENTS

Component	Health and welfare effects
Benzene	Leukemia, aplastic anemia, multiple myeloma, cytogenic changes--human carcinogen
Carbon tetrachloride	Damage to liver, lung, kidney, central nervous system. Possible embryotoxicity--probable human carcinogen
Chloroform	Damage to liver, kidney, central nervous system--probable human carcinogen
Ethylene dichloride	Damage to central nervous system--probable human carcinogen
Methylene chloride	Probable human carcinogen
Perchloroethylene	Probable human carcinogen
Trichloroethylene	Probable human carcinogen
Vinyl chloride	Central nervous system effects; brain, liver and lung cancer; possible teratogen--human carcinogen
Vinylidene chloride	Damage to liver, kidney--possible human carcinogen

The EPA has developed a system for stratifying the weight-of-evidence. This classification is not meant to be applied rigidly or mechanically. At various points in the above discussion, there is the need for an overall, balanced judgment of the totality of the available evidence. Particularly for well-studied substances, the scientific data base will have a complexity that cannot be captured by any classification scheme. The EPA's weight-of-evidence system is summarized in Table 2-3 and the specific weight of evidence classifications for the nine carcinogens of concern are provided in Section 2.3.2.[14]

2.3.2 Health Effects of Individual Compounds

A discussion of the adverse health effects and the weight evidence classification for the nine carcinogens is presented below.

2.3.2.1. Benzene. Benzene administered orally to rats has resulted in increased incidences of Zymbal gland carcinomas.[15] In mice, inhalation exposures have shown subsequent anemia and other disorders of the blood forming tissues.[16] Other studies with mammalian cells have shown cytogenic abnormalities following benzene exposure.[17]

In humans, chronic exposure to benzene has resulted in abnormalities of the blood such as anemia, leucopenia, thrombocytopenia (pancytopenia). Epidemiological studies have shown highly statistically significant causal associations between leukemia and occupational exposure to benzene and benzene-containing solvents.

Other studies of human populations exposed to benzene have shown significant increases in chromosomal aberrations. In some instances, the aberrations have persisted for years after the cessation of exposure.[18]

According to IARC, there is sufficient evidence that benzene is a human carcinogen and limited evidence that it is carcinogenic in experimental animals.[19] EPA classifies benzene as a Group A carcinogen, a human carcinogen. The Group A classification is used only when there is sufficient evidence from human studies to support a causal association between exposure to a given substance and induction of cancer.

TABLE 2-3. CLASSIFICATION OF EVIDENCE BASED ON ANIMAL AND HUMAN DATA[a,b]

	Animal Evidence				
Human evidence	Sufficient	Limited	Inadequate	No data	No evidence
Sufficient	A	A	A	A	A
Limited	B1	B1	B1	B1	B1
Inadequate	B2	C	D	D	D
No data	B2	C	D	D	E
No evidence	B2	C	D	D	E

[a] The above assignments are presented for illustrative purposes. There may be nuances in the classification of both animal and human data indicating that different classifications than those given in the table should be assigned. Supporting data (e.g., structure-activity relationships, short-term test findings, etc.) should also be considered in the weight-of-evidence classification.

[b] A - human carcinogen
B2 - probable human carcinogen
C - possible human carcinogen
D - not classifiable as to human carcinogenicity
E - evidence of noncarcinogenicity for humans

2.3.2.2 Carbon tetrachloride. Carbon tetrachloride causes damage to the liver, lungs, kidneys and central nervous system in humans.[20] The potential for embryotoxicity exists, especially for males. The carcinogenicity of carbon tetrachloride has been observed in tests with three animal species. Primarily, the tumors found in the animals were liver tumors.[21] The human data on carcinogenicity of carbon tetrachloride are centered on case reports and one epidemiological study. Using the EPA weight of evidence criteria for carcinogenicity, carbon tetrachloride is classified as a probable human carcinogen, Group B2.

2.3.2.3 Chloroform. Exposure to chloroform has been associated with adverse effects on the liver, kidneys, and central nervous system of humans.[22] Additional effects on the human cardiac system have also been reported, including cardiac arrhythmias and cardiac arrest.[23] There is also some evidence that chloroform has carcinogenic potential in several animal species, including mice (eight strains), rats (two strains) and one strain of dogs. In these studies, chloroform was administered orally. The evidence for carcinogenicity of chloroform in animals includes statistically significant increases in kidney tumors in rats and mice, and liver tumors in mice.[24]

No epidemiological studies have been found evaluating chloroform by itself. But several studies have indicated small, but statistically significant increases in rectal, bladder and colon cancer in humans consuming drinking water that contained chloroform as well as other trihalomethanes. Because chloroform was not thought to be the only possible carcinogen in the drinking water, the studies cannot be used to define chloroform's carcinogenic potential in humans. At this time, the epidemiologic evidence for the carcinogenicity of chloroform is inadequate.[25] The overall weight of evidence classification for chloroform is B2--probable human carcinogen,[26] based on existing sufficient animal evidence and inadequate epidemiological evidence.

2.3.2.4 Ethylene dichloride. The adverse effects of ethylene dichloride (EDC) that have been reported in the literature are largely associated with the gastrointestinal and nervous systems in humans. Subtle neurological effects (e.g., fatigue, irritability, sleeplessness) may be

more prevalent than overt symptoms of central nervous system toxicity at lower concentrations.

EDC was shown to be carcinogenic in a National Cancer Institute lifetime bioassay. Several types of tumors were observed in both rats and mice. In rats, carcinogens of the forestomach and circulatory system hemangiosarcomas were found. Hepatocellular carcinomas, alveolar/bronchiolar adenomas, and mammary carcinomas were seen in mice exposed to EDC.[27] The route of exposure for this bioassay was gavage (oral). No statistically significant increases in tumors occurred in rats or mice following lifetime inhalation exposure.[28] No case reports on studies in humans concerning carcinogenicity of EDC were found in the literature.[29]

The weight of evidence classification for EDC is B2, meaning it is a probable carcinogen in humans.[30] The classification is based on sufficient animal evidence from the lifetime oral exposure bioassay along with an absence of epidemiologic data.

2.3.2.5 Methylene chloride. Bioassays conducted by the National Toxicology Program (NTP) demonstrated that methylene chloride is oncogenic (tumor-causing) in both rats and mice when exposed via inhalation. In the mouse bioassay, statistically significant increases in liver and lung tumors were observed.[31] Statistically significant increases in benign mammary gland tumors were seen in the rat bioassay.[32]

Data on humans exposed to methylene chloride, primarily in the workplace, are judged to be inadequate for evaluating the carcinogenic potential of methylene chloride. Therefore, methylene chloride is classified as a Group B2 carcinogen--probable human carcinogen--because there is sufficient animal evidence and inadequate epidemiological evidence.

There has been some difference of opinion on the carcinogenic potential of methylene chloride as related to species differences in metabolic pathways. The EPA has evaluated the latest data related to the risk of cancer and exposure to methylene chloride. The EPA has concluded that the evidence of the carcinogenic mechanism of methylene chloride and species differences in use of the metabolic pathways are not sufficient to support an estimate of zero cancer risk to humans.[33]

2.3.2.6 Perchloroethylene

In humans, transient liver damage has been linked to short-term exposures to perchloroethylene at relatively high levels. Some slight effects on the central nervous system have been reported in humans exposed to relatively high perchloroethylene concentrations.[34] Excluding carcinogenicity, toxicity testing in experimental animals, along with limited human data, suggest that long-term exposure to low concentrations of perchloroethylene is not likely to present a health concern.[35]

However, inhalation bioassays conducted by the National Toxicology Program on rats and mice of both sexes showed evidence of carcinogenicity for perchloroethylene.[36] In the National Toxicology Program studies, increases in mononuclear cell leukemia, and rare kidney tumors were observed in rats. Liver tumors were observed in mice.[37] Using the EPA weight of evidence classifications, perchloroethylene is considered a probable human carcinogen, Group B2.

2.3.2.7 Trichloroethylene. The evidence for carcinogenicity of trichloroethylene is shown by tumor induction in male rats and both sexes of mice by oral and inhalation exposure.[38] Statistically significant increases in renal adenocarcinomas and adenomas were observed in bioassays of male rats by either inhalation or oral exposures. Either exposure route produced elevated incidences of leukemia in one strain of male rats.[39] Inhalation exposure produced hepatomas and hepatocellular carcinoma (liver tumors) in two mouse strains. Inhalation exposure also produced malignant lymphomas in one strain of female mice.[40] Leydig cell tumors have also been reported in two studies.[41]

Epidemiological evidence for carcinogenic potential of trichloroethylene is inadequate. EPA reviewed seven epidemiologic studies or surveys and concluded all were inadequate to allow characterization of carcinogenic potential.[42]

EPA has classified trichloroethylene as a Group B2--probable human carcinogen.[43] This classification is based on the existence of sufficient animal evidence and inadequate epidemiological evidence.

2.3.2.8 Vinylidene chloride. Metabolism of vinylidene chloride produces substances (metabolites) that exert adverse effects on the liver and kidneys.[44] Eighteen animal studies were identified by EPA in the literature that provided information on the carcinogenic potential of vinylidene chloride. None of the studies that were conducted using the inhalation exposure pathway was conducted over the lifetime of the study animals.[45] In the single study that was judged to be adequate for assessing carcinogenic potential, statistically significant increases in kidney tumors were observed in one strain of male mice.[46]

There is no adequate epidemiologic evidence to assess the carcinogenicity of vinylidene chloride in humans.[47] Because there is limited animal evidence for carcinogenicity and inadequate evidence from epidemiological studies, EPA has classified vinylidene chloride as a Group C--possible human carcinogen.[48]

2.3.2.9 Vinyl chloride. In mice, exposure to vinyl chloride via inhalation has produced lung tumors, mammary carcinomas and angiosarcomas of the liver (malignant tumors). Cancer of the liver and other organs was also observed in rats exposed to vinyl chloride.[49]

In occupational exposures of humans, vinyl chloride disease is the name given to the total clinical syndrome associated with vinyl chloride exposure. The disease includes circulatory disturbances in the extremities (hands and feet), Raynaud syndrome, skin changes and changes in liver function.[50]

Other studies have shown chromosomal aberrations in the lymphocytes of humans occupationally exposed to vinyl chloride.[51] In addition, increased incidences of fetal loss have been associated with occupational exposure to vinyl chloride.[52]

Studies of humans exposed to vinyl chloride in the workplace have shown a causal relationship between the vinyl chloride exposure and development of cancer of the liver, brain and lung.[53] Angiosarcomas are rare tumors. Finding seven cases of these tumors in a single group of workers at one vinyl chloride plant is strong evidence of the carcinogenicity of vinyl chloride. Vinyl chloride is classified as a Group A carcinogen; a human carcinogen.

2.3.3 Cancer Risk Assessment

Based on the available information, EPA attempted to quantify the potential carcinogenic risks to the people exposed to MSW landfill emissions. However, unlike other source categories that have been regulated previously, the EPA was not able to quantify for this source category as one of the critical risk assessment parameters--toxics emissions rates. This was because the MSW landfill data base was generated by collecting available information from numerous sources which were not specifically designed to quantify toxics emissions rates. Although the data base of 931 facilities contained some data for the toxic constituent concentrations and the landfill gas emissions rates, there was no facility for which both values were known. Both the toxic constituent concentration and the landfill gas emission rate are required to compute the toxic emission rate. In addition, the EPA had no reliable technique to replace a missing value for either toxics emissions parameter from the other reported parameters in the database. Thus, the EPA could not reliably calculate a toxics mass emission rate and, in turn, could not reliably calculate a risk estimate for even one facility.

Other attempts, such as random assignment of known (measured) values to those facilities with missing values, were made to extrapolate nationwide risk estimates from the limited toxics data.[54] In doing so, this extrapolation (the estimation of the toxic landfill gas mass emission rates) was creating an additional level of uncertainty above and beyond a more typical risk assessment. After considering this additional uncertainty in conjunction with the other known uncertainties associated with risk assessment, the EPA concluded that MSW landfill risk estimates would not be credible. Furthermore, because these regulations are being proposed under Sections 111(b) and (d) of the Clean Air Act and are technology-based, risk estimates were not required in selecting among the regulatory options (see Chapter 5). However, even though the risk associated with exposure to landfill emissions could not be reliably quantified, the available information indicates that toxic emissions do emanate from MSW landfills and suggests a need to regulate this source category's emissions.

2.4 METHANE EMISSIONS CONTRIBUTING TO GLOBAL WARMING

Greenhouse gases serve to trap heat from the sun and maintain the earth's climate. Methane and other greenhouse gases such as carbon dioxide and nitrous oxide occur naturally in the atmosphere. They serve as a thermal blanket allowing solar radiation to pass through the atmosphere while absorbing some of the infrared radiation emitted back from the earth's surface. The absorption of radiation warms the atmosphere and provides the present climate. The earth would be approximately 30 degrees colder without the presence of greenhouse gases. The atmospheric temperature will increase if the concentrations of greenhouse gases are increased.[55-57]

Anaerobic decomposition of municipal solid waste in landfills results in the decomposition of municipal solid waste in landfills results in the generation of methane and carbon dioxide. An estimate of the amount of methane and carbon dioxide from MSW landfills is provided in Chapter 3. Methane is more potent than CO_2 due to its radiative characteristics and other effects methane has on atmosphere chemistry. Molecule-for-molecule methane traps 20-30 times more infrared energy in the atmosphere. Therefore even a small increase in the methane concentration in the atmosphere is a concern to scientists trying to predict the warming of the climate.[58-60]

There is considerable uncertainty with regard not only to the timing but also to the ultimate magnitude of any global warming. However, there is currently strong scientific agreement that the increasing emissions of greenhouse gases such as methane will lead to temperature increases. Within EPA and the international scientific community efforts are underway to reduce these uncertainties, estimate the cost of mitigation, and identify possible control options. Reduction of methane emissions from MSW landfills is one of many options available to reduce possible global warming.

2.5 EXPLOSION HAZARDS

2.5.1 Health Effects Associated with the Explosivity Of Municipal Solid Waste Landfill Air Emissions:

Decomposition of the waste in MSW landfill air emissions produces the explosive methane gas. If the methane accumulates in structures on or off-site, explosions or fires can result. MSW landfill air emissions have

resulted in documented explosions and fires both within and beyond the landfill boundaries. Section 2.5.2 of this chapter describes the welfare effects such as the explosion hazards and associated property damage. This section briefly presents information on the health effects associated with the explosions resulting from MSW landfill gas emissions.

MSW landfill gas can migrate off-site and emissions can escape into confined spaces such as basements, crawl-spaces, utility closets and false ceilings. Explosions of the gas have caused severe personal injury and death. Table 2-4 lists documented cases of acute injury and death caused by explosions and fires related to MSW landfill gas emissions.

2.5.2 Explosivity of MSW Landfill Air Emissions

MSW landfill gas is composed largely of methane and carbon dioxide. Methane gas is odorless and is highly explosive when mixed with air at a volume between 5 and 15 percent (the lower and upper explosive limits of methane). Methane can migrate off-site from the landfill and possibly collect in basements or crawl spaces of nearby structures. For example, methane has migrated from the Port Washington landfill in New York into homes near the landfill. Within two years, four explosions occurred in homes very near the landfill. Subsequent testing by the Nassau County Fire Marshall discovered explosive levels of methane in or around twelve homes in the vicinity of the landfill.

Table 2-5 lists documented examples of explosions or fires associated with MSW landfill gas. These examples show clearly that structural damage and the loss of facility use are real possibilities related to these gas explosions. Instances of facility abandonment are also documented as shown in the table.

There is also documentation that the presence and migration of MSW landfill emissions adversely affects property value of surrounding land parcels. For example, at the Midway landfill in the Seattle, Washington, area, MSW landfill gas migrated under a major interstate highway and percolated up in residential areas. There was immediate concern in the neighborhood; 11 families were evacuated.[61] A program to subsidize the sale of houses in the area was started by the City. Information collected

TABLE 2-4. ACUTE INJURY AND DEATHS ASSOCIATED WITH MUNICIPAL LANDFILL AIR EMISSIONS EXPLOSIONS AND FIRES[a]

Location, date	Incident, injury[b]
Comack, NJ. 1984	Gas migrated to landfill weigh-station on-site. Explosion killed one, injured one.
Manchester, NJ. 1983	Spark from landfill pump probably ignited gas. One person burned.
Cleveland, OH. 1980	Explosion at foundry adjacent to landfill. One killed.
Commerce City, CO. 1977	Explosion in tunnel being built under a railroad right-of-way. Two workmen killed, four firemen injured.
Sheridan, CO. 1975	Gas migrated into drainage pipe under construction. Welding truck led to fire. Two injured.
Sheridan, CO. 1975	Gas accumulated in drain pipe running through landfill. Children playing with candle caused explosion. Several children injured.
Richmond, VA. 1975	Gas migrated from nearby landfill into apartment. Two injured.
Winston-Salem, NC. 1969	Gas migrated from adjacent landfill into basement of armory. Lighted cigarette led to explosion. Three killed, five seriously injured.
Atlanta, GA. 1967	Gas migrated from adjacent landfill into sealed basement of single story recreation center building. Lighted cigarette led to explosion. Two workmen killed, six injured.
Madison, WI (no date given)	Explosion destroyed sidewall of a townhouse. Two people seriously injured.

[a]Reference 62.

[b]These incidences highlight explosions and health effects. Other incidences of explosions related to methane migration from MSW landfills and property destruction are given in Table 2-6.

TABLE 2-5. DOCUMENTED CASES OF LANDFILL GAS MIGRATION AND ASSOCIATED FIRES AND EXPLOSIONS[a]

Landfill name/location/date	Damages and other comments
Pittsburgh, PA September 1987	Offsite gas migration is suspected to have caused house to explode. Incident is under investigation. Toxics are being monitored in homes near the landfill.
Bakersfield Landfill Fresno, California April 1984	Fresno police bomb squad used site for practice. A bomb was buried and was detonated causing LFG explosion. Explosive levels of methane were also migrating off-site.
BKK Landfill West Covina, California August-October 1984	Twenty residences temporarily evacuated due to explosive methane levels in adjoining soils.
Babylon Landfill Comack, New Jersey May 1984	Methane migrated to a house on-site and exploded.
Hardy Road Landfill Akron, Ohio 1984	One house destroyed. Ten houses evacuated temporarily.
I-95 Landfill Lorton, Virginia 1984	Explosion and fire occurred.
Landfill near Lake Township Canton, Ohio 1984	Two homes and a day care center temporarily evacuated.
PJP Landfill Jersey City, New Jersey 1984	Landfill fires causing air pollution have been a continual problem.
Smithtown Landfill Smithtown, New York 1984	Explosion damaged room in transfer station.

(continued)

TABLE 2-5. (Continued)

Landfill name/location/date	Damages and other comments
Wallingford Landfill Wallingford, Connecticut June 1984	Explosive levels of methane detected in dog pound. Dog pound temporarily closed, ventilation system to be installed.
Anderson Township Landfill Cincinnati, Ohio 1983	Explosion destroyed residence across the street from the landfill. Minor injuries reported.
Monument Street Landfill Baltimore, Maryland April 1983	Vent pipes were not maintained causing vents to become nonfunctional. Street light fire was believed related to methane migration. Ongoing lawsuit concerns presence of priority pollutants.
Ocean County Landfill Manchester, New Jersey December 1983	Spark from landfill pump probably ignited methane gas, causing explosion and fire. Office building destroyed.
Operating Industries Landfill Monterey Park, California August 1983	Vinyl chloride detection caused SCAQMD to order 30-day shutdown of landfill. It reopened, subject to closure in 6 months.
Shawnee County Landfill Topeka, Kansas August 1983	Home abandoned due to high methane levels.
Falls Street Landfill Richmond, Virginia 1975	In 1975, explosion occurred in nearby apartment building. The city decided to buy and demolish it. Two schools sited on the landfill were closed until a control system was installed.
Tyler, Texas May 1982	TDPS office building sited on closed landfill. Methane has caused problems since early 1970's. Failure of ventilation exhaust fan resulted in "significantly high" levels of methane in the building.

(continued)

TABLE 2-5. (Continued)

Landfill name/location/date	Damages and other comments
Mission Avenue Oceanside, California 1981	Schools surrounding the landfill were evacuated and classes were suspended for 4-5 months.
Port Washington Landfill North Hempstead, New York 1981	Explosions in furnace rooms of several homes. Minor damage occurred. Furnaces were replaced.
Beantown Dump Rockville, Maryland 1980	Small explosion occurred in enclosed back room of auto body shop. Shop closed for 1 month until control system was installed.
Warner Hill Landfill Cleveland, Ohio 1980	Explosion killed foundry worker on site adjacent to landfill.
Reilly Construction Company Springfield, Illinois 1979	Methane migrated into construction company offices adjacent to the landfill. Limited fires occurred No explosion. Building evacuated and use restricted for 4 weeks.
Allegheny County Landfill Frostburg, Maryland 1978	Limited fire in off-site equipment maintenance building. No explosion. Building use restricted for 2 months. Building was highly ventilated until gas control system installation.
Campground Landfill Louisville, Kentucky 1978	No physical damages occurred. Buildings evacuated for short period of time.
Lees Lane Landfill Louisville, Kentucky 1978	Small fires and explosions. Several houses evacuated and condemned. Benzene (29.5 ppm) and vinyl chloride (17.9-122.6 ppm) detected off-site.
Unnamed Landfill Adams County, Colorado	Explosion at a construction project adjacent to the landfill.

(continued)

TABLE 2-5. (Continued)

Landfill name/location/date	Damages and other comments
Falls Street Landfill Richmond, Virginia 1982	The 1982 incident occurred when children trespassed onto the landfill site, entered a control system manhole, and lit a match, resulting in an explosion.
Winston-Salem, North Carolina 1969	Methane migrated into National Guard Armory.
Greentree Hills Landfill Madison, Wisconsin	Explosion blew out one sidewall of a townhouse. Three adjacent apartment buildings and several homes evacuated for 20-30 days. Claims filed against the city total $5.2 million dollars.

[a]References 63,64.

on property values recorded during the operation of the program indicated a decrease of 5 to 10 percent in residential property value.

2.6 ODOR NUISANCE

Odors are frequently associated with air emissions from MSW landfills. Odors escape along with MSW landfill gas from surface cracks in the landfill. As waste is added to the landfill, disturbances of soil layers can also provide a means of escape for odors. Individuals vary in their ability to detect odors and in the degree of pleasantness or unpleasantness they experience with various odors.[65] However, the types of odors generally associated with the decomposition of organic material that occurs at landfills are most likely to be unpleasant or objectionable. This section describes the occurrence of odors at MSW landfills, and lists examples of the types of odorous compounds likely to emanate from landfills. The section also describes how odors affect human welfare by the unpleasantness of the odors themselves, by possibly lowering the property value of real estate near a MSW landfill, and by the potential for odors to cause properties to be abandoned and therefore leading to loss of facility and property use.

2.6.1 Odor Generation

Municipal landfill gas is generated largely by bacterial decomposition of organic materials in the municipal solid waste. As the decomposition proceeds, odiferous compounds can escape from the landfill through cracks in the landfill surface cover.

Other possible sources of odors associated with air emissions from MSW landfills are the actual wastes themselves. Household wastes that are often disposed in MSW landfills include chemicals in cleaners, paints, pesticides and adhesives. These consumer products often contain solvents or other compounds with distinctive odors. As these household products are added to a landfill, the odors associated with some of these chemicals may be noticeable to nearby residents or passersby. These odors may also emanate on a continuing basis from cracks in the landfill surface cover.

2.6.2 Adverse Effects of Odors on Human Welfare

The influence of odors on the comfort and welfare of individuals is difficult to prove. Odors can result in social and behavioral changes in an exposed population. However, odor perception and impact is subjective. Different individuals may react differently to the same type and intensity of odor. Therefore, it is difficult to quantify a degree of unpleasantness associated with different odors. The descriptions in this section on the adverse effects of odors on human welfare are necessarily qualitative.

A few studies in the United States and the Federal Republic of Germany have investigated the social and behavioral effects of odors on the population. These studies have indicated that annoyance is a common reaction of residents in communities where unpleasant odors are encountered. Examples of responses from a survey of 704 residents of Dusseldorf are shown in Table 2-6. In the U.S., studies have indicated that odors have interfered with daily activities. U.S. studies are generally older and not quite as specific as other studies in the literature.[66]

It seems likely that the presence of odors would also exert the same type of detrimental effect on property value. At this time, the effect cannot be quantified. As was discussed earlier in relation to explosivity, property values around the Midway landfill in the Seattle area decreased from 5 to 10 percent with increased awareness of the presence of MSW landfill gas. The decreases could not be directly correlated to odors associated with the landfill.

Odors can also cause temporary or perhaps permanent loss of facility use. Although specific studies were not found that documented any loss of property use because of the odors from MSW landfills, it is possible that such adverse effects would occur. The responses shown in Table 2-7 indicate that odors can interfere in outdoor activities and interfere with the comfort of living. If a population perceives an odor as offensive and has questions about other possible effects beyond an annoying odor, the use of recreational or social facilities near the odor source may be greatly reduced or eliminated.

2.7 ADVERSE EFFECTS ON SOILS AND VEGETATION FROM MSW LANDFILL AIR EMISSIONS

The inability to grow vegetation or trees at MSW landfills is believed to be caused by one or more of the following factors: (1) lack of oxygen in the root zone; (2) toxicity of carbon dioxide to the roots; or (3) anaerobic

TABLE 2-6. RESPONSE COMPONENTS OF ANNOYANCE FACTORS DERIVED FROM A SURVEY OF 784 RESIDENTS OF DUSSELDORF[a]

Survey responses
Reduced social contacts
No pleasure in coming home
Odor leads to tensions within the family
Odor interferes with or disturbs communication
Odor spoils appetite
Odor interferes with comfort of living
Odor interferes with outdoor activities
Odor induces anger

[a]Reference 67..

conditions of the soil permitting the accumulation of reduced metals, such as iron (Fe), manganese (Mn) and zinc (Zn), in concentrations toxic to the vegetation.[68] Generally when landfill gases are present in the surface soil, the concentration increases at deeper soil layers. Thus, although the deeper rooted trees die, the shallow rooted ground vegetation continues to live. Diffusion of ambient air into the soil and diffusion of landfill gases out of the soil frequently result in the soils nearest the surface (top several inches) remaining in an aerobic condition, whereas the levels where the deepest roots are present can be anaerobic.[69]

According to the literature, there is a good deal of variability in tolerance to low oxygen in the root zone. The growth of red and black raspberries was inhibited by exposure to 10 percent oxygen, whereas apple trees required 10 percent oxygen in the soil in order to sustain growth.[70] Tomato plants grown in solution culture exhibited marked reduction in growth and ability to take up potassium (K) when exposed to three percent oxygen in the root zone.[71] Leone et al. reported that red maple, which is flood-tolerant, was also more tolerant of soil contaminated by simulated landfill gas than sugar maple, which is not tolerant of flooding.[72]

Greenhouse and field studies, and other research reported in the literature all confirm that the presence of landfill gases in the root zones of vegetation can be injurious to the extent of causing the death of vegetation. The major characteristics of landfill gas deleterious to plants when found in the root zone were the high carbon dioxide and methane and low oxygen concentrations resulting from anaerobic refuse decomposition.[73] Further studies indicate the extent of effects of landfill air emissions on vegetation. Various investigators have experienced difficulties in growing vegetation at completed or closed landfill sites. Stunting of corn and sweet potatoes became evident in areas adjacent to a New Jersey site where gases had migrated away from the landfill into the root zone of corn and sweet potato plants.[74,75] Death and poor growth of loblolly and other pines planted on such sites in southern Alabama have also been attributed to the presence of fermentation gases in the soil environment.[76] Poor tree growth in these areas has also been associated with lack of soil moisture and

ncreasing amounts of ammonia, nitrogen, iron, manganese, zinc, and opper.[77]

Closed refuse and fill sites at 15 locations in New Jersey, New York tate, metropolitan New York City, New England, Washington, Oregon, and labama were sampled both where vegetation was dead or dying and where the ame species were growing normally. Inspection of the contents of a soil ampling tube inserted to a depth of 20 cm in soil at sites where vegetation as dead or dying commonly revealed an anaerobic situation (dark, foul melling soil). Soil at sites where plant species were growing were commonly found to be in aerobic conditions. Instrument readings of methane (CH_4) and carbon dioxide (CO_2) were as high as 50 percent and 43 percent respectively, at the anaerobic sites.[78]

Soil tests at a closed landfill in central New Jersey showed that, 4 years after closure, the deepest 15 cm of a 60 cm soil cover was still distinctly anaerobic. The upper 45 cm of soil showed evidence of aerobic conditions; however attempts to establish herbaceous vegetation at the site demonstrated that only a few grass species ["reliant" hard fescue (Festuca longifolia Thull.), redtop (Agrostis alba L.) and sheep's fescue (F. ovina L.)] could survive under the undesirable soil conditions created by the landfill gases. Attempts to establish woody species also failed, even where grasses had been established.

Experimental work and site investigations have demonstrated an inability of the landfill cover to support and maintain vegetation, which also leads to increased erosion potential. If the cover is eroded, there is a chance that refuse will be exposed.. Opening the landfill cover could lead to contaminated runoff from the site, increased odor nuisance, and increases in rodent or vermin populations. According to CFR Part 60, this may be defined as an effect on public welfare.

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Landfill Environmental Emissions – Regulatory Progress and Gaps

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EXH. 68

INTRODUCTION

In 1989, US EPA formally issued a national strategy for improved management of municipal solid waste (MSW).[1,2] This strategy, called "integrated waste management," features a hierarchy of techniques:

- **"Source Reduction"** (i.e., reduce the MSW generation rate and toxicity)
- **Recycling** (includes composting)
- **MSW Combustion** (with energy recovery)
- **Landfilling** (Waste that cannot be practically recycled or combusted must be landfilled, likewise for the residues resulting from MSW recycling, composting, and combustion.)

US EPA placed source reduction and recycling at the top of the hierarchy. Then, for that fraction of MSW that cannot be recycled practically, US EPA called for disposal by means of combustion, with recovery of energy. Landfilling was designated by US EPA for disposal of those waste types that cannot be recycled or combusted. US EPA's ranking of waste-to-energy is consistent with the preference of other advanced, industrialized countries. For example, Switzerland has banned by law the landfilling of untreated MSW; also, such landfilling will be significantly restricted by law in Germany this decade.[3,4]

US EPA noted that the four techniques above are complementary. No single management technique, by itself, is a panacea for waste management; rather, an appropriate mix must be tailored to local needs[2].

Notwithstanding US EPA's preferred waste-management hierarchy, the United States continues to embrace landfilling as its principal means of MSW management. According to US EPA's estimates of MSW disposal in 1990, this country landfilled two-thirds of its MSW, recycled only 17 percent, and combusted only 15 percent in waste-to-energy facilities[5]. The author is not aware of data showing a marked change since 1990 in the high landfill percentage. This disparity between US EPA's preferred hierarchy and actual practice is dramatically illustrated by the MSW management practices of the nation's most populous city, New York City. Residential waste there is collected predominantly by the City, and is disposed at the City's Fresh Kills Landfill.[6] The City currently buries about 4 million tons per year of MSW in its landfill,[6,7,8,9] and plans continued heavy reliance on this landfill for at least another decade, and likely well beyond.[9,10]

less than 1% non-methane organic compounds (NMOCs).[12] Methane, when mixed with air, is highly explosive, and has caused fires and explosions both within and beyond landfill boundaries.[13] Landfill gas can migrate subsurface, and accumulate in basements and other structures offsite.[13] US EPA notes that consequent explosions and fires "have caused severe injury and death."[13] US EPA compiled statistics on deaths, injuries, and property damage resulting from landfill-gas explosions and fires nationally, during the 20-year period, 1967 to 1987.[13] US EPA identified 20 incidents in 17 states in which gas migration resulted in explosions or fires *offsite*. Of those 20 incidents, US EPA documented eight incidents in which a total of nine members of the *public* were killed, and at least 20 were injured. Many of the other incidents, although not causing casualties, did result in property damage.

Most importantly, with regard to gaseous emissions from landfills, odor nuisance and explosion hazards are not the only concerns; gaseous emissions from landfills also contain air pollutants that pose a risk to human health and the environment. This will be documented below. The environmental importance of *air pollutant* emissions from MSW landfills is a "sleeper" issue. The public knows virtually nothing about air pollutant emissions from landfills, and state-level air quality regulators are generally only marginally aware of the issue. Because of this, the issue of air pollutant emissions from landfills has emerged as the principal subject matter of this paper.

As noted previously, landfill gas is comprised roughly of 50% methane and 50% carbon dioxide, and less than 1% of nonmethane organic compounds (NMOC). The air pollutants of concern are contained within the NMOC fraction. As summarized by US EPA,[12] the air pollutants present in landfill gas can be classified by their potential environmental effects:

- Ozone Nonattainment Precursors — Ambient ozone levels in excess of the National Ambient Air Quality Standards (NAAQS) adversely affect human health and damage vegetation.[14] Volatile organic compounds (VOC) are the principal precursor to ozone formation. US EPA has stated that landfill "NMOCs are primarily--VOCs contributing to the ozone nonattainment problem."[15] US EPA estimated NMOC emissions from MSW landfills nationwide to be 283,000 tons per year (TPY) in 1986, accounting for one percent of *all* NMOC emissions nationally from stationary emitters.[15] US EPA has also projected landfill NMOC emissions nationally to be 577,000 TPY by 1997.[16]

used to remove toxic pollutants from landfill gas. Collected gas can also be sold to an energy customer.

The overall efficiency of landfill gas control depends on what fraction of all gas generated by a landfill can be collected with a landfill gas collection system, and for that portion of gas that is collected, the control efficiency provided by the control device (e.g., flare or engine). US EPA stated that the efficiency of landfill gas collection systems has never been measured at any landfill,[23] and indicated a 50-60% efficiency is achievable for a well-designed system, based on limited available information.[24] In more recent draft guidance, US EPA has indicated a collection efficiency of 60-75% is possible[25]. This means that roughly one-quarter to one-half the gas generated in a landfill is likely *not* collected, and therefore, *not* controlled, but rather becomes uncontrolled, "uncollected" emissions to the ambient air. For that fraction of the landfill gas that is collected, US EPA believes that control devices (e.g., flares, engines) can achieve a 98% control efficiency for NMOC.[26] Conversely, this means that up to two percent of the collected gas passes through the control device without being controlled, and thus, represents a residual, uncontrolled emission. These residual emissions and the "uncollected" emissions described above are additive.

In the process of controlling the collected landfill gas, devices such as flares, engines, turbines, and boilers themselves generate air pollutant emissions,[27] referred to as "secondary emissions." Pollutants generated by these control devices include nitrogen oxides, (NO_x) carbon monoxide (CO), sulfur dioxide (SO_2), hydrogen chloride (HCl), carbon dioxide (CO_2), and particulate matter (PM),[27] as well as volatile organic compounds (VOC). In addition, there is specific technical evidence that these combustion devices produce and emit dioxin emissions as well.[28,29] Finally, heavy diesel equipment used on site to grade, compact, and cover landfilled MSW emits the same air pollutants.[30,31]

The key design requirement is directed towards groundwater protection, and necessitates, in most cases, a composite liner be placed below any new or expanded landfill unit, and that the leachate be collected. The Part 258 regulations also require monitoring wells to detect groundwater contamination. Should contamination by specified organic and metallic pollutants be detected, then corrective action is mandated.

The principal operating requirements include:

- Daily earthen covering of landfilled MSW
- Vector control
- Methane gas monitoring; corrective action if explosive levels are found
- Control of stormwater runoff
- Compliance with the State Implementation Plans (SIP), under the Clean Air Act

Finally, the regulations have landfill closure and post-closure provisions, namely a requirement for "capping" the closed landfill with an earthen layer, and for groundwater and methane gas monitoring for 30 years following closure. Many states began implementing these same types of requirements for landfills, well before US EPA promulgated national regulations.

While US EPA has formally promulgated regulations under RCRA that address the traditional environmental concerns with landfills, emissions from landfills of air pollutants covered by the Clean Air Act (and its amendments) remain not specifically regulated on a national level. What is more, states have not traditionally regulated landfill air pollutant emissions through their air quality control agencies either. In fact, US EPA searched and identified only one such state (California); 26 other states do regulate landfill air emissions, but under solid waste regulations.[33]

In 1991, US EPA took the first steps toward correcting this regulatory deficiency. US EPA issued proposed rules that would, for the first time, specifically regulate air pollutant emissions from landfills on a national basis.[34] In particular, US EPA proposed New Source Performance Standards (NSPS) for new MSW landfills under Section 111(b) of the Clean Air Act (CAA), and emissions "guidelines" for existing landfills under Section 111(d) of the CAA. US EPA's proposed standards of performance are based on its determination under Section 111 of the CAA that landfills constitute a category of stationary emission source which "...causes, or contributes significantly to air pollution which may reasonably be anticipated to endanger public health or welfare.[35]

Rate (LAER) controls, and emissions offsets. For existing facilities, requires Reasonably Available Control Technology (RACT).

- Maximum Available Control Technology (MACT) for HAPs – Title III of the 1990 CAAA. US EPA to promulgate MACT standards for MSW landfills by November, 1997.[39] MACT applies if a landfill emits any HAP in excess of 10 TPY, or multiple HAPs in aggregate exceeding 25 TPY. Of the over 100 toxic air pollutants EPA has documented to be present in landfill gas, a number are on the US EPA list of 189 HAPs regulated under Title III (acetaldehyde, acrylonitrile, benzene, ethyl acrylate, ethylchloride, ethylene oxide, formaldehyde, methanol, methyl chloride, phenol, propylene oxide, styrene, toluene, vinyl chloride, and xylenes).

- Federal Operating Permit – Title V of 1990 CAAA. Permit required for any emission source subject to the CAA.

US EPA and most state regulatory agencies presently do not require MSW landfills to comply with these requirements of the CAA and its 1990 amendments. Apparently, the technical basis for requiring compliance is not adequately recognized by regulatory agencies. The applicability of these provisions of the CAA will be demonstrated quantitatively below for the case of the landfill that serves New York City.

THE FRESH KILLS LANDFILL – NEW YORK CITY

In this section, the significance of landfill environmental emissions is illustrated for the case of the Fresh Kills Landfill in New York City. A quantitative demonstration is made that air pollutant emissions from that landfill are large enough to warrant serious scrutiny under the CAA and its 1990 amendments.

Landfill Description

As described by the New York City Department of Sanitation (NYCDOS), the Fresh Kills Landfill is the only MSW landfill serving the five boroughs of New York City.[40] The City has been disposing MSW in the Landfill since 1948.[40] Most of the City's residential MSW is collected by NYCDOS and disposed at the Fresh Kills Landfill.[6] Commercial MSW is collected privately in the City, and is exported from the City for disposal.[6]

April 1992; and #3, November 1993).[44] This supersedes previous Consent Orders executed in 1980 and 1985.

Some key requirements of the 1990 Consent Order (and its modifications) are as follows:[53]

- State Permit Applications – must be submitted to DEC by March 1995, for active portions of the Landfill, to include a solid waste permit (DEC "Part 360" permit), treated-leachate discharge permit (SPDES), and a tidal wetlands permit. The applicability of Federal and DEC air-permitting regulations was *not* addressed by the Consent Order.
- Daily Cover Requirements
- Litter Control Program
- Odor and Dust Control Programs
- Hydrogeological Study
- Long-Term Ground Water Monitoring Program
- Leachate Impact Study – on nearby surface waters and the sediment below
- Long-Term Surface Water Monitoring Program
- Leachate Collection and Treatment System – for the active sections of the Landfill, intended to collect at least 80% of the leachate.
- Landfill Gas Monitoring Program – to ensure gas does not reach explosive limits
- Landfill Gas Control System
- Ambient Air Monitoring – co-funding a DEC monitoring program to characterize the impact of air pollutant emissions from the Landfill on Staten Island's air quality. (Consent Order Modification #2)
- Closure Designs – for all Landfill sections

	Maximum Daily Concentration (mg/L)	Annual Average Concentration (mg/L)	SPDES Daily Limit (mg/L)
Ammonia	4,960	519	20.00
Phenols	158	0.54	0.30
Cyanide	0.21	0.04	0.01
Lead	4.9	0.14	0.20
Aluminum	183	3.18	1.80

Leachate with these pollutant concentrations is entering the environment today. Clearly, leachate pretreatment is needed to enable the leachate to meet the SPDES discharge limits.

NYCDOS commissioned a hydrogeological study of the Landfill, which showed that most of the leachate generated by the active portions of the Landfill does not flow downward towards groundwater, but rather, moves laterally into adjacent surface waters.[60] Landfill Section 6/7 is estimated to generate 310,000 gallons per day of leachate, and Section 1/9 about 590,000 gallons per day.[61] Groundwater modeling indicates that only five percent of the leachate from Section 6/7 moves vertically downward towards groundwater, and only 15 percent of the leachate from Section 1/9 does likewise.[60,61] Nonetheless, NYCDOS has found evidence that leachate has contaminated the groundwater below portions of Section 1/9, but noted that the groundwater there is already nonpotable because of salt water intrusion.[60]

NYCDOS commissioned studies to directly measure the impact of leachate migration on surrounding surface waters and on sediment-dwelling organisms (e.g., worms).[62] The study also included bioassay analyses, in which various aquatic organisms (e.g., fish) were exposed to leachate from the landfill.[62] Results of these studies showed that:[62]

- Landfill leachate is causing measurably elevated levels of ammonia and some metals in nearby surface waters – specifically in Main Creek and Richmond Creek.
- No discernable effect of landfill leachate on sediment-dwelling organisms was observed.
- Based on the bioassays, ammonia levels in the leachate can be detrimental to aquatic life.

- Section 3/4 – On the boundary between Section 3/4, and the residential community of Travis. This is in the general area southeast of the intersection of Route 440 and Victory Boulevard.

The report documenting these measurements of gas migration recommended that mitigative steps be taken[66].

As noted previously, the gas from a small portion of the Landfill is presently collected, treated, and sold to an off-site utility company. In response to the Consent Order, NYCDOS has installed gas collection and venting trenches to vent all gas migration pathways from the entire Landfill.[65] NYSDEC also operates a landfill gas monitoring system per the Consent Order to ensure methane gas concentrations do not reach explosive levels.[42] Finally, NYCDOS is presently in the process of procuring and implementing systems intended to control gas collected from the entire Landfill.[9]

Ambient Air Quality Monitoring

Continuing odor problems with the Fresh Kills Landfill have raised community concerns as to whether toxic air pollutants may also be emitted that are causing adverse health effects.[54] In response, NYCDOS and DEC are jointly funding a one-year air monitoring study to characterize air quality on and near the Landfill. As described by DEC[67], the program entails five monitors operated on the Landfill, four just off site in the neighborhoods, and two at greater distances. Pollutants monitored will include specific VOC's of concern for health (e.g., benzene, toluene), polar compounds (e.g., formaldehyde, hydrogen sulfide, acetonitrile), toxic metals, particulate matter and methane. DEC reports[68] that data from this monitoring program, along with data from other studies of environmental quality on Staten Island, will be used by the Federal Agency for Toxic Substances and Disease Registry (ATSDR) to address the health risks associated with exposure to the Landfill and other air pollutant emitters in the Staten Island region.

Air Pollutant Emissions

As will be detailed below, air pollutant emissions from the Fresh Kills Landfill have been quantified, and are shown to exceed, by a wide margin, regulatory thresholds established under the Clean Air Act (CAA) and its 1990 amendments (1990 CAAA).

- L_o, the methane generation potential (A value of 5441 ft^3 CH_4/Mg MSW was assumed to apply for MSW in place in the Fresh Kills Landfill, based on a value determined specifically from gas testing at the Fresh Kills Landfill in 1992.[72] For MSW to be landfilled after 1994, the average [default] value within US EPA's model was used; i.e., 4953 ft^3/Mg.[71,72,73])

- NMOC concentration in landfill gas (A value of 1532 ppmdv, as hexane, was assumed for MSW now in place, based on US EPA proposed guidance,[73] and 1398 ppmdv for MSW to be landfilled after 1994.[73]

- Gas collection system efficiency (US EPA has estimated 50-75 percent; 75 percent efficiency was conservatively assumed for this model application)

- Control device efficiency (a 98% control efficiency for thermal destruction of NMOC in landfill gas was assumed for the control device; e.g., flare, engine, turbine)

Secondary emissions from the control device were estimated using emission data given by the California Air Resources Board (CARB),[74] except for dioxin. Dioxin emissions were based on test data reported in the literature.[28] For on-site diesel equipment, emissions were based on US EPA emission factors,[31] except for dioxin. Dioxin emissions were estimated for on-site diesel equipment, based on tested dioxin emissions from diesel trucks in Norway, with those test data adjusted by others to reflect a lower operating load than highway trucks.[29,30] For the diesel equipment, the assumption was made that approximately 15 horse-power-hours are needed to process a ton of MSW at a landfill.

Future Landfilling Scenarios Considered.

Based on the most recent estimates by NYCDOS, the following summarizes the past and projected future quantities for MSW landfilling at the Fresh Kills Landfill,[9] beginning in 1977. Estimates are given by Landfill Section Number, and for the Landfill in total.

Landfill Closure (2015), for an intermediate date (2003), and for a year (2046) that is over 30 years beyond the assumed closure date.

The VOC emission rates reflect contributions from "uncollected" and residual emissions of landfill gas, as well as from on-site diesel equipment. NO_x and CO emissions included contributions from the on-site diesel equipment, as well as the gas control devices. Regarding the latter, emission rates are given for three different control devices – flares, engines, and turbines. NYCDOS is presently procuring and implementing gas-control systems to serve the entire Landfill. Those systems would be expected to use one or more of these types of control devices.

Referring to Table 1, clearly, the emission rates of VOC, NO_x, and CO are large for all three Landfill Cases. The emission rates are hundreds to thousands of tons per year through the assumed date of Landfill closure (2015), and are still hundreds of tons per year over 50 years from today (year 2046).

These emission rates can be put in perspective by comparison with regulatory thresholds established under the Clean Air Act (CAA) and its 1990 Amendments (CAAA). For example, under the CAA, any new emissions source with emissions of NO_x, CO (or certain other pollutants) in excess of 250 TPY, is deemed a "major stationary source," subject to Federal air-permitting requirements; i.e., a Prevention of Significant Determination (PSD) preconstruction permitting review. Presume for purposes of illustration that the Fresh Kills Landfill is a new source of emissions (in reality, it is a continuing existing source), and that it is located in an area where ambient air quality standards are not exceeded (in reality, New York City is nonattainment). With this presumption, it is clear that emissions of NO_x and of CO would each exceed the 250 TPY threshold. Further, the PSD permitting threshold is exceeded for all three Landfill Cases studied, and for all years from 1994 through at least 2015. Exceeding the threshold for only one year, in principle, is sufficient to trigger PSD permitting. Thus, if the Landfill were being newly proposed, the emission rates should trigger PSD permitting, which entails application of Best Available Control Technology (BACT), air quality impact modeling, and potentially, preconstruction air-quality monitoring.

In reality, the Fresh Kills Landfill is an existing emissions source, not a newly proposed project. But, such existing emissions sources can also be subject to PSD permitting, if a future *increase* in emissions is projected over existing baseline levels, and the *increase* exceeds the 250 TPY threshold. Table 2 shows 1993 baseline levels of VOC, NO_x,

VOC and NO_x from the Landfill appear subject to RACT requirements.

US EPA regulates Hazardous Air Pollutants (HAPs) under Title III of the 1990 CAAA. Should any new or existing emissions source emit any single HAP in excess of 10 TPY, or multiple HAPs in aggregate exceeding 25 TPY, then that emitter is a major source of HAPs. New and existing major sources of HAPs are subject to Maximum Available Control Technology (MACT) requirements. US EPA plans to promulgate MACT standards for landfills by 1997. As detailed previously, a number of regulated HAPs are known to be present in landfilled gas. In Table 3, estimated emission rates are shown for several HAPs. In addition, dioxin (PCDP/PCDF) emissions are shown, as produced by the on-site diesel equipment, and by the gas control equipment. From Table 3, the Landfill is shown to be a major source of the HAPs, xylene, toluene, and dichlorethene, since emission levels exceed the 10 TPY threshold for those individual HAPs. Such is true for all three Landfill cases studied. Also, the emission rate of all HAPs in aggregate exceeds the applicable 25 TPY threshold by a substantial margin. This demonstrates that the Fresh Kills Landfill is a major source of HAPs, and, therefore, appears to be subject to MACT requirements.

Under Title V of the 1990 CAA, a Federal Operating Permit must be obtained, and periodically renewed, by every emissions source subject to any provision of the CAA, as amended. As demonstrated above, a number of major requirements of the CAA and the 1990 CAAA are shown to apply to the Fresh Kills Landfill. Thus, the Landfill appears suspect to the requirement to obtain a Title V Operating Permit.

In summary, the Fresh Kills Landfill has been demonstrated quantitatively to be a major source of emissions of VOC, NO_x, CO, and HAPs, as defined by US EPA. As such, the Landfill appears subject to a number of key requirements of the CAA and the 1990 CAAA.

environment. Landfill emissions of VOC and NO_x exacerbate violations of the ambient standard for ozone. Emissions of Hazardous Air Pollutants (HAPs); e.g., vinyl chloride and benzene, pose a risk of cancer and other disease. Emissions of methane contribute to global warming under the greenhouse theory.

- US EPA has proposed new regulations that would, if promulgated, begin to regulate these air pollutant emissions, for the first time. Historically and at present, however, these emissions are going essentially unregulated at the Federal and state levels.

- Gas control devices (e.g., flares, engines), as well as diesel equipment (used on site to grade, compact and cover landfilled MSW) are sources of dioxin emissions at landfills.

- Large MSW landfills can have substantial emission rates of air pollutants. To illustrate this, emissions from the Fresh Kills Landfill were estimated. Projected emissions of VOC, NO_x and CO were in the range of hundreds to thousands of tons per year, as projected to year 2015 and beyond. HAPs, in aggregate, were projected to be emitted in the hundreds of tons per year. Only seven HAPs were evaluated here, of the more than 100 HAPs identified by US EPA as being present in landfill gas.

- These emission levels have extremely important regulatory implications. The emissions levels of these pollutants from the Fresh Kills Landfill (and by extension, other large landfills) exceed major-source thresholds set under the Clean Air Act (CAA), as amended. Accordingly, the Fresh Kills Landfill (and other large landfills) appear subject to a number of major requirements of the CAA, including obtaining a Federal "PSD" air permit for construction (BACT, air modeling), New Source Review in a Non-Attainment Area (LAER, offsets), imposition of MACT controls for emissions of HAPs, and obtaining a Federal Operating Permit.

- There are four contributors to air pollutant emissions, when landfills are viewed as a "stationary emissions source." Those are "uncollected" emissions (pollutants in the gas that escapes capture by the landfill gas collection system),

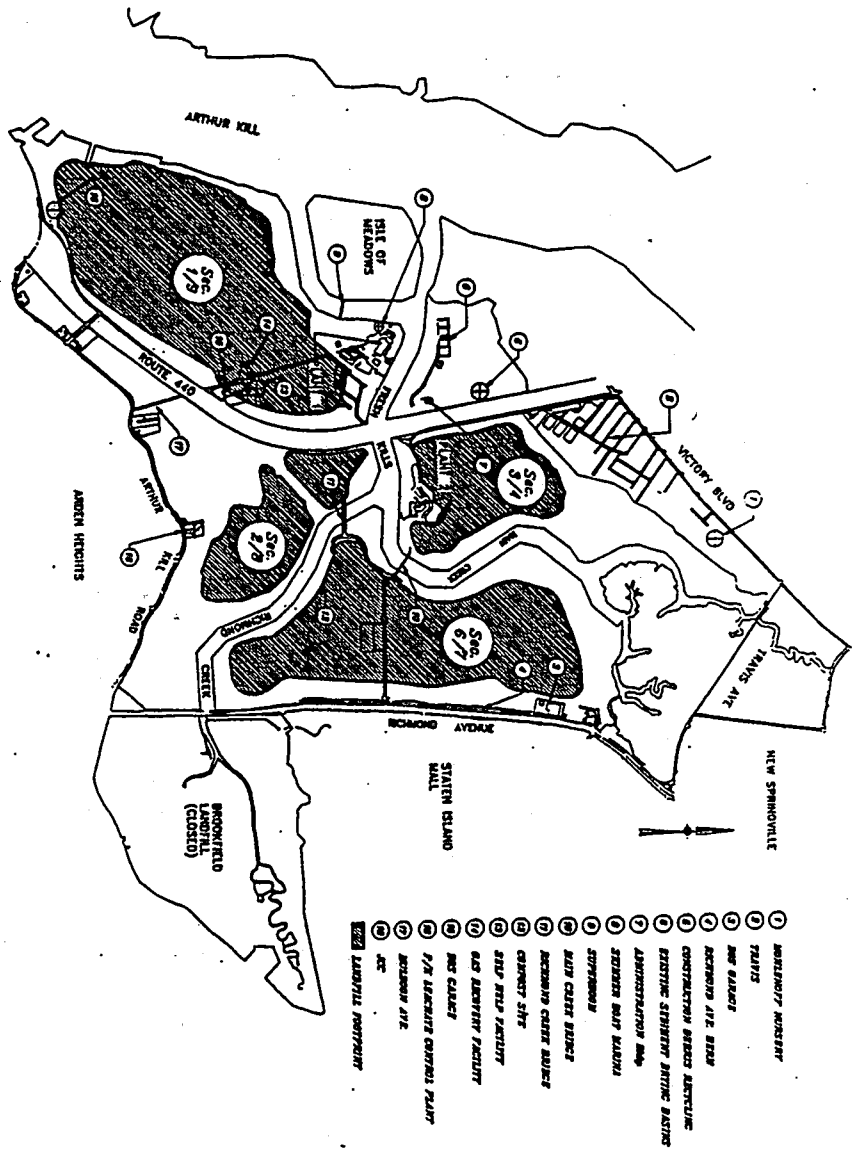


Figure 1 — Fresh Kills Landfill, New York City

Table 2

INCREMENTAL CHANGES IN ANNUAL EMISSIONS OF VOC, NO_x, AND CO, AFTER BASELINE YEAR, 1993

Landfill Case[1]	Comparisons to Baseline	Change in Annual Emissions (TPY)		
		NMOC (VOC)	NO_x[3,4]	CO[3,4]
Case 1	1993 Baseline	4,610[2]	935[3]	217[3]
	1994 vs. 1993	(-)3,511	(+)176 to 1,884	(+)358 to 2,242
	2003 vs. 1993	(-)3,309	(+)218 to 2,323	(+)441 to 2,766
	2015 vs. 1993	(-)3,121	(+)256 to 2,736	(+)519 to 3,257
Case 2	1993 Baseline	4,610	935	217
	1994 vs. 1993	(-)2,941	(+)176 to 1,884	(+)358 to 2,242
	2003 vs. 1993	(-)2,881	(+)188 to 2,007	(+)381 to 2,389
	2015 vs. 1993	(-)2,847	(+)198 to 2,113	(+)401 to 2,515
Case 3	1993 Baseline	4,000	935	217
	1994 vs. 1993	(-)3,511	(+)176 to 1,884	(+)358 to 2,242
	2003 vs. 1993	(-)3,587	(+)173 to 1,845	(+)350 to 2,196
	2015 vs. 1993	(-)3,633	(+)168 to 1,793	(+)340 to 2,134

1. See Table 1 and text for Case definitions.
2. Baseline NMOC emissions (1993) reflect the present situation of no control of collected gas (except for gas from a small portion of the Landfill). Gas control systems to serve the entire Landfill are presently in procurement and implementation by NYCDOS. Thus, NMOC emissions decreases are projected from 1994 forward.
3. Baseline emissions (1993) of NO_x and CO result from on-site diesel equipment only. The emissions increases from 1994 forward result from the added emissions from the gas control systems presently being procured and implemented.
4. Range of emission increases covers the choice of gas control devices (flare, engine, turbine). See Table 1.

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EXH. 69

☑ Emissions

Comparing Air Emissions from Landfills and WTE Plants

Simplistic ideas about health effects are leading to misguided decisions about solid waste management alternatives. Risk analysis shows that WTE plants may be better than they are often perceived in comparison to landfills. This investigation suggests the importance of assessing the effects for all MSW technologies to assist decisions about integrated waste management.

By Kay H. Jones

The two alternatives that occupy the bottom positions in the Environmental Protection Agency's waste management hierarchy waste-to-energy and landfilling–rarely get truly comparable consideration. This may be due to a *perception* by the general public that the health and environmental effects of WTE are of greater consequence than for landfills.

My studies indicate that this perception is incorrect. The side-by-side health risk estimate presented here, comparing a new landfill to a new mass burn WTE plant shows that WTE plants may be a better choice than landfills for minimizing health risks and environmental effects. More important, however, the results also suggest it is time for communities and regulatory agencies to apply similar comparative assessments to each component of an MSW management plan *before* putting rigid hierarchical thinking into practice. This article (and similar investigations) should not be used to reverse, change, or finalize thinking that one technology is better than another. Instead, they should be used to "level the playing field," broadening how communities look at MSW management options, rather than to allow continuing misperceptions to control the choice of favoring one technology over another.

Kay H. Jones, PhD, is president of Zephyr Consulting, Seattle, Washington. Dr Jones has been conducting risk assessments on WTE alternatives for more than ten years, and has been a consultant and/or expert witness on more than 30 waste projects.

☑ Peer Reviewed
This article has been evaluated and edited in accordance with reviews conducted by two or more professionals who have relevant expertise. These peer reviewers judge manuscripts for technical accuracy, usefulness, and overall importance within their field of solid waste management.

Current Practice Under the Hierarchy

Most recycling (and composting) projects move forward without any formal health or environmental assessments similar to those that WTE plants or landfills must go through. The lack of assessments is partly due to a perception that recycling is a no-risk strategy. However, the lack of assessments leaves a major knowledge gap that needs attention. One comparative health risk assessment I conducted, for instance, shows that MSW composting is not a zero risk methodology, and can present a *greater* health risk than WTE.[1]

In the past, health risk concerns about landfilling have centered on the potential for groundwater contamination. Better siting and facility design and engineering (with liners and leachate management) have lessened the potential problems, but haven't resolved them entirely.

Air emissions from landfills also can negatively affect health and the environment. Characterizing and quantifying these effects has begun, but further investigation is needed. Unlike the scant health and environmental data available from recycling facilities, there is a modest and growing data base on landfill air emissions. Recent state and federal regulatory activities, plus the development of dozens of landfill gas-to-energy projects, have helped to build an emissions profile. For instance, to develop the background for the New Source Performance Standards proposed in May 1991, the Environmental Protection Agency compiled emissions data for 22 landfills.[2,3,4] EPA's data from 13 of these facilities includes emissions associated with using gas control systems, such as flares, internal combustion engines (ICEs), and gas turbines. A testing program of the California Air Resources Board (CARB) also helped to extend considerably information on landfill gas composition.[5]

Health risk concerns about WTE plants have centered on air emissions, but there is also a concern about the potential for groundwater contamination from disposal of WTE ash in landfills or monofills. The relative risk of contamination due to ash filling is less than for raw waste landfills because of leachability considerations.

A few researchers have conducted limited risk assessments that compare emissions from landfills and WTE facilities.[6,7] These assessments generally analyzed the emissions from the landfill surface, but have not considered emissions associated with gas control devices. Yet, because some of these devices emit carcinogens, the risks should be calculated and considered along with other issues during the planning and siting of waste facilities.

Risk Assessment Concepts

Risk assessments focus primarily on cancer risks and typically attempt to estimate a worst-case exposure to carcinogens released by the facility. They attempt to account for all of the pathways by which each pollutant might affect a hypothetical individual residing in the location where the exposures are the highest. This person is called the Maximum Exposed Individual (MEI). Risk assessments usually state results in relative terms of chances per million of cancer risk at the MEI location caused by a lifetime of exposure (70 years) to facility emissions. This *relative* risk concept is a very important distinction from actual cancer risk, which is based on observed rates in the general population. By contrast, relative cancer risk is determined by employing models that have common input data. The results of such analyses are strictly an index of relative risks upon which risk management decisions depend.

Setting Up A Comparison

This analysis compares the principal health risks, and some of the environmental risks, associated with the air emissions from a hypothetical landfill and a WTE facility of equal capacity.

This analysis takes the conventional risk assessment approach, focussing primarily on cancer risks. A comprehensive review of *all* the expected or potential pollutants from the landfill and WTE options is beyond the scope of this article. However, the pollutants selected for review contribute the lion's share of the risk burden associated with these facilities. Dioxins are responsible for over 90 percent of the total calculated cancer burden from WTE plants. This analysis also includes other air toxics such as benzene and vinyl chloride that add to the cancer burden.

The landfill calculations include risks from emissions not captured by gas collection systems plus the emissions from the gas control systems. Landfill gas systems typically capture between 60 and 85 percent of the gas generated. EPA considers 75 percent capture achievable, so this was the basis for calculations used in this analysis.[3] Thus, risks are based on pollutants in the 25 percent uncontrolled landfill gas and the pollutants emitted from the systems controlling 75 percent of the landfill gas.

Beyond the health risks, this analysis also reviews some emissions that affect the environment, such as non-methane hydrocarbons (NMOCs), carbon dioxide, and nitrogen oxides (NOx).

Table 1 summarizes assumptions used in this comparison of two hypothetical 1,500-ton-per-day facilities. The landfill meets the proposed New Source Performance Standards (NSPS) for air emissions (i.e., 98 percent destruction of the captured hydrocarbon emissions). The WTE facility meets the existing NSPS for municipal waste combustors. The landfill operates for 30 years, which is the same as the life span normally assumed for WTE facilities. Although the depths of landfills can vary widely, the 24-foot depth used in this study is consistent with the model EPA used in their NSPS documentation.

The facilities are sited at the same geographical location, so that air emissions dispersion could be modeled using the same meteorological data. I assumed that flat terrain exists, although terrain effects can be and are assessed in actual cases on a site specific basis.

Table 1. Assumptions in Risk Assessment Comparison.

Facility	Landfill	WTE Plant
Size	1500 TPD	1500 TPD
Operational life	30 years	30 years
Population served	750,000	750,000
Depth of MSW	24 feet	—
Compaction	650 kg/m³	—
Area	1732 m x 1732 m	—
Gas Collection Efficiency	75%	—
Stack height	—	67 meters*
Pollution Control	None	Spray dryer/ Fabric filter

* Includes plume rise. — indicates not applicable.

Data Sources

Emissions data for the WTE case were obtained from available compliance test reports and other literature sources. The WTE dioxins emissions factor used was 0.1 nanograms/cubic meter (ng/m³) Toxic Equivalents, which is slightly above the geometric mean of the available data on 12 state of the art WTE facilities in the U.S.[9] Emissions regulations and facility permit limits in the U.S. are typically based on total dioxins and furans. However, in doing risk assessments, the risks from these emissions are calculated as Toxic Equivalents of 2,3,7,8 dibenzo-p-dioxins using the International CCMS Methodology.

To quantify dioxins emissions from landfill gas control devices for this investigation, I used measurements reported in a study of emissions from flares and ICEs in Germany.[9] The German data was used since quantitative dioxin emissions data from controlled landfills in the U.S. is nonexistent. CARB used low resolution mass spectrometry in analyzing samples during three testing campaigns previously cited. They detected furans, but could not quantify dioxins. Since dioxins and furans are always collectively emitted from combustion sources; and since dioxins and furans have been identified and quantified in mobile ICEs; there is sufficient support to believe they are present in the landfill gas combustion system exhaust gases.[10,11,12]

The landfill air emissions factors for pollutants besides dioxins were taken from EPA and CARB reports. The physical parameters (such as stack height, gas flow, etc.) for the gas destruction devices were taken from three CARB emissions test reports.[13,14,15]

Landfill gas is about half methane and half carbon dioxide with minimal amounts of other gases, including air toxics of concern such as benzene and vinyl chloride. Table calculations were based on a methane generation potential of 140 cubic meters per megagram (m^3/Mg) of MSW and a methane generation rate constant of 0.031. These values represent the average for the range of observed data reported by EPA.[4] There is some question about the representativeness of the EPA data because most the data is from landfills located in

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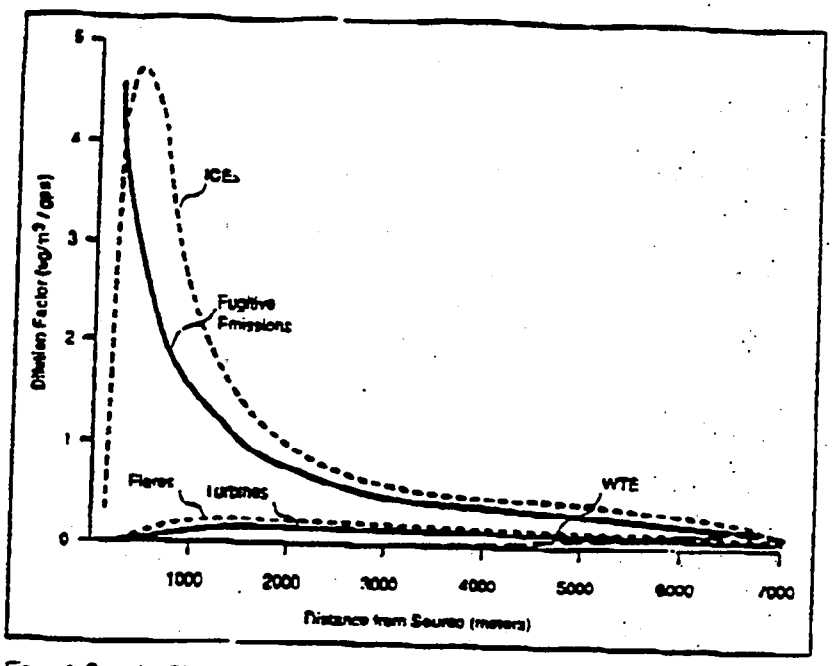


Figure 1: Emission Dilution factors for a WTE plant and three landfill gas control options. This plot shows the range of distances from the various sources where emissions have a measurable effect. It also identifies the location of the maximum exposed individual (MEI).

drier California climates. Landfills located in wetter climates would likely decompose faster and hence generate higher peak year and average gas flows. This in turn would increase the estimated off-site exposures to air toxics.

One caveat must be considered when using historical landfill gas toxic air pollutant composition data. It is possible that future landfills will have "cleaner" gas profiles because more communities are setting up programs to collect and manage some toxic constituents in MSW. The same caution applies to the use of current WTE emissions factors. In particular, trace metals emissions are clearly dependent upon waste stream composition.

To make an equitable comparison of potential exposures from landfill and WTE air emissions a common exposure period must be established. Thirty years of facility operation and a 70-year life is assumed. The hypothetical lifetime risks from WTE accumulate in the first 30 years, but for the risk assessment are calculated as though they would occur spread throughout 70 years. After the WTE plant ceases 30 years of operation, the only remaining risks are from those pathways that involve contact by humans or animals with the soil that was contaminated during plant's operating life. This analysis ignores this residual risk, which would add only a few percent of additional risk to the operating period risk. The landfill is projected to generate landfill gas for more than 110 years. For this analysis, the risk burden from the landfill is based on the average of the first 70 years of emissions. The remaining 40 years of risk

Table 2: Dilution Factors and MEI Locations for the WTE and Landfill Air Emissions

Disposal Options	Effective Stack Height (meters)[1]	Dilution Factor (ug/m³gps)
WTE Stack	87	0.0127
Landfill surface	0[2]	7.5
Landfill flare	40	0.215
Landfill ICE	13	4.67
Landfill turbine	58	0.164

[1]Effective stack height = actual stack height and plume rise under stable conditions
[2]Effect of possible gas temperature related buoyancy was assumed to be negligible

gps = grams per second

Table 3: Comparing Cancer Risks from Dioxin Emissions, WTE vs. Landfills

Disposal Alternative	Emissions Rate*	Cancer Risk (chances/million) Inhalation	Multi pathway**
WTE	7.57×10^{-9}	0.0019	0.07
Landfill flare	0.73×10^{-6}	0.0070	0.25
Landfill ICE	0.34×10^{-6}	0.072	2.53
Turbine	ND	—	—

*Emission rate is grams per second, in Toxic Equivalents; ND = Not detected
**The table's multipathway total is calculated by multiplying the inhalation risks by 35. This ratio is based on estimates used in a risk assessment for a WTE plant sited in rural Montgomery County, Maryland. The risk assessment considered the consumption of locally grown produce and meat and dairy products.

burden is hypothetically passed on to the next generation.

The pathways of exposure include direct exposure through stack emissions and indirect exposure through contaminated soils and foodstuffs. For dioxins, the principal human exposure is through consumption of beef and dairy products from locally raised animals. These animals accumulate dioxins primarily by eating fodder on which dioxins have deposited from the air. According to a risk assessment conducted for the Montgomery County, Maryland, WTE facility, the distribution of estimated dioxin/furan risk was: beef and dairy intake, 87.1 percent; vegetable consumption, 5.1 percent; dust ingestion, 4.6 percent; inhalation, 2.8 percent; fish intake and other routes, less than 1 percent.[16]

Table 4: Cancer Risks (chances per million) from Inhalation of Benzene and Vinyl Chloride Emissions from WTE and Landfill Facilities

Disposal Option	Benzene	Vinyl Chloride
WTE	0.00023	ND*
Landfill surface	4.8	13.6
Landfill flare	0.0022	0.00
Landfill ICE	3.4	0.51

*Not detected in emissions test

Dispersion Modeling of Emissions

The exposure for the Maximum Exposed Individual (discussed in accompany box) is calculated by first quantifying the annual average emissions from a facility, then determining by which routes or pathways an individual might be exposed to the pollutants. The MEI exposure is estimated based on how the emissions are dispersed from the stack. Factors such as stack height, wind direction, wind speed, and vertical mixing are considered in this dispersion modeling. Rainfall and emissions particle sizing are added considerations when estimating the level of soil and vegetation contamination. Due to its taller stack, for instance, the WTE plant has an MEI location much farther from the source (as illustrated in Figure 1), and the dilution factor is much greater.

Our analysis used an EPA dispersion model (ISCST2) and five years of meteorological data from the Seattle Tacoma International Airport (SEATAC).[17] The representativeness of the SEATAC results were tested by also modeling data from Hanford in eastern Washington. Hanford is in an entirely different geographical region with different meteorological conditions. The additional modeling yielded similar results and dilution factors, suggesting that the *relative* risk estimates are not heavily dependent on geographical location.

Table 2 shows the dilution factors and distances from the facility to the MEI location for the five scenarios. Figure 1 plots the dilution factors versus distance from the various sources. These data suggest the following:

—For the same emission rate of any pollutant, the risk is the highest for the ICE gas control option regardless of the distance from disposal site.

—Emissions which emanate from the landfill surface have much higher relative effects close to the landfill. These fugitive emissions (not captured by the control system) add effects to those for gas control devices at MEI locations.

—The number of persons at risk is much higher for all of the landfill fugitive and gas control cases than for the WTE plant, if the emissions rate for any given pollutant is the same. The figure shows, for example, that the WTE plant emissions affect people residing between 3,000 and 7,000 meters away from the facility, while the ICE affects people beginning less than 100 meters away. This assumes a uniform population density surrounding the two disposal options. Of course, uniform population density may not be the most likely scenario. Many landfills are sited in remote rural areas, while many WTE plants are sited in urban areas. And such siting practices will influence the comparative risks. For example, if a WTE plant is sited in an urban area, the total dioxin related risk drops dramatically because the beef and dairy pathway would not exist.

Table 5: Relative Cancer Risks from MSW Disposal Options and Other Activities

Chances per Million	Activity
5,000	Average household exposure to radon[1]
4,640	Pesticide residue on fresh foods[2]
720	Consumption of 1/2 pound of fish per week from Lake Ontario[3]
250	Peanut butter consumption by children, due to aflatoxin contamination[4]
180	Acceptable benzene levels[5]
20	Average diagnostic medical X-ray[6]
18	1500 TPD landfill fugitive benzene and vinyl chloride emissions inhalation only
11	MSW compost dioxin/furan exposure
10	Acceptable Ambient Level of inhalation exposure only, State of Maryland[7]
4	Frequent flyer radiation exposure 20,000 miles/year[8]
2.4	Drinking and showering with chlorinated water[9]
0.07	WTE 1500 TPD dioxin/furan emissions, all pathways

[1]Average radon level in homes (test data), EPA guideline level.
[2]National Research Council, National Academy of Science, 1987.
[3]New York State Department of Health, EPA Toxicity Factors, 1985.
[4]Wilson and Crouch, *Risk/Benefit Analysis*, 1982.
[5]Philadelphia AMS Guideline, EPA Toxicity Factor.

Health Impacts

The estimated total dioxin/furan cancer risks for the landfill and WTE scenarios

are shown in Table 3. The encouraging result is that the total cancer risk from dioxins for all of the management scenarios is very low—and below EPA's acceptable Superfund multipathway guidance of one chance in 10,000. Even so, the two landfill gas control options pose far more risk than WTE emissions. The flare poses 3.6 times the WTE risk and the ICE poses 36 times the WTE risk.

HAPS Results

The Clean Air Act Amendments of 1990 listed 189 pollutants as Hazardous Air Pollutants (HAPs), and specified both an emissions threshold of 10 tons per year for any one HAP and a combined threshold of 25 tons per year for two or more of the listed HAPs. If these thresholds are exceeded, Maximum Available Control Technology (MACT) must be employed. This new emphasis on such a range of pollutants has created a need to identify emissions levels and possibly trigger a requirement to control HAP emissions at new and existing facilities.

Over 30 of the listed HAPs have been identified in uncontrolled landfill gas. Estimates using the EPA data base indicate that an uncontrolled 1,500 TPD landfill would emit a total of more than 60 tons per year of just seven of the HAPs with the highest average uncontrolled gas concentrations. The estimates are for the peak year of gas generation in the landfill. By comparison, a 1,500-TPD waste-to-energy facility is estimated to emit only 15 of the listed HAPs and a total of 2.4 tons of HAPs annually. The WTE plant would emit only trace amounts of dioxins and PCBs, two other organics (benzene, and aldehydes), and less than 1.5 tons per year total of eleven of the listed metals. None of the HAP pollutant emissions from WTE plants approach the guideline control levels.

Two HAPs with assigned human cancer potency factors and the highest emission rates, benzene and vinyl chloride, were assessed in this study. Table 4 shows the comparative cancer risks from inhalation for these pollutants. (There were no emissions factors available for turbine landfill gas combustion.) Similar to dioxin cancer risks, the relative risks associated with the landfill option are far greater—from 10 times to 20,000 times higher—than for the WTE option. The total cancer risk for the uncontrolled landfill benzene and vinyl chloride emissions exceeds 10 chances per million, the acceptable threshold for

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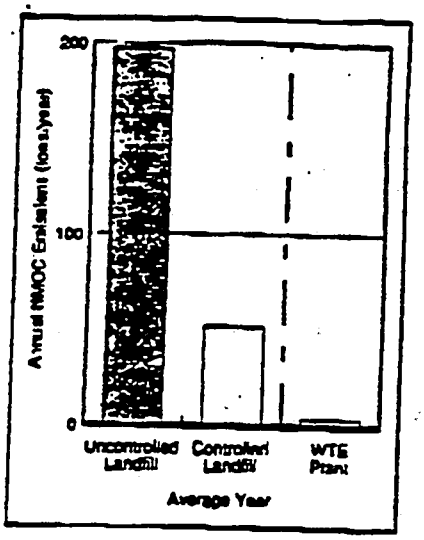


Figure 2: Comparison of Annual NMOC Emissions (tons per year) from a 1,500-TPD landfill and a 1,500-TPD waste-to-energy facility

inhalation risk in many states. Under existing California legislation, for example, such an exceedance requires public reporting. And in the state of Washington, a detailed risk/benefit analysis is required if the risk exceeds 10 chances per 100,000.

The results of this analysis do not suggest that the risks associated with the alternatives discussed are necessarily unacceptable. That is, while the risks for landfill options are higher than WTE plants, the risks for all of the options are quite low and may still compare favorably to everyday unrecognized involuntary risks (see Table 5).

Environmental Impacts

A proper comparison of air emissions from landfills and WTE facilities must consider more than just risk from carcinogenic pollutants. Non-methane hydrocarbon (NMOC) emissions, for instance, are a major public concern because they can be significant contributors to ozone loading in non-attainment areas. Figure 2 shows the estimated annual NMOC emissions from controlled and uncontrolled 1,500-TPD landfills in comparison to average annual emissions for the same size WTE plant.

Table 6 shows the comparative CO, NMOC, NOx and dioxin/furan emissions (on a common Btu basis) for the flare, ICE, and turbine gas control technologies versus the most likely emissions from a new WTE plant. In all cases, except for the flare and turbine NOx emissions factors, the WTE plant emissions are the lowest. The table also indicates that WTE facilities have regulatory limits (e.g., dioxin/furan emissions in the last column) that other facilities are not required to meet.

Based on these figures, it appears that a 1,500-TPD landfill proposed in an ozone non-attainment area should have to undergo Nonattainment Area New Source Review (NANSR). Landfills currently do not undergo such reviews. There is no EPA requirement under the Clean Air Act in this regard. NANSRs require offsets and the application of Lowest Achievable Emissions Rate (LAER) control technology. Yet, conducting NANSRs for landfills would also raise questions that have not yet been addressed, including: What *is* LAER for the various landfill pollutant control system emissions?

Another complication is that, as discussed earlier, controlled landfills will capture only about 75 percent of the generated gas. Excluding the 25 percent fugitive emissions is inconsistent with other existing regulatory approaches under the Clean Air Act. The philosophy underlying the Act is the maximum control of emissions. Yet landfills—even under the proposed New Source Performance Standards—would not be required to meet the same tests which have been applied to WTE plants and other facilities under the same provisions. Petroleum, petrochemical, and treatment and storage operations (TSO's) must use Best Available Control Technology to manage all emissions.

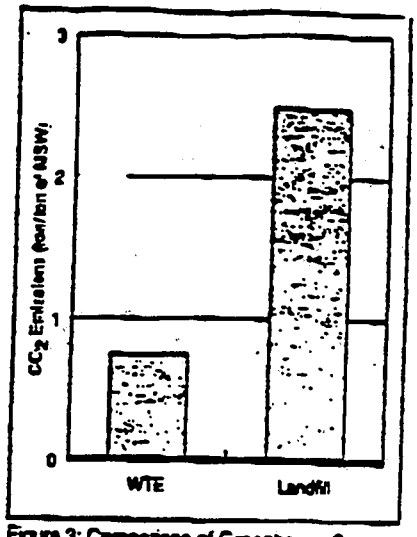


Figure 3: Comparison of Greenhouse Gas Emissions (in CO_2 Equivalents) from a 1,500-TPD landfill and a 1,500-TPD waste-to-energy facility

Greenhouse Gases

Proponents of the Greenhouse gas theory believe that man-made sources of several gases (among them CO_2 and methane) are causing global warming because they are building up in the earth's atmosphere. This buildup traps the infrared radiation being reflected from the earth's surface. If one prescribes to this theory (which the author does not), then these pollutants should also be considered in an equitable regulatory review process.

Landfills emit significantly higher amounts of greenhouse gases than comparably sized WTE facilities. Figure 3 shows this comparison in CO_2 emissions equivalents. Different gases have different impacts per ton of emissions; CO_2 emissions are used as a benchmark for estimating relative contributions. Methane is considered to be 25 times more potent than CO_2 in trapping the infrared radiation than CO_2.[18]

Other Issues

Another risk that can be compared for the various facilities is that associated with waste transportation. The accident-related risks are likely to be higher for the landfill option either because of increased trucking distances or the use of additional transportation modes such as rail haul. There may also be greater

Table 6: Emissions of CO, NOx, NMOCs and Dioxins from WTE Plants and Landfill Gas Control Devices

Facilities	Emission Factors (grams per 1000 Btu)			
	CO	NMOC	NOx	Dioxins
WTE	0.01	0.5×10^{-3}	0.11	1.3×10^{-6} [b]
Landfill flare	0.04	5.1×10^{-6}	0.02	5.2×10^{-6}
Landfill ICE	0.23	5.1×10^{-3}	0.19	1.6×10^{-6}
Landfill turbine	0.04	5.1×10^{-3}	0.10	ND

[a] For the landfill options, the emissions reported are from the landfill gas control devices only; these figures exclude fugitive emissions from the landfill surface.
[b] Equivalent to 3.0 ng/m³ total PCDD/PCDF.

emissions of ozone-forming pollutants, such as NMOCs and NOx. (Of course, there would be no transportation difference if you assume the same location for the landfill and the WTE plant). Landfill sites are moving further and further from the waste generation centers. For example, the City of Seattle chose to rail haul their waste more than 200 miles rather than build a WTE facility in the city. Although a health risk assessment found the WTE option to be acceptable, no comparative accident risk assessment was performed on the two disposal options.

So far, this analysis has sought to characterize the disposal options based on minimizing their negative effects. Yet, three of the discussed disposal options recover energy, a net benefit which should be considered in the selection process. A WTE facility recovers between two and three times more the energy per ton of MSW disposed of than by landfill gas recovery. This is because, in a landfill, a large portion of the solid fuel is not converted to gas, and hence cannot be recovered as energy. Over a period of 20 to 30 years, 20 to 60 percent of the refuse in a landfill will be converted to gas by anaerobic digestion.[9]

Conclusion

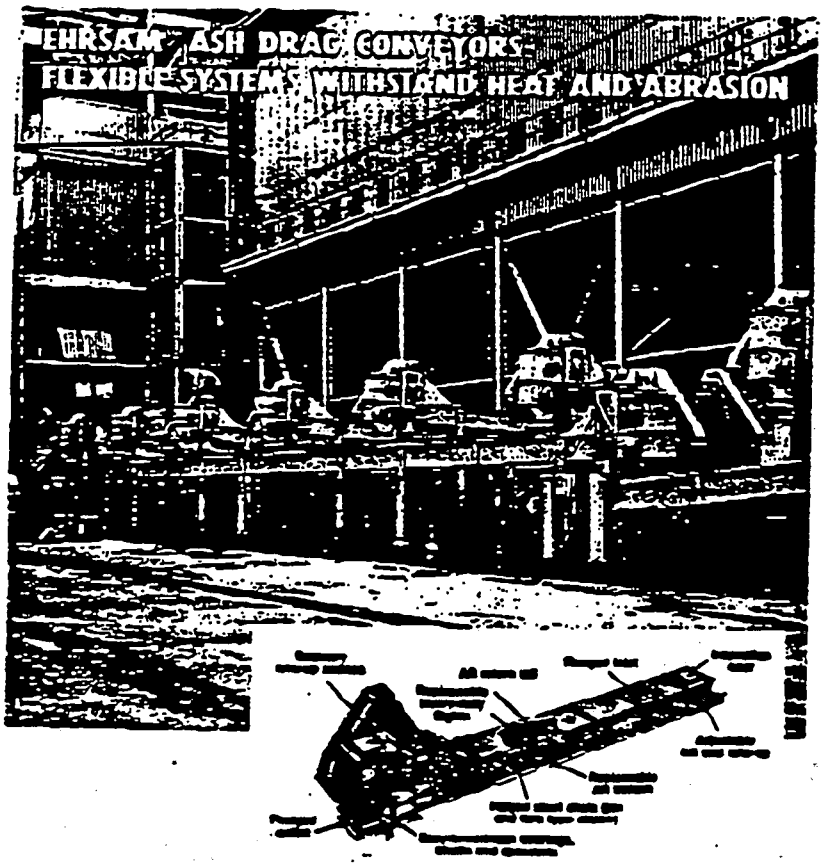
To date, WTE has been given microscopic scrutiny from a risk perspective by regulatory agencies. No similar scrutiny has been given to the other options in the disposal hierarchy. The scrutiny applied to WTE has suggested to the public that WTE facilities pose unacceptable risks while other options pose no calculable risk. In fact, as shown in this investigation, for some options, the reverse may be true.

When a new landfill and WTE facility of equal capacity are compared from a risk perspective, under specified assumptions, the landfill appears to pose greater health and environmental risks. An important inclusion in this investigation was calculating risks from landfill gas control devices. To date, regulators have focussed on fugitive landfill emissions, but have not considered emissions from landfill gas control devices.

Despite the comparative nature of this analysis, this paper is not intended to lead to a conclusion to select one technology over another. In fact, the risks associated with each of the alternatives are not necessarily unacceptable compared to everyday involuntary risks. And, ultimately, multiple technologies are needed in an integrated waste system. Indeed, the important judgment to make from this kind of analysis is that it is time for communities and regulatory agencies to apply the same level of health and environmental review to all components of proposed MSW management plans. Communities need a level base of information to be able to convince the public and regulatory agencies about the merits of their MSW management approaches. ■

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Editor's Note: This article has been extensively peer reviewed. An area of one reviewer's concern was that the EPA's landfill emissions data, in addition to the preponderance of data from MSW-only landfills, includes some data from sites that also contain hazardous wastes. Owing to EPA's methods used for collecting and assembling the data.



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it is not possible to segregate the data and some unknown skew may have been introduced. In the article, Dr. Jones discusses the relative weakness of landfill emissions data; he advises that he has endeavored to use the most reliable, best-documented information available.

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CIRCLE 102 ON READER SERVICE CARD

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ACUTE RESPIRATORY EFFECTS OF PARTICULATE AIR POLLUTION

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KEY WORDS: particulate air pollution, adverse health effects

INTRODUCTION

In the 1930s, 40s, and 50s, several episodes of extreme air pollution focused attention on the potential for adverse health effects of air pollution. These included an episode in the Meuse Valley, Belgium, in December 1930 (15), an episode in Donora, Pennsylvania in 1948 (36), and several episodes in London, England (23, 44). The sudden large increases in sickness and death that accompanied such episodes demonstrated that air pollution can adversely affect human health. The increased mortality associated with such episodes provided the first quantitative measure of the adverse effects of air pollution.

By the 1970s, a link had been well established between respiratory disease and particulate and/or sulfur-oxide air pollution, but still there remained disagreement as to the level of pollution that would significantly affect human health. In reviewing research published between 1968 and 1977, Holland and several other prominent British scientists (19) concluded that particulate and related air pollution at high levels pose hazards to human health, but that health effects of particulate pollution at lower concentrations could not be "disentangled" from health effects of other factors. Shy (45) responded by asserting that the review by Holland et al systematically discounted evidence of pollution-related health effects at contemporary pollution levels. Shy, and other reviewers (1, 12, 45, 54), contended that the cumulative weight of evidence provided sound reasons to believe that

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human health may be adversely affected by particulate pollution, even at relatively low concentrations.

Epidemiologic studies since the 1970s have provided more quantification of the health effects associated with particulate pollution at levels common in contemporary urban areas of the developed world. Recent epidemiological research has been based on more specific definitions and more precise measures both of pollution exposures and health endpoints. Advances in biostatistical and econometric analytic techniques for time-series data have expanded the opportunities to evaluate the acute health effects of particulate pollution and have increased the analytical rigor of these studies. In particular, advances in autoregressive Poisson and logistic regression analysis have permitted the evaluation of pollution associations in panels of patients or other small populations, which would not have been possible in the early 1970s. Most notable has been a series of studies showing that daily mortality is associated with particulate pollution at concentrations much lower than those experienced in the extreme episodes of the first half of this century.

Bates (3) has recently pointed out that the observation of increased mortality associated with air pollution exposures implies that measures of morbidity also must necessarily be increased—for example, hospital admissions, hospital emergency room visits, and outpatient or doctor's visits. Among potentially responsive subjects such as asthma patients, we expect to observe increased symptoms, lower lung function, increased medication use, and, ultimately, higher use of hospital services. A similar cascade of associations also may be detected among less sensitive individuals, i.e. among members of the general population. Bates (3) has described this as *coherence* of effects, i.e. the adverse effects of air pollution should be observable across a range of related health outcomes. Adverse effects of air pollution also should be reproducibly observed by different investigators in different settings, i.e. there should be *consistency* of effects across independent analytic studies.

This review presents a comparison of such recent studies of the acute effects of particulate air pollution and shows evidence for increased mortality and morbidity associated with particulate pollution, even at moderate concentrations. We evaluate both the coherency and consistency of recent epidemiologic data regarding adverse health effects of particulate air pollution. Our purpose is to stimulate a new look at these studies rather than to provide a comprehensive, detailed, or complete review.

SOURCES AND EXPOSURES

Particulate air pollution refers to an air-suspended mixture of solid and liquid particles that vary in size, composition, origin, and effects. The term

'aerosols' refers to a stable mixture of suspended particles and gases and therefore implies smaller-sized particles. Particulate air pollution is formed by condensation of gases or vapors, or by direct generation through mechanical processes. The different processes of formation lead to characteristic differences in size and composition of particles.

Particle Size and Chemical Characteristics

Particle size is expressed in terms of its aerodynamic diameter, defined as the diameter of a unit-density sphere that has the same settling velocity as the particle in question. The size distribution of suspended particles in the atmosphere is bimodal. Large particles (sometimes called "the coarse mode") are 2.5 to 30 μm aerodynamic diameter and most often have a basic pH. These large particles are derived from uncontrolled combustion and mechanical breakup of soil and other crustal materials. Biological particles such as pollens and spores are also found in this large-particle range. Smaller particles ("the fine mode") are < 2.5 μm aerodynamic diameter and are often acidic. These fine particles include soot and acid-condensates derived from vehicle emissions, manufacturing, power generation, and agricultural burning. Sulfate and nitrate aerosols generally make up the largest fraction of small particles by mass.

Deposition, Clearance, and Toxicity

Particle size is the most important characteristic influencing deposition in the respiratory system (2). Models of inhaled particle deposition relate aerodynamic particle diameter to the site of deposition. Most inhaled particles of greater than 5μm aerodynamic diameter deposit in the upper airways or larger lower airways. Particles smaller than 5μm aerodynamic diameter are more likely to deposit in the smaller airways, e.g. the bronchioles and the alveoli.

Particle clearance is achieved by several mechanisms. Particles deposited in the trachea and bronchioles rise on the mucociliary ladder to be expelled by coughing or to be swallowed. Particles deposited beyond the terminal bronchioles are cleared largely by lung macrophages that, in turn, transport the ingested particles onto the mucociliary ladder or into the lymphatic system. A small fraction of these distally deposited particles migrate through alveolar tissue directly into the lymphatic circulation.

Biologic effects of a particle are determined by the physical and chemical nature of the particle itself (particularly its solubility), the physics of deposition and distribution in the respiratory tract, and the physiologic events that occur in response to the particle's presence. Controlled human studies have focused on airway effects of single agents or simple mixtures. Toxicological studies have generally focused on chronic effects and single agents

(e.g. silica, asbestos) (55), and on the effects on sites of deposition or distribution (airways, alveoli).

Measures of in vitro macrophage cytotoxicity demonstrate the high toxicity of certain urban particle complexes relative to the classic toxic dusts, e.g. silica and asbestos. Toxicity of urban particles and diesel particulate emissions depend in part on the type of metal compounds they contain, as well as their combustion-derived organic content (16).

REVIEW METHODS

Definition of Exposure

In 1987, the US Environmental Protection Agency redefined the National Ambient Air Quality Standard (NAAQS) for particles based on particulate matter smaller than 10μm aerodynamic diameter (PM_{10}) (13). This 10μm-size cutoff focused monitoring and regulatory efforts on particles of a size that would be deposited in, and damaging to, the lower airways and the gas-exchanging portions of the lung. Recent epidemiologic studies have used PM_{10} measurements as the basis of exposure estimation. Earlier studies, however, used a variety of measures of particle concentration to define exposure. These alternative measures are discussed below to compare results with PM_{10}-based measures.

The EPA's initial standard reference measure for particles was Total Suspended Particulates (TSP), measured by high-volume samplers. This sampling method has an ill-defined upper size limit between 25μm and 45μm that is dependent on wind speed and direction (22). In addition, TSP measurements are subject to artifactual conversion of SO_2 to sulfate on the filters or to volatilization of nitrate aerosols from sampler filters. Many epidemiologic studies of air pollution in the 1960s and 1970s in the United States used TSP measurements as the indicator of particle exposures. The EPA (26) determined that the PM_{10}-to-TSP ratio was generally between 50% and 60% for US sampling sites.

In the late 1970s and early 1980s, the EPA established a network of particulate matter samplers with an upper-size cutoff of 15μm aerodynamic diameter (PM_{15}) to measure "inhalable particulates." This cutoff was recommended to define the fraction of particles that would deposit primarily in the conducting airways and the gas-exchange areas of the respiratory system during mouth breathing (24). Only very limited data are available comparing the PM_{15} to PM_{10} concentrations, but concentrations measured by these two methods appear to be similar.

In addition to the total inhalable particle concentration, particles smaller than 2.5μm aerodynamic diameter ($PM_{2.5}$) were measured based on consideration of their characteristic chemical composition and the predominant

penetration into the gas-exchange regions of the respiratory tract (24). Spengler & Thurston (47) have presented data for $PM_{2.5}$ and PM_{10} from six US cities. The mean $PM_{2.5}$-to-mean PM_{10} ratio was approximately 60%.

In most parts of the United States, fine particle ($PM_{2.5}$) concentrations are highly correlated with sulfate (SO_4) concentrations. For example, in the Six Cities Study (47), city-specific correlations were all greater than 0.70, and in four cities, greater than 0.84. In these data, the mean ratio of SO_4 to PM_{10} was approximately 25%.

Studies from Great Britain and other European countries have often used a pseudomeasure of particle mass called British Smoke (BS). This is a measure of the darkness of particles collected on a filter and determined by reflectance. Mass concentration is estimated based on the reflectance of a standard particle mass. Calibration of reflectance depends on the specific chemical composition of the particles (22). The upper size limit of the sampler is nominally 4.5μm aerodynamic diameter, although the penetration of particles through the sampler inlet does not define a sharp size cut-point (22). Generally, particles in the fine mode tend to be dark while those in the coarse mode tend to be lighter in color (11). British Smoke, therefore, is thought of as a measure of fine particle mass concentrations. The EPA (26) concluded that British Smoke was equal to PM_{10} as a lower bound and equal to TSP as an upper bound.

In the United States, a similar method was used in which particles were deposited on a filter tape and the concentration was estimated by light transmission through the sample, measured in Coefficient of Haze (CoH) units. A comparison of CoH and PM_{10} measurements in Santa Clara County, California, indicated that the CoH-to-PM_{10} ratio equals 55% (14).

Thus for this discussion we will use the following guidelines for estimating PM_{10} exposures in epidemiologic studies where other measures of particle concentration were reported:

$$PM_{10} \approx PM_{15} \qquad PM_{10} \approx PM_{2.5}/0.60$$

$$PM_{10} \approx TSP * 0.55 \qquad PM_{10} \approx BS$$

$$PM_{10} \approx CoH/0.55 \qquad PM_{10} \approx SO_4 * 4$$

Criteria of Study Selection

In this review, we have included studies that provide the following information (a) exposure to particulates reported as PM_{10} concentrations or a

measure that allowed conversion to PM_{10}; (*b*) health effects measured as change in mortality or indicators of respiratory disease with time scales of days up to weeks or months; and (*c*) reported measures of association and their variance, which would allow calculation of the relative increase in effect compared to particle exposures and the confidence that can be ascribed to the effect estimate.

We have separated epidemiologic studies by comparable health endpoints (for example, mortality or exacerbation of asthma). Within each of these health endpoints, we have expressed reported results as the estimated relative percent change in the health measure associated with a 10 $\mu g/m^3$ increase in daily mean PM_{10} concentrations. For many recent studies that used logistic or Poisson regression and PM_{10}, this is a simple calculation based on reported regression coefficients and their standard errors. Many earlier studies, in which particle concentrations were not measured as PM_{10}, required converting from the reported measure of particle concentrations to PM_{10} concentrations, conversions based on relationships described above.

In some studies, particularly those with continuous health endpoints such as pulmonary function, associations are reported as a linear rather than a proportional (or logarithmic) change associated with particulate pollution. For these studies, we re-estimated the effect as percent change from the mean response associated with 10 $\mu g/m^3$ increase in PM_{10} above the mean exposure. This is a reasonable assumption for estimates close to the mean but will break down far from the mean.

For a few studies, particle concentrations had been transformed before including them in the analysis, e.g. effects reported as a function of the logarithm of the particle mass concentrations. For these studies, we estimated the effect of a 10 $\mu g/m^3$ increase in PM_{10} above the mean exposure. Again, this is appropriate close to the mean but should not be extrapolated to concentrations far from the mean.

Ninety-five percent confidence intervals were calculated for each exposure estimate. In most cases, reports included standard errors of the estimates or confidence intervals. In a few early studies, however, only p-values were given. In these studies we estimated the standard error, assuming a normal distribution. When p-values were reported as less than some arbitrary cut-off (e.g. $p<0.05$), the standard errors were calculated, based on the upper limit of the cut-off probability (e.g. $z = 1.96$ for $p<0.05$).

To provide a combined estimate of the effect of 10 $\mu g/m^3$ increase in PM_{10} concentration for each health endpoint, a weighted average effect estimate was calculated where the study-specific effect was weighted by its inverse variance (one over the standard error squared).

HEALTH EFFECT STUDIES

Mortality

In the past few years, a series of papers has been published describing the association between daily mortality and suspended particulate concentrations in various communities across the United States. In 1990, an association between particle concentrations and daily mortality was reported for residents of Santa Clara County, California, for the period 1980–1986 (14). Associations were observed at relatively low concentrations of particles and sulfur dioxide.

This report was followed by analyses of similar data for Steubenville, Ohio (40) and for Philadelphia, Pennsylvania, (39). Both analyses suggested increased daily mortality associated with increased particle concentrations, even after adjusting for sulfur dioxide exposures. A quantitatively similar association was reported for Utah Valley, Utah, for the period 1985–89 (33). This study was notable because these associations with particle exposures are observed in the absence of substantial sulfur dioxide or ozone pollution. In analysis of data from St. Louis, Missouri, and Kingston, Tennessee (9), daily mortality was associated with several measures of particle exposures, but not with aerosol acidity, sulfur dioxide, ozone, or nitrogen dioxide concentrations.

In large communities (with a population of several million), the mean number of deaths/day is far enough from zero that the distribution is reasonably symmetric and Gaussian statistics can be applied. In most communities, however, the mean number of deaths/day is small and the distribution is skewed towards higher values. In both cases, because daily death counts can be modeled as following a Poisson process, regression analysis using the Poisson rather than the Gaussian distribution is appropriate. Associations are typically fitted to the logarithm (ln) of the number of deaths/day, that is, on a proportional rather than a linear scale. Specifically, the Poisson regression estimates the (ln) relative risk of mortality associated with a given exposure, which can be re-expressed as a percent increase in risk. All of the recent analyses of daily mortality and air pollution have used Poisson regression methods.

Use of the same endpoint (nonaccidental daily mortality), particulate exposure measures, which can be converted into a common metric (PM_{10}), and common analytic methods (Poisson regression) make it possible to tabulate approximately comparable effect estimates: the percent increase in daily mortality for each 10 $\mu g/m^3$ increase in PM_{10} concentrations (see Table 1)

able 1 Studies of acute effects of particles on daily mortality

ocation and period	Particulate measure	Mean PM_{10} ($\mu g/m^3$)	% Change in daily mortality for each 10 $\mu g/m^3$ increase in PM_{10} (95% CI)	Reference
tal mortality				
St. Louis, MO 1985-86	PM_{10} (previous day)	28	1.5% (0.1%, 2.9%)	9
Kingston, TN 1985-86	PM_{10} (Previous day)	30	1.6% (-1.3%, 4.6%)	
Santa Clara, CA 1980-82, 84-86	Coefficient of haze	35	0.8% (0.2%, 1.5%)	14
Philadelphia, PA 1973-80	TSP (2-Day mean)	40	1.2% (0.7%, 1.7%)	39
Birmingham, AL 1985-88	PM_{10} (3-Day mean)	48	1.0% (0.2%, 1.9%)	38
Utah Valley, UT 1985-89	PM_{10} (5-Day mean)	47	1.5% (0.9%, 2.1%)	33
Detriot, MI 1973-82	TSP	48	1.0% (0.5%, 1.6%)	37
Steubenville, OH 1974-84	TSP (previous day)	61	0.7% (0.4%, 1.0%)	40
Combined			1.0%	
espiratory				
Santa Clara, CA 1980-82, 84-86	Coefficient of haze	35	3.5% (1.5%, 5.6%)	14
Philadelphia, PA 1973-80	TSP (2-Day mean)	40	3.3% (0.1%, 6.6%)	39
Utah Valley, UT 1985-89	PM_{10} (5-Day mean)	47	3.7% (0.7%, 6.7%)	33
Birmingham, AL 1985-88	PM_{10} (3-Day mean)	48	1.5% (5.8%, 9.4%)	38
Combined			3.4%	
ardiovascular				
Santa Clara, CA 1980-82, 84-86	Coefficient of haze	35	0.8% (0.1%, 1.6%)	14
Philadelphia, PA 1973-80	TSP (2-Day mean)	40	1.7% (1.0%, 2.4%)	39
Utah Valley, UT 1985-89	PM_{10} (5-day mean)	47	1.8% (0.4%, 3.3%)	33
Birmingham, AL 1985-88	PM_{10} (3-Day mean)	48	1.6% (0.5%, 3.7%)	38
Combined			1.4%	

There is good consistency in the estimated effect of PM_{10} across these studies. Effect estimates range between 0.7% and 1.6% increase in daily mortality for each 10 $\mu g/m^3$ increase in PM_{10} concentration with a weighted mean of 1.0%. Ostro (26a) has recently estimated a similar combined effect (0.96% per 10μ/m^3 PM_{10}) in a review of time-series and cross-sectional mortality studies.

Four of the daily mortality studies (14, 33, 38, 39) also provided a breakdown of mortality by broad cause-of-death categories. Cardiovascular deaths, which were about 45% of all deaths in these three studies, had effect estimates between 0.8% and 1.8% (weighted mean, 1.4%) increase for each 10$\mu g/m^3$ PM_{10}. Respiratory deaths, which were 2% to 8% of the total, had effect estimates between 1.5% and 3.7% (weighted mean, 3.5%) increase for each 10 $\mu g/m^3$ PM_{10}. In all four studies, no associations were found with cancer mortality or with other causes.

Epidemiologic studies suffer from the weakness that observed associations with a specific exposure may result from an unmeasured association with an unknown or uncontrolled factor correlated with *both* exposure and disease, i.e. from a confounder. These time-series studies have the advantage that many major causes of increased mortality (such as smoking, hypertension, or even age) cannot confound the observed associations with particulate air pollution because these factors do not vary with daily pollution exposures. This is not to say that response may not differ by these factors. Indeed, the mortality effects of particulate air pollution are most strongly seen in the elderly in all those studies in which age is considered as an effect modifier.

Other factors such as weather conditions, which can vary with daily pollution exposures, are potential confounders in these analyses. All of the recent studies have attempted to control for weather factors (such as temperature) in the analysis. Residual confounding due to inadequate modeling or an unmeasured weather factor is removed by modeling the covariance of the residuals as autoregressive in these analyses. Similar associations are observed in areas with high winter particulate concentrations, characterized by trapping of direct industrial emissions—Utah Valley (33) and Steubenville (40)—and in areas of high summer particulate concentrations characterized by photochemical production of secondary particles such as sulfates and nitrates– Philadelphia (39) and Birmingham (38). The consistency of the effect estimate across different communities—in warm versus cold climates, in dry versus moist climates—suggests that climatic factors are in fact not important confounders

If we accept the association between daily mortality and particulate air pollution shown in these studies, the possibility still remains that the true association is with some other pollutant correlated with PM_{10} or with a

specific component of the mixture of particles that makes up PM_{10}. The study of St. Louis and Kingston (9) considered a variety of pollutants and found the strongest associations with PM_{15} concentrations. Several studies (9, 39) evaluated sulfur dioxide as a possible confounder; no such confounding was shown. More importantly, associations between daily mortality and particulate air pollution in communities with low sulfur dioxide concentrations—Santa Clara (14) and Utah Valley (33)—were comparable to associations in communities with high sulfur dioxide concentrations—Steubenville (40). Kinney & Özkaynak (20) reported associations between daily mortality and ozone in Los Angeles. They emphasize the association with ozone, but strong associations were also observed with KM, a measure of light scattering by particles similar to Coefficient of Haze. The consistency of results across communities suggests an important if not dominant role of particle mass concentration in producing the observed associations with daily mortality.

Another interesting feature of these studies is the consistent finding of lagged associations between particle exposure and increased mortality. Most of the results presented have reported associations of increased mortality with particle concentrations on the previous day. It would violate a basic tenet of causality if the observed effect were not either concurrent with or lagged behind the exposure. In their analysis of Utah Valley deaths, Pope et al (33) considered longer lag structures up to seven days and found the strongest associations with the five-day moving average, i.e. with the mean PM_{10} of the current day and the four previous days. Thus, these data suggest that mortality effects of particulate air pollution may be lagged by several days.

In summary, a series of time-series analyses of the associations of daily mortality with particulate air pollution has shown a ~1.0% increase in total deaths/day associated with each 10 $\mu g/m^3$ increase in PM_{10} concentration. Stronger associations were observed with cardiovascular disease (1.4% per 10 $\mu g/m^3$ PM_{10}) and respiratory disease (3.4% per 10 $\mu g/m^3$ PM_{10}). The consistency of these estimates across communities suggests that these results are not due to confounding with an unknown or uncontrolled factor and that the mass concentration of the particle mix common to many urban areas, rather than specific chemical species within the mix, may be responsible for the observed associations.

Hospital Usage

If daily mortality is associated with daily particulate pollution levels, then associations with increased hospital admissions and emergency department visits should also be expected. In a unique natural experiment, Pope (28, 29) observed hospital admissions of children for respiratory disease in Utah Valley dropped by over 50 percent during the winter of 1986–87 compared to adjacent years. During this winter, a strike at the local steel mill led to much lower PM_{10} concentrations—a mean of 51 $\mu g/m^3$ and maximum of 113 $\mu g/m^3$ compared to a mean of 90 $\mu g/m^3$ and a maximum of 365 $\mu g/m^3$ in the previous year. Regression analyses estimated a 4.2% decrease in asthma and bronchitis admissions of children and a 7.1% decrease in all respiratory admissions of children associated with a 10 $\mu g/m^3$ decrease in the two-month mean PM_{10} concentration.

Increased rates of respiratory admissions, including asthma, for the years 1974 to 1983 in Southern Ontario have been associated with increased sulfate and ozone concentrations (4). A more recent analysis of hospital admissions for respiratory disorders in Southern Ontario for the summers of 1983 to 1988 (7) found an association with increased sulfate concentrations that was independent of associations with ozone exposures. Both studies have been interpreted as suggesting an association between hospital respiratory admissions and an unmeasured air pollutant correlated with sulfates and ozone. Specifically, the authors have suggested a link to acid aerosol concentrations. Alternatively, these associations may be attributable to particle mass concentrations, another air pollutant not considered in the analyses.

Recently, Thurston and colleagues have reported analyses of hospital admissions for respiratory complaints for Toronto, Ontario (50) and for several cities in New York state (51). Although the focus of these studies is the effects of acid aerosols, effect estimates are reported for various measures of particle exposure (Table 2). Taken together, these studies found an increase in hospital admissions for all respiratory diagnoses ranging from 0.8% to 3.4% (weighted mean, 0.8%) for each 10 $\mu g/m^3$ increase in daily mean PM_{10}. A slightly greater effect was seen in hospital admissions for asthma, ranging from 1.9% to 2.1% (weighted mean, 1.9%) for each 10 $\mu g/m^3$ increase in daily mean PM_{10}.

Emergency department visits also have been analyzed by many investigators, and three studies provided quantitative effect estimates of the effects of particles (see Table 2). An analysis of emergency department visits for asthma in Seattle (42) found an increase of 3.4% associated with a 10 $\mu g/m^3$ increase in PM_{10}. Emergency department visits for chronic obstructive pulmonary disease in Barcelona (48, 49) increased by 1.7% associated with a 10 $\mu g/m^3$ increase in PM_{10}. Emergency department visits in Steubenville (35) increased by 0.5% associated with a 10 $\mu g/m^3$ increase in PM_{10}. The weighted mean of these combined effect estimates was a 1.0% increase in emergency department visits associated with each 10 $\mu g/m^3$ increase in PM_{10}

ble 2 Acute effects of particles on hospital usage

:asure of hospital ige	Location and period	Particulate measure	% Change in hospital usage for each 10 μg/m³ increase in PM_{10}	Reference
ospital Admissions				
Asthma	New York City	Daily mean SO_4	1.9% (0.4%, 3.4%)	51
	Buffalo, NY		2.1% (−0.6%, 5.0%)	
	Toronto, ONT Summer 86–88	Daily mean $PM_{2.5}$	2.1% (0.8%, 5.1%)	50
	Combined		1.9%	
All respiratory	New York City	Daily mean SO_4	1.0% (0.2%, 1.8%)	51
	Buffalo, NY		2.2% (0.6%, 3.8%)	
	Toronto, ONT Summer 86–88	Daily mean $PM_{2.5}$	3.4% (0.4%, 6.4%)	50
	Southern Ontario Summer 83–88	Daily mean SO_4	0.8% (0.4%, 1.1%)	7
	Combined		0.8%	
nergency Department Visits				
Asthma (<65 yr)	Seattle, WA 1989–90	Daily mean PM_{10}	3.4% (0.9%, 6.0%)	42
Respiratory disease	Steubenville, OH	Daily mean TSP	0.5% (0.0%, 1.0%)	35
Chronic obstructive pulmonary disease	Barcelona, Spain Winter 85–89	British Smoke	2.3% (1.4%, 3.2%)	49
	Combined		1.0%	

Asthma

Evidence from hospital admissions and emergency department visits presented above suggests that particle exposures may be directly associated with asthma attacks. Several investigators have considered less severe asthmatic attacks reported by panels of asthma patients. Winter studies of asthmatic children with chronic respiratory symptoms in The Netherlands (34) and of asthmatic adults in Denver, Colorado, (27) both found substantial increases in reported asthmatic attacks associated with particle exposures. An earlier study of sixteen asthma panels in the Los Angeles area (56) reported increased attacks associated with particle exposures but the effect was much lower than in the more recent studies (see Table 3). In part this lower effect estimate may reflect over-control of lagged effects of particles by including the previous day's asthma status in the model. The weighted mean of these three studies, however, gives an effect estimate of 3% increase in asthmatic attacks associated with 10 $\mu g/m^3$ PM_{10}.

The use of bronchodilators also has been evaluated as a measure of exacerbation of asthma in a panel of asthmatics in The Netherlands (34) and in panels of symptomatic children and asthmatic patients in the Utah Valley (31; see Table 3). The weighted mean of these studies gives an estimated effect of a 2.9% increase in bronchodilator use associated with 10 $\mu g/m^3$ PM_{10}.

Lung Function

Lung function is a sensitive indicator of acute response to ozone in controlled exposure and chamber studies (21). Repeated measures of lung function in panels of children also have been used to evaluate the effect of particulate air pollution episodes on children.

Panels of elementary school children in Steubenville had their lung function measured weekly before, during, and after particulate and sulfur dioxide episodes during four periods in 1978 through 1980 (10). Forced Expired Volume in three-quarters of a second ($FEV_{.75}$) was reported to decline following these episodes. There was a suggestion that $FEV_{.75}$ remained depressed for up to two weeks following the episode. A study of weekly lung function measurement of school children in The Netherlands (7a) following a sulfur dioxide and particulate episode in January 1985 reported decreases in Forced Expired Volume in one second (FEV_1), which were similar in magnitude and in lag structure to those observed in Steubenville. Subsequent studies of panels of school children with weekly lung function measurements (17, 18) have also shown decreased FEV_1 associated with daily PM_{10} concentrations.

Analysis of longer lags in The Netherlands panel (17) found a significant association between decreased FEV_1 and mean PM_{10} over the previous seven days. Similarly, in a re-analysis of the Steubenville data, Brunekreef (6) found the strongest association with the mean TSP over the previous five days.

Recently, Pope & Kanner (32) analyzed repeated FEV_1 measurements in a panel of chronic obstructive pulmonary disease patients participating in the Lung Health Study. Measurements were taken 10 to 90 days apart. FEV_1 level was reported to be associated with a 0.2% decrease in FEV_1 for each 10 $\mu g/m^3$ increase in daily PM_{10}

Taken together, these studies found a decrease of between 0.05% and

Table 3 STudies of acute effects of particles on exacerbation of asthma

Measure of asthmatic response	Location and period	Particulate measure	Subjects	% Change in daily asthma response for each 10 $\mu g/M^3$ increase in PM_{10}	Reference
Bronchodilator use	Utah Valley, UT Winter 1989–90	Daily mean PM_{10}	School panel Asthma panel	11.2% (2.4%, 20.7%) 12.0% (4.7%, 19.7%)	31
	2 Dutch Cities Winter 1990–91	Daily mean PM_{10}	School panel	2.3% (0.7%, 3.8%)	34
	Combined			2.9%	
Asthmatic attacks	2 Dutch Cities Winter 1990–91	Daily mean PM_{10}	School panel	1.1% (−3.5%, 5.9%)	34
	Los Angeles, CA 1972–75	TSP	Asthma panels	1.4% (0.3%, 2.6%)	56
	Denver, CO 1987–88	$PM_{2.5}$	Asthma panel	11.5% (8.9%, 14.3%)	27
	Combined			3.0%	

0.35% or a weighted average of 0.15% decrease in FEV_1 associated with each 10 $\mu g/m^3$ increase in daily mean PM_{10} (see Table 4).

Peak flow measurements have been widely used as a simple, inexpensive indicator of acute changes in lung function among asthmatic patients. Weekly peak flow measurements were made in the spirometric studies of school children in The Netherlands (17, 18). In these two studies, peak flow declined approximately 0.16% for each 10 $\mu g/m^3$ increase in PM_{10}.

Daily peak flow measurements have been gathered in a series of recent

Table 4 Studies of acute effects of particles on lung function

Measure of lung function	Location and period	Particulate measure	% Decrease in daily lung function for each 10 $\mu g/m^3$ increase in PM_{10}	Reference
Forced Expired Volume				
$FEV_{.75}$	Steubenville, OH 1978–80	Daily Mean TSP	0.05% (0.00%, 0.10%)	10
FEV_1	4 Cities, NL Winter 1987–90	Daily Mean PM_{10}	0.06% (−0.01%, 0.14%)	18
	Wageningen, NL Winter 1990–91	Daily Mean PM_{10}	0.35% (0.23%, 0.48%)	17
	Salt Lake City, UT 1987–89	Daily Mean PM_{10}	0.21% (0.05%, 0.37%)	32
	Combined		0.15%	
Peak Expiratory Flow				
Daily (evening)	Utah Valley, UT 1989–90	Daily Mean PM_{10}	0.25% (0.10%, 0.39%)	31
	Utah Valley, UT 1990–91	Daily Mean PM_{10}	0.06% (−0.00%, 0.12%) 0.04% (−0.02%, 0.09%)	30
	Wageningen, NL 1990–91	Daily Mean PM_{10}	0.09% (−0.01%, 0.20%)	34
	Uniontown, PA Summer 1990	Daily Mean PM_{10}	0.19% (0.01%, 0.37%)	25
(> = weekly)	4 Cities, NL Winter 1987–90	Daily Mean PM_{10}	0.16% (0.05%, 0.28%)	18
	Wageningen, NL Winter 1990–91	Daily Mean PM_{10}	0.16% (−0.03%, 0.36%)	17
	Combined		0.08%	

studies. In two separate panel studies in the winters of 1989–90 and 1990–91 in Utah Valley (30, 31), panels of school children measured their peak flow daily before going to bed. In both cases, small but significant reductions in peak flow were found associated with mean PM_{10} concentrations that day. In both studies there appeared to be associations between lower peak flow and PM_{10} concentrations for up to five days prior, and stronger associations were found when these lag structures were included in the models. In the second study (30), the estimated effect was about twice as large with the five-day lagged mean compared to the one-day mean PM_{10}.

Similar winter panel studies of school children have been conducted in The Netherlands (34). Effects were observed between evening peak flow and daily mean PM_{10} concentrations, and seven-day mean PM_{10} concentration, which were similar to those observed in Utah.

A panel study of children was conducted in the summer of 1992 in Uniontown, Pennsylvania, (25) to evaluate peak flow changes in an area of high aerosol acidity. Although the strongest associations were found with aerosol acidity, there also was an association between evening peak flow and daily mean PM_{10} that was very consistent with the estimates from other studies.

Comparing the results from these studies of repeated peak flow measurements, there was a decrease of between 0.04% and 0.25% in peak flow (weighted mean of 0.08%) associated with each 10 $\mu g/m^3$ increase in daily mean PM_{10} concentration (Table 4).

In summary, studies of repeated measure of lung function consistently show a small decrement in FEV_1 (weighted mean 0.15%) and peak flow (weighted mean 0.08%) associated with each 10 $\mu g/m^3$ in PM_{10} daily mean concentration. There is a strong suggestion in these data that changes in lung function may reflect the cumulative exposure of several (5–7) days prior to the measurement.

Respiratory Symptoms

Daily diaries of respiratory symptoms, an inexpensive method of evaluating acute changes in respiratory health status, have been widely used in evaluating acute effects of particulate air pollution. In a commonly applied study design, panels of school children recorded the presence of specific respiratory symptoms daily on weekly or monthly calendars. These symptom reports are often aggregated into *upper respiratory symptoms* (including such symptoms as runny or stuffy nose, sinusitis, sore throat, wet cough, head cold, hayfever, and burning or red eyes) and *lower respiratory symptoms* (including wheezing, dry cough, phlegm, shortness of breath, and chest discomfort or pain). In addition, *cough*, the most frequently reported symptom, is often analyzed separately. In this review, symptom reports are presented separately for each of these symptom groups.

The frequency of reported respiratory symptoms was generally taken as their prevalence on any given day, that is, the fraction of participating children reporting a symptom complex on each day. In some cases (41), however, incident cases were reported, where "incidence" required that the child be symptom-free for two days prior to the incident symptom report.

Studies of upper and lower respiratory symptoms have been conducted in Utah Valley (30, 31), The Netherlands (17, 18), in a study of six US cities (41), and Southern California (27a; Table 5).

The combined weighted average from these studies gives an estimated effect of 3.0% increase in lower respiratory symptoms with each 10 $\mu g/m^3$ increase in daily mean PM_{10} concentrations. For upper respiratory symptom reports, the weighted average effect estimate was only a 0.7% increase in upper respiratory symptoms with each 10 $\mu g/m^3$ increase in daily mean PM_{10} (Table 5).

Cough reports were analyzed in three of these studies as well as in a winter diary study in The Netherlands (34), a study of two Swiss cities (5), and the summer diary study in Uniontown (25; Table 5). The weighted mean effect estimate from these studies was a 1.2% increase in cough associated with each 10 $\mu g/m^3$ increase in daily mean PM_{10}.

SUMMARY

Evidence from the selected epidemiologic studies presented in this review suggests a *coherence* of effects across a range of related health outcomes and a *consistency* of effects across independent studies with different investigators in different settings. This compilation also provides insights into the relative magnitude of effects being observed in various studies (Table 6).

Total mortality is observed to increase by approximately 1% per 10 $\mu g/m^3$ increase in PM_{10}. Somewhat stronger associations are observed for cardiovascular mortality (approximately 1.4% per 10 $\mu g/m^3$ PM_{10}), and considerably stronger associations are observed for respiratory mortality (approximately 3.4% per 10 $\mu g/m^3$ PM_{10}). No acute effects are detected with cancer and other nonpulmonary and noncardiovascular causes of mortality. These relative differences in cause-specific mortality are plausible, given the respiratory route of particle exposures.

If respiratory mortality is associated with particulate pollution, then health care visits for respiratory illness would also be expected to be associated with particulate pollution. Respiratory hospital admissions and emergency department visits increase by approximately 0.8% and 1.0% per 10 $\mu g/m^3$

Table 5 Studies of acute effects of particles on respiratory symptom reports

Measure of respiratory symptoms	Location and period	Particulate measure	Sample	% Change in daily symptom reporting for each 10 $\mu g/m^3$ increase in PM_{10}	Reference
Lower respiratory	Utah Valley, UT Winter 1989–90	Daily mean PM_{10}	Children Asthmatics	5.1% (1.1%, 9.3%) 0.2% (−4.2%, 4.8%)	31
	Utah Valley, UT Winter 1990–91	Daily mean PM_{10}	Symptomatic children Asymptomatic children	4.8% (1.5%, 8.3%) 2.4% (−1.8%, 6.8%)	30
	6 US cities Summer 1984–88	Daily mean PM_{15}	School children	15.2% (6.3%, 24.9%)	41
	Wageningen, NL Winter 1990–91	Daily mean PM_{10}	School children	1.2% (−3.1%, 5.7%)	17
	4 Dutch cities Winters 87–90	Previous day PM_{10}	School children	1.5% (−1.1%, 4.2%)	18
	Southern CA Winter 1978–79	Daily mean CoH	Nonsmoking adults	5.9% (−1.9%, 14.3%)	27a
	Combined			3.0%	
Upper respiratory symptoms	Utah Valley, UT Winter 1989–90	Daily mean PM_{10}	Children Asthmatics	3.7% (0.7%, 6.8%) −0.2% (−4.2%, 4.0%)	31
	Utah Valley, UT Winter 1990–91	Daily mean PM_{10}	Symptomatic children Asymptomatic children	3.7% (0.6%, 6.9%) −0.2% (−4.9%, 4.7%)	30
	6 US cities Summer 1984–88	Daily mean PM_{15}	School children	6.9% (−0.7%, 15.0%)	41
	Wageningen, NL Winter 1990–91	Daily mean PM_{10}	School children	2.6% (0.1%, 5.3%)	17
	4 Dutch cities Winters 1987–90	Previous day PM_{10}	School children	−0.2% (−1.2%, 0.8%)	18
	Southern CA Winter 1978–79	Daily mean CoH	Nonsmoking adults	2.7% (−2.5%, 8.2%)	27a
	Combined			0.7%	
Cough symptoms	Utah Valley, UT Winter 1990–91	Daily mean PM_{10}	Symptomatic children Asymptomatic children	5.2% (2.3%, 8.2%) 3.4% (−0.1%, 7.0%)	30
	6 US cities Summer 1984–88	Daily mean PM_{15}	School children	8.6% (2.2%, 15.4%)	41
	2 Dutch cities Winter 1990–91	Previous day PM_{10}	Symptomatic children	0.1% (−0.8%, 1.1%)	34
	4 Dutch cities Winters 1987–90	Previous day PM_{11}	School children	1.3% (−0.1%, 2.7%)	18
	2 Swiss cities	Previous day TSP	Children	8.6% (2.1%, 15.6%)	5
	Uniontown, PA Summer 1990	Daytime mean $PM_{2.5}$	Children	28.1% (4.5%, 57.1%)	25
	Combined			1.2%	

Table 6 Combined effect estimates of daily mean particulate pollution

	% Change in health indicator per each 10μg/m³ increase in PM_{10}
Increase in daily mortality	
Total deaths	1.0
Respiratory deaths	3.4
Cardiovascular deaths	1.4
Increase in hospital usage (all respiratory)	
Admissions	0.8
Emergency department visits	1.0
Exacerbation of asthma	
Asthmatic attacks	3.0
Bronchodilator	2.9
Emergency department visits*	3.4
Hospital admissions	1.9
Increase in respiratory systems reports	
Lower respiratory	3.0
Upper respiratory	0.7
Cough	1.2
Decrease in lung function	
Forced expired volume	0.15
Peak expiratory flow	0.08

*One study only

PM_{10} respectively. Emergency department visits for asthmatics (3.4% increase per 10 μg/m³ PM_{10}) and hospital admissions for asthmatic attacks (1.9% increase per 10 μg/m³ PM_{10}) are more strongly associated. Asthmatic subjects also report substantial increases in asthma attacks (an approximate 3% increase per 10 μg/m³ PM_{10}) and in bronchodilator use (an approximate 3% increase per 10 μg/m³ PM_{10}).

Less severe measures of respiratory health also are associated with particle exposures. Lower respiratory symptom reporting increases by approximately 3.0% per 10 μg/m³ PM_{10} and cough by 2.5% per 10 μg/m³ PM_{10}. Weaker effects are observed with upper respiratory symptoms (approximately 0.7% per 10 μg/m³ PM_{10}). While lung function provides accurate objective measures, the observed mean effects are fairly modest: approximately 0.15% decrease for FEV_1 or $FEV_{.75}$ and 0.08% decrease for peak flow per 10 mg/m³ PM_{10}. Despite the relatively small size of these lung-function effect estimates, they consistently achieve statistical significance. Moreover, mean changes in lung function may not reflect substantial changes in sensitive individuals.

In this review, changes in health measures are reported for only small changes in daily particulate pollution: 10 μg/m³ increase in PM_{10} concentrations. Because daily concentrations of PM_{10} in some US cities average over 50 μg/m³ and often exceed 100 or 150 μg/m³, the effects of particulate pollution can be substantial for realistic acute exposures. For example, a 1% effect estimate per each 10 μg/m³ increase would produce a 5% increase in the health measure for a 50 μg/m³ increase in PM_{10} concentrations, and a 3% effect estimate would produce a 16% increase. Thus the estimated increase in attacks of asthma (3.0% per 10 μg/m³ PM_{10}) would be 16% for a 50 μg/m³ increase in PM_{10} concentrations.

LIMITATIONS

Mass concentration of inhalable particles is only one measure of a complex mixture of gaseous and particulate air pollution to which people are exposed. In this review the possible contribution of gaseous co-pollutants has been ignored. The mass concentration of PM_{10} includes a wide array of potentially toxic chemical species. It is, therefore, presumptuous to assign these observed health effects solely to the mass concentration of particulates. On the other hand, the consistency of these observed effects across so many communities suggests that, lacking an explicit hypothesis, these associations should be assigned to a nonspecific definition of inhalable or fine particle concentrations common to urban areas.

The physical and chemical characteristics of ambient particles are generally not known and so are impossible to duplicate in controlled animal- or human-exposure studies. Many health effects of particles are thought to reflect the combined action of the diverse components in the pollutant mix. Until controlled animal- and human-exposure studies identify the active component(s) of these complex mixtures and can characterize their underlying mechanisms of toxicity, it is prudent to ascribe health effects observed by epidemiologists to the undifferentiated particle mass rather than to any specific component.

Conversion of various measures of particle concentration to PM_{10} mass concentrations are approximations only, based on results presented in published reports. These conversions are certainly correct within a factor of two and are probably within 20% of the true relationship. Thus, while other reviewers may legitimately argue about specific relationships between the

article measures used in the various studies, the estimated effects would emain remarkably comparable, even assuming other reasonable conversions to PM_{10} mass concentrations.

The results of epidemiologic studies of acute effects of particulate air pollution, particularly those describing associations with cardiovascular mortality, have been called into question because of the lack of a biologically plausible mechanism (52, 53). The linkage between air pollution exposure and acute cardiovascular mortality is not clear. Many authors have suggested that air pollution episodes, like episodes of extreme temperature, high or low, are an additional environmental stress that may cause death in otherwise-compromised patients. Bates (3) has suggested three additional mechanisms by which respiratory and cardiovascular mortality might increase in air pollution episodes: (*a*) acute bronchitis and bronchiolitis may be misdiagnosed as pulmonary edema; (*b*) air pollutants may increase lung permeability and precipitate pulmonary edema in people with myocardial damage and increased left atrial pressure; (*c*) bronchiolitis or pneumonia induced by air pollution, in the presence of pre-existing heart disease, might precipitate congestive heart failure. An alternative explanation is that respiratory causes of death, either primary or contributing, are erroneously reported as cardiovascular. In a summary of a workshop of chronic obstructive pulmonary disease mortality, Speizer (46) observed that chronic obstructive pulmonary disease is considerably underdiagnosed on death certificates. While the specific biologic mechanism for these acute increases in mortality is not clear, the internal consistency of the mortality studies and the external consistency with evidence of acute increases in morbidity measures suggest that these results are not artifacts.

RECOMMENDATIONS

Mortality has always been a key health endpoint in epidemiologic studies, i.e. it serves as a leading indicator for hypothesis generation. It is a well-defined health outcome and mortality data are routinely collected and are readily available for epidemiologic analysis. When the numerous time-series studies of the association of mortality with particulate air pollution are compiled, using comparable measures of effect (% increase) and exposure (PM_{10}) as in Table 1, the consistency of estimated effects becomes clear. When estimated effects of particulate air pollution are similarly combined for other health indicators, the consistency and coherence of results also becomes apparent. These findings highlight the importance of using equivalent exposure metrics and health endpoints in air pollution studies.

Thus, we recommend that researchers report results such that they can be readily compared with previous (and future) investigations. The groupings

of health endpoints considered here present some guidance. Likewise, the reporting of associations with PM_{10} concentrations is important. This recommendation should not be interpreted as a request for regimentation or an attempt to limit innovation. Rather, it is recommended that the associations with common endpoints and PM_{10} exposures be reported in addition to other, potentially more sensitive or specific, indicators of health effect or exposure.

A quantitative effect estimate and its estimated standard error should be reported in all cases. Reports of statistical significance without effect estimates are not very informative. Likewise, correlation coefficients and other unscaled measures of association fail to provide useful information.

Epidemiologic research regarding the health effects of particulate air pollution has been impeded by the lack of daily (or more frequent) particle measurements (8). In communities that are not likely to violate (or that clearly exceed) the NAAQS for particles, PM_{10} measurements are made only once every six days, as required by the EPA (13). Fortunately for epidemiologists, the EPA has required daily monitoring in communities likely to violate the NAAQS for particles. These regulations have had the unanticipated (but beneficial) effect of making feasible new epidemiologic studies of the acute effects of particles. Inasmuch as associations are being observed between daily particle exposures and adverse health effects down to the lowest measureable concentrations, it is recommended that daily PM_{10} concentrations be measured whenever possible. When alternative measures of particle concentrations are used, then a description of the relationship to PM_{10} concentrations should be provided.

Research into mechanisms of the adverse health effects of PM_{10} mass concentrations observed in recent epidemiologic studies needs to be undertaken in controlled exposure studies of humans and animals. It is only through integration of the complementary evidence from laboratory animal and controlled human exposure studies with the results from epidemiologic studies that the risk of particle exposures can be fully evaluated. Nevertheless, these recent epidemiologic studies implicate particulate air pollution as contributing to respiratory morbidity and mortality even at exposure levels below the current NAAQS in the United States.

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WOOD SMOKE: EMISSIONS AND NONCANCER RESPIRATORY EFFECTS

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KEY WORDS: respiratory effects, chemical composition, air emissions, air quality, young children

INTRODUCTION

During the past twenty years, the use of wood has become popular as an alternative to conventional home heating fuels. Part of this movement has been due to uncertainty about the availability of fossil fuels. About ten percent of space heating in urbanized areas of the northern United States is from wood burning, with up to fifty percent in some smaller, rural towns (42, 63, 75, 85). Wood is obviously a renewable resource. This attraction is offset, however, by the increased air pollution emissions from wood heating devices compared with devices fueled with oil or gas. As noted initially by Cooper (20), particle and organic carbon emission rates can be as much as one to two orders of magnitude larger in wood heating devices than in oil or gas heating units. Legislation restricting the sale of conventional wood stoves first appeared in Oregon in 1984, followed by nationwide restrictions in 1988. Although rapid progress has reduced emissions in some types of modern wood heaters, older "conventional" wood stoves and fireplace inserts are still the predominant appliance in use today. As discussed later in this document, a number of communities continue to experience elevated levels of wood smoke during the winter heating season. In addition, elevated indoor air pollution levels have been observed in homes with non-airtight or improperly operated wood stoves. As a result, there has been an ongoing interest in the potential health effects of exposure to wood smoke. Several reviews of the health effects of wood smoke have been

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Energy management

High-temp SCR competes with DLN combustors Recent installations confirm the viability of high-temperature selective catalytic reduction for a broad range of gas turbines. The zeolite-based catalyst offers several advantages over both vanadia/titania SCRs and dry low-NOx combustors

By W M Rogers and M Durilla, Engelhard Corp Edited by Robert Swanekamp, PE

Selective catalytic reduction systems (SCR) have provided efficient, reliable service in hundreds of installations worldwide. These systems can lower NOx emissions by 80 to 90% with a useful catalyst life of more than five years.

But conventional SCR technology (POWER special report, "Controlling NOx Emissions," May 1993) is limited in one very important way: The typical vanadia/titania catalyst works only in a temperature range of approximately 575 to 800F. Any higher, the catalyst undergoes irreversible changes, losing conversion efficiency and active life.

High-temperature SCR technology was introduced commercially in the late 1980s to overcome the limitations of precious-metal designs. The zeolite-based catalysts, which have been applied to gas turbines as large as 36 MW, offer comparable NOx reduction at operating temperatures up to 1125F. They open up new system design options for gas-turbine facilities (Figure 1).

Applications for high-temperature SCR include simple-cycle gas turbines, cogeneration plant retrofits, and stationary engines.

Most gas-turbine exhaust temperatures exceed 800F, hence conventional SCRs cannot be applied to simple-cycle units.

Existing cogeneration units often cannot accommodate the retrofit of conventional SCRs without expanding the heat-recovery steam generator (HRSG) housing to provide room for the catalyst. A high-temperature SCR, which can be placed in the transition duct between the turbine and HRSG, overcomes this problem.

Even if space allows expanding the HRSG housing, retrofitting a conventional SCR may impair operating flexibility. Cogeneration units that pre-date strict air-quality regulations often feature exhaust bypass dampers upstream of the HRSG to enable simple-cycle operation. If a conventional SCR is retrofit into the HRSG, the unit can no longer operate simple cycle without exceeding emissions limits. In contrast, a zeolite catalyst retrofit upstream of the bypass dampers allows simple-cycle operation without sacrificing compliance.

Additional benefits

Beyond its ability to withstand high temperatures, a zeolite-based catalyst has two other significant attributes: Unlike a conventional SCR catalyst, its conversion efficiency increases as (1) inlet NOx concentration increases and (2) exhaust water concentration decreases. These attributes lead to four major benefits; they:

-- Allow operators to reduce or even eliminate water/steam injection into the combustor--reducing potential erosion problems, extending combustor life, and lowering gas-turbine maintenance costs.

-- Make the application of lower-cost, high-NOx-emitting gas turbines a viable alternative.

-- Extend the application of dry low-NOx (DLN) combustors with exhaust emissions in the 25-ppmv range.

-- Make practical the attainment of 5-ppmv NOx emissions at the stack for meeting extremely tight permitting requirements or for banking emissions credits.

Key design issues

Design issues for high-temperature SCRs are similar to those for all SCR technologies:

-- Uneven flow distribution--caused by gas swirling out of the turbine or being deflected in exhaust ducts with severe bends. The more uneven the flow distribution, the larger the volume of catalyst needed to maintain performance. Flow distribution in the range of + or - 15% across the catalyst inlet face is a common design specification for precious-metal and zeolite-based SCRs. Computer simulation or model testing sometimes is required, and may reveal the need to reshape the exhaust ducting or install turning vanes.

-- Ammonia and NOx must mix together in the proper ratio at the active catalyst site. If insufficient mixing occurs, both gases will pass through the system unreacted, potentially forcing permit violations of NOx and ammonia slip. Ammonia/NOx mixing at 5% standard deviation is a typical design specification. The more stringent the performance requirements, the more critical this

deviation becomes.

-- Requirements for space velocity--defined as the gas flow rate per unit volume of catalyst (SCFH/ft superscript 3)--vary widely depending on the particular turbine and catalyst. To achieve a given level of performance, a highly active catalyst requires only a small volume. Hence, the highly active catalyst can operate at a higher space velocity. Conversely, a less active catalyst will require a larger catalyst volume, and thus must operate at a lower space velocity.

Many factors affect the selection of a design space velocity, including turbine fuel, NOx conversion required, ammonia slip constraint, process temperature, desired service life, and degree of ammonia/NOx mixing.

-- A catalyst in the exhaust stream increases system backpressure, and lowers net turbine output. Therefore, designers strive to minimize back pressure. But trade-offs must be made.

For example, frictional losses through the catalyst vary with the square of gas velocity. A larger duct cross section will reduce velocity, but will also occupy more plot space and cost more money.

Frictional losses also vary in direct proportion to system temperature. Recall that catalyst activity, for zeolite-based systems, also increases with temperature. Hence, the zeolite SCR's catalyst volume can be reduced at higher operating temperatures, helping to offset pressure drop.

Another trade-off is in cell density of the honeycomb catalyst. The lower the cell density, the lower the pressure drop. However, the catalyst volume must increase to achieve comparable NOx-conversion and ammonia-slip performance.

Recent installations

A variety of gas-turbine projects currently are using high-temperature SCR technology, demonstrating levels of NOx reduction, ammonia consumption, and ammonia slip similar to conventional catalysts (table). One recent project features both a high-temperature SCR and a CO catalyst. The system was retrofit into a cogeneration unit comprising a 2.8-MW Centaur GS4000 gas turbine/generator, supplied by Solar Turbines Inc, San Diego, Calif. Exhaust temperatures range from 600 to 872F. The retrofit allows the unit to meet emissions limits, even when the HRSG is off-line.

The high-temperature SCR/CO system was installed in a 17-ft transition area between the turbine exhaust flange and an existing HRSG bypass damper. The system is designed to meet a 75% NOx conversion requirement, reducing the inlet NOx from 36 to 9 ppmv

and allowing 10 ppmv ammonia slip. Exhaust flow from the turbine is extremely turbulent, so a perforated plate is placed near the turbine exhaust flange to better distribute flow to the CO catalyst. The CO catalyst further streamlines the exhaust flow for proper ammonia/NOx mixing upstream of the SCR catalyst.

Frame units also

A high-temperature SCR was selected over a DLN combustor for retrofit to a Frame 6 gas turbine, manufactured by GE Industrial & Power Systems Co, Schenectady, NY. The high-temperature SCR was installed upstream of an existing HRSG bypass damper, subjecting it to an exhaust temperature of 992F. The new system reduces NOx by more than 94%--to 9 ppmv--with ammonia slip below 10 ppmv.

Because high-temperature SCRs are relatively new, it is too early to precisely define their life expectancy. Data gathered to date, however, support offering warranty periods comparable to those for precious-metal catalysts.

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POWER PLANT PROFILES: HANES MILL ROAD PROJECT

Extraction, collection, compression are keys to landfill gas project The gas turbine is the least of the worries when converting landfill gas to electricity. Getting fuel to the machine is the challenge, met successfully here

Landfill gas-to-energy projects have grown nearly 50% since 1991, spurred by environmental regulations, tax incentives, and competitive pressures (see box, p 94). Reflecting this trend is the Hanes Mill Road project, a 4.3-MW powerplant co-developed last year by Biomass Energy Systems, Ann Arbor, Mich; Sherdyne Power Systems, Charlotte, NC; and Landfill Energy Systems, Wixom, Mich (Fig 1).

The gas-turbine-based plant recovers nearly 1-billion ft3 of gas per year from a landfill owned by the city of Winston-Salem, NC, and sells electricity to Duke Power Co, Charlotte, NC, under a 15-yr contract. As evidence of the earnestness of landfill-gas project developers, consider that Biomass Energy Systems is a subsidiary of DTE Energy Co, owned by Detroit Edison Co.

Packaged gas turbine The Hanes Mill project, which started up last July, comprises a 4.3-MW gas turbine/generator, manufactured and packaged by Solar Turbines Inc, San Diego, Calif (Fig 2). The turbine typically fires 100% landfill gas, but No. 2 diesel fuel is available as backup. The plant has demonstrated the ability to switch smoothly between fuels "on the fly."

Because landfill gas is extracted and collected around the clock, the Hanes Mill turbine is designed for base-load operation. The gas must still be flared, as it was before the turbine was installed, whenever the plant is down for maintenance (Fig 3).

Extraction, collection are key Extraction and collection of landfill gas are critical to a project's success, because the bacteria in the decomposing garbage will only produce a certain amount of gas over a specific period of time. If the system is oversized and too much gas is pulled from the landfill, excessive O2 will be drawn into the pile and kill the bacteria. If the system is undersized, energy will be wasted, impairing the project's economics.

The landfill-gas extraction system at Hanes Mill, designed by SCS Engineers, Richmond, Va, has over 21,000 linear feet of collection piping and vertical transport lines made of high-density polyethylene (HDPE), which carry the gas from 112 extraction wells. The lower portion of each extraction-well casing is slotted to provide for 8 in.3 of opening per linear foot for methane extraction. Set at an average depth of 50 ft, each of the vertical extraction wells is fitted with a flexible, commercial wellhead that allows for landfill subsidence and provides fittings for technicians to "balance" the system (Fig 4). According to facility manager Bob Biskeborn, a technician attends to each well twice weekly to verify methane, CO2 ,O2, and N2 concentrations.

Unique compression system A sorespot with many landfill-gas power projects is the gas compression and treatment system. Landfill gas is approximately 50% methane, 30% CO2, 10% N2 (which is drawn into the mix from the atmosphere when vacuuming gas into the collection systems), and 10% other chemical compounds. Many of these "other" compounds are destructive to plant machinery.

Probably the worst compounds are the total organic halides expressed as chloride (TOH/Cl), formed from the decomposition of household and industrial cleaning products. The TOH/Cls combine with water to form hydrochloric and other acids that wreak havoc on valves, pistons, cylinders, combustors, and so on. Landfill gas also contains an abundance of water, which combines not only with the TOH/Cls, but with oxides of nitrogen to form acids that harm systems downstream of the combustion process.

Concerned about the compression/treatment process, Biomass Energy Systems specified what it calls a unique system that delivers high-quality fuel and accommodates the gas turbine's high fuel-flow and -pressure requirements. The modular, skid-mounted system has a 2250-scfm design rating, with two electric-motor-driven rotary compressors. The first compressor provides 8 in. Hg of vacuum for gas extraction. The second compressor delivers fuel at 225 psig to the gas-turbine combustor.

The extracted and unfiltered landfill gas is initially collected in a coalescer vessel, before being piped to the first compressor. There, a 350-hp electric motor drives a positive-displacement rotary blower, designed to operate at a differential pressure up to 18 psig, to discharge landfill gas at approximately 230F/9 psig. From the discharge of the first compressor, the landfill gas is then directed to an intercooler and inter-stage coalescer to separate condensate.

The landfill gas next flows to the second stage of compression, where an 800-hp flooded-screw-type compressor boosts pressure to 225 psig and raises temperature to 236F. Lube oil is then injected into the compressor gas path at a rate of approximately 90 gal/min. This oil injection serves to cool the compressor, and also to strip all suspended particles before the gas/oil separator. The separator vessel doubles as the compression

train's sole reservoir of lube oil for all rotating components.

Gas exiting the gas/oil separator passes through a shell-and-tube heat exchanger where it is again air-cooled for condensate separation, before being delivered to the gas turbine at a warm, dry 135F.

Plant performance Since startup last June, the Hanes Mill plant has operated well, Biskeborn reports, selling nearly 9000 MWh to Duke Power Co. The veteran facility manager offers several observations based on his experience at Hanes Mill and other landfill-gas projects:

-- The power generation equipment itself firing landfill gas, whether based on gas turbines or reciprocating engines, can deliver high capacity and availability factors, as long as fuel is available.

-- Problems with the wellfield collection system account for most of the operation and maintenance difficulties, and nearly all of the plant downtime.

-- Reciprocating engines, which comprise nearly two-thirds of the landfill-gas power projects in the US, enjoy a slight advantage because of their simpler fuel-gas compression requirements. This translates into fewer maintenance hours and lower parasitic power losses.

EXH. 23

Incidence of Cancer among Persons Living Near a Municipal Solid Waste Landfill Site in Montreal, Québec

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ABSTRACT. The Miron Quarry municipal solid waste landfill site in Montreal, Québec, generates copious quantities of methane and other gases, including a rich mixture of volatile organic compounds, some of which are recognized or suspected human carcinogens. The site is the third largest in North America and is located in the center of a densely populated area. Using data from the Québec Tumour Registry, we conducted Poisson regression analyses to evaluate whether cancer incidence among persons who lived near the site was higher than expected. Potential exposure to ambient air pollutants from the site was defined in terms of a set of geographic exposure zones proximal to the site. A set of reference areas distal from the site was selected to be similar to these exposure zones with respect to several key sociodemographic factors. Risk ratios (RRs) were adjusted for age and calendar year. Among men living in the exposure zone closest to the site, elevated risks were observed for cancers of the stomach (RR = 1.3, 95% confidence interval [95% CI] = 1.0–1.5); liver and intrahepatic bile ducts (RR = 1.3, 95% CI = 0.9–1.8); and trachea, bronchus, and lung (RR = 1.1, 95% CI = 1.0–1.2). Among women, rates of stomach cancer (RR = 1.2; 95% CI = 0.9–1.5) and cervix uteri cancer were elevated (RR = 1.2, 95% CI = 1.0–1.5), but breast cancer incidence was less than expected (RR = 0.9, 95% CI = 0.9–1.0). Prostate cancer was also elevated in one of the proximal exposure subzones (RR = 1.2, 95% CI = 1.0–1.4). Further studies at this and at other landfill sites are needed to confirm or refute these observations.

IN 1968, the Miron Quarry municipal solid waste (MSW) landfill site in Montreal, Québec, opened as a repository for domestic, commercial, and industrial wastes. At that time, little attention was given to the environmental and health consequences that might occur from the landfilling of refuse in an urban area. This may have been a serious oversight because there are about 100 000 persons who now live within 2 km of what is currently the third largest MSW landfill site in North America. The site has an area of about 750 000 m²; a depth of 50–80 m; and, in January 1993, it was estimated that the site contained about 36 million tons of domestic, commercial, and industrial waste. Because the site is still in operation, it has not been capped.

The chief environmental problems are the amount of toxic chemicals on site, the production of liquids (leachates), and vapors and gases (biogas). Although leachates can contaminate underground water supplies,

this is not a primary health concern because Montreal obtains its potable water from other sources. The main health considerations derive from the release of biogas into ambient air and soil. Other exposures include noise, diesel fumes, and dust.

Biogas is generated by anaerobic decomposition of organic compounds and by other processes.[1] It is a complex chemical mixture composed mainly of methane and carbon dioxide, but it also contains important quantities of volatile organic compounds and sulfur-based substances[1–5] (Table 1). Biogas is associated with pungent odors.

Since 1980, the biogas has been collected through a network of pipes, but the system has operated at low efficiency. After collection, the biogas is burned but combustion is incomplete. Information from other MSW landfill sites[6–9] suggests that the combustion products include nitrogen oxides, carbon dioxide, carbon monoxide, sulfur dioxide, and hydrochloric acid; it is also possible that dioxins, furans, and other volatile organic compounds are released.

Given the concerns for health expressed mainly by residents who live near the site, the city of Montreal commissioned the Public Health Department in 1991 to conduct a cancer-risk assessment study of the site. The justification for this study was that a number of volatile organic compounds found in the biogas were recognized or suspected human carcinogens. Concentrations of the constituents of the biogas, measured within the biogas capture system,[5] are shown in Table 1. Thirty-five volatile organic compounds were identified, including the recognized human carcinogens benzene and vinyl chloride monomer and the suspected human carcinogens methylene chloride, chloroform, 1,2-dichloroethane, bromodichloromethane, tetrachloroethylene, 1,4-dichlorobenzene, 1,2-dibromoethane, and carbon tetrachloride.[10,11]

There are minimal data that indicate the extent of exposure to biogas within the community, although residents who live up to about 1.5 km from the site have complained frequently of odors, and spot measurements of methane on streets of Montreal near the site resulted in concentrations that ranged from 0 to 25 ppm.[15] The presence of odors near MSW sites is not unusual.[1,12–14] Lateral migration of biogas through the ground is also a concern,[16,17] although we have no information regarding this potential route of exposure.

In addition to the ongoing cancer-risk assessment study, two epidemiologic studies have been completed and others are in progress. In one study, we found a 20% increase in the frequency of low birthweight (i.e., < 2 500 g) among children born to women who lived proximal to the site.[18] In the current study, we describe the second investigation,[19] the purpose of which was to determine if rates of cancer during the period 1981–1988 among persons who lived near the Miron Quarry MSW landfill site were higher than expected.

Table 1.—Concentrations of Selected Constituents of the Biogas, as Measured in the Biogas Collection System of the Miron Quarry Municipal Solid Waste Landfill Site, Montreal, Quebec

Chemical	Range of concentration in biogas collection system*
Methane	~ 50%
Carbon dioxide	~ 50%
Hydrogen sulfide	Mean, 23** ppm
Mercaptans	Mean, 2 ppm
Hydrocarbons (C_1–C_{11})	114–1 061
Dichlorofluoromethane	47–218
Trichlorofluoromethane	6–141
Dichlorodifluoromethane	8–64
Toluene	1–154
Tetramethylbenzene isomers	35–87
M + P-xylene	24–64
O-xylene	12–24
3-Ethyl toluene	13–38
Ethyl benzene	2–36
Carbon disulfide	3–28
Chloroform	12–25
1,1-Dichloroethane	2–21
Methylene chloride	3–20
Acetone	5–17
M-xylene	7–17
Tetrachloroethylene	6–17
1,1,1-Trichlorethane	1–16
Methyl ethyl ketone	1–16
1,4-Dichlorobenzene	7–14.8
Cumene	6–13
Trichloroethylene	1–9
Benzene	5–8
Vinyl chloride	1–7
Chlorobenzene	3–5
1,2-Dichloroethane	Detected†
Bromodichloromethane	Detected†
1,2-Dibromoethane	Detected†
Carbon tetrachloride	Detected†

Note: ppm = parts per million.
*Unless noted otherwise, values are mg/m³.
**Not quantified; data from reference 5.

Material and Method

Definition of exposure zones. Given the lack of environmental exposure data, we carried out the analyses of cancer incidence rates according to a set of three areas proximal and distal to the quarry. These zones were formed by grouping contiguous or nearly contiguous three-character postal-code areas. These zones are hereafter referred to as the low-, medium-, and high-exposure zones (Fig. 1).

The high-exposure zone comprised the postal-code area in which the quarry is located and the postal-code areas that border it. This zone included an irregular region (about 28 km²), ranging from approximately 2–4 km distant from the edge of the site. The medium-exposure zone included all postal-code areas that bordered the high zone on the north, south, and east sides but excluded two postal-code areas in the east that were ≥ 4 km distant from the site. The low-exposure zone included all postal-code areas located northeast of the medium and high zones.

In addition, the high-exposure zone was divided into

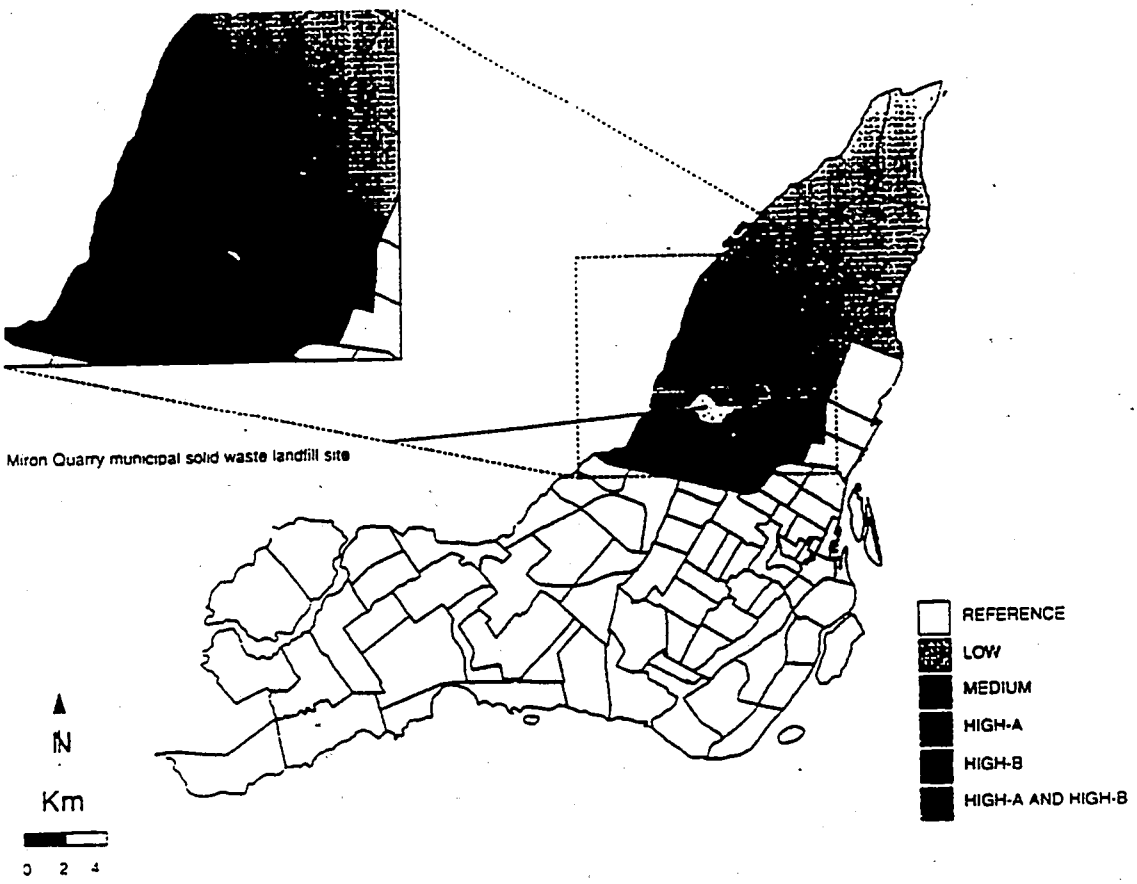


Fig. 1. Definition of the exposure zones surrounding the Miron Quarry municipal sold waste landfill site, Montreal, Québec.

two subzones (referred to as high-A and high-B; Fig. 1) so that prevailing winds could be accounted for. These two subzones were not mutually exclusive in that they both included the postal-code area in which the quarry is located.

Separate analyses were conducted for these four exposure zones, using four different referent zones, as follows:

Exposure zone	Reference zone
High, medium, low	Reference-1
High	Reference-2
High-A	Reference-3
High-B	Reference-4

The first reference zone (reference-1) comprised all "nonexposed" areas on the Island of Montreal. It was not entirely comparable sociodemographically to the three exposure zones (Table 2). For the three other exposure zones, we created separate reference zones from subsets of the unexposed areas of Montreal; therefore, these reference zones were similar to the high-exposure zones with respect to average household income, proportion of immigrants, and the proportion of persons whose native language was French. Similar proportions between exposure and reference zones for these factors, except for the proportion of French-speaking persons in the reference-3 zone, are shown in Table 2. As well, there were similar proportions of women and men; blacks; and persons who (a) rented their homes, (b) were below the poverty line, (c) were unemployed, (d) were < 4 and > 65 y of age, and (e) had not moved subsequent to the 1981 census. There were, however, differences in the proportion of persons with Italian ancestry, those with less than grade 9 education, and those having a university education.

Cancer incidence. Incident cases of cancer among persons who lived on the Island of Montreal at the time of diagnosis during the 8-y period from 1981 to 1988 were identified from the Québec Tumour Registry (Minister of Health and Social Affairs, Québec). The Registry relies solely on hospital discharge reports submitted by each hospital's medical records office. Since 1981, all Québec hospitals forwarded their discharge reports to a central collection and processing system known as Med-Echo.[20] Each hospital that reported to Med-Echo was responsible for the abstraction, coding, and verification of their own data; data verification was also carried out centrally, as was internal record linkage to distinguish prevalent from incident cases. The coding

Table 2.—Distribution of Selected Sociodemographic Characteristics of the Exposed and Reference Zones

Zone	Total population	Ratio of men to women (%)	Age (y)		Characteristics			
			< 4 (%)	≥ 65 (%)	Renters (%)	Large households* (%)	French speaking (%)	Black persons (%)
Reference-1	1 059 270	91.8	5.4	12.7	68.0	2.1	52.3	1.9
Low	178 490	94.2	6.2	7.8	52.8	2.6	79.2	1.2
Medium	247 325	87.7	5.0	13.3	75.0	1.9	74.5	1.9
High	242 655	87.8	5.5	10.8	68.3	2.8	60.0	3.0
Reference-2	296 710	87.8	5.1	13.4	73.8	1.8	59.5	2.3
High	242 655	87.8	5.5	10.8	68.3	2.8	60.0	3.0
Reference-3	246 460	93.3	5.9	11.2	73.2	2.8	41.9	3.6
High-A	154 130	89.3	5.8	9.2	68.5	3.5	51.1	3.8
Reference-4	135 300	87.3	5.2	13.1	72.2	1.4	70.6	1.7
High-B	125 245	86.7	5.5	11.7	68.6	2.4	69.4	3.2

Zone	Italian descent (%)	Immigrants (%)	Nonmovers† (%)	Uneducated‡ (%)	University education (%)	Poverty rate§ (%)	Unemployment rate (%)	Average household income ($)
Reference-1	4.3	24.1	51.0	20.0	28.4	21.3	12.0	32 553
Low	11..	11.2	49.0	24.0	13.8	16.7	10.1	33 499
Medium	9.6	16.2	51.1	28.9	15.6	25.1	13.0	24 941
High	25.5	24.1	55.2	30.3	11.3	22.3	11.1	27 841
Reference-2	6.1	22.4	51.1	22.4	21.3	22.0	12.0	28 150
High	25.5	24.1	55.2	30.3	13.3	22.3	11.1	27 841
Reference-3	10.8	33.3	47.4	22.9	25.0	25.9	13.9	27 594
High-A	32.2	29.2	57.1	32.9	11.2	23.9	11.4	27 651
Reference-4	6.1	14.3	54.0	25.3	17.2	22.0	12.3	27 359
High-B	17.2	19.3	53.2	28.9	14.1	23.5	11.3	27 190

Source: Statistics Canada, 1986 Census, Profiles A and B.
*Households with six or more persons.
†Persons 5 y of age and older who did not move between 1981 and 1986.
‡Persons 15 y and older who did not complete grade 9.
§Households under the poverty line in 1986.

of discharge diagnoses was not done by physicians but by trained nosologists at each hospital, using information on a summary sheet kept with the patient's chart. This summary sheet contained relevant diagnostic information recorded by the treating physicians. Information on sociodemographic factors was provided, usually by patients or by next-of-kin, and this information was recorded on the hospital discharge form.

The following information was used: date of birth; age at time of diagnosis; sex; three-character postal code of subject's residence at time of discharge; date of discharge (used as surrogate for date of diagnosis); and four-digit topological code, according to the ninth revision of the International Classification of Diseases (ICD9). The major sites of cancer, as well as a number of smaller a priori sites, were retained for the statistical analysis (Table 3).

Estimates of the population. Data from the Canadian censuses for 1981 and 1986 were used to estimate the size of the population, by sex and age, for each exposure and reference zone. With respect to the years 1981 and 1986, exact numbers provided by the census were used. For the intervening and following years, we conducted linear interpolation and extrapolation, respectively.

Statistical methods. Cancer cases were assigned to the exposure or reference zones, according to their postal code at time of discharge from hospital. For each site of cancer, we tabulated the number of incident cases, according to sex, 5-y age groups, calendar year, and residence in the exposure or reference zones. Rates in each zone were calculated by dividing the number of incident cases by the corresponding estimates of the population at risk.

It was assumed that incidence rates followed a Poisson distribution.[21] Multiplicative Poisson regression models that included age and calendar year as covariates were developed to estimate adjusted relative risks between exposed and reference zones. Poisson regression is a generalization of indirect standardization. It is a maximum likelihood procedure that can account for potential confounding factors and can allow the assessment of statistical interactions. We calculated 95% confidence intervals (95% CI), assuming that the log relative risks were distributed normally. Separate analyses were carried out for men and women. Statistical interactions between age and exposure zone and year and exposure zone were assessed with the likelihood ratio goodness-of-fit test, based on hierarchical models.[21,22] There were no significant statistical interactions between geographic region and age or calendar year for any site of cancer.

Results

Shown in Table 3 are the number of incident cases for the 17 sites of cancer among men and the 20 sites of cancer among women, according to exposure and reference zones for the entire Island of Montreal during the 8-y period 1981–1988. Of the 68 analyses conducted for men and the 80 analyses carried out for women, significant (95% CI excluding unity) or nearly significant positive associations (lower 95% confidence limit > 0.95) in the high-exposure zones were observed for two sites of cancer in women and four sites in men (Table 4). It should be noted that because the high-A and high-B exposures zones overlapped, the total number of cases in these two subzones was greater than the number in the high-exposure zone.

Rates of stomach cancer and cancer of the cervix uteri in women were in excess. Rates of breast cancer were, however, significantly less than expected. Among men, cancer of the stomach; cancer of the liver and intrahepatic bile ducts; cancer of the trachea, bronchus, and lung; and cancer of the prostate were higher than expected. Except for cancer of the liver and intrahepatic bile ducts, most excess relative risks for the high-exposure zones were quite low (i.e., < 1.3).

With respect to stomach cancer, relative risks between 1.04 and 1.27 were observed in the high-exposure zones. The pattern of risks was similar in men and women. In the high-exposure zone, there was little difference in relative risks between the reference area encompassing all other areas of Montreal (reference-1) and the "matched" reference zone for the high-exposure zone (reference-2). It was also observed that most of the excess risk was restricted to the high-A subzone, which was predominantly downwind from the site.

Analyses of cancer of the liver and intrahepatic bile ducts showed considerable differences between the sexes. These differences may have resulted from statistical variability, especially because there were few cases among women. For men, the relative risks in the high-exposure zone decreased from 1.55 when all of Montreal was used as a reference zone (reference-1) to 1.31 when a more sociodemographically comparable reference zone was used (reference-2). As was observed for stomach cancer, most of the excess risk was restricted to the high-A exposure zone (RR = 1.79, 95% CI = 1.21–2.64). The pattern of risks for women in the high-exposure subzones was directly opposite to that observed in men, although there was considerable variability in the estimates; the RR for the high-B exposure zone (RR = 1.54, 95% CI = 0.62–3.51) was higher than for the high-A zone (RR = 1.06).

There were no excess risks of lung cancer observed among women. For men, however, significantly high risks relative to the general population (reference-1) were observed in the low-, medium-, and high-exposure zones, with the lowest risks found in the high-exposure zone (RR = 1.11, 95% CI = 1.04–1.19). The RRs for the high-exposure zone were slightly lower when a matched reference zone (reference-2) was used (RR = 1.06, 95% CI = 0.98–1.16). Risks in the high-A zone were significantly different from unity (RR = 1.15, 95% CI = 1.04–1.29), and no excesses were detected in the high-B zone.

Table 3.—Number of Cases of Cancer, by Site, Sex, and Exposure and Reference Zones, Montreal, Quebec, 1981–1988

		Males (no.), by zone				Females (no.), by zone			
ICD-9*	Cancer site	Reference-1	Low	Medium	High	Reference-1	Low	Medium	High
151	Stomach	899	105	206	190	646	64	161	129
153	Colon	1 909	228	413	324	2 365	229	489	402
154	Rectum and rectosigmoid	1 262	154	296	221	1 080	115	208	203
155	Liver	265	34	59	72	129	15	35	25
156	Gallbladder	169	13	33	32	262	23	60	50
157	Pancreas	672	73	130	118	622	47	132	83
161	Larynx	665	80	150	137	126	26	32	26
162	Trachea, bronchus, and lung	5 158	685	1 264	1 008	2 096	237	458	330
163	Pleura	61	19	28	14	31	11	8	12
174	Female breast	1	0	0	0	6 226	669	1 231	1 060
180	Cervix uteri	0	0	0	0	751	81	196	171
182	Body of uterus	0	0	0	0	1 308	154	284	229
183	Ovary	0	0	0	0	1 012	104	208	173
185	Prostate	3 376	260	614	563	0	0	0	0
188	Kidney	1 793	177	360	290	717	65	127	98
189	Bladder	698	71	124	109	483	58	111	65
191	Brain	402	45	62	72	363	45	62	56
200	Lymphosarcoma and reticulum cell sarcoma	367	27	75	63	344	44	75	65
204	Lymphoid leukemia	384	44	71	69	291	29	63	52
205	Myeloid leukemia	247	23	46	31	208	19	42	37
208	Other leukemia of unspecified type	77	14	20	18	74	15	29	18

*Ninth revision of the International Classification of Diseases.

We did not observe an association between prostate cancer and living in the high-exposure zone. This null result, however, resulted from a significantly decreased risk in the high-A exposure zone (RR = 0.85, 95% CI = 0.73–0.98) and from a significantly elevated risk in the high-B exposure zone (RR = 1.18, 95% CI = 1.02–1.37).

Significantly elevated RRs of 30% and 23% were observed for cancer of the cervix uteri in the medium- and high-exposure zones, respectively. The RR for the high-exposure zone was not influenced by the choice of reference zone; however, risks for the two high-exposure subzones dropped dramatically and were non-significantly different from expected (RR = 1.07 and RR = 1.04 in the high-A and high-B zones, respectively).

Of all the sites of cancer considered, only female breast cancer showed a significant deficit in the high-exposure zone. The RRs for this exposure zone were invariant with respect to the reference zone used (RR = 0.92), but risks were lower in the high-A zone (RR = 0.88, 95% CI = 0.79–0.97) than in the high-B zone (RR = 0.95, 95% CI = 0.86–1.06).

Discussion

The results of this study suggest that there may be increased risks for cancers of the stomach, liver, lung, prostate, and cervix uteri among persons who live near the Miron Quarry MSW landfill site. Prior to considering these results in more detail, the relevant methodologic aspects of this study will be discussed.

A strength of this study was that a population-based cancer registry was used to identify incident cases. Residents of Québec treated out of province were not, however, included in the database unless they were hospitalized in Québec. Therefore, although there may have been some underreporting of cases, it is unlikely that this underreporting would be associated with area of residence because of Canada's universal health-care system and because of the similarity of the exposure and reference zones on sociodemographic factors, notably average income.

We are unaware of any studies in which the reliability of the data retained in the Cancer Registry's files has

Table 4.—Relative Risks for Selected Sites of Cancer, by Geographic Region and Sex

Geographic region	Females			Males		
	No.	RR	95% CI	No.	RR	95% CI
Stomach						
Reference-1	646	1		899	1	
Low	64	1.05	0.81–1.36	105	1.13	0.92–1.38
Medium	161	1.20	1.01–1.43	206	1.15	0.99–1.34
High	129	1.14	0.95–1.38	190	1.24	1.06–1.44
Reference-2	158	1		208	1	
High	129	1.20	0.95–1.52	190	1.27	1.04–1.55
Reference-3	121	1		180	1	
High-A	76	1.25	0.94–1.67	121	1.20	0.95–1.51
Reference-4	72	1		107	1	
High-B	63	1.04	0.74–1.45	94	1.07	0.81–1.41
Liver and intrahepatic bile ducts						
Reference-1	129	1		265	1	
Low	15	1.17	0.69–2.01	34	1.18	0.82–1.69
Medium	35	1.29	0.89–1.88	59	1.11	0.84–1.48
High	25	1.09	0.71–1.67	72	1.55	1.19–2.01
Reference-2	29	1		74	1	
High	25	1.23	0.72–2.09	72	1.31	0.95–1.81
Reference-3	23	1		50	1	
High-A	14	1.06	0.55–2.08	53	1.79	1.21–2.64
Reference-4	10	1		30	1	
High-B	13	1.54	0.62–3.51	30	1.20	0.77–1.99
Trachea, bronchus, and lung						
Reference-1	2 096	1		5 158	1	
Low	237	1.07	0.94–1.23	685	1.23	1.14–1.34
Medium	458	1.02	0.92–1.13	1 264	1.22	1.15–1.30
High	330	0.86	0.76–0.96	1 008	1.11	1.04–1.19
Reference-2	522	1		1 293	1	
High	330	0.88	0.76–1.01	1 008	1.06	0.98–1.16
Reference-3	362	1		827	1	
High-A	193	0.90	0.75–1.07	562	1.15	1.04–1.29
Reference-4	255	1		684	1	
High-B	180	0.83	0.69–1.01	562	0.99	0.88–1.11

(continued on next page)

Table 4.—Continued

Geographic region	Females			Males		
	No.	RR	95% CI	No.	RR	95% CI
Prostate						
Reference 1				3 376	1	
Low				260	0.80	0.70–0.90
Medium				614	0.92	0.84–1.00
High				563	1.01	0.90–1.11
Reference 2				820	1	
High				563	1.00	0.90–1.11
Reference-3				609	1	
High-A				259	0.85	0.73–0.98
Reference-4				366	1	
High-B				350	1.18	1.02–1.37
Cervix uteri						
Reference-1	751	1				
Low	81	0.92	0.73–1.16			
Medium	196	1.30	1.11–1.52			
High	171	1.23	1.04–1.45			
Reference-2	185	1				
High	171	1.21	0.98–1.49			
Reference-3	156	1				
High-A	104	1.07	0.83–1.37			
Reference-4	98	1				
High-B	88	1.04	0.78–1.38			
Female breast						
Reference-1	6 226	1				
Low	669	0.98	0.91–1.07			
Medium	1 231	0.94	0.89–1.07			
High	1 060	0.92	0.86–0.98			
Reference-2	1 567	1				
High	1 [illegible]60	0.92	0.85–0.99			
Reference-3	1 064	1				
High-A	561	0.88	0.79–0.97			
Reference-4	736	1				
High-B	605	0.95	0.86–1.06			

Notes: No. = numbe. of cases, RR = relative risk, and CI = confidence interval.

been investigated. Errors can occur during the coding of diagnoses because of incorrect interpretations of the diagnostic summary form retained in the hospital chart or in the transcription of information onto computer files. A recently completed reliability study of respiratory and other diseases, based on discharges from hospitals (Med-Echo system) in Montreal from which the Tumour Registry derives its data, has shown that diagnosis, age, sex, year of admission, municipality codes, and postal codes were recorded quite accurately.[27] Indirect evidence regarding the accuracy of the diagnoses for those sites of cancer presented here is provided by the similarity between Montreal and other jurisdictions of age- specific incidence rates[28] and the ratio of male-to-female cancer cases.[29,30] It is, therefore, likely that the data from the Tumour Registry are sufficiently accurate for the purposes of the analyses presented here and that they are superior to data retained in mortality records, for which the accuracy of diagnosing cancer has been estimated at about 80%.[31,32]

The main limitations of this study were related to potential errors in exposure classification, to inadequate control of potential confounding factors, and to a relatively short period from first exposure (1968) to cancer onset (1981–1988).

Because no direct measurements of biogas were available, we defined exposure zones in terms of proximity to the site. This probably led to misclassification because it was likely that there was heterogeneity in actual exposures to biogas in these broad areas. In an attempt to distinguish between "downwind" and "upwind" areas, the exposure zone closest to the site was divided into two subzones. Our results for stomach cancer in men and women and for liver cancer and lung cancer in men were consistent with the assumption that these subzones represented different average exposure levels, although results for prostate cancer did not.

Because exposure data were unavailable, we were unable to directly assess cancer incidence in relation to exposure to biogas.

Other than age and sex, potential confounding factors could not be controlled directly in the statistical

analyses. Indirect control over a number of key sociodemographic factors was, however, achieved through the matching of exposure and reference areas. Because the exposure zones were fairly broad, we could not match as closely as we would have liked (e.g., the high-exposure zone was different from the reference-2 zone with respect to percentages of Italian-speaking persons and in level of education). This difference in the proportion of persons of Italian extraction may have had a bearing on the results for stomach cancer. A study by Terracini et al.[13] showed a statistically significant increased risk of stomach cancer among Montreal males of Italian origin. However, adjustment for socioeconomic status and urban residence in childhood reduced the differences considerably. It was not possible, however, to evaluate formally the magnitude of these potentially distorting effects.

One of the analyses dealt with the comparison of cancer incidence rates for the high-, medium-, and low-exposure zones with respect to the remaining areas of Montreal. These comparisons should not be interpreted as being representative of exposure- or distance-response relationships because it is unknown to what extent, if any, biogas migrated into the medium- and low-exposure zones. It is nonetheless difficult to interpret the results for stomach cancer in men and women and lung cancer in men because they showed excess risks in the low- and medium-exposure zones, as well as in the high-exposure zone. For lung cancer, the excess risks may have been caused, for example, by a greater frequency of cigarette consumption or, for the low- and medium-exposure zones, by emissions from petroleum and petrochemical plants located in the east end of Montreal. Results from previous environmental studies near petrochemical plants have not, however, been consistent in indicating excess risks for lung cancer.[21-25]

No data were available regarding residential history; therefore, it was not possible to determine the length of time that subjects had lived in the relevant geographic areas. Given that the site has been in operation since 1968 and the cancer data cover the period 1981–1988, latency and exposure periods overlapped. Moreover, the maximum latency period was only 20 y, which, for solid tumors, is quite short.[26]

Some or all of the positive findings may have arisen because of multiple testing. Including all four exposure zones, 80 and 68 tests were carried out for women and men, respectively. Because these tests were not independent, it is difficult to predict the number of associations that would be expected solely by chance. Focusing on the analyses of the high-exposure zone, using only the reference-2 zone and assuming a 5% level of statistical significance, one would have expected to detect about one significant association for men and one for women. We observed one excess positive association among women and one among men.

The large difference in rates between men and women for liver cancer is consistent with that observed usually; women tend to have a higher incidence of gallbladder cancer and a lower incidence of liver cancer than men.[27,28] The increased risk in liver cancer among men is intriguing given that vinyl chloride monomer—a recognized liver carcinogen[29,30]—is present in the biogas. However, the excess risks may have resulted from other risk factors (e.g., alcohol consumption, aflatoxin exposure, and hepatitis-B virus). Risks among women were also greater than unity, but there was considerable variability in the estimates.

It would be useful to compare our estimates of RR with those obtained from calculating the expected number of excess cancers attributable to exposures to specific agents, using, for example, lifetable methods and available dose-response coefficients[14] (e.g., IRIS slopes[31]). This is the subject of our risk-assessment study mentioned above, which will be completed when environmental measurements have been carried out.

Conclusion

This is the first study in which cancer incidence was assessed in a population living near an active MSW landfill site. Because of the unavailability of detailed environmental data to define exposure areas and the absence of some important potentially confounding variables, we cannot conclude whether the excess risks for cancer observed here represent true associations with exposure to biogas. The results from this investigation will, however, be used in conjunction with other studies that will be carried out at the site.

Additional studies are warranted. There are approximately 6 000 MSW landfill sites currently in operation in the United States,[4] and, given that since World War II almost all communities in North America have used this method of solid waste disposal,[15] there must be an enormous number of inactive sites. Although MSW landfill sites were usually situated outside of urban areas, many sites are now in close proximity to large populations. The potential toxicity of emissions from MSW landfill sites is underscored by the fact that many are classified as hazardous; by 1986, 187 of the 850 sites proposed for the American superfund priority list for remedial action were of this type.[16]

* * * * * * * * * * *

A preliminary version of this study was presented at the Third National Conference of the Canadian Society for Epidemiology and Biostatistics, Québec, Québec, June 2–4, 1993.

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FOR IMMEDIATE RELEASE
Sept. 10. 1997
NIEHS ADV #17-97

NIEHS contact: John Peterson
919/541-7860

LOW BIRTHWEIGHT, EARLY BIRTHS FOUND AMONG INFANTS NEAR HAZARDOUS LANDFILL

In a study that may have far-reaching implications for people living beside hazardous chemical waste sites. two scientists today reported that infants born to mothers living immediately adjacent to a New Jersey landfill at the height of its activity had substantially lower birthweights and as much as twice the risk of being born preterm.

Epidemiologists Michael Berry. currently with the New Jersey Department of Health and Senior Services. and Frank Bove of the federal Agency for Toxic Substances and Disease Registry. which partly financed the study, reported their findings in *Environmental Health Perspectives*, the monthly* journal of the National Institute of Environmental Health Sciences.

The report is based on data collected from residents of four municipalities that border the Lipari landfill. a 15-acre site located in Gloucester County that was used for the dumping of household and industrial wastes from 1958 until 1971. The landfill was once rated number one on the Environmental Protection Agency's priority list. a national ranking system for hazardous waste sites based on the health risks they pose to surrounding populations.

The researchers divided the infants' mothers into "exposure categories" based on the distance of their residences from the landfill. Those who lived within a one-kilometer radius of the landfill (slightly more than six-tenths of a mile) were placed in the "exposed" category; those who lived beyond this boundary constituted the "unexposed" group. To assess the effects of chemical exposure on those who lived immediately downwind from the landfill. the investigators conducted separate analyses on the residents located directly adjacent to the site.

The researchers found that the average birthweight of infants born in the "exposed" area was 65 grams (more than two ounces) less than that of the infants born in the "unexposed" group. Then they discovered the birthweight differences were concentrated in the residential area nearest the landfill—these infants were. on average, 141 grams (more than four ounces) lighter than their "unexposed" counterparts. They also found that infants born in this residential area had twice the risk of being born preterm (gestational age less than 37 weeks) compared to the unexposed controls.

These effects occurred only among those infants born between 1971 and 1975. the period corresponding to the heaviest runoff of hazardous materials and the greatest likelihood of chemical exposure to nearby residents. Neither the infants born before. when dumping had not yet reached its peak. nor those these born afterward, when dumping had ended and remedial cleanup had begun, were similarly affected.

"The magnitude of this effect is about as bad as the birthweight reduction that is associated with cigarette smoking during pregnancy," said Berry, the lead investigator. "These findings are quite significant given the fact that low-birthweight and preterm babies have a lower chance of survival and a greater risk of developing post-birth problems than those born within the normal range."

Developed as a joint venture between the New Jersey Department of Health and community leaders

and activists. the study was designed to address the concerns of nearby residents to toxic chemicals emanating from the hazardous waste landfill. Infant birthweights were selected for study because they are an objective indicator of infant health. and because the information could be readily obtained from birth certificates. The researchers took into account potential risk factors such as maternal age and education. previous pregnancies and prenatal care. but other factors. such as maternal health. and cigarette and alcohol consumption during pregnancy. were not included on the birth certificate and could not be evaluated.

First excavated as a source of sand and gravel. the Lipari landfill was later back-filled with municipal waste. household wastes. liquid and solid chemical wastes. and other industrial wastes. These included cleaning solvents. resins. paint and paint thinners. ester press cakes. phenol wastes and amine wastes. Operation of the landfill ended in 1971 because of nearby residents' complaints regarding odors. respiratory problems. headaches. nausea. and dying vegetation.

In 1985. a remedial investigation of the Lipari landfill conducted by EPA revealed hazardous levels of a chemical called bis chloroethyl ether (BCEE). Other chemicals identified by the investigators included benzene. toluene. methylene chloride. dichloroethane, formaldehyde, phenol. chromium. nickel. mercury. lead. selenium, arsenic, and silver.

The researchers said. "The real public health threat to residents near the contamination was likely due to volatile organic compounds—chemicals such as benzene and xylene that evaporate into the air and thus expose people nearby." Both have been associated with low birthweight in some animal studies.

Other studies have linked low birthweight offspring to men working with auto body solvents and working mothers exposed to polychlorinated biphenyls (PCBs). Low birthweight (an average decrease of 50 grams) was also shown in the newborns of homeowners in the Love Canal. N.Y.. neighborhood.

* This is the August issue of the journal. which was delayed by publishing difficulties until today.

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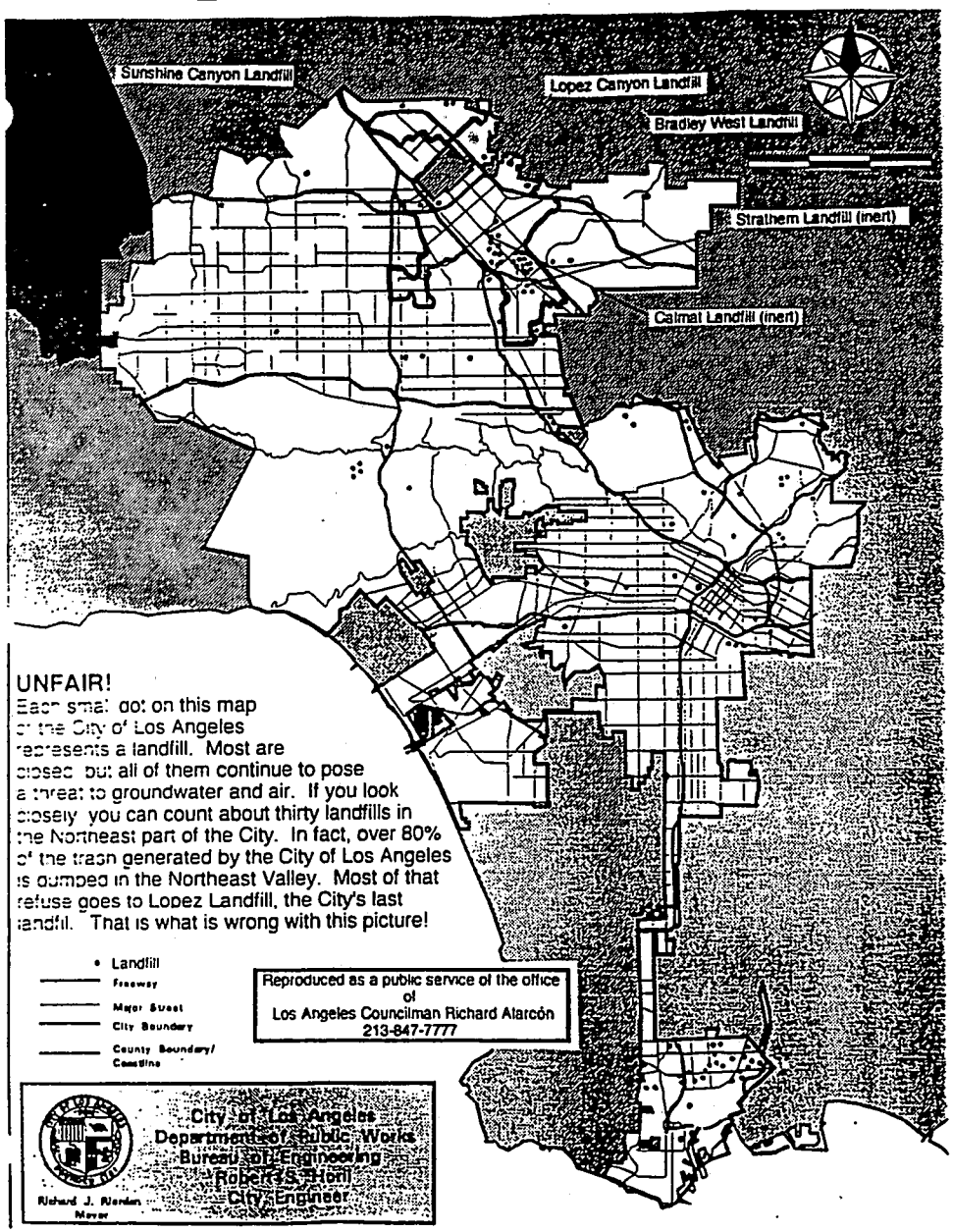
FACILITY LOCATIONS

ID#	Permit #	Facility Name	Address	Phone	Size	Status	Type
	Landfills						
1	19-AA-0820	Lopez Canyon	11950 Lopez Canyon Rd	213/376-6962		Active	Class III
2	19-AA-0008	Bradley West	9227 Tuiuna Ave	818/767-6180		Active	Class III
3	19-AR-0008	Calmat Inert	9436 Glenoaks Blvd	213/258-2777		Active-Exempt	Inert
4	19-AR-1160	Scatchem Inert	11201 Scatchem St.	213/233-4175		Active-Exempt	Inert
5	19-AR-1016	Sunshine Canyon	14747 San Fernando Rd	818/362-1367		In Closure	Closed
6	19-AR-0002	Ascon/Watson Energy System	1605 Alameda St.	310/775-3486		In Closure	Closed
7	19-AR-0003	Bradley East	9227 Tuiuna Ave	213/767-6180		In Closure	Closed
8	19-AR-0004	City Disposal/Harbor Dump	1402 E. Lomita Blvd	213/830-0370		In Closure	Closed
9	19-AR-0005	Penrose	8301 Tuiuna Ave	213/233-4175		In Closure	Closed
10	19-AA-0835	Sheldon/Arleta	12455 Wicks St			Closed	Closed
11	19-AA-0819	Toyon Canyon	5080 Mt. Hollywood Dr	213/237-2705	11ac	In Closure	Closed
11	19-AA-0821	Mission Canyon #1-3	2501 N. Sepulveda		360ac	In Closure	Closed
11	19-AA-0822	Mission Canyon #4-7	2201 N. Sepulveda Blvd		500ac	In Closure	Closed
11	19-AA-0823	Mission Canyon #8	1801 N. Sepulveda Blvd		500ac	In Closure	Closed
	Transfer Stations						
12	19-AR-0302	Community Recycling	9147 De Garmo Ave	213/875-0587		Active	Large
13	19-AR-1185	General Recycling Services	2474 Porter St., Los Angeles	213/623-9221		Active	Large
14	19-AR-1182	Central LA Transfer Station	2201 E. Washington Blvd.	213/746-9700		Active	Large
15	19-AR-0302	Falcon Refuse Center	3031 E. "T" St	310/590-8531	5.7ac	Active	Large
16	19-AR-1182	WTR	840 S. Mission Rd	213/262-9659	3.3ac	Active	Large
	Maintenance Yards						
17	19-AA-0814	Van Nuys St MDY	15145 Oxnard St	818/989-8812		Active	Large
18	19-AA-0817	Granada Hills St MDY	10210 Etiwanda	213/485-5630	3.12ac	Active	Large
19	19-AA-0809	Lindley Ave Transfer Station	6351 Lindley Ave	213/485-5630		Temp Inactive	Small
20	19-AA-0804	Alabama St/Canoga MDY	7453 Canoga Ave	213/254-4303	0.96ac	Active	Small
21	19-AA-0813	Sunland St MDY	9401 Wentworth St	818/353-2328	2.02ac	Active	Small
22	19-AA-0811	San Fernando St MDY	11370 San Fernando Rd	213/254-4303	4.04ac	Temp Inactive	Small
23	19-AA-0803	Cahuenga Pass St MDY	2770 Cahuenga Blvd	213/851-0305	1.72ac	Temp Inactive	Small
24	19-AA-0807	Hollywood St MDY	6640 Romaine St	213/485-4501	1.03ac	Active	Small
25	19-AA-0808	Eagle Rock St MDY	2231 Fair Park Ave	213/255-1463	0.37ac	Active	Small
26	19-AA-0801	Central St MDY	1274 W. Second St	213/250-9017	0.54ac	Active	Small
27	19-AA-0805	N. Hollywood/Studio City MDY	10811 Chandler Blvd	818/989-1214	3.29ac	Active	Small
28	19-AA-0811	Southeast St MDY	4206 S. Main St	213/485-3717	0.96ac	Active	Small
29	19-AA-0301	County Public Works #233	5330 W. 83rd St			Active	Small
30	19-AA-0814	Caltrans - Silverlake	2187 Riverside Dr	213/620-4745	5ac	Active	Small
31	19-AA-0802	Bel Air St MDY	11165 Missouri Ave	310/575-8478	0.77ac	Active	Small
32	19-AA-0815	Wilshire St MDY	1274 S. Cochran Ave	213/485-3481	0.56ac	Active	Small
33	19-AA-0810	Palisades St MDY	1479 Stoner Ave	213/312-8479	0.70ac	Emerg. Only	Small
34	19-AA-0818	Southwest St MDY	5850 S. Wilton Pl.	213/485-3702	3.66ac	Active	Large
35	19-AA-0816	East St MDY	452 E. San Fernando Rd	213/485-5680	8.69ac	Active	Large
	Composting						
	19-AR-0851	Griffith Park Composting					
	Refuse Collection Vehicle Yards						
36		South Central District	786 South Mission Rd	213/485-4911		Active	
37		North Central District	452 N. San Fernando Rd	213/485-4906		Active	
38		Western District	2027 Stoner Ave	310/575-8393		Active	
39		East Valley District	9701 San Fernando Rd	818/989-8522		Active	
40		West Valley District	8840 Vanalden Ave	818/989-8627		Active	
41		Harbor District	1400 N. Cafiey St	310/548-7655		Active	

Notes: PERMIT date is for renewal of permit
MDY=Maintenance District Yard

11/93 FAC_LOC.WB1

WHAT'S WRONG WITH THIS PICTURE?



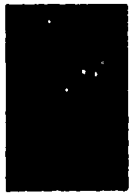
EXH. 76

Richard Alarcon, Los Angeles city councilman, 7th District

"We need a lot more to upgrade the r ly the year 2003, the life of a ndfill will have expired. When that happens, we'll need to negotiate with another agency to dispose of our trash if anything, we should leave space open to allow us room to negotiate with that agency."



Richard Alarcon



Lander Warren

Lander Warren, administrator of Forester Haveoe Senior Home, San Fernando

"Our grounds are [less than a mile] away from the landfill. Because of the intermittent odors and fumes coming out of there, our residents have experienced frequent headaches, burning eyes and exacerbated problems with breathing. We use buses to get people to the doctor or the hospital and, at times, are forced to wait for five trucks to go by before we can get through. Along with the noise, that is a nuisance."

Drew Sones, assistant director of the Los Angeles Bureau of Sanitation

"The Lopez Canyon Landfill will have room for another 3 million tons of refuse in 1998. Normally, landfills take in an average of 1 million tons per year, but with recycling doing so well, it would take us five years to use up that remaining space. As an asset, the landfill would not be utilized to its full potential [if it were to close next year]. Financial aspects, as well as environmental, need to be considered."

Barbara Fine, vice chairwoman of the Solid Waste Citizens Advisory Group for Los Angeles

"It appears that an inclination toward landfilling has surfaced again. According to [Assembly Bill] 939, local agencies have to divert 50% of their refuse away from landfills by the year 2000. Our fear is that the waste management officials will eventually ask for a delay in those requirements when they find agencies unable to meet them. With more landfills open, less will be the incentive to recycle."

Bill Thompson, senior manager of public facilities at the South Coast Air Quality Management District

"Landfills are still the cheapest way to dispose of trash. There have been a number of stringent regulations applied to them in the recent past. Most landfills can produce electrical energy from their gas emissions. The Puente Hills Landfill produces enough to light a few thousand households. A similar proposal was made for Lopez Canyon. We're very supportive of that."

Jackson, who has pressed for other infrastructure improvements in Pacoima, one of the San Fernando Valley's most economically depressed communities.

TIM MAY

ANGELES NATIONAL FOREST

Tiger Family Brought From Ireland Mends

A starved and abused family of Siberian tigers, brought from Ireland in December for rehabilitation at the Wildlife Waystation animal refuge in Angeles National Forest, have made a full recovery and will be released from quarantine into a new enclosure next Wednesday, way station officials said.

The female adult tiger began nursing her two cubs several weeks ago, and the male adult has improved dramatically since arriving Dec. 11, said way station founder Martine Colette.

The tigers were found at a farm in Ireland by Irish animal regulatory officials in December. Purchased from a circus in England by an individual who improperly cared for them, the tiger family originally included five cats, but one died before officials contacted the way station.

Animal welfare authorities first tried to place the severely malnourished tigers in zoos in Europe, but were unsuccessful.

When the tigers arrived at Los Angeles International Airport, Colette met them and feared the worst for the 7-year-old male, Batak, who was less than half his normal weight and appeared to be suffering from a stomach tumor. Way station veterinarians later examined Batak and determined the tumor was benign.

On Wednesday, Colette and her staff will move the furry foursome from their current quarters in the way station's quarantine area to a new 10,000-square-foot enclosure on a hill overlooking the main animal compound. The enclosure was built using donations from a way station sponsor who specified that the money could be spent only on new housing for tigers.

"We had literally just finished building the enclosure and pouring the concrete for the tiger pool when we heard these tigers in Ireland needed a home," said Diana Wenners, Colette's assistant. "It's amazing how it worked out."

The mother and the two cubs will enter the enclosure first, transported in crates carried by forklifts. The father will be introduced to the enclosure later in the day.

At the way station, the tigers have become part of one of the region's most remarkable and diverse collection of big cats. Cougars, bobcats, jaguars, panthers, tigers, lions and a tigress—a lion crossbred with a tiger—are among the way station's wards.

—TIM MAY

PANORAMA CITY

Rezoning Urged for New Housing Site

The Los Angeles Planning Commission will recommend that the City Council approve a zone change to allow higher-density housing on a 70,000-square-feet property in Panorama City.

The commission voted Thursday to recommend changing the designation of the property, at 9763 Vesper Ave., from one that would allow one home per lot and one unit per 7,500 square feet to one that allows multiple residences on each lot and one unit every 6,000 square feet.

If approved by the council, the zone change would allow 12 houses to be built on the irregularly shaped parcel south of Lassen Street. Eleven houses would be situated around a private cul-de-sac, while one would be constructed on Cedros Avenue, on which the property also has frontage.

An unusual feature of the development is that the lot will not be divided into individual plots. Instead, the yard space around the two story houses will be considered common areas, although each homeowner will have to maintain landscaping close to his or her home. Because of the lot's odd shape, property lines would have been difficult to draw between the homes, said Tom Henry, planning aide to Joel Wachs.

Henry said he heard few complaints about the project at a public hearing in December. The proposed zone "pretty much matches the density of property to the west and north."

The property is owned by Panorama City resident Helen Higashida. Two houses now on the site would be torn down to make way for the new homes, Henry said.

The project will probably go before the City Council's Planning and Land Use Management Committee within the next month and a half, and to the full council some time thereafter.

Henry said Wachs has not decided whether to support the project.

"To the south you have condominiums," Henry said. "To the north and west you have single-family homes. We want something that will be a nice buffer between the two, that will not have a negative impact, especially on the single-family homes."

—KAY HWANGBO



SHERMAN OAKS

Gas Station Seeks Alcohol Sales Permit

A Los Angeles zoning official next week will consider an application by a businessman to sell beer and wine at a proposed mini-mart located at the intersection of Burbank and Sepulveda boulevards.

Valencia businessman Jack Khangura has applied for a conditional use permit to sell alcoholic beverages at a 24-hour market that he wants to add to his Shell station at 6556 Sepulveda Blvd.

"We have not yet taken a position" on the project, said Bonnie Kopp, an aide to City Councilman Marvin Braude. "We are talking to the police and trying to figure out what the impact on the community would be."

Kopp said she heard that a local homeowners association has expressed concerns about the proposed market, which would be open 24 hours a day, seven days a week.

Many community activists oppose the sale of alcohol at gas stations, fearful that it might encourage drinking and driving.

According to Khangura's application, there are now two liquor stores within the Shell station's so-called census tract, a designated area of residents surrounding it. The state Alcoholic Beverage Control Department allows six liquor licenses in a census tract, Khangura said.

The businessman said in his application that he would like to sell beer and wine coolers in single cans if he is allowed to do so by the city.

There are five parking spaces at the site.

The hearing will take place at 8:30 a.m. Feb. 24 at the Sherman Oaks Woman's Club, 4808 Kester Ave., in Sherman Oaks.

—KAY HWANGBO

tremendous amount of liability the city is posing itself to. To say they don't know is ridiculous, because they put [pylons] out to direct people around the debris. . . . Can't the city just put up a fence or something?'

MARJORIE MILLER
Lake View Terrace resident

VAN NUYS

Alternatives to All-Year School Cited

Teachers opposed to converting Van Nuys High School to a year-round campus said Thursday that reducing enrollment or installing portable classrooms on nearby property would prevent the need to go year-round to relieve overcrowding.

Van Nuys is scheduled to enroll its first freshman class in 1998-99 under a districtwide plan to add ninth-graders to all high schools. To accommodate them, the school would probably have to host students year-round, rotating teenagers onto campus on staggered schedules.

But Charlie Wilken, one of several teachers opposed to a scheduling change, said he has come up with several proposals that would eliminate the need to operate on a year-round calendar.

One solution, said Wilken, the school's teachers union representative, would be for the Los Angeles Unified School District to make use of a piece of property that it owns several blocks away from the school.

"Next week, I'll be meeting with the district's people to talk about using the farm across the street from Valley Presbyterian Hospital and putting six bungalows on it," Wilken said.

He added that he would like to see those bungalows turned into an agricultural academy for Van Nuys students, but said the extra classroom space could at least relieve the overcrowding expected once ninth-graders are included.

Wilken will also suggest reducing the number of students at the high school by about 14%, a move that would force students at Van Nuys and its three specialized magnet programs to attend other schools.

One of those magnet programs is a joint medical studies program with Valley Presbyterian Hospital. Some teachers contend that the year-round system would hurt the three magnet programs by making it impossible for students to cross-register among them—currently one of the main attractions of the school.

But Joyce Peyton, director of the district's Office of School Utilization, said the district does not have the money to cover the $30,000 to $100,000 that each new bungalow would cost.

She also said that reducing the student population at Van Nuys would only overcrowd neighboring campuses such as Grant and Birmingham high schools.

"I don't know that we should be taking kids out of Van Nuys and putting them where that causes [problems] at another school," said Peyton, who is scheduled to meet with Wilken next week.

She added that the plot of land across from the hospital has already been reserved for an expansion of Van Nuys' medical studies program, which the district cannot afford at the moment.

—MAKI BECKER

On the Issue

INFORMED OPINIONS ON TODAY'S TOPICS

Has Landfill at Lopez Canyon Had Its Fill?

By ANTONIO OLIVO
SPECIAL TO THE TIMES

Plans to close the Lopez Canyon Landfill in early 1996 may be postponed by the Los Angeles City Council if Bureau of Sanitation recommendations to continue operating the facility through the year 2000 are approved.

The bureau's suggestion came in response to a 1994 report that said the city could save $75 million by using the 20-year old facility another five years instead of adopting an alternative method of trash disposal next year.

The council had approved a similar five-year extension back in 1991 and had given the bureau until next February to shut the landfill.

Outraged community members responded to the possibility of yet another extension by pointing to language in a 1991 conditional use permit that promised a one-time-only renewal of operations at Lopez Canyon.

But bureau directors said that not only would the extension generate cash savings, but more time is needed to study alternative disposal programs.

They maintain that the facility is one of the best-run landfills in California, despite four citations in the last three months by the South Coast Air Quality Management District for gas emissions violations.

Situated in the hills just above Lake View Terrace, the landfill takes in about 80% of the city's household waste.

Should the Lopez Canyon Landfill be allowed to operate another five years?

Richard Alarcon, Los Angeles city councilman, 7th District

"We need to do a lot more to upgrade the system. By the year 2003, the life of this landfill will have expired. When that happens, we'll need to negotiate with another agency to dispose of our trash. If anything, we should leave space open to allow us room to negotiate with that agency."



Richard Alarcon

Sander Warren,

EAST VALLEY FOCUS



- Arleta
- Lake View Terrace
- Mission Hills
- N. Hollywood
- Pacoima
- Panorama City
- San Fernando
- Sherman Oaks
- Studio City
- Sunland-Tujunga
- Sun Valley
- Sylmar
- Universal C
- Valley Villa
- Van Nuys

LAKE VIEW TERRACE

Accident Calls Attention to Crumbling Hill

For years, Lake View Terrace and Pacoima residents say, they've asked that something be done about the steadily crumbling sandstone hill that towers over a 50-yard stretch of Osborne Street near Hansen Dam.

Rocks and dirt from the 100-foot-high embankment sometimes tumble onto the sidewalk and into the street, making passage difficult for pedestrians and cars going to and from Hansen Dam Recreation Area, a major outdoor attraction.

So when a rock recently rolled down the hill, bounced in the street and cracked the windshield of 68-year-old Marjorie Miller's passing car, residents said the time had come for the city to take action.

"I'm not concerned for me—I'm fine," said Miller of Lake View Terrace. "What I'm concerned about is the tremendous amount of liability the city is exposing itself to. To say they don't know is ridiculous, because they put [pylons] out to direct people around the debris.

"What I'm most concerned about is the young mothers who walk by that hill with babies," Miller said. "They are forced to push their strollers in the street because the sidewalk is covered with mud and rock. Can't the city just put up a fence or something?"

A spokesman for Councilman Richard Alarcon acknowledged that complaints have been made about the hill. The spokesman said field deputies will study the problem and possibly recommend action to the Department of Public Works.

Ray Jackson, president of the North East Valley Homeowners Assn., said he first requested action on the hill situation more than two years ago, when former Councilman Ernani Bernardi represented the district.

"They ignored us then," grumbled Jackson, who has pressed for other infrastructure improvements in Pacoima, one of the San Fernando Valley's most economically depressed communities.

—TIM MAY



RICHARD DERK / Los Angeles Times

Marjorie Miller stands on the sidewalk near rocks from the crumbling hill near Hansen Dam. Miller says the city should protect itself by making the area safe.



'What I'm concerned about is the tremendous amount of liability the city is exposing itself to. To say they don't know is ridiculous, because they put [pylons] out to direct people around the debris. . . . Can't the city just put up a fence or something?'

MARJORIE MILLER
Lake View Terrace resident

ANGELES NATIONAL FOREST

Tiger Family Brought From Ireland Mends

A starved and abused family of Siberian tigers, brought from Ireland in December for rehabilitation at the Wildlife Waystation animal refuge in

The enemy below L.A.

Landfills in Valley hold explosive, toxic threats

By TONY KNIGHT
Daily News Staff Writer

Escaping landfill gas, seeping toxic chemicals and the threat of contaminated wells have convinced city officials it was a mistake — one that may never be corrected — to cluster eight garbage dumps in the North Hollywood-Sun Valley area.

At least twice in the last five years, methane gas, a byproduct of decomposing trash, has reached explosive levels at schoolyards in the East Valley landfill area, long the primary garbage dumping ground for the city of Los Angeles.

Traces of toxic chemicals, some known to cause cancer, are being found in gas at most of the landfills, where only non-toxic refuse was supposed to be buried.

Water quality officials suspect that toxic solvents at the landfills are leaching through the sandy soil and adding to the Valley's already serious groundwater pollution problem.

In extensive interviews and checks of city, county and state

Please see LANDFILL Pg. 16

EXH. 77

from page 1

Landfill errors of the past pose today's toxic threats

LANDFILL from Pg. 1

records, the Daily News found a lack of coordination among various government agencies that have authority over the dumps and evidence that past efforts to lessen the environmental threats have fallen short.

Despite the environmental problems, plans for two more dumps have been approved in the area by the city Bureau of Sanitation. State officials are blocking their operation because of the threat of more groundwater pollution.

Indeed, with the city generating 35,000 tons of garbage a day, dumpsites are becoming harder to find.

"I think it's a crisis," said Del Biagi, director of the Bureau of Sanitation. "The people in the city say, 'Take it to the desert,' and the people in the desert say, 'You generated it, you eat it.'"

Sanitation officials said the new dumps will be lined with impervious clay barriers and equipped with modern gas control systems. Strengthened state and federal regulations will prevent further environmental damage, they believe.

But such protections have not eased the concern of Councilman Howard Finn, whose First District gets 80 percent of the city's garbage.

"They really have no control over what's been dumped in those landfills — that's the problem," Finn said.

"They say, 'If we knew 20 years ago what we know now, you wouldn't have all these problems.' I'm saying that's the same thing they're going to say 20 years from now."

Even if past mistakes are avoided, serious problems remain from refuse dumped over the last 50 years at landfills clustered in a 1.5-mile radius in the North Hollywood-Sun Valley area.

More than 50 million cubic yards of garbage — enough to cover five football fields to a height of one mile — have been buried in the area since the 1930s. Most of the landfills reached capacity and closed in the 1970s.

The dumps are the legacy of sand mining operations that left yawning pits in the area. The city's plan was to fill those eyesores with garbage.

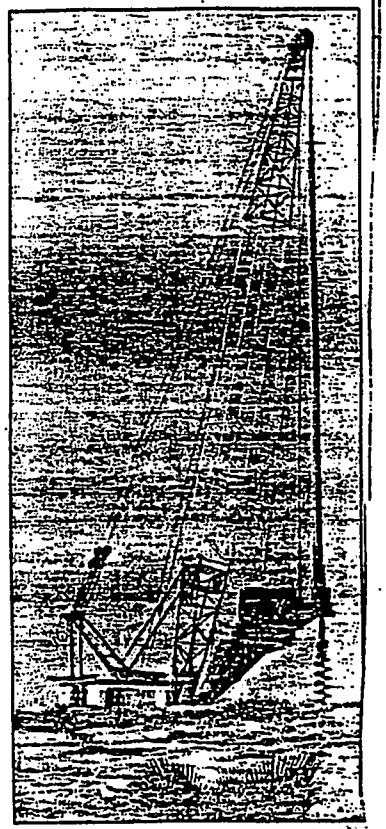
"At that time it seemed like the logical thing to do," said Sterling Buesch, assistant director of the Bureau of Sanitation. "They didn't know about the gas problems associated with landfills."

Air quality records show decomposing trash at the landfills produce more than 15 million cubic feet of gas daily — enough to supply 200 single-family homes with gas for a year.

Sanitation officials said the area's gas problems have been controlled by collection systems which channel the gas to a flare where it is burned off.

However, records show L.A. By-Products' Tuxford Pit still has no collection system. Gas migrating from the site reached explosive levels in 1982, and migrating gas was measured there as late as last week.

The gas collection system at the city-owned Sheldon-Arleta Landfill wasn't installed until 1978, three years after the dump closed.



Scott Garrey / Daily News

Drilling rig is used to check for possible problems at Penrose Landfill near Arminta Street school.

In 1980, gas migrating about 900 feet from the landfill forced the evacuation of gyms at nearby John H. Francis Polytechnic High School for four months. Migrating gas set off alarms at the school March 28. The boy's gym was evacuated for a day.

"Significant" levels of toxic compounds have been measured in landfill gas at the Penrose Landfill, across the street from Arminta Street Elemen-

Please see LANDFILL Pg. 17

Landfills contain residue of errors made years ago

LANDFILL from Pg. 16

tary School. The dump was in violation of gas control regulations in 1980 and 1983.

"If we knew what we know now, we wouldn't have done it. Or we would have done it differently," said Robert Alpern, principal civil engineer for the city Bureau of Sanitation. "The intent was that there were all these pits, and the people wanted them filled in, and there wasn't anything else to put in it."

Officials shudder at the prospect of digging up the landfills because of the odor and cost of such operations.

"We're going to live with them unless we excavate them — and I don't think that's going to happen," said Hank Yacoub, supervising engineer for the Los Angeles Regional Water Quality Control Board. "With today's knowledge, instruments, and standards, you wouldn't have seen that many landfills in that area."

Originally, the dumps were regulated by the city Bureau of Street Maintenance and the regional water quality board. The state's Solid Waste Management Board wasn't in existence until 1976. Federal laws regulating landfills weren't passed until 1978.

"I think it is no secret that although those landfills operated as trash-only facilities, it appears hazardous materials made their way in with the trash," said Yacoub of the water quality board.

"The regulations were nothing near as stringent as they are today," said John L. Lewis, the water quality board's enforcement officer. "Plus, there was little or no enforcement of the regulations at that time."

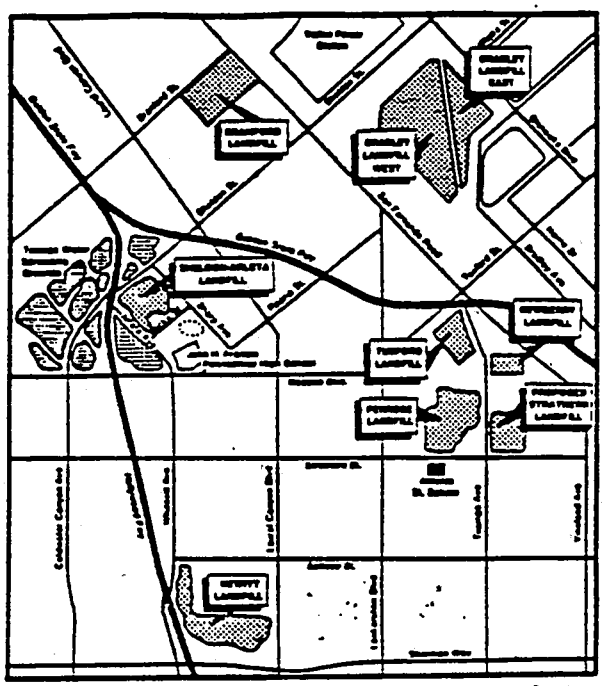
Toxic levels in the landfill gas are so low they would be harmless once the gas is diluted in the open air, sanitation officials said.

Health officials agreed people near the landfills are not in imminent danger, but they said there is no way of knowing the long-term risks of exposure to low levels of cancer-causing compounds.

"What it gets down to is what is an exposable risk based on proximity to the landfill," said Dr. James Stratton, a state health department epidemiologist who is conducting a study to determine health effects on residents near the BKK landfill in West Covina.

Long-time teachers at Poly High and Armuta Street School are worried about the health effects of working across the street from the dumps. Many teachers have worked at the schools for more than 20 years.

LOCATION OF NORTHEAST VALLEY LANDFILLS



Daily News

In retrospect, Los Angeles city officials say it was a mistake to cluster eight garbage dumps in North Hollywood-Sun Valley area.

A TOXIC LEGACY

- Gyms at John H. Francis Polytechnic High School were closed for four months in 1980 after health officials measured explosive levels of methane coming from the city-owned Sheldon-Arleta Landfill, 12455 Wicks St. Gas collection system failed because of corrosion of pipes and was redesigned completely. Gas monitor alarms went off in 1983, requiring enlargement of the collection system.
- Sheldon-Arleta closed in 1975, but a gas migration system was not installed until 1978. Traces of benzine have been measured in the landfill gas.
- Significant levels of toxic chemicals were measured in landfill gas at the Penrose Landfill, 8251 Tujunga Ave., across the street from Armuta Street Elementary School. In 1983, teachers complained that odors from the landfill were making children sick. The landfill was in violation of gas migration regulations in 1980 and 1983, state officials said.
- In 1982, explosive levels of methane gas were measured coming from the Toxford Pit, 8501 Tujunga Ave. State officials say the city Bureau of Sanitation was supposed to require installation of a gas control system, but this never happened.
- The Sheldon-Arleta Landfill shares a common well with the city's Tujunga Spreading Grounds, where mountain runoff percolates into groundwater. A clay liner was placed between the trash and the drinking water, but officials doubt whether it is working properly.
- Operation of Hansen Dam Spreading Grounds was halted in 1981 when rising groundwater came within 10 feet of the bottom of the Bradley East Landfill, 11629 Wicks St., nearly causing a major environmental problem. The Hansen Dam water was released to the Los Angeles River and "wasted" to the ocean.
- Toxic solvents measured in wells near the Penrose Landfill and the Hewitt Landfill, 7245 Laurel Canyon Blvd. Officials say the dumps are probably one source of the Valley's groundwater contamination problem.

"We think we've had a lot of cancer," said Sylvia Brown, a Poly High counselor. "One of the teachers gets headaches all the time. The P.E. teachers feel there is something."

In 1980, teachers at Poly High complained that mysterious fumes were seeping into the locker rooms. A county health official said the cause was dirty sweat socks.

When teachers complained of burning eyes and headaches, investigators checked again and found explosive levels of methane gas in the locker rooms and in the school auditorium. They traced the fumes to Sheldon-Arleta.

A year later, Harvey Noels, an assistant principal and part-time coach, died of liver cancer, triggering a wave of concern among faculty members. A committee was formed and is trying to determine the chemical composition of gas generated at the dump site.

Air quality records show the landfill gas contains traces of benzine, a known carcinogen. However, no links have been made between Noels' death and the landfill gas.

Jack Waldron, district health and safety officer, said the toxic traces were insignificant and the landfill no longer poses a health risk.

A 1983 school district survey at Arminta Street school, near the Penrose Landfill, indicated 96 percent of the teachers "report adverse health effects associated with the dump site." The same year a teacher told a water quality inspector about strong odors and that, "kids get sick often due to the landfill."

In 1982, measurements of concentrated landfill gas at Penrose revealed the presence of such suspected carcinogens as benzine (20,000 parts per billion), trichloroethylene (1,300 parts per billion), and vinyl chloride (4,500 parts per billion.)

"What that demonstrates is that there are significant levels of carcinogenic gases in the landfill gas," said Robert Stevens, chief of the state Department of Health's hazardous materials lab. "The fact that they are flaring it is good, because it isn't escaping into the neighborhood."

The state safety standard for vinyl chloride in the open air is 10 parts per billion; there are no known standards for safe open air concentrations of TCE or benzine. All three compounds would dilute quickly in the open air.

The Penrose Landfill was in violation of gas migration regulations in 1980 and 1983, said John Bell, manager of the Solid Waste Management Board's monitoring section. Sanitation officials said the problem has been corrected. State officials, checking the site last week for the first time in four years, found two methane probes clogged and inoperable.

Arminta teachers still complain of frequent headaches. "When I walk into my room, I can smell it from the night before," said Ada Bender, a fifth-grade teacher.

Richard Salisbury, president of L.A. By-Products, operators of the Penrose Landfill, said toxic volumes in the dump are too small to be dangerous. "Those contaminants are found all over the Valley," Salisbury said. "I think everybody is trying to point the finger at landfill operators when there are other sources of contamination."

L.A. By-Products operated the Tuxford Pit until 1973 when it was sold to Adlen Brothers Auto Wreckers.

In 1982 state officials measured explosive levels of methane migrating underground from the site. The Bureau of Sanitation was supposed to force installation of a gas control system, said Mary Coyle, an enforcement officer with the state Solid Waste Management Board.

It never happened.

"I think it was pointed out that under existing law we didn't have authority to require compliance," said Buesch, the assistant sanitation director.

"We are in the process now of showing them that they are the enforcing party ... the responsible agency," said John Bell, of the waste management board.

Water officials said the primary sources of well contamination are undergorund industrial tanks and "backyard" commercial dumping with landfills a likely secondary source.

"The landfills may be a contributor, and we suspect that they are," said Mel Blevins, the Department of Water and Power's senior hydrologic engineer. "But they're not the major contributor."

Recent tests show 40 percent of the Valley wells are contaminated with traces of TCE and perchloroethlyene (PCE), carcinogenic industrial solvents. Health officials have closed 13 of the 109 Valley wells. Forty others are tainted but can be used if the water is blended with untainted water.

The state's safety standard for TCE in drinking water is 5 parts per billion. The standard for PCE is 4 ppb. TCE has been measured at 31 ppb in a well downsteam from Penrose. PCE has been measured at 3.9 ppb downstream from Valley Reclamation Inc.'s Hewitt Landfill.

"What that means is that the existing landfills have leached some of this material into the groundwater," Blevins said. "That's not a lot, but it's enough to say, 'Well, what's happening there.'"

State regulations now require an impervious clay liner on the bottom and sides of landfills. Previously, the only regulation was that the bottom of the trash heap be 10 feet above the historical high water mark.

"That's an antiquated standard," Yacoub said. "The gas can travel in any direction."

Officials hope the monitoring program will determine if water from the spreading grounds has inundated trash at the Bradley East and Sheldon-Arleta landfills.

B.F. GOODRICH COMPANY; Upjohn Company; Dow Corning Corporation; Reynold Aluminum Building Products Company; Uniroyal Chemical Company, Inc. and Hoechst Celenese Corporation, Plaintiffs-Appellees,

v.

Harold MURTHA; A.C. Hampson Printing; A.W. Sandora & Sons; Action Refuse; Action Moving Co., Defendants,

and

Town of Beacon Falls; Town of Bethany; Connecticut Resources Recovery Authority; Town of Hamden; Town of Killingworth; Town of Middlebury; City of Milford; City of New Haven; Town of Orange; Town of Plymouth; Town of Seymour; Town of Stratford; Town of Thomaston; City of Waterbury; and Town of Westport, Defendants-Appellants.

UNIROYAL CHEMICAL CO., INC., Plaintiff,

v.

Harold MURTHA; Murtha Trucking, Inc.; Murtha Enterprises, Inc., Defendants,

and

City of Ansonia; Town of Beacon Falls; Town of Bethany; Town of Killingworth; Town of Middlebury; Borough of Naugatuck; New Haven Housing Authority; Town of Orange; Town of Plymouth; Town of Seymour; City of Shelton; City of Stamford; Town of Stratford; Town of Thomaston; Town of Watertown; Watertown Housing Authority; Town of Westport and Town of Woodbury, Defendants-Appellants.

STATE OF CONNECTICUT, Plaintiff,

v.

Harold MURTHA; Murtha Trucking, Inc.; Murtha Enterprises, Inc., Defendants.

UNITED STATES of America, Plaintiff,

v.

Harold MURTHA; Terrance Murtha; Murtha Trucking, Inc., Defendants.

UNITED STATES of America, Plaintiff,

v.

ARMSTRONG RUBBER COMPANY; Eastern Company; Primerica Corporation, Defendants.

No. 375, Docket 91-7450.

United States Court of Appeals, Second Circuit.

Argued Oct. 2, 1991.

Decided March 12, 1992.

Action was brought against owners and operators of landfill to recover past and future cleanup costs under CERCLA. Landfill owner filed third-party actions for contribution and indemnification from municipalities. Complaints were amended to add municipalities as defendants in the original action. Motions of the municipalities for summary judgment was denied by the United States District Court for the District of Connecticut, Peter C. Dorsey, J., 754 F.Supp. 960, and municipalities appealed. The Court of Appeals, Cardamone, Circuit Judge, held that CERCLA imposes liability on municipality which arranges for disposal or treatment of municipal solid waste that contains primarily household waste.

Affirmed.

1. Health and Environment ⇐25.5(5.5)

CERCLA imposes strict liability. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107, as amended, 42 U.S.C.A. § 9607.

2. Health and Environment ⇐25.5(5.5)

Where environmental harm is indivisible, liability under CERCLA is joint and several. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107, as amended, 42 U.S.C.A. § 9607.

3. Health and Environment ⇐25.5(5.5)

Broad reach of CERCLA extends liability to all those contributing, from generation through disposal, to problems caused by hazardous substances. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107, as amended, 42 U.S.C.A. § 9607.

4. Health and Environment ⇐25.5(5.5)

Because it is a remedial statute, CERCLA must be construed liberally to effectuate its two primary goals of enabling the Environmental Protection Agency (EPA) to respond efficiently and expeditiously to toxic spills and holding those parties responsible for releases liable for the costs of the cleanup. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107, as amended, 42 U.S.C.A. § 9607.

5. Health and Environment ⇐25.5(5.5)

Liability under CERCLA is precluded only by defense that the release or threatened release was caused solely by an act of God, an act of war, or certain acts or omissions of third parties other than those with whom defendant had a contractual relationship. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107, as amended, 42 U.S.C.A. § 9607.

6. Health and Environment ⇐25.5(5.5)

Prima facie cause of action under CERCLA requires that plaintiff establish that defendant fits one of the four classes of responsible parties outlined in the statute, that the site is a facility, that there is a release or threatened release of hazardous substances at the facility, that the plaintiff incurred costs in responding to the release or threatened release, and that the costs and response actions conform to the National Contingency Plan. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107, as amended, 42 U.S.C.A. § 9607.

7. Health and Environment ⇐25.5(5.5)

Municipality may be liable for response costs under CERCLA as a potentially responsible party if it arranges for the disposal of hazardous substances. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107, as amended, 42 U.S.C.A. § 9607.

8. Health and Environment ⇐25.5(5.5)

Liability under CERCLA as an arranger requires sufficient nexus between municipality and hazardous substances, one that does not exist in cases where the governmental unit is responsible only for promulgating disposal regulations or for permitting disposal facilities. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107, as amended, 42 U.S.C.A. § 9607.

9. Health and Environment ⇐25.5(5.5)

CERCLA does not provide exemption from municipalities arranging for disposal of municipal solid waste that contains hazardous substances simply because the municipality undertakes that action in furtherance of its sovereign status. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107, as amended, 42 U.S.C.A. § 9607.

10. Health and Environment ⇐25.5(5.5)

Substance need only be designated as hazardous under any one of the four environmental statutes or under EPA table in order to be a hazardous substance under CERCLA; CERCLA does not require substance to be delineated as hazardous under more than one of the subsections. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, as amended, 42 U.S.C.A. §§ 9601(14), 9602.

11. Health and Environment ⇐25.5(5.5)

CERCLA does not make any distinction either among potentially responsible parties or by virtue of source of hazardous substance; whether potentially responsible party is owner or operator of facility, arranger, generator, or transporter of hazardous substance, or is a municipality, individual, or chemical manufacturing company, is not relevant in determining whether substance is hazardous. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, as amended, 42 U.S.C.A. §§ 9601(14), 9602.

12. Health and Environment ⇐25.5(5.5)

CERCLA's definition of hazardous substance makes no distinction dependent upon whether the substance's source was industrial, commercial, municipal, or household, and whether the substance is a consumer product, manufacturing by-product, or element of waste stream is irrelevant. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, as amended, 42 U.S.C.A. §§ 9601(14), 9602.

13. Health and Environment ⇐25.5(5.5)

Quantity or concentration is not a factor in determining whether a substance is hazardous for purposes of CERCLA. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, as amended, 42 U.S.C.A. §§ 9601(14), 9602.

14. Health and Environment ⇐25.5(5.5)

Concentration of hazardous substances in municipal solid waste, regardless of how low a percentage, is not relevant in deciding whether CERCLA liability is incurred. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, 107, as amended, 42 U.S.C.A. §§ 9601(14), 9602, 9607.

15. Health and Environment ⇐25.5(5.5)

Silence of CERCLA on the subject of municipal solid waste is not evidence that municipal solid waste should be excluded from definition of hazardous substances. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, as amended, 42 U.S.C.A. §§ 9601(14), 9602.

16. Health and Environment ⇐25.5(5.5)

When mixture of waste solution contains hazardous substances, that mixture is itself hazardous for purposes of determining CERCLA liability. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, 107, as amended, 42 U.S.C.A. §§ 9601(14), 9602, 9607.

17. Contribution ⇐5(6)

Health and Environment ⇐25.5(5.5)

If municipality arranges for disposal or treatment of waste containing substances listed as hazardous in any of four environment statutes or the EPA table, it may be held liable for contribution or response costs under CERCLA if subsequent release or threatened release requires cleanup efforts. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, 107, as amended, 42 U.S.C.A. §§ 9601(14), 9602, 9607.

18. Health and Environment ⇐25.5(5.5)

Exemptions for household waste, promulgated by Environmental Protection Agency (EPA) and subsequently confirmed in part by Congress, from certain regulatory requirements under the Resource Conservation and Recovery Act (RCRA) does not extend through incorporation by reference to the definition of hazardous substance under CERCLA. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, as amended, 42 U.S.C.A. 9601(14), 9602; Solid Waste Disposal Act, § 1002 et seq., as amended, 42 U.S.C.A. § 6901 et seq.

19. Health and Environment ⇐25.5(5.5)

Resource Conservation and Recovery Act (RCRA) is designed primarily to regulate on-going treatment, storage, and disposal of solid and hazardous waste. Solid Waste Disposal Act, § 1002 et seq., as amended, 42 U.S.C.A. § 6901 et seq.

20. Health and Environment ⇐25.5(5.5)

Congress and the Environmental Protection Agency (EPA) carefully distinguished between wastes, to which the Resource Conservation and Recovery Act (RCRA), applies, and substances, to which CERCLA applies. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, as amended, 42 U.S.C.A. §§ 9601(14), 9602.

21. Health and Environment ⇐25.5(5.5)

Application of Resource Conservation and Recovery Act's (RCRA) regulations turns in part upon threshold quantity or concentration requirements, considerations which are irrelevant in finding hazardous substances under CERCLA. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, as amended, 42 U.S.C.A. §§ 9601(14), 9602.

22. Health and Environment ⇐25.5(5.5)

Subpart C regulations under the Resource Conservation and Recovery Act (RCRA) impose tough standards for operating active toxic waste sites, but do not cover sites operated prior to its enactment, nor sites where the owner is unknown or bankrupt, nor does it address spills, illegal dumping, or releases generally; RCRA is preventative, and CERCLA is curative. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 102, as amended, 42 U.S.C.A. §§ 9601(14), 9602.

23. Health and Environment ⇐25.5(5.5)

Where substance is not exempted from definition of hazardous substance set forth in CERCLA, but merely is exempted from regulation under a separate statute, that exemption will not be incorporated into the definition of hazardous substance under CERCLA. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 101(14), as amended, 42 U.S.C.A. 9601(14).

24. Health and Environment ⇐25.5(5.5)

Environmental Protection Agency's (EPA's) exemption of household wastes from notification requirements under CERCLA does not suggest that disparate treatment of municipal solid waste under the Act's liability provisions is appropriate. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(14), 103(c), 107, as amended, 42 U.S.C.A. §§ 9601(14), 9603(c), 9607.

25. Statutes ⇐219(6)

Court should defer to Environmental Protection Agency's (EPA's) reasonable construction of CERCLA absent clearly expressed contrary congressional purpose; to be accorded deference, EPA's construction of CERCLA need not be one that the court would have chosen, nor the only reasonable one permitted by the Act's language. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 101 et seq., as amended, 42 U.S.C.A. § 9601 et seq.

26. Health and Environment ⇐25.5(5.5)

Amount of liability imposed upon municipality for response costs under CERCLA will not necessarily be a function solely of the total volume of municipal waste disposed of in the landfill but, rather, will be a function of the extent to which municipal dumping of hazardous substances both engendered the necessity and contributed to the costs of cleanup. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 113(f)(1), as amended, 42 U.S.C.A. § 9613(f)(1).

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General Counsel, Nat. Ass'n of Mfrs., David F. Zoll, Vice President and General Counsel, Dell E. Perelman, Sr. Asst. Gen. Counsel, Chemical Mfrs. Ass'n, G. William Frick, Susan Schmedes, American Petroleum Institute, of counsel), filed a brief on behalf of Nat. Ass'n of Mfrs., Chemical Mfrs. Ass'n, and American Petroleum Institute as amici curiae.

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Before CARDAMONE, WALKER and McLAUGHLIN, Circuit Judges.

CARDAMONE, Circuit Judge:

This appeal deals with the disposal of municipal solid waste that contains hazardous substances and as such is one piece of the national environmental problem. The problem is precipitated by the presence of over 200 municipal landfills, comprising about 20 percent of the more than 1,000 sites, that pose sufficient environmental concerns to warrant priority in federal cleanup efforts. *See generally* Interim Municipal Settlement Policy, 54 Fed.Reg. 51,071 (1989). Whether, when, and at what cost this environmental muddle will be resolved is unknown; but to maintain Congress' comprehensive statutory chain of responsibility it is essential that one step at a time be taken.

To take that step on this appeal we must carefully analyze the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Act), 42 U.S.C. § 9601, *et seq.*, as amended by the Superfund Amendments and Reauthorization Act of 1986 (Superfund Amendments), Pub.L. No. 99-499, 100 Stat. 1613 *et seq.*, and while remaining aware of the interaction of CERCLA with other federal environmental statutes—in this case primarily the Resource Conservation and Recovery Act (Resource and Recovery Act or RCRA), 42 U.S.C. § 6901, *et seq.*—determine what CERCLA defines as hazardous substances, and whether CERCLA imposes liability on a municipality which arranges for the disposal or treatment of municipal solid waste that contains primarily household waste.

BACKGROUND

At the center of this litigation lie the Beacon Heights and Laurel Park landfills, both located in Connecticut, designated as Superfund sites on a National Priority List by the Environmental Protection Agency (EPA). Four actions, now consolidated, were commenced separately in 1987 by the EPA, the State of Connecticut Department of Environmental Protection, Uniroyal Chemical Company, Inc., and a coalition of corporations led by B.F. Goodrich Company (collectively, plaintiffs). Plaintiffs sought reimbursement for past and future cleanup costs from the owners or operators of the landfills, including Terrence and Harold Murtha and their several corporations (collectively, Murtha).

In turn, Murtha commenced third-party actions seeking contribution or indemnification and other statutory and common law relief against approximately 200 third-party defendants. Among the third-party defendants are the Connecticut municipal appellants. They include the cities and/or towns of Ansonia, Beacon Falls, Bethany, Hamden, Killingworth, Middlebury, Milford, New Haven, Orange, Plymouth, Seymour, Shelton, Stamford, Stratford, Thomaston, Waterbury, Watertown, Westport, Woodbury, the borough of Naugatuck, the Housing Authorities of New Haven and Watertown, and the Connecticut Resources Recovery Authority.

In 1988 the district court permitted plaintiffs to amend their complaints and add the third-party defendants as defendants in the original action. Fundamental to both the original and the third-party actions are the allegations that the municipal defendants arranged for the disposal and/or treatment of hazardous substances at the two landfills and are therefore subject to liability under § 9607 of CERCLA for a share of past and future cleanup costs, now estimated to exceed $47.9 million.

After serving answers denying liability, the municipal defendants as a group moved for summary judgment arguing that, as a matter of law, their generation and collection of municipal solid waste did not subject them to liability under CERCLA. The United States District Court for the District of Connecticut (Dorsey, J.) denied this motion in a judgment dated January 8, 1991. *B.F. Goodrich Co. v. Murtha*, 764 F.Supp. 960 (D.Conn.1991). It held that CERCLA does not contain any exemption for municipal waste, and that the exclusion for household solid waste found in the Resource and Recovery Act is not incorporated into the CERCLA definition of hazardous substances. It held further that a municipality disposing of hazardous substances at a site where there is a release or threatened release of such substances may be liable under § 9607 and that plaintiffs had raised genuine issues of material fact as to whether the municipal defendants' waste contained hazardous substances covered by CERCLA. The municipalities appeal from the judgment denying them summary judgment. We affirm.

DISCUSSION

The focus of our inquiry is the question of municipal liability under CERCLA for arranging for the disposal or treatment of municipal solid waste. Procedurally, we review a denial of appellants' motion for summary judgment; summary judgment may appropriately be granted only if the record demonstrates that there is no genuine issue as to any material fact and that the movant is entitled to a judgment as a matter of law. Fed.R.Civ.P.Rule 56(c); *Celotex Corp. v. Catrett*, 477 U.S. 317, 330, 106 S.Ct. 2548, 2556, 91 L.Ed.2d 265 (1986) (Brennan, J., dissenting). Appellants do not seriously dispute the district court's finding that genuine issues of material fact exist, *i.e.*, that plaintiffs raised a genuine issue, unrefuted by the municipalities, as to the existence of CERCLA-defined hazardous substances in the municipalities' solid waste. *See* 764 F.Supp. at 968-72. Rather the municipal defendants argue that CERCLA provides plaintiffs no grounds for relief and, as a result, the municipalities are entitled to judgment as a matter of law.

At the center of our discussion is the subject of municipal solid waste which, while possibly containing material from commercial and industrial sources, is primarily composed of household waste. *See* 54 Fed.Reg. at 51,075. Despite the tremendous volume of household waste, surveys generally reveal that it contains very low concentrations—less than 1 percent by weight—of substances the EPA considers hazardous to the environment or to public health. *See* Ferrey, *The Toxic Time Bomb: Municipal Liability for the Cleanup of Hazardous Waste*, 57 Geo.Wash.L.Rev. 197, 200-10 (1988). Yet, even though household waste has a low concentration of hazardous substances, when the EPA determines that a cleanup under CERCLA is warranted the costs of cleanup at municipal landfills may be greater than at similar industrial or commercial toxic waste sites due to household waste's greater volume and reduced toxicity. With this in mind, we turn to the statutory framework.

I *Statutory Framework Under CERCLA*

In CERCLA Congress enacted a broad remedial statute designed to enhance the authority of the EPA to respond effectively and promptly to toxic pollutant spills that threatened the environment and human health. The EPA is authorized to commence "response actions" to abate any actual or threatened releases of hazardous substances, § 9604(a)(1), and a federal Superfund exists to pay for mandated cleanups. Response actions include remedial efforts to prevent or minimize releases as well as attempts to remove hazardous substances entirely. The Act also authorizes the EPA to recover its costs from responsible parties as a means to replenish and maintain the Superfund. *See* § 9607(a)(4)(A). Alternatively, the EPA may seek to compel potentially responsible parties to commence private response actions if there is an "imminent and substantial endangerment to the public health." § 9606(a). Such parties may recover a por-

tion of their response costs from other potentially responsible parties. § 9613(f).

[1-3] CERCLA imposes strict liability. *See Tanglewood East Homeowners v. Charles-Thomas, Inc.*, 849 F.2d 1568, 1572 (5th Cir.1988); *State of New York v. Shore Realty Corp.*, 759 F.2d 1032, 1042 (2d Cir. 1985). Where the environmental harm is indivisible liability is joint and several. *See O'Neil v. Picillo*, 883 F.2d 176, 178-79 (1st Cir.1989), *cert. denied sub nom. American Cyanamid Co. v. O'Neil*, 493 U.S. 1071, 110 S.Ct. 1115, 107 L.Ed.2d 1022 (1990); *United States v. R.W. Meyer, Inc.*, 889 F.2d 1497, 1506-08 (6th Cir.1989), *cert. denied*, 494 U.S. 1057, 110 S.Ct. 1527, 108 L.Ed.2d 767 (1990). CERCLA establishes four classes of responsible parties liable for the costs of responding to releases or threatened releases of hazardous substances. These include past and present owners or operators of facilities, transporters of hazardous substances, and those, such as appellants, who generate or arrange for the disposal or treatment of hazardous substances. § 9607(a). The Act's broad reach extends liability to all those contributing to—from generation through disposal—the problems caused by hazardous substances.

[4, 5] Because it is a remedial statute, CERCLA must be construed liberally to effectuate its two primary goals: (1) enabling the EPA to respond efficiently and expeditiously to toxic spills, and (2) holding those parties responsible for the releases liable for the costs of the cleanup. In that way Congress envisioned the EPA's costs would be recouped, the Superfund preserved, and the taxpayers not required to shoulder the financial burden of a nationwide cleanup. *See United States v. Aceto Agric. Chems. Corp.*, 872 F.2d 1373, 1377, 1380 (8th Cir.1989) (quoting *Dedham Water Co. v. Cumberland Farms Dairy, Inc.*, 805 F.2d 1074, 1081 (1st Cir.1986)); *City of New York v. Exxon Corp.*, 744 F.Supp. 474, 485 (S.D.N.Y.1990). Potential affirmative defenses are limited to those listed in § 9607(b). *See Shore Realty*, 759 F.2d at 1048-49; *United States v. Hooker Chems. & Plastics Corp.*, 680 F.Supp. 546, 557-58 (W.D.N.Y.1988). Hence, liability under § 9607(a) is precluded only by a defense that the release or threatened release was caused solely by an act of God, an act of war, or certain acts or omissions of third parties other than those with whom a defendant has a contractual relationship. *See* § 9607(b). Undeterred by the inapplicability of any of these affirmative defenses to the present case, appellants insist that a municipality may not be held liable under CERCLA, § 9607(a)(3), for arranging for the disposal or treatment of municipal solid waste because that waste is not defined as a hazardous substance under the Act.

[6] A *prima facie* cause of action under CERCLA requires a plaintiff to establish: (1) defendant fits one of the four classes of responsible parties outlined in § 9607(a); (2) the site is a facility; (3) there is a release or threatened release of hazardous substances at the facility; (4) the plaintiff incurred costs responding to the release or threatened release; and (5) the costs and response actions conform to the National Contingency Plan set up under the Act and administered by the EPA in order to prioritize hazardous substance release sites throughout the nation. *See Shore Realty*, 759 F.2d at 1043. The municipalities' summary judgment motion turns on whether their arranging for the disposal of municipal solid waste satisfies the first and third elements.

II *Responsible Party*

[7] As to the first element, it is clear that a municipality may be liable as a potentially responsible party if it arranges for the disposal of hazardous substances. CERCLA expressly includes municipalities, states, and other political subdivisions within its definition of persons who can incur such liability under § 9607. § 9601(21). The Supreme Court has held that the "cascade of plain language" clearly demonstrates Congress aimed to abrogate sovereign immunity for the states. *Pennsylvania v. Union Gas Co.*, 491 U.S. 1, 7-13, 109 S.Ct. 2273, 2277-80, 105 L.Ed.2d 1 (1989). As further evidence of Congress' plan that municipalities be held as responsible parties, CERCLA includes limited exceptions to potential municipal liability. Where, as an "owner or operator," a municipality acquires ownership or control of a facility involuntarily as a result of its sovereign function, § 9601(20)(D), or where a municipality acts in response to an emergency caused by the release of hazardous substances from a facility owned by another party and does not act with gross negligence or willful misconduct, § 9607(d)(2), no liability attaches. These express exceptions to liability are strong evidence that municipalities are otherwise subject to CERCLA liability.

In the face of CERCLA's unambiguous scheme concerning municipal liability and the limited exceptions to it, appellants cite *Lincoln v. Republic Ecology Corp.*, 765 F.Supp. 633 (C.D.Cal.1991), apparently for the proposition that liability cannot attach to a municipality that arranges for the disposal or treatment of hazardous substances in its sovereign capacity. We regard *Lincoln* as merely holding that the city's activities in that case, taken in furtherance of its sovereign function to abate public nuisances, were insufficient to give rise to "arranger" status for purposes of liability under CERCLA. *See id.* at 636-38. To the extent *Lincoln* can be construed as extending the "function as a sovereign" exception beyond the liability provision for owners or operators to that for arrangers, we disagree with it. *Cf. Union Gas*, 491 U.S. at 12-13, 109 S.Ct. at 2280 (§ 9601(20)(D) qualifies entire definition of "owner or operator," not merely the portion thereof applicable to involuntary owners). Congress limited the sovereign function exception to those situations where liability is premised on the state or local government entity being an "owner or operator" of a vessel or facility. *See* § 9601(20). Nothing in the language of the Act suggests that it be extended.

[8, 9] We recognize that liability under the arranger subsection requires a sufficient nexus be present between the municipality and the hazardous substances, one that does not exist in cases where the governmental unit is responsible only for promulgating disposal regulations or for permitting disposal facilities. *See United States v. New Castle County*, 727 F.Supp. 854, 872-74 (D.Del.1989); *State of New York v. City of Johnstown, N.Y.*, 701 F.Supp. 33, 36 (N.D.N.Y.1988). Nonetheless, once a sufficient nexus is established (such as, in this case, by managing the disposal activities), the reasons prompting the establishment of that nexus are of no consequence. To construe CERCLA as providing an exemption for municipalities arranging for the disposal of municipal solid waste that contains hazardous substances simply because the municipality undertakes such action in furtherance of its sovereign status would create an unwarranted break in the statutory chain of responsibility.

III *Hazardous Substance*

A. CERCLA Definition

Since release or threatened release is not here at issue, discussion of the third element—which is the principal subject of this opinion—turns to whether municipal solid waste falls within CERCLA's definition of hazardous substance. We start by reviewing the language of the Act itself, *United States v. James*, 478 U.S. 597, 604, 106 S.Ct. 3116, 3120, 92 L.Ed.2d 483 (1986), and assume the ordinary meaning of the language used expresses Congress' purpose. *American Tobacco Co. v. Patterson*, 456 U.S. 63, 68, 102 S.Ct. 1534, 1537, 71 L.Ed.2d 748 (1982). Unless a clearly expressed legislative aim to the contrary is found, that meaning controls. *Consumer Product Safety Commission v. GTE Sylvania, Inc.*, 447 U.S. 102, 108, 100 S.Ct. 2051, 2056, 64 L.Ed.2d 766 (1980).

[10] CERCLA defines as hazardous any substance so designated by the EPA pursuant to § 9602 or by any of four other environmental statutes. Section 9601(14) states

> The term "hazardous substance" means (A) any substance designated pursuant to section 1321(b)(2)(A) of Title 33, (B) any element, compound, mixture, solution, or substance designated pursuant to section 9602 of this title, (C) any haz-

ardous waste having the characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act ..., (D) any toxic pollutant listed under section 1317(a) of title 33, (E) any hazardous air pollutant listed under section 112 of the Clean Air Act ..., and (F) any imminently hazardous chemical substance or mixture with respect to which the Administrator has taken action pursuant to section 2606 of title 15. The term does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of this paragraph, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

Pursuant to subsection (B) above and under § 9602, the EPA has listed over 700 hazardous substances in Table 302.4 of 40 C.F.R. § 302. The Act's definition of hazardous substance covers a vast array. A substance need only be designated as hazardous under any *one* of the four environmental statutes or under Table 302.4 to be a hazardous substance under CERCLA. Courts uniformly have found that the Act does not require a substance to be delineated as hazardous under more than one of the subsections to be so viewed. *See, e.g., Eagle-Picher Industries, Inc. v. United States EPA*, 759 F.2d 922, 927 (D.C.Cir. 1985); *United States v. Carolawn Co.*, 21 E.R.C. 2124, 2125 (D.S.C.1984); *United States v. Metate Asbestos Corp.*, 584 F.Supp. 1143, 1146 (D.Ariz.1984).

[11] Other features of § 9601(14) demonstrate its breadth. For example, though Congress specifically excluded from the definition of hazardous substance two substances—natural gas and oil—no other exclusions are found. Nor is any distinction made either among potentially responsible parties or by virtue of the source of the hazardous substances. Whether a potentially responsible party is an owner or operator of a facility, or an arranger, generator or transporter of the hazardous substance, or a municipality, individual or chemical manufacturing company is not relevant in determining whether a substance is hazardous. Where Congress differentiated based on a potentially responsible party's status, it did so directly through specific exemptions such as those for municipalities that acquire title to facilities involuntarily or that act in response to emergencies. *See* §§ 9601(20)(D), 9607(d)(2).

[12-14] Similarly, the definition makes no distinction dependent upon whether the substance's source was industrial, commercial, municipal or household. Whether the substance is a consumer product, a manufacturing byproduct, or an element of a waste stream is irrelevant. Quantity or concentration is not a factor either; when Congress wanted to draw distinctions based on concentration or quantity, it expressly provided as much. *See* §§ 9602, 9603. *See also, e.g., Amoco Oil Co. v. Borden, Inc.*, 889 F.2d 664, 669 (5th Cir. 1989); *Exxon Corp.*, 744 F.Supp. at 485-86 n. 16; *United States v. Wade*, 577 F.Supp. 1326, 1339-40 (E.D.Pa.1983). When § 9601(14) is compared to sections containing threshold limits found elsewhere in CERCLA, *see, e.g.*, §§ 9602, 9603, and within other environmental statutes, *see, e.g.*, §§ 6903(5), 6921(d) (RCRA sections conditioning regulation applicability on threshold quantity waste generation); 33 U.S.C. §§ 1321(b)(4), 1317(d) (Clean Water Act conditioning liability upon exceeding reportable quantities and effluent standards), it is plain that the definition does not depend on the concentration of the substance present. Thus, the concentration of hazardous substances in municipal solid waste—regardless of how low a percentage—is not relevant in deciding whether CERCLA liability is incurred.

Against this backdrop, the municipalities nonetheless contend that CERCLA's silence regarding municipal solid waste is evidence that Congress aimed to have it excluded from the definition of hazardous substances. Alternatively, the municipalities argue that Congress intended an exemption for household hazardous waste found in the Resource and Recovery Act

regulations to be incorporated, through § 9601(14)(C), thus excluding municipal solid waste from the definition of hazardous substances under CERCLA.

[15-17] We disagree with both contentions. The Act's silence on the subject of municipal solid waste is not evidence that such should be excluded from the definition of hazardous substances. To the contrary, § 9601(14)'s comprehensive definition of hazardous substances, coupled with the specific exclusions of oil and natural gas, leads to the opposite conclusion. Municipal waste need not be listed by name—instead of its constituent components—to fall within the Act. For us to consider the whole separate from its hazardous constituent parts would be to engage in semantic sophistry. When a mixture or waste solution contains hazardous substances, that mixture is itself hazardous for purposes of determining CERCLA liability. *See, e.g., Eagle-Picher*, 759 F.2d at 930-31; *Exxon Corp.*, 744 F.Supp. at 483-84; *Carolawn*, 21 E.R.C. at 2126. Liability under CERCLA depends only on the presence in any form of listed hazardous substances. Hence, if a municipality arranges for the disposal or treatment of waste containing substances listed as hazardous in any of the four identified environmental statutes or in Table 302.4, it may be held liable for contribution or response costs under the Act if a subsequent release or threatened release requires cleanup efforts.

B. Resource and Recovery Act Exemption for Household Waste

[18, 19] The municipalities strenuously insist further that the exemption for household hazardous waste—promulgated by EPA and subsequently confirmed in part by Congress—from certain regulatory requirements under the Resource and Recovery Act extends, through incorporation by reference, to the definition of hazardous substance under CERCLA. This latter argument, as the former, is not persuasive. The Resource and Recovery Act is designed primarily to regulate on-going treatment, storage, and disposal of solid and hazardous wastes. *See Aceto Agric. Chems.*, 872 F.2d at 1376-77. Pursuant to RCRA, EPA promulgated two distinct regulatory systems for the transportation of wastes and the operation of waste storage and disposal facilities: one for *solid* wastes (under Subpart D of RCRA, §§ 6941-49a); and the other for *hazardous* wastes (under Subpart C of RCRA, §§ 6921-39b). *Hazardous wastes*, identified in 40 C.F.R. §§ 261.30-33, are subject to more stringent standards than are solid wastes.

"In regulations identifying and listing hazardous wastes subject to the RCRA Subtitle C regulations, EPA excluded for regulatory purposes certain solid wastes from the definition of hazardous wastes, *even though these wastes might otherwise be considered hazardous wastes.*" Notification of Treatment, Storage and Disposal Facilities, 46 Fed.Reg. 22,144, 22,145 (1981) (emphasis added). The EPA included household wastes, under 40 C.F.R. § 261.4(b)(1), pursuant to Congressional plan, among those wastes excluded from the Resource and Recovery Act's Subpart C hazardous waste regulations. Subsequently, Congress "clarified" the household waste exclusion with respect to resource recovery facility regulations under that Act for the recovery of energy through the mass burning of municipal waste by adding § 3001(i). That section provides that such facilities are not deemed to be handling hazardous wastes if they receive only household waste and other solid waste not containing hazardous waste. § 6921(i). From this statutory exclusion, appellants assert that municipal solid waste cannot be a hazardous waste under CERCLA.

The household waste exclusion was promulgated pursuant to a Congressional scheme that such waste not be subjected to the same stringent standards during the day-to-day management of transportation, storage and disposal. The legislative history relied on by the EPA in promulgating the household waste exclusion follows Congress' narrow aim to exclude specific waste streams from Resource and Recovery Act coverage. *See, e.g.*, Identification and Listing of Hazardous Waste, 45 Fed.Reg. 33,084, 33,099 (1980); Hazardous Waste

Guidelines and Regulations, 43 Fed.Reg. 58,946, 58,969 (1978); S.Rep. No. 988, 94th Cong., 2d Sess. 15–16 (1976). The subsequent "clarification," already referred to, was passed four years after CERCLA's enactment. It applies only to resource recovery facilities. § 6921(i); *see also* H.R.Conf.Rep. No. 1133, 98th Cong., 2d Sess. 106 (1984), *reprinted in* 1984 U.S.Code Cong. & Admin.News 5576, 5649, 5677; S.Rep. No. 284, 98th Cong., 2d Sess. 61 (1983). This narrow RCRA exemption in no way limits the definition of hazardous substance under CERCLA. The EPA expressly recognized the exemption's limited scope when it stated that the exempted "[solid] wastes might otherwise be considered hazardous wastes." 46 Fed.Reg. at 22,145. To construe this exemption to apply also to CERCLA would frustrate that Act's broad remedial purposes as well as unjustifiably expand the scope of the Resource and Recovery Act's regulations.

[20] Congress and the EPA have carefully distinguished between *wastes*, to which the Resource and Recovery Act applies, and *substances*, to which CERCLA applies. *See, e.g.*, §§ 6901 *et seq.* (particularly § 6903(5)); §§ 9601 *et seq.* (particularly § 9601(14)); S.Rep. No. 988, 94th Cong., 2d Sess. 15–16 (1976); 40 C.F.R. § 261.(4)(b); 46 Fed.Reg. at 22,145; EPA Directive Number 9574.00–1 Clarification of Issues Pertaining to Household Hazardous Waste Collection Programs (Nov. 1, 1988) (EPA Directive 9574.00–1); 54 Fed. Reg. at 51,073; *see also United States v. Conservation Chem. Co.*, 619 F.Supp. 162, 239 (W.D.Mo.1985). It may be seen therefore that the exemption which appellants urge should be extended to CERCLA applies to household *waste*. CERCLA, though, applies to hazardous *substances*. This statutory and regulatory distinction is a substantial one and should be preserved, absent a clear legislative intent to the contrary.

[21] In addition, application of the Resource and Recovery Act's regulations turns in part upon threshold quantity or concentration requirements—considerations which are irrelevant in defining hazardous substances under CERCLA. RCRA contains, for example, a small quantity generator exemption that imposes more stringent Subpart C regulations upon persons generating in excess of threshold quantities. *See* § 6921(d). The household hazardous waste exemption is consistent with this strategy because the concentration of hazardous waste is small relative to the total volume of household waste. 54 Fed.Reg. at 51,074. On the other hand, incorporating such a concentration/toxicity exemption into CERCLA is not consistent with CERCLA provisions that impose liability—when a release occurs that warrants a cleanup response—regardless of the amount of hazardous substances present.

[22] Nor does including wastes that are not subject to the stringent Subpart C regulations under the Resource and Recovery Act within the definition of hazardous substances under CERCLA create a conflict between the two statutes. Subpart C imposes tough standards for operating *active* toxic waste sites, but does not cover sites operated *prior* to its enactment, *nor* sites where the owner is unknown or bankrupt, *nor* does it address spills, illegal dumping or releases generally. RCRA is preventative; CERCLA is curative. It does not follow that because the environmental risk posed by household waste is deemed insufficient to justify the most stringent regulations governing its day-to-day handling that the environmental harm caused when that risk is realized is insufficient to require holding liable those responsible for that harm. In fact, the EPA expressly recommended that household waste, though exempt from subtitle C regulations, should be managed as a hazardous waste. EPA Directive 9574.00–1 at p. 2. The agency has also noted that the additional safeguards of management under Subpart C regulations merely *reduce* the likelihood of liability arising under CERCLA. *See id. See also* Solid Waste Disposal Facility Criteria, 56 Fed.Reg. 50,978 (1991) (to be codified at 40 C.F.R. pts. 257, 258) (final rule creating new criteria, more stringent than Subpart D but less stringent than Subpart C, for municipal solid waste landfills). Even total compliance with Subpart C regulations will not prevent releases or avoid CERCLA liability. Similarly, the increased likelihood of a release occurring pursuant to Subpart D regulations does not necessarily suggest a proportional increased likelihood that a response will be warranted under CERCLA, because of the small concentrations of hazardous substances found in wastes regulated under that Subpart.

[23] Other courts have concluded that exemptions from Resource and Recovery Act coverage do not extend so far as to exclude those materials from the definition of hazardous substances under CERCLA. *See, e.g., Eagle-Picher*, 759 F.2d at 927 (exclusion in § 9601(14)(C) for material suspended from RCRA regulation by Congress restricted in application to that subsection). We agree that had Congress aimed to exempt such materials from § 9601(14) it could have placed the exemption explicitly in the section exactly as it did with petroleum and natural gas. *See id.; see also State of Idaho v. Hanna Mining Co.*, 699 F.Supp. 827, 833 (D.Idaho 1987), *aff'd*, 882 F.2d 392 (9th Cir.1989); *Metate Asbestos Corp.*, 584 F.Supp. at 1147 (asbestos mill and mine wastes statutorily exempt from RCRA are hazardous substances under CERCLA, §§ 9601(14)(D), (E)); *Transportation Leasing Co. v. California*, 32 E.R.C. 1499, 1501, 1990 WL 300777 (C.D.Cal.1990) (RCRA exemption for household waste does not extend to the CERCLA definition for hazardous substances). Where a substance is not exempted from the definition of hazardous substance set forth in CERCLA, but merely is exempted from regulation under a separate statute, we decline to incorporate the exemption into § 9601(14). A regulatory exemption cannot take precedence over Congress' concerns spelled out in § 9601(14) of the Act.

Finally, the municipalities point to § 9603(c) of CERCLA as supporting their argument that Congress sought to exclude municipal solid waste comprised primarily of household waste from § 9601(14). Section 9603(c) sets forth notification requirements regarding solid waste storage, disposal, and treatment facilities, but expressly limits those requirements to facilities "at which hazardous substances (*as defined in section 9601(14)(C) of this title*) are or have been stored" (emphasis added). The municipalities assert that the EPA excluded household waste from its notification requirements because the agency recognized that household waste is exempt from CERCLA in its entirety.

[24] Quite the contrary, the EPA recognized that its notification requirements pursuant to § 9603(c) could apply, according to Congress' mandate, only to those hazardous substances identified under § 9601(14)(C). *See* 46 Fed.Reg. at 22,145 ("Section [9601(14)(C)] of the Act refers only to those hazardous substances that are hazardous wastes identified under or listed pursuant to Section 3001 of RCRA"). Hence, the agency realized that Congress expressly planned that the identification of substances as hazardous under the other subsections of § 9601(14) would not be affected by a contrary determination under RCRA. Contrary to the municipalities' argument, the EPA's exemption of household wastes from *notification* requirements under CERCLA does not suggest that disparate treatment of municipal solid waste under the Act's *liability* provisions is appropriate.

C. Legislative History

Although appellants recognize that the legislative history discussing municipal waste is meager, they contend that combined with legislative debate regarding the general aim of CERCLA, the history evinces such a clearly expressed legislative purpose, *see Consumer Product Safety Commission*, 447 U.S. at 108, 100 S.Ct. at 2056, that we should disregard the apparently contrary language of the Act itself. In this regard the municipalities rely heavily upon statements by Rep. Stockman, who, in opposition to H.R. 7020 (a bill offered as an amendment to the Resource and Recovery Act, which was superseded when the Senate bill, S.1480, was ultimately enacted separately as CERCLA) criticized the unrestrained and unlimited powers the bill would delegate to the EPA and the number

of items the Resource and Recovery Act would consider hazardous. 126 Cong.Rec. H9438–41 (Sept. 23, 1980). Rep. Stockman's own proposed amendment to the bill was eventually rejected by the House of Representatives, and most responses to his criticism focused on the powers of the EPA and the envisioned relationship between the state and federal governments. *See, e.g.*, 126 Cong.Rec. H9440–49 (Sept. 23, 1980) (statements of Reps. Florio, Gore, and Madigan).

Claiming that Congress agreed with Congressman Stockman's remarks, appellants urge that the bill actually passed did not envision such a broad scope as to include household wastes among hazardous substances. Yet, much of the legislator's criticism and the House's reaction to it is irrelevant in this case because it was directed towards the Resource and Recovery Act and not CERCLA. Congressman Stockman correctly understood that household waste may be exempt from coverage under the Resource and Recovery Act and that the toxic spill cleanup amendments, which he proposed changing, failed to include the same exemption; it is those amendments that were eventually enacted into CERCLA. *See* Dissenting Views, Comm. on Interstate and Foreign Commerce, H.R.Rep. No. 1016, 96th Cong., 2d Sess., pt. 1, 72 (1980), *reprinted in* 1980 U.S.Code Cong. & Admin.News 6119, 6148; *see also* 126 Cong.Rec. H9443 (Sept. 23, 1990) (statement of Rep. Florio, in response to Rep. Stockman, reading a letter from the National Conference of State Legislatures and the National Governors' Association agreeing that, "in order to allow recovery of Superfund expenditures and to provide an incentive for proper care to all parties connected with hazardous waste, all major Superfund bills contain rigorous liability provisions.... [The] NCSL and NGA support the applications of liability schemes to all parties, *including states and localities* when circumstances merit. No one disputes the principle that those who contribute to the problem should share in the cost of cleanup. Imposition of a comprehensive liability provision will assure that this principle is obs[illegible]") (emphasis added).

Examination of the legislative history reveals no further discussion relating to whether municipal solid waste could trigger liability under CERCLA. Rather, most of the debate upon which the municipalities would have us rely focused on Congress' scheme to hold the parties responsible for releases liable for the ensuing cleanup costs, and not taxpayers generally. *See, e.g.*, 126 Cong.Rec. H9162 (Sept. 19, 1980) (statement of Rep. Florio); *id.* at H9157 (statement of Rep. Carter); 126 Cong.Rec. S15,003 (Nov. 24, 1980) (statement of Sen. Leahy); H.R.Rep. No. 1016, 96th Cong., 2d Sess., pt. II, pp. 5, 33 (1980), *reprinted in* 1980 U.S.Code Cong. & Admin.News 6151, 6153; S.Rep. No. 848, 96th Cong., 2d Sess. 13, 98 (1980).

Appellants apparently believe this notion that "the responsible party pays" excludes situations where the responsible party happens to be a municipality disposing of solid waste. To impose CERCLA liability on these local governments results, appellants continue, in taxpayers within their jurisdictions shouldering the costs of cleanup. We agree that this will inevitably be the result, but are unable to agree that it is adverse to Congress' aim. To the contrary, a narrow interpretation of CERCLA that exempts municipalities arranging for the disposal of municipal solid waste from liability increases the probability that cleanup costs will never be recovered, and will be paid instead from the Superfund funded in part by the taxpayers at large. To accept the municipalities' argument that the municipal waste exemption in the Resource and Recovery Act should apply to CERCLA would free a potentially responsible party from liability, in blatant contravention of the statute's goals.

Although municipalities do not benefit in a proprietary sense from arranging for the disposal of municipal solid waste, their taxpayers do obtain a benefit—given the necessity of disposal of such waste. Thus, our refusal to exempt such waste from the definition of hazardous substance under CERCLA cannot be said to create an irrational and clearly unintended result. *See United States v. Rutherford*, 442 U.S. 544, 555, 99 S.Ct. 2470, 2477, 61 L.Ed.2d 68 (1979). On this question, review of the legislative history reveals a picture more confusing than pellucid, and a Congressional purpose not so discernible that it should cause us to depart from the plain meaning of § 9601(14).

D. EPA Interpretation

[25] The municipalities next argue that the EPA interprets CERCLA to impose no liability on municipalities arranging for the disposal of municipal refuse containing primarily household wastes. The EPA, they state, has created in a policy notice a "rebuttable presumption that generation and transportation of municipal solid waste and domestic sewage sludge would not be deemed to incur CERCLA liability." We concede that a court should defer to EPA's reasonable construction of CERCLA, absent a clearly expressed contrary Congressional purpose. *See, e.g., Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, 842–45, 104 S.Ct. 2778, 2781–83, 81 L.Ed.2d 694 (1984). EPA's interpretation of CERCLA, as the agency charged with its administration, will be followed so long as it " 'is based on a permissible construction of the statute' " and " 'there are [not] compelling indications that it is wrong.' " *Weeks v. Quinlan*, 838 F.2d 41, 43–44 (2d Cir.1988). Thus, to be accorded deference, EPA's construction of CERCLA need not be one we would have chosen, nor the only reasonable one permitted by the Act's language. *See, e.g., Chevron*, 467 U.S. at 843 n. 11, 104 S.Ct. at 2782 n. 11.

We do not dispute appellants' characterization of how EPA's interpretation should be treated. Rather, we disagree with appellants' characterization of EPA's interpretation itself. Here, in fact, the EPA interprets CERCLA to *impose* liability on municipalities arranging for the disposal of municipal waste at sites that release or threaten the release of hazardous substances. Appellants' view of the EPA's pronouncements on the issue is more wish than reality, especially in light of the EPA's opposition to appellants' arguments in the district court.

In taking this somewhat disingenuous position, the municipalities primarily rely on the agency's Interim Municipal Settlement Policy, which was intended "to provide interim guidance to EPA Regional offices on how they should exercise their enforcement discretion." 54 Fed.Reg. at 51,071. Yet, decisions regarding enforcement discretion, which must reflect limited agency resources, enforcement priorities and other administrative constraints, do not necessarily mirror the liability scheme imposed by CERCLA. The statute does not forbid the EPA from selectively prosecuting only the major contributors to a hazardous response site. In exercising its enforcement discretion the agency routinely prosecutes only the largest contributors, or those with the greatest means to pay for the cleanup response costs, and leaves those defendants to seek, through third-party actions, contribution from any other liable polluters. The Interim Municipal Settlement Policy merely indicates that the EPA presently does not intend to pursue enforcement actions against municipalities generating or transporting municipal waste—regardless of whether hazardous substances are present—unless the total privately generated commercial hazardous substances are insignificant compared to the municipal waste. *Id.* at 51,072.

Moreover, there is no room for confusion as to the limited implications of EPA's prosecutorial position. The Interim Municipal Settlement Policy expressly warns, "[n]othing in the interim policy affects any party's potential legal liability under CERCLA ... [N]othing in the interim policy precludes a *third party from initiating a contribution action.*" *Id.* at 51,071 (emphasis added). In a similar vein, the notice states that CERCLA "does not provide an exemption from liability for municipalities ... [T]he statute does not provide an exemption from liability for municipal wastes." *Id.* at 51,074. In order to eliminate any lingering doubt regarding the EPA's interpretation of CERCLA, the agency states "[t]o the extent municipal wastes contain a hazardous substance that is covered under section 101(14) of CERCLA and there is a release or threatened release, such municipal wastes [illegible] fall

within the CERCLA liability framework." *Id.*

Other EPA pronouncements point out its unambiguous position and provide strong support for the argument that it does not believe Congress planned for municipal waste to be exempt from CERCLA. *See, e.g.*, EPA Directive 9574.00-1 at p. 2; EPA Note to Correspondents (July 17, 1991) (announcing that EPA will help develop guidelines for determining superfund liability for municipalities whose MSW contributed to a release or threatened release); Address by EPA Administrator William Reilly to National Association of Counties (July 16, 1991) (same); Statement of EPA Assistant Administrator for Solid Waste and Emergency Response Don R. Clay (July 29, 1991) (interim municipal settlement policy "describes [EPA's] exercise of enforcement discretion, not an interpretation of liability"). We conclude consequently that the EPA emphatically construes CERCLA to impose liability on municipalities disposing of household waste that contains hazardous substances.

CONCLUSION

Plaintiffs have sufficiently established a *prima facie* cause of action under CERCLA, including the first and third elements challenged by the appellants on this appeal. We are aware that holding the municipal defendants as responsible parties and including municipal solid waste within the definition of hazardous substances will have far reaching implications for municipalities and their taxpayers. But burdensome consequences are not sufficient grounds to judicially graft an exemption onto a statute, a graft that would thwart the language, purpose, and agency interpretation of the statute.

[26] Appellant municipalities are not without recourse to avoid inequitable and disproportionate burdens that may arise from their liability as third-party contributors. Courts have the authority to "allocate response costs among liable parties using such equitable factors as the court determines are appropriate." § 9613(f)(1). An array of equitable factors may be considered in this allocation process, including the relative volume and toxicity of the substances for disposal of which the municipalities arranged, the relative cleanup costs incurred as a result of these wastes, the degree of care exercised by each party with respect to the hazardous substances, and the financial resources of the parties involved. Consequently, the amount of liability imposed will not necessarily be a function solely of the total volume of municipal waste disposed of in the landfills, but rather will be a function of the extent to which municipal dumping of hazardous substances both engendered the necessity, and contributed to the costs, of cleanup.

In sum, the plain meaning of CERCLA, its stated purposes, the absence of a clearly expressed Congressional aim to the contrary, and unequivocal agency policy support the view that the municipal defendants are responsible parties under the Act and that the definition of hazardous substance under CERCLA includes municipal solid waste if that waste contains a hazardous substance, found in any amount, that is listed in any of the subsections of § 9601(14). The municipal defendants are not entitled to summary judgment as a matter of law declaring otherwise.

The judgment is affirmed.



UNITED STATES of America, Appellee,

v.

William REA, Getty Terminals Corp., and John Pabone, Defendants-Appellants,

Getty Terminals Corp., William Rea, John Pabone, and John Quock, Defendants.

Nos. 184, 187 and 191, Dockets 91-1177, 91-1182 and 91-1251.

United States Court of Appeals, Second Circuit.

Argued Oct. 16, 1991.

Decided March 13, 1992.

Defendants were convicted of conspiracy to defraud United States and federal tax evasion in connection with scheme to evade payment of federal excise taxes on sales of gasoline, following trial in the United States District Court for the Eastern District of New York, Leonard D. Wexler, J., and they appealed. The Court of Appeals, Kearse, Circuit Judge, held that: (1) opinion of lay witness that particular defendant must have known that he was participating in tax evasion scheme was not inadmissible on the sole ground that state of defendant's knowledge was an ultimate issue in the case; (2) the opinion was inadmissible on the ground that it was not helpful to the jury; (3) error in admitting the opinion was harmless; and (4) there was sufficient evidence as to intent.

Affirmed.

1. Conspiracy ⇐24(1)

In order to prove conspiracy, Government need not present evidence of explicit agreement; proof of tacit understanding will suffice. 18 U.S.C.A. § 371.

2. Conspiracy ⇐24(1)

Coconspirators need not have agreed on details of conspiracy, so long as they have agreed on the essential nature of the plan, and goals need not be congruent, so long as they are not at cross purposes. 18 U.S.C.A. § 371.

3. Conspiracy ⇐47(2)

Defendant's knowledge of conspiracy and participation in it with requisite criminal intent may be established through circumstantial evidence. 18 U.S.C.A. § 371.

4. Conspiracy ⇐40.3

Defendant need not have joined conspiracy at its inception in order to incur liability for unlawful acts of conspiracy committed both before and after he or she became a member. 18 U.S.C.A. § 371.

5. Criminal Law ⇐460

Witness' opinion that defendant must have known that he was participating in tax evasion scheme was not inadmissible on the sole ground that the state of defendant's knowledge was an ultimate issue in the case. Fed.Rules Evid.Rules 701, 704(a), 28 U.S.C.A.

6. Criminal Law ⇐449(2)

There is no theoretical prohibition against allowing lay witnesses to give their opinions as to the mental state of others, and thus rules as to opinion testimony do not, in principle, bar lay witness from testifying as to whether defendant in criminal prosecution had requisite knowledge; rule expressly forbidding opinion testimony by expert as to state of mind of defendant in criminal case where that mental state is an element of the crime does not apply to lay witnesses. Fed.Rules Evid.Rules 701, 704(a, b), 28 U.S.C.A.

7. Criminal Law ⇐449(1)

While lay opinion testimony is not totally excluded, there are two express preconditions to its admissibility; opinion evidence may be allowed only if court finds that opinion is rationally based on witness' own perception; and it is to be allowed only if court concludes that it will be helpful to a clear understanding of the testimony of the witness or the determination of a fact in issue. Fed.Rules Evid.Rules 602, 701, 701 note, 704(a), 704 note, 28 U.S.C.A.

8. Criminal Law ⇐449(1), 465

When lay witness has not identified objective bases for his opinion, proffered opinion fails to meet requirements that court assess whether opinion is rationally based on perceptions of witness and that opinion help the jury, while if witness fully describes what defendant was in position to observe or was told, opinion of witness as to defendant's knowledge will often not be "helpful" as required for admission. Fed. Rules Evid.Rule 701, 28 U.S.C.A.

9. Criminal Law ⇐449(1)

Even lay opinions that pass dual test of admissibility under rule authorizing lay opinion testimony may be excluded if court determines that admission of opinion will be cumulative or waste of time, or that its helpfulness is substantially outweighed by danger of unfair prejudice. Fed.Rules Evid.Rules 403, 701, 28 U.S.C.A.

10. Criminal Law ⇐464

Questions of whether proffered lay opinion is rationally based on knowledge of

B) *Judicial Review*

Although the Court finds that plaintiffs successfully allege standing, plaintiffs do not successfully allege a basis for judicial review. Neither the Klamath Basin Act nor the Trinity Basin Act (the "Acts") contain provisions granting a private right of action. Plaintiffs seek judicial review pursuant to the Administrative Procedure Act ("APA"), or, in the alternative, assert there to be an implied private right of action in the Acts.

i). *Judicial Review Under the APA.*

[24] Plaintiffs have generally alleged jurisdiction under the APA, 5 U.S.C. § 551 *et seq.* When jurisdiction is alleged pursuant to the APA, a plaintiff can claim a right to judicial review under § 10(a) of the APA, which provides:

> A person suffering legal wrong because of agency action, or adversely affected or aggrieved by agency action within the meaning of a relevant statute, is entitled to judicial review thereof.

5 U.S.C. § 702. This provision contains two separate requirements. First, the person claiming a right to sue must identify some "agency action" that affects her in the specified fashion. *Lujan v. National Wildlife Federation*, 497 U.S. 871, 881–82, 110 S.Ct. 3177, 3185, 111 L.Ed.2d 695 (1990). Second, the party must show she has suffered legal wrong, or has been adversely affected or aggrieved by that action. *Id.*

Plaintiffs' complaint refers to no specific action or inaction that violates the Acts, but only generally states that Secretary Babbitt has failed to implement measures to improve Klamath River Runs, including habitat improvement and fish planting measures. Plaintiffs do not attempt to meet the test laid out in *Lujan*. Rather, according to plaintiffs, because they allege general agency *inaction*, review is available under 5 U.S.C. § 706(1) which authorizes a district court to "compel agency action *unlawfully withheld or unreasonably delayed*" (emphasis added).

However, the claims plaintiffs present here do not match what is required to invoke 5 U.S.C. § 706(1). Courts which have reviewed claims of delay pursuant to this provision have done so in the context of specific allegations of inaction, usually in the context of delayed administrative review of a plaintiff's claim before an agency, or of delayed agency rulemaking. *See Telecommunications Research & Action v. F.C.C.*, 750 F.2d 70 (D.C.Cir.1984), *Public Citizen Health Research Group v. Comm'r Food and Drug Admin.*, 740 F.2d 21 (D.C.Cir.1984). Plaintiffs do not point to any authority to support their position that 5 U.S.C. § 706(1) can be utilized to review the kind of claim of agency inaction here made by plaintiffs.

ii). *Implied Private Right of Action.*

[25, 26] Plaintiffs alternatively contend that the Acts contain an implicit private right of action. Whether the Acts confer a private right of action is determined by the four-part test announced by the Supreme Court in *Cort v. Ash*, 422 U.S. 66, 78, 95 S.Ct. 2080, 2087, 45 L.Ed.2d 26 (1975): (i) the plaintiff must belong to the class for whose *especial* benefit the statute was created; (ii) the legislature must have shown an intent, either explicitly or implicitly, to create a private remedy; (iii) finding an implied cause of action must be consistent with the underlying purposes of the statute; and (iv) the cause of action must not be one that has traditionally been left to state law. An evaluation of the other elements is not necessary if the Court finds that Congress did not intend to create a private cause of action. *See California v. Sierra Club*, 451 U.S. 287, 298, 101 S.Ct. 1775, 1781, 68 L.Ed.2d 101 (1981); *Stupy v. Postal Service*, 951 F.2d 1079, 1081 (9th Cir. 1991).

There is no indication that Congress intended the Acts to provide a basis for a private right of action. The search for legislative intent begins with an examination of the language of the statute and then proceeds to a review of the legislative history and the application of traditional aids to statutory interpretation. *See Middlesex County Sewerage Auth. v. National Sea Clammers Ass'n*, 453 U.S. 1, 13, 101 S.Ct. 2615, 2622, 69 L.Ed.2d 435 (1981).

An examination of the language of the Acts indicates no intent to provide for a private cause of action. Rather, the text of the Acts provides that task forces to formulate management programs and to coordinate management activities among federal, state and local agencies are to be established. Trinity Basin Act, 98 Stat. at 2721, 2722-23 and Klamath Basin Act, 16 U.S.C. § 460ss-1 to -3. The Klamath Basin Act explicitly mandates membership of the Task Force to include representatives of the commercial salmon fishing industry, the in-river sport fishing community, the Department of the Interior, and the Hoopa Valley and Yurok Tribes, indicating that Congress intended the members of these various groups to communicate and resolve disputes through direction of the Task Force. 16 U.S.C. § 460ss-3(c)(1)(A).

Nor does the legislative history indicate any congressional intent to create a private cause of action. Plaintiffs point to legislative history discussing the seriousness of the degradation of the Klamath and Trinity Rivers and the frustration with past federal inaction felt by many who testified at the hearings on the proposed Acts. However, these facts do not suffice to show legislative intent to create a private remedy. Thus, plaintiffs successfully allege neither an implied private right of action nor a basis for judicial review pursuant to the APA.

Lastly, plaintiffs suggested in their written briefs that the Court should stay consideration of defendants' motion to dismiss pending intervention of either the Yurok or Hoopa Valley Tribes. Plaintiffs in fact assert that the parties have stipulated to such an intervention. However, defendants state that no such stipulation has been agreed to, and indeed, no such stipulation has been filed with the Court. Therefore, the Court declines to stay consideration of defendants' motion for this reason. Plaintiffs' sixth cause of action is therefore dismissed.[16]

CONCLUSION:

For the foregoing reasons, defendants' motion to file a supplemental opposition is granted, and plaintiffs' motion for a partial summary judgment is denied. Plaintiffs' motion to strike is denied, and defendants' motion to dismiss plaintiffs' remaining claims is granted. Further, as there are no remaining causes of action in the complaint, the action is dismissed in its entirety.

IT IS SO ORDERED.

16. Plaintiffs also allege in their complaint that their sixth cause of action should not be dismissed because it is based on Secretary Babbitt's "trust responsibility." There are no specific pleadings whatsoever regarding this violation, and plaintiffs only address this claim in their motion to dismiss by citing to two cases, which do not suffice to clarify how Secretary Babbitt has allegedly violated a "trust responsibility."

TRANSPORTATION LEASING COMPANY; et al., Plaintiffs,

v.

The STATE OF CALIFORNIA (CalTrans), et al., Defendants.

No. CV 89-7368-WMB.

United States District Court, C.D. California.

Jan. 29, 1993.

Potential responsible parties who settled claims asserted against them under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) brought action against various cities, a county and county garbage disposal districts, and the California Department of Transportation, seeking to recover fair share of costs incurred under consent decree. In resolving various pretrial issues, the District Court, Wm. Matthew Byrne, Jr., Chief Judge, held that: (1) potentially responsible parties could sue for response costs, rather than suing for contribution; (2) public policy did not preclude imposition of liability; (3) cities, county and disposal districts, and Department "arranged" for transportation of waste within meaning of CERCLA; and (4) cities, county and disposal districts, and Department

"owned or possessed" waste for arranged disposal.

Ordered accordingly.

1. Health and Environment ⇐25.5(5.5)

For party to liable as "arranger" under CERCLA, substances disposed of must have been "hazardous" under CERCLA, party must have "owned or possessed" substances, and it must have "arranged" for their disposal. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

See publication Words and Phrases for other judicial constructions and definitions.

2. Health and Environment ⇐25.5(5.5)

Whether private parties that had settled CERCLA claims asserted against them could bring suit to recover response costs against other potentially responsible parties, or instead had to maintain action for contribution, could be determined before trial, and did not have to await development of specific facts of case. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 107(a), 1113(f), 42 U.S.C.A. §§ 9607(a), 9613(f).

3. Health and Environment ⇐25.5(5.5)

Potentially responsible parties whose CERCLA liability was based on consent decree could maintain action against alleged arrangers to recover response costs, and were not restricted to maintaining action for contribution, although their response costs were not voluntarily incurred and though they were themselves potentially liable for contribution. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 107(a), 1113(f), 42 U.S.C.A. §§ 9607(a), 9613(f).

4. Health and Environment ⇐25.5(5.5)

State governmental body is not automatically foreclosed from CERCLA liability merely because it is acting in regulatory capacity pursuant to statutory mandate; state governmental entities may be liable for response costs under any statutorily enumerated circumstances from which they are not expressly exempted. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a), 42 U.S.C.A. § 9607(a)

5. Health and Environment ⇐25.5(5.5)

Whether joint and several liability was available in suit to recover CERCLA response costs could not be determined before trial, because whether harm caused was divisible could not yet be determined. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a), 42 U.S.C.A. § 9607(a).

6. Health and Environment ⇐25.5(5.5)

"De minimus non curat lex" (the law does not concern itself with trifles) is not available defense to liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a, b), 42 U.S.C.A. § 9607(a, b).

7. Health and Environment ⇐25.5(5.5)

Fact that cities' contract with waste haulers did not specifically mention hazardous substances did not prevent cities from being liable for CERCLA response costs as "arrangers." Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

8. Health and Environment ⇐25.5(5.5)

Fact that cities' contracts with waste haulers did not mention disposal site did not prevent cities from being held liable for CERCLA response costs as "arrangers." Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

9. Health and Environment ⇐25.5(5.5)

Cities that issued business licenses to private waste haulers permitting them to conduct business within city limits "arranged" for transport of waste for disposal, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3)

See publication Words and Phrases for other judicial constructions and definitions

10. Health and Environment ⇐25.5(5.5)

County disposal districts that entered into contract with private disposal companies to collect, transport, and dispose of refuse "arranged" with transporter for transport of waste for disposal, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

11. Health and Environment ⇐25.5(5.5)

County that disposed of some of its governmental waste by transporting that waste to disposal sites in county vehicles "arranged" for transport of its governmental waste for disposal, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

12. Health and Environment ⇐25.5(5.5)

County that created garbage disposal districts and took a day-to day responsibility for their operation "arranged" for transport of residential, commercial and curbside governmental waste for transport, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

13. Health and Environment ⇐25.5(5.5)

Fact that California Department of Transportation's excavation and hauling contract with private entity for removal of material from former landfill included provisions that hazardous waste was not to be taken to another site did not preclude Department from being held liable as "arranger" for CERCLA response costs incurred at other site. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3)

14. Health and Environment ⇐25.5(5.5)

Additional evidence showing with greater factual specificity what contractor was hired to do and what it in fact did in construction of freeway was required before California Department of Transportation could be determined to have "arranged" for transport of construction waste for disposal, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

15. Health and Environment ⇐25.5(5.5)

Ownership or possession of waste can be either actual or constructive, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

16. Health and Environment ⇐25.5(5.5)

Cities "owned or possessed" their own governmental waste, for purposes of arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

17. Health and Environment ⇐25.5(5.5)

Cities constructively "owned or possessed" residential and commercial waste collected under contractual arrangements, for purposes of determining arranger liability for CERCLA response costs, under either control test or nexus test, by virtue of their statutory duty to provide waste collection services and their control over aspects of waste handling and disposal from point after waste was generated to point it was hauled away by transport. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

See publication Words and Phrases for other judicial constructions and definitions

18. Health and Environment ⇐25.5(5.5)

It is exercise of control, rather than authority to control, that is relevant inquiry in using control test to determine constructive ownership or possession of waste, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3)

19. Health and Environment ⇐25.5(5.5)

Cities' duty to provide for waste disposal was fact tending to demonstrate exercise and control over waste, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

20. Health and Environment ⇐25.5(5.5)

Neither cities' limited involvement in sites selection or their lack of proprietary interest in haulers compelled finding that cities did not constructively own or possess residential and commercial waste, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

21. Health and Environment ⇐25.5(5.5)

Cities that issued business licenses to waste haulers to conduct business within city limits did not, solely by their statutory duty to provide for collection, constructively possess waste, for purposes of determining arranger liability for CERCLA response costs; additional evidence showing control would have to be presented. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

22. Health and Environment ⇐25.5(5.5)

County and county disposal districts actually "owned and possessed" governmental waste they generated themselves, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

23. Health and Environment ⇐25.5(5.5)

Fact that disposal companies were independent contractors did not preclude finding that county constructively owned or possessed residential and commercial waste, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), (b)(3), 42 U.S.C.A. § 9607(a)(3), (b)(3).

24. Health and Environment ⇐25.5(5.5)

California Department of Transportation (CalTrans) "owned or possessed" material excavated from former landfill despite fact that excavated material, by contract, became property of excavation contractor, for purposes of determining arranger liability for CERCLA response costs. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 107(a)(3), 42 U.S.C.A. § 9607(a)(3).

25. Health and Environment ⇐25.5(5.5)

Exclusion from definition of "owner or operator" under CERCLA for governmental unit which acquired ownership or control of waste facility involuntarily did not prevent California Department of Transportation from being held liable as arranger for CERCLA response costs based upon its acquiring land through eminent domain and arranging to have material on that land transported for disposal. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, §§ 101(20)(D), 107(a)(3), 42 U.S.C.A. §§ 9601(20)(D), 9607(a)(3).

AMENDED ORDER

WM. MATTHEW BYRNE, Jr., Chief Judge.

I. BACKGROUND

A. *History of the Action*

This action arises out of efforts to clean up hazardous substances at a facility in Monterey Park, California, known as the Operating Industries, Inc. (OII) landfill.

In 1988, the United States Environmental Protection Agency (EPA), the State of California, and the California Hazardous Substance Account sued a number of parties, including plaintiffs in this action, alleging that those parties were liable to perform certain remedial actions at the OII landfill and to reimburse the United States and the State of California for response costs incurred in abating various hazardous conditions at the landfill.

The 1988 action was settled with a Partial Consent decree entered on May 11, 1989. Under the terms of the decree, plaintiffs here agreed to perform certain work at the OII landfill and to pay approximately $61,000,000 to the EPA and the State of California. However, plaintiffs expressly reserved the right to assert claims for reimbursement and indemnification against other potentially liable persons who were not signatories of the decree.

Plaintiffs now assert that right by bringing this action against fourteen municipal defendants,[1] the County of Los Angeles and five County Garbage Disposal Districts (GDDs),[2] and the State of California Department of Transportation (CalTrans). Plaintiffs seek to recover from these defendants a fair share of the costs incurred pursuant to the Partial Consent Decree, on the grounds that (1) defendants either owned, operated, or utilized the OII landfill, and (2) defendants were not signatories of the decree.[3]

On December 5, 1990, the Court issued an Order denying in part and granting in part defendant cities' motion for an order specifying issues without substantial controversy. The Court granted defendant cities' motion to specify that "[r]ubbish generated by residences and businesses located within the city limits of defendant cities is not a 'hazardous substance' under CERCLA absent specific evidence that the particular rubbish generated by those residences and businesses that was disposed of at the OII landfill site contained 'hazardous substances' as defined by CERCLA § 101(14)" only to the extent that it sought a ruling that for arranger liability, plaintiffs must prove that the waste disposed of at the OII landfill contained "hazardous substances" under CERCLA. Additionally, the Court found that CERCLA § 101(14) does not expressly exempt from liability the disposal of household wastes. The Court denied defendants' motion with regard to all remaining issues presented.

In its order of September 24, 1991 (Sept. Order), the Court found the following issues were without substantial controversy:

1) A "release" of a "hazardous substance," as those terms are defined in CERCLA §§ 101(14), 101(33) has occurred at the OII landfill;

2) In connection with the OII site, plaintiffs have incurred "necessary costs of response" that are "consistent with the national contingency plan" within the meaning of CERCLA § 107(a)(4)(B);

3) By contracting with a disposal company for the collection and disposal of the waste of city residents, defendant City of Alhambra "by contract, agreement, or otherwise arranged for disposal ... or arranged with a transporter for transport for disposal" of that residential waste, within the meaning of CERCLA § 107(a)(3).

The Court further ruled that liability under § 107(a)(3) requires proof that defendants "owned or possessed" the hazardous substances for which defendants arranged for disposal and that plaintiffs could satisfy this requirement by showing constructive, as well as actual, ownership or possession.

II. DISCUSSION

[1] Plaintiffs claim defendants fall within the class of persons liable as an arranger under CERCLA § 107(a)(3). Arrangers liable under CERCLA include:

1. Plaintiffs originally named 29 cities as defendants. During 1991 plaintiffs dismissed five defendant cities: Baldwin Park, Artesia, Walnut, Santa Fe Springs, and City of Industry. In early 1992, plaintiffs settled with 10 defendant cities: El Monte, Sierra Madre, South El Monte, Pasadena, San Marino, Huntington Park, Norwalk, Beverly Hills, La Puente, and Bell Gardens. Stipulated judgments have been entered as to these ten defendants.

2. The West Hollywood Sherman GDD is not named as a separate defendant because it no longer exists. The court will still make findings of fact and conclusions of law concerning this GDD because the County is liable for waste collected in West Hollywood-Sherman to the same extent that it is liable for the waste collected in the five GDDs that are named defendants. Furthermore, in this order, when the Court refers to the GDDs as a group, without naming them individually, the parties should understand that West Hollywood Sherman is meant to be included within the meaning of the term "GDDs."

3. On July 16, 1990 the Court granted the municipal defendants' motion to dismiss the pendent state claims. The only claims remaining in this action are the first and the second claims under CERCLA and the portion of the fifth claim under the Declaratory Judgments Act.

> Any person who by contract, agreement, or otherwise arranged for disposal or treatment, or arranged with a transporter for transport for disposal or treatment, of hazardous substances owned or possessed by such person, by any other party or entity, at any facility or incineration vessel owned or operated by another party or entity and containing such hazardous substances.

CERCLA § 107(a)(3); 42 U.S.C. § 9607(a)(3). To be liable as an arranger, the substances disposed of must have been "hazardous" under CERCLA,[4] the liable party must have "owned or possessed" the substances, and it must have "arranged" for their disposal.

Phase I of this action presents three categories of issues. First, the parties have identified several legal issues for pre-trial legal determination. Second, the Court will determine whether defendants "arranged with a transporter for transport for disposal" within the meaning of CERCLA § 107(a)(3). Lastly, the Court will determine if defendants "owned or possessed" the waste for which they arranged disposal within the meaning of CERCLA § 107(a)(3).[5]

A. *Pre-Trial Legal Determinations*

1. *Do Plaintiffs Have Standing To Sue For Cost Recovery Under CERCLA § 107 or Are They Limited to Remedies For Contribution Under CERCLA § 113(f)?*

Plaintiffs have brought this action under CERCLA § 107(a)(3), which imposes liability on arrangers for "all costs of removal or remedial action incurred by the United States Government or a State or an Indian tribe not inconsistent with the national contingency plan; (B) any other necessary costs of response incurred by any other person consistent with the national contingency plan." CERCLA § 107(a)(4); 42 U.S.C. § 9607(a)(4). Defendants argue plaintiffs may not bring an action to recover response costs under § 107.

Each group of defendants takes a different position on this issue. The County defendants argue the enactment of CERCLA § 113(f) in the Superfund Amendments and Reauthorization Act of 1986 (SARA), makes an action for contribution under § 113(f) the only remedy available to plaintiffs against defendants. Section 113(f)(1) provides that:

> Any person may seek contribution from any other person who is liable or potentially liable under section 9607(a) of this title, during or following any civil action under section 9606 of this title or under section 9607(a) of this title. . . In resolving contribution claims, the court may allocate response costs among liable parties using such equitable factors as the court determines are appropriate.

CERCLA § 113(f)(1); 42 U.S.C. § 9613(f)(1).

Defendant cities argue this issue is not susceptible to pre-trial determination because the decision on whether to utilize § 107(a) or § 113(f) depends on the specific facts of this case. CalTrans does not address the § 107/§ 113 issue in its papers.

a. *Can This Issue Be Determined Pre-Trial?*

[2] In addition to determining whether or not plaintiffs can bring suit under § 107, the parties have requested the Court to decide before trial whether defendants can be held jointly and severally liable. Defendant cities seem to view the question of whether plaintiffs can sue under § 107 as another way of determining the joint and several liability question.

Defendant cities apparently equate § 107 with joint and several liability and § 113(f) with several liability. The cities argue plaintiffs are limited to a contribution remedy under § 113(f) absent a showing justifying joint and several liability. Unless an individual defendant can show that the harm caused by that defendant is divisible and that a reasonable basis for apportionment of damages exists, liability under § 107 is joint and several. *United States v. Chem-Dyne*, 572 F.Supp. 802, 811 (S.D.Ohio 1983).

Under § 113(f), on the other hand, the court may allocate response costs using such equitable facts as the court determines appropriate. According to defendant cities, neither the § 107/§ 113 issue nor the issue of joint and several liability can be determined before trial because the divisibility of the harm depends on the particular facts of this case.

The question of whether plaintiffs can bring suit under § 107(a) does not depend on whether defendants may be held jointly and severally liable. Similarly, the question of whether joint or several liability applies does not determine whether this action can be brought under § 107 or must be brought under § 113. This issue can be resolved before trial.

b. *Can Plaintiffs Bring This Action under § 107?*

[3] Section 107 makes certain persons, such as arrangers, liable for any "necessary costs of response incurred by any other person consistent with the national contingency plan." CERCLA § 107(a)(4); 42 U.S.C. § 9607(a)(4). In its September order, the Court found plaintiffs have incurred "necessary costs of response . . . consistent with the national contingency plan." Sept. Order at 20. Plaintiffs thus conclude they are entitled to bring an action against alleged arrangers such as defendants under § 107(a) to recover the response costs they have incurred.

In the face of this statutory language, the County defendants argue that potentially responsible parties (PRPs) whose liability is based on a judgment (such as the consent decree entered against plaintiffs) are entitled to contribution under § 113(f)(1) but not full indemnity under § 107(a). Section 107(a)(4) allows a plaintiff to recover all its response costs. Section 113(f)(1), on the other hand, does not allow a plaintiff to recover all its costs. Instead, it allows persons liable or potentially liable under § 107(a) to "seek contribution from any other person who is liable or potentially liable" and provides that the court "may allocate response costs among liable parties using such equitable factors as the court determines are appropriate." 42 U.S.C. § 9613(f)(1).

When it was originally enacted, CERCLA did not provide a mechanism for a PRP held jointly and severally liable for cleanup costs to seek contribution from other PRPs. In the absence of such a provision, courts implied a private right of contribution into the statutory scheme. *See Sand Springs Home v. Interplastic Corp.*, 670 F.Supp. 913, 916–17 (N.D.Okla.1987); *United States v. New Castle County*, 642 F.Supp. 1258 (D.Del.1986). Congress ratified this approach in SARA by adding § 113(f) to CERCLA.

The County argues § 113(f)'s enactment demonstrates that indemnity under § 107 is limited to situations in which a PRP promptly and voluntarily cleans up a site without the necessity of a lawsuit. The County defendants claim PRPs such as plaintiffs, who incur response costs pursuant to a court order (in plaintiffs' case, the partial consent decree in the 1988 action), cannot obtain full indemnity under § 107(a) but are instead limited to contribution under § 113(f)(1) from other PRPs.

The cases which have compared and contrasted sections 107(a) and 113(f) have concluded PRPs can bring actions under § 107(a). In *General Elec. Co. v. Litton Indus. Automation Sys., Inc.*, defendant Litton contended plaintiff General Electric (GE) could not bring suit under § 107(a) because GE did not incur response costs until after GE was threatened with a lawsuit. 920 F.2d 1415, 1418 (8th Cir.1990), *cert. denied*, 499 U.S. 937, 111 S.Ct. 1390, 113 L.Ed.2d 446 (1991). The court rejected this argument, holding that:

> the motives of the private party attempting to recoup response costs under 42 U.S.C. § 9607(a)(4)(B) are irrelevant. The purpose of allowing a private party to recover its response costs is to encourage timely cleanup of hazardous waste sites. This purpose would be frustrated if a plaintiff's motives were subject to question. We

4. Under CERCLA, the term "hazardous substance" is defined broadly and includes any substance designated as hazardous by the EPA under CERCLA § 102 or other legislative acts including the Solid Waste Disposal Act, the Clean Air Act, the Clean Water Act of 1977, and the Toxic Substances Control Act. CERCLA § 101(14); 42 U.S.C. § 9601(14).

5. This phase of this action was heard on stipulated facts. The Court adopts the stipulated facts as its findings of fact and issues this order as its conclusions of law. Fed.R.Civ.P. 52.

not look at the impetus behind a plaintiff's decision to begin the cleanup process; we will look only to see if there has been a release or threatened release for which the defendant is responsible.

Id.

United States v. Kramer contains perhaps the most detailed discussion of the differences between § 107(a) actions and § 113(f) actions. 757 F.Supp. 397 (D.N.J.1991). In *Kramer*, the United States brought an action against various defendants under § 107(a) to recover its response costs. Defendants argued the government's action was properly characterized as a § 113(f) action because the United States generated large amounts of the waste at the site. *Id.* at 413. The court held:

> The Government's potential liability for contribution does not affect this section 107(a) response cost recovery action. The Government's potential liability alters neither the type of affirmative defenses permissible under section 107(a), nor the Government's right to full recovery of its response costs. Defendants are correct that the Government's ultimate recovery of its response costs would be decreased, once it was found liable for contribution and the amount to be apportioned to it of total response costs was determined. However, it is in the nature of the claims made, that even when, as here, a section 107(a) claim co-exists in a single action with section 113 contribution claims, defendants' liability on the Government's section 107(a) claim almost certainly will be determined before the Government's liability for contribution.

Id. at 414. The court went on to state:

> the structure of CERCLA does not preclude consideration of equitable factors, including the liability of a PRP who was (or is) a plaintiff in a section 107 action. Rather, CERCLA separates those equitable factors from section 107 and considers them in a section 113 contribution action. . . . [S]ections 107 and 113 serve distinct purposes. . . . Section 107 permits the Government or a private party to go in, clean up the mess, pay the bill, then collect *all* its costs not inconsistent with the NCP from other responsible parties—even if plaintiff was also responsible for the contamination. Any PRP is entitled under section 113 to bring a contribution action against other PRPs including the PRP who previously cleaned up the mess and was paid for its trouble through a section 107 proceeding—to apportion costs equitably among all the PRPs. Practically speaking, section 107 permits a PRP, including the Government, to collect all its response costs, even those that same PRP may be required to pay back to other PRPs as its equitable share in a section 113 proceeding.

Id. at 416 (emphasis in original). Other courts have reached the same conclusion, albeit not necessarily for the same reasons. *E.g., Sand Springs Home v. Interplastic Corp.*, 670 F.Supp. 913, 916 (N.D.Okla.1987); *Chemical Waste Management, Inc. v. Armstrong World Indus., Inc.*, 669 F.Supp. 1285, 1291–92 (E.D.Pa.1987).[6] The County defendants distinguish the above cases by arguing that each involved either an innocent landowner, *e.g., General Electric*, or PRPs who voluntarily incurred response costs before being forced to do so by judicial decree, *e.g., Kramer*.

CERCLA permits plaintiffs to sue under § 107. Section 113 does not abrogate § 107 but instead codifies the efforts of federal courts to imply a contribution remedy to assist those held jointly and severally liable. No reported decision has drawn the distinction suggested by the County defendants, and numerous courts have rejected similar arguments. Plaintiffs have incurred necessary response costs, and § 107(a)(4)(B) explicitly states arrangers shall be liable for any necessary costs of response incurred by any other person consistent with the NCP.

2. *Do Public Policy Considerations and Regard For a City's Sovereign Power to Protect the Public Health, Safety, and Welfare Preclude Imposition of CERCLA Liability?*

Defendant cities claim they are exempt from CERCLA liability because they were exercising sovereign power to abate a public nuisance and to protect the public health, safety, and welfare. Defendants claim both CERCLA § 101(20)(D) and considerations of public policy support such an exemption. In making this argument, defendant cities rely almost exclusively on *Lincoln v. Republic Ecology*, 765 F.Supp. 633 (C.D.Cal.1991).

In *Lincoln*, plaintiffs alleged the City of Pasadena was liable as an arranger based upon contracts which the city had signed with private companies providing for the towing of vehicles abandoned on public streets. The *Lincoln* court granted the city's motion for summary judgment, holding that:

> an unmistakable purpose behind CERCLA's strict liability standard was to force parties who *profit* from the use and generation of hazardous wastes, or directly cause or contribute to their release, to account, in the pricing of their products, for the environmental externalities associated with improper disposal. This rationale simply does not apply to the City's abatement of public nuisances.

Id. at 635–36 (emphasis in original). The court went on to state that:

> strict liability under CERCLA should not attach to government entities engaged in legitimate sovereign, as opposed to proprietary or commercial, functions. This is especially true when, as here, the City had no "hands on" involvement with or control over the hazardous substances and enjoyed no commercial interest or benefits by virtue of the regulatory legislation.

Id. at 637–38. The municipal defendants conclude that *Lincoln* should apply to exempt them for liability for their conduct in this case because their regulation of waste collection, like the City of Pasadena's activity in *Lincoln*, constituted a "non-contributory exercise of sovereign power."

Faced with this argument, the Second Circuit recently rejected defendant cities' interpretation of *Lincoln* in *B.F. Goodrich Co. v. Murtha*, 958 F.2d 1192, 1199 (2d Cir.1992). In *Murtha*, plaintiffs and defendants alleged several municipalities were liable under § 107(a)(3) because they had arranged for the disposal and/or treatment of hazardous substances at two landfills. *Id.* at 1196. The municipalities cited *Lincoln* for the proposition that liability could not attach to municipalities which arranged for the disposal or treatment of hazardous substances in their sovereign capacity. *Id.* at 1199. The Second Circuit rejected the argument, stating:

> We regard *Lincoln* as merely holding that the city's activities in that case, taken in furtherance of its sovereign function to abate public nuisances, were insufficient to give rise to "arranger" status for purposes of liability under CERCLA. *See id.* at 636–38. To the extent *Lincoln* can be construed as extending the "function as a sovereign" exception beyond the liability provision for owners or operators to that for arrangers, we disagree with it. Congress limited the sovereign function exception to those situations where liability is premised on the state or local government entity being an "owner or operator" of a vessel or facility. Nothing in the language of the Act suggests that it be extended.

Id. (citations omitted).

[14] *Martha's* interpretation of *Lincoln* is persuasive. A governmental body is not automatically foreclosed from CERCLA liability merely because it is acting in a regulatory capacity pursuant to a statutory mandate. *United States v. New Castle County*, 727 F.Supp. 854, 875 (D.Del.1989). Indeed, this Court has already implicitly rejected the cities' argument in its September order by finding a defendant city could be held liable under § 107(a)(3) if the prerequisites of the statute are met. Congress intended that state governmental entities be liable along with everyone else for cleanup costs recoverable under CERCLA. Thus, they may be liable under any circumstance described in § 107(a) from which they were not expressly excluded. *Cf. Pennsylvania v. Union Gas Co.*, 491 U.S. 1, 7, 109 S.Ct. 2273, 2278, 105 L.Ed.2d 1 (1989).

3. *Joint and Several Liability*

[15] All defendants dispute whether plaintiffs are entitled to joint and several liability. Regardless of whether plaintiffs are allowed to sue under § 107(a) or are limited to § 113(f), the County defendants and Cal

6. *Chemical Waste* does not properly differentiate between § 107 and § 113. In that case, the court allowed plaintiffs to sue under § 107, which imposes liability for any necessary response costs, but then applied the legal standards of § 113 to limit plaintiff's potential recovery in the § 107 action. *See* 669 F.Supp. at 1292 & n. 10.

Trans argue this Court should apply several liability. Defendant cities appear to argue the Court's decision on whether or not to impose joint and several liability follows from its decision with regard to whether plaintiffs can sue under § 107(a). The cities argue the Court has discretion to impose or not to impose joint or several liability depending on the facts of the case and equitable considerations, citing *Allied Corp. v Acme Solvents Reclaiming, Inc.*, 691 F.Supp. 1100, 1116 (N.D.Ill.1988); *United States v. Chem-Dyne Corp.*, 572 F.Supp. 802, 808 (S.D.Ohio 1983).

In *Chem-Dyne*, the court interpreted the scope of liability under § 107:

> If the harm is divisible and if there is a reasonable basis for apportionment of damages, each defendant is liable for only the portion of harm he himself caused. In this situation, the burden of proof as to apportionment is upon each defendant. On the other hand, if the defendants caused an indivisible harm, each is subject to liability for the entire harm.

572 F.Supp. 802, 811 (S.D.Ohio 1983). The majority of courts have adopted *Chem-Dyne*'s holding. *See O'Neil v. Picillo*, 883 F.2d 176, 178 (1st Cir.1989) (citing cases), *cert. denied*, 493 U.S. 1071, 110 S.Ct. 1115, 107 L.Ed.2d 1022 (1990).[7]

Plaintiffs assert courts have consistently and unanimously held CERCLA imposes joint and several liability. *E.g., County Line Investment Co v. Tinney*, 933 F.2d 1508, 1516 (10th Cir.1991); *O'Neil*, 883 F.2d at 178 79; *United States v. Monsanto Co.*, 858 F.2d 160, 171 (4th Cir.1988), *cert. denied*, 490 U.S. 1106, 109 S.Ct. 3156, 104 L.Ed.2d 1019 (1989). However, plaintiffs themselves recognize that the majority of courts will apportion damages when defendants can demonstrate that the harm is divisible. *E.g., O'Neil*, 883 F.2d at 178.

With regard to the issue of joint and several liability, the Court holds joint and several liability applies under § 107. However, individual defendants may be entitled to several liability if they can show the harm they caused is divisible. The parties dispute the divisibility of the harm caused at the OII site. While plaintiffs claim the harm at OII is indivisible, defendants claim the harm is divisible. The parties have presented no evidence to suggest whether the harm is divisible or indivisible because the question of divisibility involves issues not before the Court in this phase of the case. Because the divisibility of the harm cannot be resolved at the present time, the Court's final decision on joint and several liability must wait until it considers evidence relating to the divisibility of harm.

4. *Does the Doctrine of 'De Minimis Non Curat Lex' Absolve Defendants From Liability?*

[6] Defendant cities argue that a cost recovery or contribution action under CERCLA amounts to an equitable proceeding for restitution in which equitable defenses, particularly 'de minimis non curat lex,' should apply. Some courts have recognized the availability of equitable defenses in cost recovery actions under CERCLA § 107. *E.g., United States v. Mottolo*, 695 F.Supp. 615, 626-27 (D.N.H.1988); *United States v. Hardage*, 116 F.R.D. 460 (W.D.Okla.1987).

Relying on the above, defendant cities argue the Court can apply, if appropriate, 'de minimis non curat lex' (the law does not concern itself with trifles) to this action. Defendant cities realize the application of this doctrine depends on the introduction of evidence regarding the amount and toxicity of the waste attributable to the cities. Accordingly, the cities request only a ruling that they may assert this defense at the appropriate time.

Section 107(a) states those arranging for the transport for disposal of hazardous waste which they own or possess shall be liable "[n]otwithstanding any other provision or rule of law, and subject only to the defenses set forth in subsection (b) of this section." Section 107(b) does not set forth the defense of 'de minimis non curat lex.'

Numerous courts have construed § 107(b) as precluding all defenses not enumerated in CERCLA. *E.g., United States v. Bliss*, 667 F.Supp. 1298, 1304 (E.D.Mo.1987); *United States v. Stringfellow*, 661 F.Supp. 1053, 1061-62 (C.D.Cal.1987). Given the Court's finding that plaintiffs can sue under § 107(a), 'de minimis non curat lex' is not an available defense because § 107(b) limits the defenses available. "The principle of 'de minimis non curat lex' (the law does not concern itself with trifles) is simply not a defense to CERCLA liability." *United States v. Western Processing Co.*, 734 F.Supp. 930, 936 (W.D.Wash.1990).

B. *The First Trial Phase*

Plaintiffs claim defendants fall within the class of persons liable as an arranger under CERCLA § 107(a)(3). Arrangers liable under CERCLA include:

> Any person who by contract, agreement, or otherwise arranged for disposal or treatment, or arranged with a transporter for transport for disposal or treatment, of hazardous substances owned or possessed by such person, by any other party or entity, at any facility or incineration vessel owned or operated by another party or entity and containing such hazardous substances.

CERCLA § 107(a)(3); 42 U.S.C. § 9607(a)(3). To be liable as an arranger, the substances disposed of must have been "hazardous" under CERCLA, the liable party must have "owned or possessed" the substances, and it must have "arranged" for their disposal.

For the purposes of this phase of the trial, the Court will determine only if the defendants "arranged for transport for disposal" of waste "owned or possessed" by defendants. Later phases of this action will determine issues such as the volume of the waste and whether or not the waste contained hazardous substances.

1. *Arranger Issues*

In its 1st order, the Court delineated three principles which have emerged from case law to guide determinations of whether a particular contract or agreement constitutes an arrangement for disposal:

> First, courts have not hesitated to look beyond a defendant's characterizations to determine whether a transaction in fact involved an arrangement for the disposal of a hazardous substance. Second, if persons have a legal responsibility for disposal of hazardous substances, they cannot evade liability if they do nothing and simply "close their eyes" to the method of disposal of their hazardous substances. Third, courts have stated that "a liberal judicial interpretation of the term is required in order (to) achieve CERCLA's 'overwhelming remedial' statutory scheme."

Sept. Order at 26 (citations omitted). The Court applied these principles to find that defendant City of Alhambra could be held liable as an arranger because the city had contracted with a disposal company for the transportation and disposal of its residential waste.

a. *The Defendant Cities*

Plaintiffs argue each defendant city arranged for transport for disposal by contracting with waste haulers to pick up waste within the city. In addition, plaintiffs argue five defendant cities (Bell, Commerce, Compton, Lynwood, and South Gate) arranged for disposal by licensing waste haulers to operate within those cities.

i. *Contractual Agreements With Waste Haulers*

[7] Defendant cities raise three basic arguments on the arranger by contract issue. First, they point to the language of § 107(a)(3), which states defendants must have arranged for the disposal of "hazardous substances." Defendant cities claim they are not arrangers because the contracts at issue said nothing about hazardous substances.

It is undisputed defendant cities contracted with disposal companies to transport residential, commercial, and governmental waste for disposal. In other cases, courts have not hesitated to look beyond a defendant's characterizations to determine whether a transaction in fact involved an arrangement for the disposal of a hazardous substance. *See* Sept.

7. Defendant cities further suggest the Gore Amendment factors present consideration the Court can take into account when determining whether joint and several liability is appropriate. *United States v. A & F Materials*, 578 F.Supp. 1249, 1256-57 (S.D.Ill.1984). As plaintiffs point out, however, most appellate decisions have refused to follow the approach of *A & F Materials*

Order at 26. The fact that the contracts at issue in this case did not specifically mention hazardous substances does not prevent defendant cities from being held to be arrangers.

[8] Second, defendant cities point out that § 107(a)(3) imposes liability on those who arrange for transport for disposal to a "facility." Defendant cities argue their contracts with private waste haulers do not qualify as arrangements because no city picked OII as the site for waste from within the city to be dumped.

In its most recent order, the Court noted that "it is well settled that one who contracts for disposal has 'arranged' for disposal even if the contract does not mention the disposal site." Sept. Order at 22. One who contracts for disposal has "arranged" for disposal even if the contract does not mention the disposal site. *Id.* at 48. Defendant cities did not have to pick OII as the site to qualify as arrangers under § 107(a)(3). By contracting with disposal companies, the municipal defendants arranged for waste to be taken to a facility. The fact they did not pick OII as the final destination is not determinative.

Lastly, defendant cities reiterate the policy arguments they make in asserting their sovereign power defense, namely that considerations of public policy should prevent the imposition of CERCLA liability on municipalities. As stated above, the Court does not find those policy arguments persuasive under the facts of this case. As stated below, the Court finds the stipulated facts demonstrate each municipal defendant arranged with a transporter for transport for disposal within the meaning of CERCLA § 107(a)(3).

In discussing the arranger issue, plaintiffs and defendant cities have divided the waste collected by the disposal companies into three categories. The first category is "residential waste"– refuse from households and apartments within the defendant city. The second category is "commercial waste"--refuse from businesses located with the defendant city. The third category is "governmental waste"--waste from governmental operations and city refuse receptacles. In making its findings, the Court adopts this nomenclature.

1. *Alhambra*

Alhambra arranged with a transporter for transport for disposal of residential waste by contracting with CV Disposal and Athens Disposal from 1960 to 1984. [1.2; 1.3] Alhambra's contracts with Athens Disposal further provided Athens would collect, transport, and dispose of governmental waste and some commercial waste. [1.4; 1.5] Based on the stipulated facts, the Court finds Alhambra arranged with a transporter for transport for disposal of residential, commercial, and governmental waste within the meaning of CERCLA § 107(a)(3) from 1960 to 1984.

2. *Bell*

Bell contracted with System Disposal Services, Inc. (System Disposal) to collect, transport, and dispose of residential and governmental waste from 1970 to 1981. [2.2] The Court finds Bell arranged with a transporter for transport for disposal of residential and governmental waste within the meaning of CERCLA § 107(a)(3) from 1970 to 1984.

3. *Commerce*

From 1962 until 1977, Commerce contracted with O.G. Cannavo to collect, transport, and dispose of residential waste. [5.2] From 1977 until 1984, Commerce contracted with Metropolitan Waste Disposal Company to collect, transport, and dispose of residential waste. [5.4] The Court finds Commerce arranged with a transporter for transport for disposal of residential waste within the meaning of CERCLA § 107(a)(3) from 1962 until 1984.

In 1976 and 1977, the Commerce-Cannavo contracts required Cannavo to collect, transport and dispose of Commerce governmental refuse. [5.3] The Commerce-Metropolitan contracts from 1977 to 1984 required Metropolitan to collect, transport, and dispose of Commerce governmental refuse.' [5.5] The Court finds Commerce arranged with a transporter for transport for disposal of governmental waste within the meaning of CERCLA § 107(a)(3) from 1976 to 1984.

4. *Compton*

Compton contracted with Murcole, Inc. to collect, transport and dispose of residential waste from 1969 to 1984 except for a portion of East Compton and the 'Nestor Tract' from 1975–1980. [6.2] The Compton–Murcole contracts also covered Compton governmental waste from 1969 to 1984. [6.3] The Court finds Compton arranged with a transporter for transport for disposal of residential and governmental waste within the meaning of CERCLA § 107(a)(3) from 1969 to 1984.

5. *Cudahy*

From 1981 to 1984, Cudahy contracted with System to collect, transport and dispose of residential and governmental waste from Cudahy. [7.2] The Court finds Cudahy arranged with a transporter for transport for disposal of residential and governmental waste within the meaning of CERCLA § 107(a)(3) from 1981 to 1984.

6. *Lynwood*

Lynwood contracted with CV Disposal Service from 1962 to 1984 to collect, transport and dispose of residential and commercial waste. [12.2; 12.3] From 1978 to 1984, the Lynwood-CV contracts required CV to collect, transport, and dispose of governmental waste as well. [12.4] The Court finds Lynwood arranged with a transporter for transport for disposal within the meaning of CERCLA § 107(a)(3) of residential and commercial waste from 1962 to 1984, and for disposal of government waste from 1978 to 1984.

7. *Maywood*

From 1958 to 1972 Maywood contracted with Pacific Waste Disposal Company, a transporter, to collect, transport, and dispose of residential and governmental waste. [13.3; 13.8] From 1958 to 1970, the Maywood-Pacific contracts required Pacific to collect, transport, and dispose of commercial waste. [13.6] From 1972 to 1984, Maywood contracted with System Disposal to collect, transport, and dispose of residential and governmental waste. [13.4; 13.9]

The Court finds Maywood arranged with a transporter for transport for disposal of residential and governmental waste within the meaning of CERCLA § 107(a)(3) from 1958 to 1984. The Court further finds Maywood arranged with a transporter for transport for disposal of commercial waste within the meaning of CERCLA § 107(a)(3) from 1958 to 1970.

8. *Montebello*

From 1952 to 1958, Montebello contracted with Michael Harabedian and George Slater to collect, transport, and dispose of residential and commercial waste. [14.2] From 1962 to 1984, Montebello contracted with Athens Disposal to collect, transport, and dispose of residential, commercial, and governmental waste. [14.7; 14.10]

The Court finds Montebello arranged with a transporter for transport for disposal within the meaning of CERCLA § 107(a)(3) of residential and commercial waste from 1952–1958 and from 1962–1984. The Court further finds Montebello arranged with a transporter for transport for disposal of governmental waste within the meaning of CERCLA § 107(a)(3) from 1962–1984.

9. *Monterey Park*

Monterey Park contracted with Michael Harabedian to collect, transport, and dispose of residential waste from 1947–1958. [15.2] Monterey Park contracted with CV Disposal to collect, transport, and dispose of residential and governmental waste from 1960–1970. [15.3; 15.5] From 1970 until 1984, Monterey Park contracted with Athens Disposal to collect, transport, and dispose of residential and governmental waste. [15.4; 15.6]

The Court finds Monterey Park arranged with a transporter for transport for disposal of residential and governmental waste within the meaning of CERCLA § 107(a)(3) from 1960-1984. The Court also finds Monterey Park arranged with a transporter for transport for disposal of residential waste within the meaning of CERCLA § 107(a)(3) from 1947 1958.

10. *Rosemead*

Rosemead contracted with Dick Griegorian (doing business as Griegorian Disposal Service and Modern Service Co.) to collect, transport, and dispose of residential waste from 1961 until 1984. [18.2] During the period 1965 1984, the Rosemead-Griegorian contracts required Griegorian to collect, transport, and dispose of commercial and governmental waste. [18.3; 18.4]

The Court finds Rosemead arranged with a transporter for transport for disposal of residential waste within the meaning of CERCLA § 107(a)(3) from 1961-1984, and for disposal of residential, commercial, and governmental waste within the meaning of CERCLA § 107(a)(3) from 1965-1981.

11. *San Gabriel*

San Gabriel contracted with George Solomon to collect, transport and dispose of residential and commercial waste from 1948 to 1956. [19.2] During 1954-1956, the San Gabriel-Solomon contracts provided that Solomon would also collect, transport, and dispose of governmental refuse. [19.3] From 1957 to 1964, San Gabriel contracted with Community Disposal Company to collect, transport, and dispose of residential, commercial, and governmental waste. [19.8; 19.9]

In 1956-1957, and from 1964-1984, San Gabriel contracted with San Gabriel Valley Disposal Company (also known as San Gabriel Disposal Company) to collect transport and dispose of residential, commercial, and governmental waste. [19.6; 19.6; 19.7] Based on this series of contracts, the Court finds San Gabriel arranged with a transporter for transport for disposal of residential, commercial, and governmental waste within the meaning of CERCLA § 107(a)(3) from 1948-1981.

12. *South Gate*

From 1956-1957, South Gate contracted with System Disposal to collect, transport, and dispose of residential and commercial waste. [23.2] From 1957-1962, South Gate contracted with Santa Ana Commercial for collection, transportation, and disposal of residential and commercial waste. [23.4] From September 26 to December 15, 1962, the South Gate-Santa Ana contract provided for collection, transportation and disposal of South Gate governmental waste as well. [*Id.*]

From 1962-1967, South Gate contracted with Andrew Hohn to collect, transport, and dispose of residential, commercial, and governmental was[illegible]23.5] From 1967 to 1984, South Gate c[illegible]ed with CV Disposal Service to collect, transport, and dispose of residential and governmental waste. [23.6]

The Court finds that by making these contracts, South Gate arranged with a transporter for transport for disposal of residential waste within the meaning of CERCLA § 107(a)(3) from 1955-1984, of commercial waste within the meaning of CERCLA § 107(a)(3) from 1955-1967, and of governmental waste within the meaning of CERCLA § 107(a)(3) from Sept. 26, 1962 to 1984.

13. *South Pasadena*

From 1950 to 1979, South Pasadena contracted with South Pasadena Rubbish Company and South Pasadena Disposal Company to collect, transport, and dispose of residential and commercial waste. [24.1; 24.2] From 1979 to 1984, South Pasadena contracted with Ronara to collect, transport, and dispose of residential, commercial, and governmental waste. [24.4; 24.5; 24.6] Based on these contracts, the Court finds South Pasadena arranged with a transporter for transport for disposal of residential and commercial waste within the meaning of CERCLA § 107(a)(3) from 1950-1984, and of governmental waste within the meaning of CERCLA § 107(a)(3) from 1979-1984.

14. *Temple City*

From 1960 to 1984, Temple City contracted with Community Disposal to collect, transport and dispose of residential, commercial, and governmental waste. [25.1; 25.2; 25.3] Accordingly, the Court finds Temple City arranged with a transporter for transport for disposal of residential, commercial, and governmental waste within the meaning of CERCLA § 107(a)(3) from 1960-1984.

b. *Licenses*

[9] Plaintiffs claim the issuance of business licenses by five municipal defendants (Bell, Commerce, Compton, Lynwood, and South Gate) which permitted a waste hauler to conduct business within city limits constituted an "arrangement" subjecting the cities to liability under CERCLA § 107(a)(3). These five defendants claim the licenses they issued were generic licenses no different than those issued to other types of businesses. Plaintiffs claim the licenses issued by these five defendants were not generic business licenses but explicit permits to collect and dispose of refuse. The parties have stipulated that Bell licensed a hauler to collect and dispose of commercial waste [2.33], Commerce licensed a hauler to collect and dispose of commercial waste [5.16], Compton licensed a hauler to engage in the business of rubbish collection within Compton [6.57], Lynwood licensed two haulers to operate refuse collection and disposal businesses in Lynwood [12.21, 12.23], and South Gate licensed three different haulers to collect and dispose of commercial waste [23.57 23.59].

California law requires municipal corporations like defendants "to make adequate provision for solid waste handling ... within their respective jurisdictions." Cal.Pub.Res. Code § 40002. Municipalities can fulfill this duty by delegating it to private parties through a "nonexclusive franchise." *Id.* at § 40059.[8] Plaintiffs argue Bell, Commerce, Compton, Lynwood, and South Gate arranged within the meaning of CERCLA § 107(a)(3) because each had a statutory duty to arrange for disposal of waste, their licensing of private haulers was an approved method for carrying out this duty, and they exercised control over aspects of waste collection and disposal. In particular, plaintiffs argue Bell, Compton, and South Gate extensively controlled disposal companies they licensed. Each of these three defendants contracted with a transporter to collect and dispose of residential waste and licensed that same transporter to collect and dispose of commercial waste.

Defendants argue the issuance of a business license does not constitute a contract or agreement by which the city arranges for disposal because a license permits, but does not require, a licensee to conduct the business for which it is licensed. Defendants suggest plaintiffs' license argument would hold the Department of Motor Vehicles liable as an arranger because it issued vehicle registrations and drivers' licenses to waste haulers.

In support of their argument that they are not liable as arrangers, defendants rely on *Hassayampa Steering Comm. v. Arizona* 768 F.Supp. 697 (D.Ariz.1991). In *Hassayampa*, the plaintiffs alleged the State of Arizona was liable as an "arranger" for the disposal of hazardous substances because it issued manifests which permitted hazardous waste to be deposited at a landfill. The court refused to impose liability, holding that:

> the State's issuance of a permit does not constitute an agreement with the permittee. The manifest merely allowed the waste generator or transporter to deposit the waste at [the site] and did not require such disposal, even after the manifest was approved.

768 F.Supp. at 700.

Hassayampa, however, is distinguishable from this case. The *Hassayampa* court rested it decision on the issue of "owned or possessed," *not* the arranger issue. Indeed, the *Hassayampa* court noted that plaintiffs' arguments "may establish the State's activities constituted 'arranging' for disposal." *Id.* Defendant cities' DMV licensing argument is without merit. By issuing drivers' licenses and vehicle registrations, the DMV does not arrange for transport for disposal but instead only permits garbage trucks to be driven. While DMV has a duty to register such vehicles, it does not have a duty to arrange for garbage disposal such as defendant cities have. Thus, DMV's licensing cannot amount to an arrangement for disposal.

Based on the stipulated facts discussed below, the Court finds defendants Bell, Commerce, Compton, Lynwood, and South Gate arranged with a transporter for transport for disposal within the meaning of CERCLA § 107(a)(3) by issuing business licenses to private haulers. Given these defendants' statutory and common law duty to assure the pick-up and disposal of residential trash, defendants' licensing of private haulers amounted to an arrangement.

1. *Bell*

In 1977 and in 1982, Bell licensed System Disposal to collect and dispose of commercial waste. The Court finds Bell arranged with a transporter for transport for disposal of commercial waste within the meaning of CERCLA § 107(a)(3) in 1977 and 1982.

[illegible] Code §§ 66755 et seq.

2. *Commerce*

In 1983 and 1984, Commerce licensed Athens Disposal to collect and dispose of commercial refuse. The Court finds Commerce arranged with a transporter for transport for disposal of commercial waste within the meaning of CERCLA § 107(a)(3) in 1983 and 1984.

3. *Compton*

From 1972 to 1977, Compton licensed Murcole to engage in the business of commercial waste collection within Compton. The Court finds Compton arranged with a transporter for transport for disposal of commercial waste within the meaning of CERCLA § 107(a)(3) from 1972 to 1977.

4. *Lynwood*

From 1963 to 1969, Lynwood issued business licenses to Lynwood Disposal Service to operate a refuse collection and disposal business. In 1962, 1965–1969, 1973–1975, 1977, and 1979–1981, Lynwood licensed System Disposal to operate a refuse collection and disposal business. Lynwood required its licensees to apply for a special permit, including fingerprinting, a police background check, and approval by the City Council. [Exh. 1758; 1763; 1780] The Court finds Lynwood arranged with a transporter for transport for disposal within the meaning of CERCLA § 107(a)(3) in 1962, 1963–1969, 1973–1975, 1977, and 1979–1981.

5. *South Gate*

South Gate licensed three companies to collect and dispose of commercial waste. From 1967 to 1984, South Gate licensed CV Disposal. From 1964 to 1984, South Gate licensed System Disposal. From 1970 to 1984, South Gate licensed Murcole. Like Lynwood, South Gate had special permitting features for waste haulers. [Exh. 2344; 2345; 2355] Accordingly, the Court finds South Gate arranged with a transporter for transport for disposal from 1967 to 1984.

2. *The County Defendants*

[10] The Athens Woodcrest-Olivita GDD, Belvedere GDD, Firestone GDD, Mesa Heights GDD, and Walnut Park GDD each entered contracts with private disposal companies to collect, transport, and dispose of refuse. For the same reasons outlined above, the Court finds each GDD arranged for transport for disposal of waste within the meaning of CERCLA § 107(a)(3). With respect to the County itself, however, the issue presented is somewhat different. However, the Court finds it too arranged for disposal

a. *Athens Woodcrest Olivita GDD*

Stipulated facts 26.1 to 26.6 demonstrate the Athens Woodcrest Olivita GDD arranged with a transporter for transport for disposal of residential, commercial, and curbside public waste from 1963 to 1984. Accordingly, the Court finds the Athens-Woodcrest-Olivita GDD arranged with a transporter for transport for disposal of residential commercial, and curbside public waste within the meaning of CERCLA § 107(a)(3) from 1963 to 1984.

b. *Belvedere GDD*

Stipulated facts 27.1 to 27.7 demonstrate the Belvedere GDD arranged with a transporter for transport for disposal of residential and commercial waste from 1953 to 1983. Stipulated facts 27.9 to 27.10 demonstrate the Belvedere GDD arranged with a transporter for transport for disposal of curbside government waste from July 1, 1961 to June 30, 1983. Accordingly, the Court finds the Belvedere GDD arranged with a transporter for transport for disposal of residential and commercial waste within the meaning of CERCLA § 107(a)(3) from 1953 to 1983, and of curbside governmental waste within the meaning of CERCLA § 107(a)(3) from July 1, 1961 to June 30, 1983.

c. *Firestone GDD*

Stipulated facts 28.1 to 28.4 reveal the Firestone GDD arranged with a transporter for transport for disposal of residential, commercial, and curbside government waste from 1971 to 1984. Accordingly, the Court finds the Firestone GDD arranged with a transporter for transport for disposal of residential, commercial, and curbside governmental waste within the meaning of CERCLA § 107(a)(3) from 1971 to 1984.

d. *Mesa Heights GDD*

Stipulated facts 29.1 to 29.4 reveal the Mesa Heights GDD arranged with a transporter for transport for disposal of residential, commercial, and curbside governmental waste from 1969 to 1974. Accordingly, the Court finds the Mesa Heights GDD arranged with a transporter for transport for disposal of residential, commercial, and curbside governmental waste within the meaning of CERCLA § 107(a)(3) from 1969 to 1974.

e. *Walnut Park GDD*

Stipulated facts 30.1 to 30.13 reveal the Walnut Park GDD arranged with transporters for the transport for disposal of residential, commercial, and curbside governmental waste from 1964 to 1983. Accordingly, the Court finds the Walnut Park GDD arranged with a transporter for transport for disposal of residential, commercial, and curbside governmental waste within the meaning of CERCLA § 107(a)(3) between 1964 and 1983.

f. *West Hollywood-Sherman GDD*

Stipulated facts 31.1 to 31.4 demonstrate that the West Hollywood-Sherman GDD arranged with a transporter for transport for disposal of residential, commercial, and curbside public waste from July 1953 through December 1957 and July 1961 through June 1984. Accordingly, the Court finds that the West Hollywood-Sherman GDD arranged with a transporter for transport for disposal of residential, commercial, and curbside public waste within the meaning of CERCLA § 107(a)(3) from July 1953 through December 1957 and July 1964 through June 1984.

g. *County of Los Angeles*

Plaintiffs argue the County itself is liable for two types of arrangements. First, the County arranged to haul some waste generated by County facilities in County-owned trucks. Second, plaintiffs claim the County is liable for all waste collected under the GDDs' contracts because the County also acted as an arranger with respect to that waste.

i. *Waste Hauled in County Owned Trucks*

[11] From 1958 until 1981, the County disposed of some of its governmental waste by transporting that waste to disposal sites in County vehicles. [425] By transporting that waste in County vehicles, the County arranged for disposal of its governmental waste. [426] Accordingly, the Court finds the County arranged for transport for disposal of its governmental waste from 1958 through 1981 within the meaning of CERCLA § 107(a)(3) by transporting that waste in County owned vehicles.

ii. *Waste Collected Under GDD Contracts*

[12] Plaintiffs claim the County acted as an arranger with respect to waste collected under the GDDs' contracts because the County created, controlled, and operated every aspect of the GDDs. The County responds that it is an entity separate from the GDDs and is thus not liable for the conduct of the GDDs. The County argues plaintiffs seek to impose some version of corporate alter ego liability on it for the acts of its GDDs.

The Los Angeles County Board of Supervisors created the GDDs to organize garbage collection services and to provide for payment of those services. [32.49, 32.50] The Board of Supervisors governed the GDDs [32.51], and County employees had daily responsibility for operation of the GDDs [32.60]. The GDDs had no offices [32.61], owned no property [32.62], had no employees [32.59], and had no physical existence separate from the County [32.63]. Plaintiffs claim the County prepared for and brought about the transport and disposal of waste by drafting, approving, executing, monitoring, and enforcing the contracts between the GDDs and the private disposal companies.

The County claims the GDDs are entities separate from the County. The GDDs have their own budgets and pay for their expenses by charging district residents a user fee. *See generally* Cal.Pub.Res.Code §§ 49000 *et seq.* The County argues that transferring the GDDs' potential liability to it would impose an inequitable burden on County residents located outside the boundaries of the GDDs.

The Court finds the County did arrange for transport for disposal of waste by creating and controlling the GDDs. By creating the GDDs and taking day to day responsibility for their operation, the County itself arranged for transport for disposal of residen

tial, commercial, and curbside governmental waste from within the boundaries of the GDIs within the meaning of CERCLA § 107(a)(3).

3 *CalTrans*

Plaintiffs claim CalTrans arranged with a transporter for transport for disposal by contracting with private companies during two freeway projects, the Pomona Freeway (State Route 60) and the Century Freeway (Interstate 105). CalTrans disputes that these contracts amounted to an arrangement for transport for disposal within the meaning of CERCLA § 107(a)(3).

a. *Willco Site*

[13] While building the Century Freeway, CalTrans hired Papac & Sons, a private contractor, to excavate and remove material (Willco material) from the Willco site (a former landfill in Lynwood). [33.1] From March 1983 to June 30, 1983, some of the excavated Willco material was deposited at the OII site by Papac & Sons. [33.4] Plaintiffs argue CalTrans arranged with a transporter for transport for disposal by contracting with Papac & Sons to excavate and remove the Willco material.

CERCLA § 101(29) equates the CERCLA definition of "disposal" with that of the Solid Waste Disposal Act, namely:

> the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water.

42 U.S.C. § 6903(3). Plaintiffs claim CalTrans arranged for disposal because it contracted with Papac & Sons to excavate material and then discard it by placing it elsewhere.

CalTrans asserts it is not liable as an arranger because its contract with Papac & Sons explicitly provided that any hazardous materials were not to go to a class II landfill such as the OII site. Under CalTrans' contract with Papac & Sons, CalTrans had no discretion to decide where the excavated material would be disposed other than requiring that material was to be tested during excavation and was not to go to a class II landfill such as OII if hazardous. Section 107(a)(3) imposes liability on persons who "arranged for disposal or treatment, or arranged with a transporter for transport for disposal or treatment, of hazardous substances . . ." CalTrans claims it does not fall within this language because it adhered to its contract by hiring Calscience Research to provide environmental consulting services at the Willco site, including monitoring the excavation being performed by Papac & Sons and characterizing the excavated material as hazardous or non-hazardous. [33.7]

Despite the exclusionary language of the contract, the Court finds CalTrans did arrange for disposal of the Willco site material. CalTrans hired a transporter to take the Willco material away, and that material ended up at OII. If that waste contained hazardous substances, CalTrans cannot escape liability by pointing to a contractual clause stating hazardous waste should not have been taken to OII. Instead, CalTrans will have to wait until a later phase of this action to rebut plaintiffs' proffered evidence that the Willco material which went to the OII site contained hazardous substances.

b. *Pomona Freeway Right of Way*

[14] The current day Pomona Freeway traverses the OII site. In building the freeway, CalTrans contracted with Milburn & Sansone, a private contractor, to construct a portion of the Pomona Freeway between Woods Avenue and Arroyo Drive, which included the right of way. [33.15] Pursuant to this contract, CalTrans or its agents excavated and removed material (the Pomona material) from the right of way. [33.16] Plaintiffs argue CalTrans thus arranged for disposal of the Pomona material. CalTrans argues it did not "arrange" for disposal of the Pomona material because there is no evidence that any of the material excavated during this grading was transported and placed at the OII site.[9]

Plaintiffs have not provided enough evidence in this first phase for the Court to determine whether CalTrans "arranged" with regard to any excavated Pomona Freeway right of way material. Plaintiffs need to show with greater factual specificity what Milburn & Sansone was hired to do and what they in fact did. Pursuant to the stipulation between the parties, plaintiffs can (if they desire) present disputed evidence on this issue before the Court makes its final ruling on this issue.

9. CalTrans also argues plaintiffs have not produced evidence that any material which was transported and deposited at OII contained hazardous substances. This issue is appropriately contested in a later phase of this action.

C. *Owned or Possessed Issues*

[15] CERCLA § 107(a)(3) provides that persons who have "arranged for disposal . . . , or arranged with a transporter for transport for disposal" are liable for those hazardous substances they "owned or possessed." The Court has previously held arranger liability under § 107(a)(3) requires that defendants own or possess waste in addition to arranging with a transporter for transport for disposal. Sept. Order at 44. Ownership or possession under § 107(a)(3) can be either actual or constructive. *Id.*

1. *The Municipal Defendants*

a. *Waste Actually Owned or Possessed*

i. *Governmental Waste*

[16] With regard to the "owned or possessed" issue, all defendant cities have stipulated that they arranged with a transporter for transport for disposal of their governmental waste. These municipal defendants admit they owned and possessed their governmental waste. Thus, each defendant city "owned or possessed" the governmental waste for which it arranged for transport for disposal within the meaning of CERCLA § 107(a)(3).

ii. *Residential and Commercial Waste*

In their trial brief, plaintiffs further argued defendant cities actually owned or possessed (as opposed to constructively owned or possessed) the residential and commercial waste for which they arranged transport because (1) individual citizens and businesses abandoned their waste on city property by placing it out for collection, (2) defendants had complete authority to decide what happened to the waste once it was set out for collection, and (3) the ownership interest of defendant cities in the refuse was acknowledged by both the cities and their disposal companies.

At oral argument, plaintiffs abandoned this argument. However, plaintiffs still assert these facts tend to show constructive ownership or possession of residential and commercial waste. Because plaintiffs no longer assert defendant cities' actually owned or possessed residential and commercial waste, the Court need not address plaintiffs' actual ownership or possession argument further.

b. *Constructive Ownership or Possession*

[17] Plaintiffs contend that defendant cities constructively owned or possessed residential and commercial waste. In its prior order, the Court stated:

> the broad remedial objectives of CERCLA counsel in favor of holding that this requirement may be satisfied by a showing of constructive, rather than actual, ownership or possession. Constructive ownership or possession will be established by a demonstration of the existence of defendants' exercise of control over the waste.

Sept. Order, at 44. Plaintiffs argue defendants constructively owned or possessed residential and commercial waste by controlling aspects of waste handling and disposal from the point after waste was generated by a resident or business to the point it was hauled away by the transporter.

Courts have developed two different tests to judge whether a defendant constructively owns or possesses waste within the meaning of CERCLA § 107(a)(3). The first focuses on a defendant's authority to control waste. The second examines whether defendant had a sufficient nexus with the actual owner or possessor to satisfy § 107(a)(3)'s "owned or possessed" requirement. The Court agrees with the parties that these two tests are essentially different formulations of the same legal standard. However, the Court's discussion is divided into "control" and "nexus" sections to reflect the different formulations developed by these two strands of case la

1. The Control Test

1. Exercise of Control or Authority to Control?

[18] In its prior order, the Court held constructive ownership or possession "will be established by a demonstration of the existence of defendants' exercise of control over the waste." Sept. Order at 44. Plaintiffs attempt to loosen this test by arguing authority to control, rather that the existence of actual control, can satisfy the "owned or possessed" requirement.

California law "authorize[s] and require[s] local agencies, as subdivisions of the state, to make adequate provision for solid waste handling." Cal.Pub.Res.Code § 40002. While state statutes authorizing and requiring waste collection only date back to 1989,[10] California state courts have long held local political subdivisions (such as defendant cities) have a duty to collect waste or cause it to be collected. *E.g., Matula v. Superior Court*, 146 Cal.App.2d 93, 303 P.2d 871 (1956). Plaintiffs argue defendant cities constructively owned or possessed residential and commercial waste because the cities had the power under state law to exercise complete dominion over the handling and disposal of such waste.

In making this argument, plaintiffs primarily rely on two cases. In *United States v. Northeastern Pharmaceutical & Chemical Co.*, a company supervisor claimed he could not be held individually liable under § 107(a)(3) because the company, not the supervisor himself, owned or possessed the waste in question. The Eight Circuit held the supervisor was not exempt from liability because "[i]t is the authority to control ... that is critical under the statutory scheme." 810 F.2d 726, 743 (8th Cir.), *cert. denied*, 484 U.S. 848, 108 S.Ct. 146, 98 L.Ed.2d 102 (1987) (*NEPACCO*).

Plaintiffs also rely on *United States v. Bliss*, 667 F.Supp. 1298 (E.D.Mo.1987). In *Bliss*, one defendant (IPC) had arranged for Bliss, a disposal company, to dispose of certain wastes actually owned and possessed by another defendant (a manufacturer). The court found IPC liable under § 107(a)(3) because:

> IPC acted as a broker between a chemical manufacturer and a disposal company ... IPC had authority to control the place and manner of disposal, for example IPC could have chosen Bliss or any other party to dispose of the waste.

Id. at 1307.

Plaintiffs' authority argument has two flaws. First, both of the cases on which plaintiffs rely to support their position that "authority to control" is the appropriate test for determining whether a defendant constructively owned or possessed waste appear to actually hold that defendants need not own or possess waste at all for liability under CERCLA to attach. In stating it is "authority to control" which is critical, *NEPACCO* cited and relied on *United States v. Mottolo*, 629 F.Supp. 56, 60 (D.N.H.1984), which held a § 107(a)(3) defendant is liable for arranging for disposal regardless of whether he owns or possesses. The *Bliss* court also relied on cases which have held § 107(a)(3) does not require proof that a defendant both arranged and owned or possessed. *See id.* (citing *United States v. Northeastern Pharmaceutical & Chemical Co.*, 579 F.Supp. 823, 847 (W.D.Mo.1984) ("the person arranging for the disposal is not required to actually own or possess the hazardous waste")); *Mottolo*, 629 F.Supp. at 60). A later opinion in the *Bliss* action confirms that *Bliss* held that "[i]t is not necessary for the person who arranges for disposal or transport to own or possess the waste." *United States v. Bliss*, 16 Chem. Waste Lit.Rep. 1061, 1065, 1988 WL 169818, at *6 (E.D.Mo.1988) (citing *NEPACCO*, 810 F.2d at 743).

Second, plaintiffs' argument that 'authority to control' demonstrates constructive possession does not conform with this Court's previous order that constructive possession would be "established by a demonstration of the existence of defendants' exercise of control over the waste." In this particular case, California statutes and case law required defendant cities to provide for solid waste collection. However, if authority to control was sufficient to establish ownership or possession, any government with police power would be liable under § 107(a)(3) so long as it arranged. While a plaintiff would still have to show an arrangement, the authority of the government to control through its police power would automatically satisfy the "owned or possessed" requirement. Focusing on authority to control makes governmental CERCLA defendants potentially liable regardless of their actual exercise of control over waste. Examining defendant cities' exercise of control is the correct means for judging whether defendant cities constructively owned or possessed waste within the meaning of CERCLA § 107(a)(3).

2. Defendant Cities' Exercise of Control

[19] While the municipal defendants' authority to exercise control over waste does not in and of itself demonstrate constructive ownership or possession, their duty to provide for waste disposal is a fact tending to demonstrate exercise of control over waste. *See General Elec. Co. v. AMCO Transmissions, Inc.*, 962 F.2d 281, 286 (2d Cir.1992). California law authorized defendant cities to make adequate provision for solid waste handling and required cities to make such provisions. Defendant cities fulfilled their duty to provide waste collection by hiring transporters to haul away residential and commercial rubbish.

In addition to the municipal defendants' duty to provide for waste collection, plaintiffs point to the control exercised by the cities through contractual provisions and city ordinances while they fulfilled their duty. Plaintiffs organize the stipulated facts into fourteen categories which they urge demonstrate exercise of control over the waste. Through contracts, licenses, and ordinances, the cities:

(1) excluded unauthorized transporters from engaging in waste handling and disposal;

(2) controlled the type of waste to be collected;

(3) controlled the type, size, and construction of waste receptacles;

(4) controlled schedules, routes, days, and hours of collection;

(5) controlled the type, construction, maintenance, and appearance of refuse collection vehicles;

(6) controlled waste handling procedures and personnel;

(7) engaged in overall supervision of waste handling and hauling;

(8) set out procedures for dealing with complaints by residents and businesses about waste collection and hauling;

(9) governed notices and other communications between the transporter and residents and businesses concerning waste collection and hauling;

(10) set rates for refuse collection services;

(11) checked up on the financial stability and reliability of the transporter; and

(12) governed billing and collection of fees for refuse collection services.

Plaintiffs argue that every city exercised control over at least one of these categories in all material years, and that most cities exercised control over all or nearly all of the twelve categories for each year in question through contractual and licensing arrangements.[11]

Defendant cities acknowledge they imposed regulatory requirements on residents, businesses, and disposal companies with respect to waste, but claim there is no evidence that any of the cities ever exercised any control over the waste itself. Plaintiffs correctly respond that control over those in actual possession is the only kind of control which could demonstrate constructive possession of waste. If one does not actually possess the waste, the only means of controlling that waste is controlling the person in actual possession.

Many of the stipulated facts do not show control over the waste. For example, contract specifications requiring disposal workers to wear clean uniforms, disposal trucks painted a uniform color with certain sized letter, and ordinances prescribing route collection times seem to have little to do with control over waste. Some categories of facts,

10. Cal.Pub.Res.Code § 40002 was enacted in 1989. It derived from former Cal.Gov't Code § 66755, which contains nearly identical language and was enacted in 1980.

11. The facts for individual cities are summarized below.

on the other hand, do demonstrate control In arranging with haulers for waste collection and disposal, defendant cities exercised significant control. Essentially, defendant cities did everything but select the specific site for disposal. Each city selected specific haulers to provide collection service to fulfill the city's waste collection responsibility and then extensively regulated those haulers through contract and ordinance.

[20] Defendant cities point to two areas in which they exercised little, if any, control. Specifically, the cities stress that plaintiffs have produced no evidence (1) which suggests any defendant city determined how or where the residential waste was to be dumped once it was collected, or (2) which suggests any defendant city had any proprietary interest in the waste haulers or the disposal of residential and commercial rubbish. Defendant cities claim these two factors are the most important means of determining whether a defendant has exercised the control necessary to make it a constructive owner or possessor.

While defendant cities are correct that prior cases have focused on these two areas, neither the cities' limited involvement in site selection nor their lack of proprietary interest in the haulers compels a finding under the facts of this case that the cities did not constructively own or possess residential and commercial waste.

a. Determining the Place of Disposal

In discussing indicia of control amounting to ownership or possession within the meaning of CERCLA § 107(a)(3), several courts have focused on who decided to deposit waste at the site in question. *E.g., United States v. Consolidated Rail Corp.*, 729 F.Supp. 1461, 1469 (D.Del.1990) ("The inquiry under section 9607(a)(3) turns on the determination of who made the crucial decision to dispose of hazardous substances under the Act, and thus falls within the class of responsible persons"); *United States v. A & F Materials Co.*, 582 F.Supp. 842, 845 (S.D.Ill.1984) ("the relevant inquiry is *who decided* to place the waste into the hands of a particular facility that contains hazardous wastes") (emphasis in original); *see also Hassayampa Steering Comm. v. Cyprus*, 768 F.Supp. 697, 702 (D.Ariz.1991) (constructive ownership or possession "usually evidenced by having the authority to decide on behalf of the owner where the waste would be deposited") (applying nexus test).

The cases cited by defendants, however, focus on the arranger issue and not the owned or possessed issue. *Consolidated Rail* states "liability may also be extended to generators 'who did not make the crucial decision of how [the substances] would be disposed or treated, and by whom,' where '[a]ny other decision would allow defendants to simply 'close their eyes' to the method of disposal of their hazardous substances....'" 729 F.Supp. at 1470 (quoting *United States v. Aceto Agricultural Chem. Corp.*, 699 F.Supp. 1384, 1389 (S.D.Iowa 1988) (alterations in original), *aff'd in part and rev'd in part*, 872 F.2d 1373 (8th Cir. 1989)). *A & F* does not discuss ownership or possession at all because it was not disputed the defendant in that case actually owned the waste.

Evidence that a defendant selected a site for disposal can demonstrate constructive ownership or possession. However, lack of such evidence does not necessarily mean a defendant did not constructively own or possess waste. One of the few cases to mention a defendant's role in deciding where waste was deposited in the context of determining whether that defendant constructively owned or possessed waste is *Hassayampa*, 768 F.Supp. at 702. While *Hassayampa* utilized the nexus test instead of the control test, it is nevertheless instructive. The *Hassayampa* court stated:

> The standard established by prior case law for determining when a non-generator will be constructively held to have owned or possessed the waste requires that the alleged arranger have some nexus with the actual owner, usually evidenced by having the authority to decide on behalf of the owner where the waste would be deposited.

Id. The *Hassayampa* court found the state governmental defendant in that case did not constructively own or possess the waste in question because, *inter alia*, the generator made the determination to transport the waste to the site. *Id.*

There is no evidence in this case to suggest that individuals and businesses that generated the residential and commercial wastes, made a determination to transport waste to OII. Defendant cities disclaim any involvement in site selection, arguing the private disposal companies serendipitously determined where such waste was deposited.

However, the stipulated facts suggest all cities were involved in such decisions to a varying extent. Some cities required haulers to dump waste outside city limits. Some cities knew waste from within their city was being dumped at OII. At least one city, Compton, identified OII as a disposal site available for used by its contractor. In any case, each city selected the hauler who did determine the site and delegated some amount of autonomy over site selection to that transporter.

b. Financial Interest

Defendant cities also argue they did not constructively own or possess residential and commercial waste because they had no proprietary interest in the waste haulers or the disposal of rubbish. According to defendants, Congress intended to impose the cost of cleanup on those who profited from transactions in hazardous waste. Several cases have held this to be an important consideration. *E.g., Lincoln v. Republic Ecology*, 765 F.Supp. at 635-36 ("an unmistakable purpose behind CERCLA's strict liability standard was to force parties who *profit* from the use and generation of hazardous wastes, or directly cause or contribute to their release, to account, in the pricing of their products, for the environmental externalities associated with improper disposal") (emphasis in original); *United States v. New Castle County*, 727 F.Supp. 854, 858 (D.Del.1989) (CERCLA "assures that those who benefit financially from a commercial activity internalize health and environmental costs of that activity into the cost of doing business") (quoting S.Rep. No. 848, 96th Cong., 2d Sess. at 13).

The evidence shows the municipal defendants had no property interest in the haul[illegible] with whom they arranged for disposal [illegible]er, some cities billed residents directly for collection costs. Others received a percentage of the transporter's billings and/or free collection service for governmental waste. Defendant cities who did neither still profited indirectly from contracting with private disposal companies, thus relieving themselves from having to provide collection service.

ii. Nexus Test

Plaintiffs also argue defendant cities constructively owned or possessed residential and commercial waste because of the 'nexus' between defendant cities and the actual owners and possessors of the waste. The nexus test stems from *New York v. City of Johnstown*, which held "there has to be some nexus between the allegedly responsible person and the owner of the hazardous substances before a party can be held liable under 42 U.S.C. § 9607(a)(3)." 701 F.Supp. 33, 36 (N.D.N.Y.1988).

Plaintiffs point out that residential waste and commercial waste was owned or possessed by residents and businesses respectively before the waste was set out for collection. After the waste was hauled away by the disposal company, that waste was owned and possessed by the transporter. Plaintiffs conclude the municipal defendants constructively owned or possessed residential and commercial waste because of the cities' nexus with the generators of residential and commercial waste and/or the transporters of residential and commercial waste, both of whom actually owned or possessed the waste.

1. Nexus with Generators

Plaintiffs claim defendant cities' constructively owned or possessed residential and commercial waste because of their nexus with residents and businesses. As noted above, the 'nexus' test was developed in *Johnstown*, 701 F.Supp. at 36. In *Johnstown*, the state of New York brought suit to remediate problems at two solid waste management facilities. Defendants argued the state was a responsible party under § 107(a)(3) because it "arranged" for disposal by permitting or directing waste to be placed in the facilities. After stating that "there has to be some nexus between the allegedly responsible person and the owner of the ha[illegible]

ardous substances before a party can be held liable" under § 107(a)(3), *id.* at 36, the *Johnstown* court found no nexus existed because the state was attempting to remediate the hazardous waste problems at both sites. *Id.* *Johnstown* distinguished cases which had found defendants constructively owned or possessed as involving either an officer or plant supervisor of a waste-producing corporation or a hired third party who decided how to dispose of the company's waste. *Id.*

The nexus formulation was also used in *United States v. New Castle County*, 727 F.Supp. 854 (D.Del.1989). In *New Castle County*, the state of Delaware was involved in the selection of the site as well as planning its design and operation. The state also determined the type of waste suitable for disposal at the sight. After stating "there must be some nexus or relationship between the person under attack and the actual owner or possessor of the hazardous substance," *id.* at 871, the *New Castle County* court concluded the state of Delaware was not liable because it was attempting to solve the problem of the safe disposal of waste. *Id.*[12]

2. *Nexus with Transporters*

Plaintiffs also argue defendant cities constructively owned or possessed residential and commercial waste because of their nexus with private haulers. Plaintiffs claim the cities' contractual or licensing relationship with transporters was the source of the transporter's possession and ownership of residential and commercial waste. But for the city's approval of the contract or license, the hauler would not be able to transport and dispose of the waste.

In arguing defendant cities' nexus with private haulers made them constructive owners or possessors, plaintiffs rely on a recent Second Circuit decision, *B.F. Goodrich Co. v. Murtha*, 958 F.2d 1192 (2d Cir.1992). The plaintiffs in *Murtha* sought reimbursement for past and future clean up costs from the owner-operators of two landfills. The owner-operator defendants then commenced third party contribution actions against numerous municipalities, alleging the municipalities were liable under § 107 because the cities had arranged for the disposal of municipal waste at the site.

In ruling on an interlocutory appeal from the district court's denial of the cities' summary judgment motion, the court wrote:

> liability under the arranger subsection requires sufficient nexus to be present between the municipality and the hazardous substances, one that does not exist in cases where the governmental unit is responsible only for promulgating disposal regulations or for permitting disposal facilities. Nonetheless, once a sufficient nexus is established (such as, in this case, by managing the disposal activities), the reasons prompting the establishment of that nexus are of no consequence.

Id. at 1199 (citations omitted). Plaintiffs claim defendant cities constructively owned or possessed residential and commercial waste because they too 'managed disposal activities.'

While the *Murtha* opinion does mention what might constitute a "nexus," it actually involved issues decided by this Court back in December, 1990.[13] *See id.* at 1203 (citing Court's December, 1990 order). The *Murtha* opinion addressed three rulings made in the course of the district court's denial of the cities' summary judgment motion. The district court had held:

> that CERCLA does not contain any exemption for municipal waste, and that the exclusion for household solid waste found in the Resource and Recovery Act is not incorporated into the CERCLA definition of hazardous substances. It held further that a municipality disposing of hazardous substances at a site where there is a release or threatened release of such substances may be liable under § 9607 and that plaintiffs had raised genuine issues of material fact as to whether the municipal defendants' waste contained hazardous substances covered by CERCLA.

Id. at 1197.

Thus, the Second Circuit did not examine in *Murtha* the question of whether the cities in that case "owned or possessed" household waste. *Murtha*'s mention of "managing disposal activities" arose in a discussion of a city's immunity for arrangements for disposal of hazardous substances in its sovereign capacity. Fairly read, the *Murtha* decision stated only that plaintiffs could establish a nexus between a city and hazardous substances by introducing evidence on the city's management of disposal activities. The *Murtha* court did not have evidence before it on the interlocutory appeal to reach the "owned or possessed" issue.

To the extent *Murtha* can be read as stating "management of disposal activities" constitutes ownership or possession, its statements are dicta unsupported by factual analysis. In short, defendant cities are correct that *Murtha* did not address the issues presently before the Court and provides little help or guidance in determining whether defendant cities owned or possessed the residential and commercial waste at issue in this action.

The major cases involving governments have all found the governmental entity did not constructively own or possess waste. In *Johnstown*, the court found no owned or possessed nexus even though the state of New York permitted and/or directed waste to placed in the facility. 701 F.Supp. at 36. In *New Castle County*, the court found the state of Delaware did not constructively own or possess waste even though it determined the types of waste permitted to be deposited and approved the disposal of particular wastes at the facility "pursuant to its regulatory and statutory mandate." 727 F.Supp at 874. In *Hassayampa*, the court found the state of Arizona did not constructively own or possess hazardous substances despite the fact that the state notified transporters of the availability of a landfill, issued permits allowing transporters to deposit hazardous waste at that landfill, and assisted in the design of pits into which various types of waste were directed. 768 F.Supp. at 701.

The control exercised by the defendant cities here went beyond that imposed by the defendants in *Johnstown*, *New Castle County*, *Hassayampa*, and *Lincoln*. The municipal defendants contracted with private disposal companies to haul away waste for which they had responsibility and exercised significant control over those haulers through contract and ordinance.

iii. *Conclusion*

1. *Franchises/Contracts*

Taking into account the Court's prior order, the evidence before the Court, and cases already decided under CERCLA, the Court finds defendant cities constructively owned or possessed residential and commercial waste collected under the cities' contracts with private rubbish haulers.

A substantial reason for the Court's conclusion that defendant cities did own or possess is rooted in the California statutes and case law requiring defendants to provide waste collection service. If defendants had provided that service, they clearly would have 'owned or possessed' the waste they collected. CERCLA does not permit defendants to avoid liability by simply hiring an outside contractor to perform collection services instead of the city fulfilling that duty itself. Despite contracting with private disposal companies to perform this function, defendant cities still constructively owned or possessed the waste those companies collected.

In addition to having a duty to provide for disposal service, the stipulated facts discussed below show each defendant city exercised control over residential and commercial waste when it contracted with a transporter. When both duty and control exist, CERCLA § 107(a)(3)'s "owned or possessed" requirement is satisfied.

a. *Alhambra*

From 1960-1984, the Alhambra Athens contracts granted Athens Disposal the exclusive right to collect and dispose of all residential waste. [1-12] During the same time period, the Alhambra Athens contracts

12. Like the court in *Johnstown*, the *New Castle County* court found a nexus does exist where the arranger owned the hazardous substances or where a corporate employee was an arranger. *Id.* at 872 & n. 42.

13. In its December 5, 1990 order, the Court held the Resource and Recovery Act's exemption for household waste did not apply to exempt household waste from CERCLA's definition of hazardous substances.

granted Athens Disposal a non exclusive basis to collect and dispose of refuse from some businesses in Alhambra. [1.4] The Alhambra Athens contracts specified the type of waste to be collected by Athens. [1.39] By ordinance, Alhambra prevented anyone except the city or its agents from removing waste from curbside or alley containers. [1.13] From 1975 1984, the Alhambra-Athens contracts required Athens to report any refuse in violation of the Alhambra Municipal Code, but that the contractor not discuss those violations with members of the public. [1.16] The Alhambra-Athens contracts required Athens immediately clean-up any spills or leaks. [1.29] While Alhambra had no ownership or proprietary interest in Athens [1.40], Alhambra billed and collected fees for refuse collection from residents and some businesses between 1960 and 1984. [1.27] The Alhambra-Athens contracts required Athens to dispose of waste outside city limits, but did not specify a particular site. [1.49] Finally, the Alhambra-Athens contracts required waste collect be done under the direction and to the satisfaction of a designated city employee. [1.51]

b. *Bell*

The Bell System contracts granted System Disposal the exclusive right to collect refuse from all residential dwellings of five units or fewer within the city from 1970 to 1984. [2.6] By ordinance, Bell prohibited anyone from collecting or transporting waste within Bell unless they had a contract or written permit from the city. [2.10] The Bell-System contracts required System Disposal to immediately clean up any spills. [2.20] The Bell-System contracts required System Disposal to provide a full time supervisor satisfactory to the Director of Public Works to supervise the contractor's employees. [2.23] While the Bell-System contracts required System to dispose of all waste outside city limits, the contracts did not specify any site. [2.31; 2.32]

c. *Commerce*

Under the Commerce Cannavo contracts, Commerce granted Cannavo the exclusive right to collect and remove residential waste from 1962 to 1977. [5.9] Under the Commerce-Metropolitan contracts, Commerce granted Metropolitan the exclusive right to collect residential waste from 1977 to 1984. [5.10] Commerce's contracts defined the type of waste to be collected from 1975 to 1984. [5.18][14] While Commerce had no ownership or proprietary interest in Cannavo or Metropolitan, Commerce established the rates for waste collection and paid the waste disposal contractors for refuse collection services performed under the contracts from 1962 until 1984. [5.19; 5.20; 5.40] During that same period, Commerce required that waste collection be under the supervision and to the satisfaction of the city. [5.22] Commerce has stipulated that between 1976 and 1984, its contracts required its waste disposal contractors immediately clean up any spills. [5.32][15] From 1962 until 1977, the Commerce-Cannavo contracts specified that Cannavo was solely responsible for selecting a disposal site located outside city limits for disposal of all waste collected. [5.40]

d. *Compton*

Compton granted Murcole the exclusive right to collect and dispose of residential waste from 1969 to 1984. [6.7] While Compton had no ownership or proprietary interest in Murcole [6.6], Compton established the rates residents were charged for waste collection [6.14] and itself billed and collected waste collection fees from residential units [6.15].

Compton reserved the right to identify and approve the dumpsite(s) used by the city's waste disposal contractor [6.18], and from 1975 through 1984, identified OII as a disposal site available for use by Murcole [6.17]. The Compton-Murcole contracts provided that Murcole's performance would be under the direction and supervision of the City Manager, and that Murcole would obey all orders given by the City Manager with regard to the waste collection and disposal not in conflict with the contracts. [6.31]

14. The parties dispute whether Commerce's contracts defined the type of waste to be collected between [illegible] and 1974

15. The parties dispute whether the contracts so required from 1962 through 1975

e. *Cudahy*

The Cudahy-System contract granted System the exclusive right to collect and dispose of residential waste. [7.5] The Cudahy-System contract prescribed the type of waste to be collected [7.7], and prohibited anyone other than the owner, the city, or the authorized waste collector from removing or transporting waste from a refuse container. [7.6] Although it received no monetary payments from System [7.17] and had no ownership or proprietary interest in System [7.19], Cudahy established maximum monthly rates for residential garbage collection [7.13]. By ordinance, Cudahy specified that all refuse collected within the city be lawfully disposed of in existing public dumps outside the city. [7.22]

f. *Lynwood*

From 1965–1984, Lynwood by ordinance prohibited any authorized person from removing any refuse containers or bins. [12.11] Between 1972 and 1984, Lynwood prohibited the burying of garbage within the city. [12.7] Lynwood established fees for collection and disposal of residential waste and certain commercial pickups between 1972 and 1984. [12.18] Between 1962 and 1978, the Lynwood-CV contracts provided that CV perform the contract under the general supervision of and to the satisfaction of the city manager [12.45], required that CV dispose of all collected refuse at some point outside the city [12.51], and provided that all refuse collected by the waste disposal contractor would become property of the contractor after collection [12.52]. At all relevant times, Lynwood's contracts defined the type of refuse to be collected by the waste disposal contractor. [12.54] Lynwood had no proprietary interest in CV [12.38], but paid CV a monthly fee and then billed and collected fees for residential waste disposal [12.61, 12.65] From 1973-1978, the Lynwood CV contracts required CV to allow city employees to ride with the contractor's crews to supervise their activities [12.75]

g. *Maywood*

By ordinance, Maywood established rates to be charged for waste disposal services between 1961 and 1984. [13.14] During that same time, Maywood defined the type of waste to be collected from within the city. [13.18] Maywood prohibited any person from accumulating garbage on any premises in the city for more than one week. [13.30] From 1957 to 1984, Maywood prohibited by ordinance any person from transporting garbage without a contract or written permission from the city from 1957 until 1984. [13.31] Maywood prohibited disposal upon any public place or vacant premises [13.35] and required waste disposal contractors to disposal of all garbage outside of city limits. [13.40]

h. *Montebello*

From 1952 until 1958, and from 1962 until 1984, Montebello granted certain waste disposal companies the exclusive right to collect residential waste in the city. [14.23] The Montebello–Athens contracts required Athens to dispose of refuse at a place legally empowered to accept garbage for disposal. [14.26] Montebello prescribed the type of waste disposal contractors were to collect [14.41] and the rates for collection service [14.49]. The Montebello–Athens contracts provided that the collection and removal of refuse shall be under the general supervision of the city coordinator from 1963-1972. [14.51] While the Montebello contracts did not specify a disposal site [14.61], the contracts provided that the refuse collected by Athens would become the property of the hauler [14.60] and it is undisputed individuals in the Montebello city government knew waste was being deposited at OII [14.62].

i. *Monterey Park*

Monterey Park granted disposal contractors the exclusive right to collect and dispose of residential waste and a nonexclusive right to collect and dispose of commercial waste. [15.9; 15.10] Monterey Park prescribed the type of waste the waste disposal contractor was to collect [15.25] and established rates for refuse collection service [15.31] From 1970 1984, the Monterey Park contracts required the waste disposal contractor to dispose of refuse at a place legally empowered to accept garbage for disposal. [15.15][16] From 1947 1958, Monterey Park granted

16. The parties dispute whether the contracts so provided from 1960 1969

Harabedian permission to dispose of refuse at OII (subject to obtaining various conditional permits [15.28]). However, the Monterey Park Athens contracts specified Athens was solely responsible for selecting a disposal site [15.44] Monterey Park billed for and collected fees for waste collection services. [15.52] Lastly, the Monterey Park city government knew some waste being collected under its contracts was being deposited at OII. [15.56]

j. *Rosemead*

Rosemead granted its contractor exclusive rights to collect residential waste [18.7] and prescribed the type of waste to be collected by the waste disposal contractor [18.8]. Its contracts require the contractor to collect waste to the satisfaction of a city employee [18.9] and provided that Rosemead would be paid a specific percentage of revenues collected by the contractor [18.20]. By ordinance, Rosemead prohibited any person other than its contractor from collecting or removing waste from residential premises within the city. [18.32] Rosemead also granted disposal companies title to certain waste. [18.35]

k. *San Gabriel*

San Gabriel granted its waste disposal contractors the exclusive right to collect residential waste within the city [19.18] and defined the type of waste to be collected by the contractors. [19.19] While the San Gabriel contracts did not specify the disposal site location for waste collected under the contracts, the contracts did require waste be disposed of outside the city limits. [19.21] San Gabriel established rates for refuse collection services provided by the waste disposal contractors [19.33] and received a percentage of the gross annual receipts collected by the contractor [19.37]. San Gabriel also received free disposal service for its government waste. [19.38]

l. *South Gate*

From 1957 to 1984, South Gate prohibited any person other than the owner, the city, or an authorized collector from removing waste from a waste container [23.13] and prohibited transporting garbage without a contract or written permit from the city [23.10]. At all pertinent times, South Gate prescribed the type of waste to be collected [23.22] and established rates for waste collection service [23.23]. South Gate specified that payments for collection service were to be made to the city. [23.25] The South Gate contracts required waste disposal contractors to collect waste under the supervision of and to the satisfaction of the city engineer. [23.28] The South Gate contracts specified that disposal was to be made at a place devised by the contractor and satisfactory to South Gate. [23.41]

m. *South Pasadena*

South Pasadena granted its haulers an exclusive franchise for the collection of residential and commercial waste in the city. [24.15] The South Pasadena contracts defined the type of waste to be collected. [24.14] The South Pasadena contracts did not specify a site for disposal [24.23], but the South Pasadena city government knew that some of the waste collected was deposited at OII [24.20]. South Pasadena billed its residents and businesses directly for collection [24.33] and retained a specified percentage of the gross collection as a billing and collection fee/franchise fee [24.51]. The contracts required waste collection be performed to the satisfaction of a designated city official. [24.34; 24.51]

n. *Temple City*

Temple City granted Community the exclusive right to collect residential waste [25.9] and defined the type of waste to be collected [25.13]. By ordinance, Temple City prevented any person from collecting or transporting refuse in the city without obtaining a license or contract from Temple City [25.11] and established requirements concerning the maximum period of time that refuse could be stored or accumulated [25.22]. Temple City required the waste disposal companies to pay a monthly fee to the city in consideration for being granted an exclusive contract for the collection of residential waste. [25.36] These facts, among others, demonstrate that each of the above cities, which had a duty to provide for waste collection and exercised control over commercial and/or residential waste and while fulfilling that duty, constructively owned or possessed the residential and commercial waste for which it arranged for transport for disposal by contract. This finding as to the cities of Bell, Commerce, Compton, Cudahy, and Monterey Park relates only to residential waste.

2. *Licenses*

[21] While those defendants who arranged for transport for disposal of commercial waste through licenses had the same duty to provide for waste disposal service, the stipulated facts do not show the same extent of control over waste. The Court concludes plaintiffs have not shown by a preponderance of the stipulated facts that defendant cities constructively possessed waste for which they arranged disposal through licenses. Most of the stipulated facts discuss defendants' contractual arrangements, not their licensing arrangements. For example, plaintiffs' owned or possessed evidence with regard to Commerce relates to Commerce's contracts with private haulers, not its licensing arrangements. Because defendants' duty to provide for collection in and of itself does not suffice for constructive possession, plaintiffs must provide additional evidence showing control by the licensing defendants.

3. *The County Defendants*

a. *Actual Possession*

[22] Each County defendant admits it owned and possessed waste generated by the County. The County has stipulated that some of the waste it generated was disposed of at OII between 1958 and 1981 (although it has not stipulated its waste went to OII in each year between 1958 and 1981). Thus, the County admits waste it owned and possessed was sent to OII during this time frame. Accordingly, the Court finds the County defendants actually owned and possessed County governmental waste.

b. *Constructive Possession*

Plaintiffs and the County defendants make basically same arguments concerning constructive ownership or possession as the arguments of plaintiffs and defendant cities discussed above. While the County defendants do make one additional argument, discussed below, it is not persuasive. Based on the stipulated facts, the Court finds each County defendant constructively owned or possessed residential and commercial waste.

i. *Independent Contractor Argument*

[23] The County defendants argue the disposal companies with whom they contracted were independent contractors. The County defendants claim they did not constructively own or possess residential and commercial waste because the disposal companies, as independent contractors, were not within the control of the County defendants when those haulers deposited waste at OII.

There is no statutory or CERCLA case law support for the County defendants' position and at least one court, *United States v. Bliss*, 16 Chem.Waste Lit.Rep. 1061, 1065–66, 1988 WL 169818, at *6 (E.D.Mo.1988), has rejected that argument. Section 107(b) (which sets forth all defenses available in a § 107(a) action) provides that a person shall not be held liable under § 107(a) if a release was caused solely by the act or omission of a third party. In *Bliss*, the court noted § 107(b) further provides that this third party defense is not available when the acts or omissions of the third party "occur[ ] in connections with a contractual relationship, existing directly or indirectly with the defendant." CERCLA § 107(b)(3); 42 U.S.C. § 9607(b)(3).

Even if the disposal companies hired by the GDDs were independent contractors, that fact does not affect the possible liability of the County defendants under CERCLA. As pointed out in *Bliss*, the structure of CERCLA rejects the County defendants' independent contractor argument. Section 107(a) imposes liability on those who arrange for disposal through "contract, agreement, or otherwise." Creating an exemption for independent contractors would eviscerate § 107(a)(3) by placing many contractual arrangements outside that section's "contract, agreement, or otherwise" language.

ii. *Summary of Evidence*

The GDDs and County had a duty to provide for waste disposal, and fulfilled that duty by contracting with haulers for transport for disposal. Each GDD granted haulers an exclusive right to collect all garbage

and combustible and non combustible rubbish. Each required its hauler to dispose of waste outside the geographical boundaries of the GDD. The contracts between the GDDs and their haulers required performance under direction of and to the satisfaction of a designated county employee. The GDDs billed residents for collection services and property owners paid their fees for refuse collection to the Los Angeles County Treasurer. Each GDD sometimes received more revenue from property owners than they paid out for collection service. When this occurred, the money was used to pay for waste collection in later years.

Because the one additional argument raised by the County defendants is unpersuasive, the Court finds each County defendant constructively "owned or possessed" the residential and commercial waste for which it arranged for transport for disposal within the meaning of CERCLA § 107(a)(3).

4. *CalTrans*

CalTrans claims it did not own or possess the material removed from the Willco site and the Pomona Freeway right-of-way within the meaning of § 107(a)(3). Plaintiffs claim CalTrans has already stipulated it actually owned and actually possessed the material removed from the Willco site and the Pomona freeway right-of-way.

i. *The Contract Governing the Willco Site*

[24] The parties have stipulated that in 1983 CalTrans owned the Willco site and the material found there. [33.5] However, under the contract governing the Willco site excavation, the excavated Willco material became the property of the contractor, Papac & Sons. [33.6] While CalTrans may have originally owned the material, title passed to Papac & Sons when the material was removed from the site. CalTrans thus claims it did not own or possess the material within the meaning of CERCLA § 107(a)(3) because the contract provided that Papac & Sons, who possessed the material once it was excavated, owned the material.

The Court finds CalTrans owned or possessed the Willco material within the meaning of CERCLA § 107(a)(3). Section 107(a)(3) imposes liability on any person who "arranged with a transporter for transport for disposal or treatment, of hazardous substances owned or possessed by such person." At the time CalTrans arranged for transport for disposal, it did own the Willco site material. The sole fact that title subsequently passed to the transporter does not absolve CalTrans of potential liability.

ii. *Pomona Freeway Right Of Way*

[25] CalTrans has stipulated that it acquired a portion of the OII site in the 1950s to use as a right of way for the Pomona Freeway. [33.13] CalTrans argues it cannot be held liable as an owner of the Pomona Freeway right of way material because it acquired title by eminent domain.[17]

CalTrans obtained title to both the Willco and Pomona Freeway sites by eminent domain. Section 101(20)(D) of CERCLA states:

> The term "owner or operator" does not include a unit of State or local government which acquired ownership or control involuntarily through bankruptcy, tax delinquency, abandonment, or other circumstances in which the government involuntarily acquires title by virtue of its function as sovereign. The exclusion provided under this paragraph shall not apply to any State or local government which has caused or contributed to the release or threatened release of a hazardous substance from the facility.

42 U.S.C. § 9601(20)(D). CalTrans claims this provision of CERCLA exempts it from liability based on its having "owned or possessed" because its acquisition of the Willco and Pomona material through eminent domain was 'involuntary' under § 101(20(D).

Section 101(20)(D) contains the statutory definition of the term "owner or operator," as in owner or operator of a facility for disposal liable under § 107(a)(1). Section 101(20)(D) prevents a governmental entity from being held liable when it involuntarily inherits a waste facility. It does not prevent CalTrans for being held liable for acquiring land through eminent domain and then arranging

17. CalTrans makes this same argument with respect to the Willco material

to have material on that land transported for disposal.

The Court finds CalTrans owned or possessed the Pomona Freeway right of way material. However, plaintiffs still must show CalTrans arranged with a transport for transport for disposal of this material.

D. *Whether Waste Went to the Site*

As summarized below, most of the parties have stipulated that some waste collected under the various contracts and licenses at issue in the action was disposed of at the OII site.

1. *Municipal Defendants*

a. *Alhambra*

During the period October, 1960 through 1984, Athens Disposal disposed of some residential waste, some commercial waste, and some of the governmental waste collected in the City of Alhambra under its contracts with the city. [1.9-1.11] However, the parties have not stipulated to any specific time frame during that period when those waste streams were disposed of at OII.

b. *Bell*

During the period August, 1970 through December, 1984, System Disposal disposed of some residential waste collected under its contractual arrangement with Bell. [2.36] However, the parties have not stipulated to any specific years within that time frame when residential waste from Bell was disposed of at OII.

c. *Commerce*

Plaintiffs and defendant City of Commerce have not stipulated to any residential, commercial, or governmental refuse from Commerce being disposed of at the OII site.

d. *Compton*

Between 1969 and 1984, Murcole disposed of some of the residential waste and some of the governmental waste collected under its contracts with Compton at the OII site [6.63, 6.66] During the period March, 1969 through June, 1977, Murcole also disposed of some of the commercial waste collected under its license from Compton at OII [6.64] These stipulations are not specific as to years.

e. *Cudahy*

From October, 1981 through December, 1984, System Disposal disposed of some of the residential waste collected under its contract with Cudahy. [7.33] This stipulation is not specific as to years.

f. *Lynwood*

Between 1962 and 1984, CV Disposal disposed of some of the residential waste collected under its contracts with Lynwood at the OII site. [12.31] This stipulation is not specific to years.

g. *Maywood*

From December, 1972 through 1984, System Disposal disposed of some of the residential waste collect under its contracts with Maywood. [13.56] This stipulation is not specific as to years.

h. *Montebello*

From February 1952 through 1958, Harabedian and Slater disposed of some of the residential waste collected under their contract with Montebello at the OII site. [14.15] During the period October 1962 through 1984, Athens Disposal disposed of some of the residential waste and some of the commercial waste collected under its contracts with Montebello. [14.18; 14.19] These stipulations are not specific as to years.

i. *Monterey Park*

Between 1947 and 1958, Harabedian disposed of some of the residential waste collected under his contracts with Monterey Park at the OII site. [15.62] During the period July 1960 through January 1970, CV Disposal disposed of some of the residential waste it collected under its contract with Monterey Park at the OII site. [15.63] Between January, 1970 and 1984, Athens Disposal disposed of some of the residential waste and some of the governmental waste collected under its contractual arrangement with Monterey Park at the OII site [15.64; 15.68] During the period 1960 through 1984, Athens Disposal disposed of some of the commercial waste collected under its contractual arrangement with Monterey Park. [15.65] Monterey Park itself disposed of

some of its governmental waste collected and transported in city vehicles at OII. [16.69] None of these stipulations are specific as to years.

j. *Rosemead*

Between 1961 and 1981, Griegorian/Modern disposed of some of the residential waste collected under its contracts with Rosemead at the OII site. [18.38] Between 1965 and 1981, Griegorian/Modern also disposed of some of the commercial waste collected under its contracts with Rosemead. [18.39] These stipulations are not specific as to years.

k. *San Gabriel*

During the period December 1957 to March, 1964, Community Disposal Co. disposed of some of the residential waste and some of the commercial waste collected under its contracts with San Gabriel. [19.16] This stipulation is not specific as to years.

l. *South Gate*

Between December, 1967 and December, 1984, CV Disposal disposed of some of the residential waste collected under its contractual arrangement with South Gate. [23.65] This stipulation is not specific as to years.

m. *South Pasadena*

Between 1950 and 1969, South Pasadena Disposal disposed of some of the residential waste and some of the commercial waste collected under its contracts with South Pasadena. [21.9; 24.10] During the period 1979 through 1984, Romra disposed of some of the residential waste and some of the commercial waste collected under its contracts with South Pasadena. [24.12] These stipulations are not specific as to years.

n. *Temple City*

Between 1960 and 1982, Community disposed of some of the residential waste and some of the commercial waste collected under its contracts with Temple City. [25.6; 25.7] This stipulation is not specific as to years.

2. *County Defendants*

All of the County defendants except the Walnut Park GDD have stipulated that waste from the GDD or County was deposited at OII.

a. *Athens Woodcrest-Olivita GDD*

The Athens Woodcrest Olivita GDD has stipulated that during the period January 1970 through 1984, the G.K. Companies disposed of some of the waste collected under its contracts with the GDD at the OII site. [26.8]

b. *Belvedere GDD*

Between 1970 and 1977, Holthe Disposal disposed of some of the waste it collected under its contract with the Belvedere GDD at the OII site. [27.16] During the period April 1, 1977 through June 30, 1983 System Disposal disposed of some of the waste it collected under its contract with the Belvedere GDD at the OII site. [27.18]

c. *Firestone GDD*

Between January 1971 and 1984, Universal disposed of some of the waste collected under its contracts with the Firestone GDD at the OII site. [28.6]

d. *Mesa Heights GDD*

During the period 1970 through 1974, Holthe Disposal disposed of some of the waste collected under its contracts with the Mesa Heights GDD at OII. [29.6]

e. *Walnut Park GDD*

Defendant Walnut Park GDD and plaintiffs have not reached any stipulation regarding waste disposal at the OII site.

f. *Los Angeles County*

Documentary evidence such as deposit tickets and other accounting records show that during the period 1958 through September, 1981, the County itself disposed of some County governmental waste at the OII site by transporting the waste to OII in County vehicles. [32.33]

3. *CalTrans* *

a. *Willco Site*

CalTrans has stipulated that Papac & Sons deposited some of the Willco material at the OII site during the period from March, 1983 to June 30, 1983. [33.4]

b. *Pomona Freeway Right of Way*

CalTrans and plaintiffs have not reached any stipulation regarding whether or not excavated Pomona material was taken to the OII site.

III. CONCLUSION

A. *Issues Submitted for Pre-Trial Legal Determination*

1. *Do Plaintiffs Have Standing To Sue For Cost Recovery Under CERCLA § 107 or Are They Limited to Remedies For Contribution Under CERCLA § 113(f)?*

Both the language of the statute and equitable consideration lead to the conclusion that plaintiffs may bring this action under § 107(a). Accordingly, the Court finds that plaintiffs have standing to sue for cost recovery under § 107(a)(3).

2. *Do Considerations of Public Policy and a Due Regard For the Sovereign Power of a City to Protect the Public Health, Safety, and Welfare Preclude Imposition of Liability in this Case?*

Neither public policy considerations nor a due regard for a city's sovereign power to protect the public health, safety, and welfare preclude imposition of liability in this action. Defendants' sovereign power defense is no defense to potential CERCLA liability in this case.

3. *Joint and Several Liability*

Although the parties, to one degree or another, have submitted this issue for pretrial determination, the Court cannot give a final answer to this question before trial. Joint and several liability is available under CERCLA, but its availability depends of the severability of the harm. Individual defendants may be entitled to joint and several liability if they can show the harm they caused is divisible. The Court declines to rule on the question of divisibility because that issue is not yet ready for determination.

4. *Does the Doctrine of De Minimus Non Curat Lex Absolve Defendants From Liability?*

Given that plaintiffs can sue under § 107, the doctrine of 'de minimus non curat lex' cannot be asserted as a defense.

B. *Are Defendants 'Arrangers,' And If So, For What Years?*

1. *The Municipal Defendants*

Under the legal standards established by the Court's September, 1991 Order, each municipal defendant "arranged" within the meaning of CERCLA § 107(a)(3). Each either contracted with a disposal company/transporter or licensed haulers to provide for transport for disposal of specific waste streams for the years discussed in the body of this order.

2. *The County Defendants*

All of the GDDs qualify as arrangers within the meaning of CERCLA § 107(a)(3). As for the County itself, it also arranged for transport for disposal within the meaning of CERCLA § 107(a)(3) by establishing and maintaining the GDDs.

3. *CalTrans*

CalTrans was an arranger with respect to the material excavated from the Willco site. With respect to the material excavated from the Pomona Freeway right of way, plaintiffs have not shown sufficient facts to justify a finding that CalTrans arranged within the meaning of CERCLA § 107(a)(3).

C. *Did Defendants "Own or Possess" the Waste For Which It Arranged Disposal, And If So, For What Years?*

1. *The Municipal Defendants*

Defendant cities do not dispute they actually owned and possessed their governmental waste during the relative time periods. Furthermore, defendant cities constructively owned or possessed residential and commercial waste collected under contractual arrangements. With regard to those defendants who arranged by license, plaintiffs must introduce additional facts evincing control over the waste.

2. *The County Defendants*

Both plaintiffs and the County defendants agree the County defendants actually owned and possessed government waste. The Court additionally finds the County defendants constructively owned or possessed residential or commercial waste.

3. *CalTrans*

The Court finds CalTrans owned and possessed the material excavated from both the Willco site and the Pomona Freeway right of way within the meaning of CERCLA § 107(a)(3). Although title may have passed to the actual excavator, the language of the statute covers situations in which the defendants arranges for transport for disposal while he owns the material and then subsequently passes on title.

D. *Was At Least Some of the Waste 'Owned or Possessed' by Defendants For Which Defendants Arranged Disposal, Disposed of At OII?*

The stipulated facts reveal that some waste, be it residential, commercial, or governmental, was deposited at the OII site at some relevant time frame with regard to all defendants except the City of Commerce, the Walnut Park GDD, and CalTrans (with regard to the Pomona material). Plaintiffs have shown only that some waste at some relevant time was deposited at OII. Plaintiffs will have to provide more exact proof on this issue in later phases of the action.

Upon completion of all proceedings in this matter, the Court will expand upon this order and file final Findings of Fact and Conclusions of Law or a final memorandum order.



AMERICAN STATES INSURANCE CO., Plaintiff,

v.

SACRAMENTO PLATING, INC., et al., Defendants.

No. Civ. S-93-0569-WBS/PAN.

United States District Court, E.D. California.

Aug. 29, 1994.

Insurer brought action against property owners and operators of metal electroplating facility, seeking declaration that comprehensive general liability policies did not cover cleanup costs resulting from soil contamination below facility. On insurer's motion for summary judgment, the District Court, Shubb, J., held that under California law, contamination did not fall within "sudden and accidental" exception to pollution exclusions in comprehensive general liability insurance policies, notwithstanding evidence of three large spills.

Motion granted.

1. Insurance ⇐137.1(1)

Under California law, insured had burden to prove that "sudden and accidental" exception to pollution exclusion in comprehensive general liability insurance policies applied.

2. Insurance ⇐137(1)

Under California law, contamination of soil below metal electroplating facility did not fall within "sudden and accidental" exception to pollution exclusions in comprehensive general liability insurance policies, notwithstanding evidence of three large spills; spills were not "sudden and accidental," as they were not unexpected, there was no evidence that soil contamination was caused by the spills, and even if they did cause some soil contamination, they only contributed to contamination caused by pollution occurring in regular course of plating operation.

See publication Words and Phrases for other judicial constructions and definitions.

3. Federal Civil Procedure ⇐2515

Litigant objecting to admission of expert's deposition testimony in summary judgment context on ground that there were insufficient foundational facts regarding expert's qualifications and as to scientific methods used to reach his conclusions could not prevail in light of litigant's failure to provide court with any portions of deposition which would call into question either witness' qualifications or bases of his opinions, counsel for litigant had had opportunity to cross examine expert on both his qualifications and methods used to reach his opinion. Fed.Rules Evid. Rule 705, 28 U.S.C.A.

4. Federal Civil Procedure ⇐2515

In considering motion for summary judgment, court had broad discretion in ruling upon admissibility of expert testimony.

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Richard Perry, pro se.

Daniel William Smith, Hefner Stark and Marois, Sacramento, CA, for Arthur LaBour.

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Daniel William Smith, Hefner Stark and Marois, Sacramento, CA, for Arthur LaBour.

MEMORANDUM AND ORDER

SHUBB, District Judge.

American States Insurance Company ("ASI") brought this action seeking a declaration that certain ASI comprehensive general liability ("CGL") policies do not cover clean-up costs resulting from the contamination of soil below a Sacramento metal electroplating facility. The defendants are the property owners and the operators of the facility.

ASI has filed a motion for summary judgment on its claim for declaratory relief and on defendant Arthur LaBour's counterclaims. Only LaBour, the current property owner, filed a memorandum in opposition to ASI's motion. Because the court finds that the pollution exclusions contained in ASI's policies preclude coverage, the motion for summary judgment will be granted.

I. FACTUAL AND PROCEDURAL BACKGROUND

A. The Parties and the Property

The dispute centers on four parcels of property located on "S" Street in Sacramento, California. On one parcel, located at 2809 "S" Street, was an industrial electroplating facility. In 1963, defendants Richard and Arlene Perry ("Perry") entered into a contract to purchase the property from defendant Alice Kazanjian. In February 1972, title was transferred from Kazanjian to Perry.

From 1963 to 1988, Perry, the former owner and general manager of Sacramento Plating, Inc. ("SPI"), operated the electroplating facility. During that time, Richard Perry "was physically at the site watching and participating in the electroplating processes on a full-time daily basis...." Perry Decl. ¶ 5.

LaBour purchased the property from Perry in January 1981. After purchasing the property, LaBour leased it back to Perry until October 1989. LaBour is the present owner of the property.

B. The ASI Policies

ASI issued CGL policies covering Perry/SPI and LaBour for different periods of time during SPI's operation at the "S" Street site. ASI issued two policies to Perry/SPI for two one-year periods between March 6, 1981 and March 6, 1986 (hereinafter "S1" and "S2"). ASI may have issued a third one-year policy covering the period of time between March 6, 1986 and March 6, 1987 (hereinafter "S3").[1]

ASI issued LaBour a total of three CGL policies. The first two policies covered two one year time periods from March 23, 1984 to March 23, 1986 (hereinafter "L1" and "L2"). The third policy period began March 23, 1986, but was cancelled effective May 21, 1986 (hereinafter "L3").

1. The parties agree that the policy may have been issued, but that it cannot, at present, be located

Waste Management & Research (1993) 11, 257–268

A REVIEW OF RECENT STUDIES ON THE SOURCES OF HAZARDOUS COMPOUNDS EMITTED FROM SOLID WASTE LANDFILLS: A U.S. EXPERIENCE

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Municipal solid waste landfills operating in the United States receive a large variety of materials generated by an industrialized, "throwaway" society. As a result, liquid and gas emissions (produced during the normal decomposition processes occurring within the landfill) are often contaminated with hazardous compounds. The presence of hazardous pollutants in liquid and gaseous emissions is well documented, however, the source of these pollutants is not always apparent. Potential sources of these hazardous contaminants in municipal solid waste landfills may include small quantity generators of hazardous wastes, household hazardous wastes, wastes disposed prior to the 1980 enactment of U.S. hazardous waste disposal legislation, and biological and chemical transformation products of buried refuse. Source identification will facilitate characterization and quantification of emissions necessary for the design and operation of leachate gas collection and treatment facilities.

Key Words—Leachate, solid waste, biogas, hazardous wastes, refuse, landfills, waste management, landfill emissions, waste disposal, waste characterization, U.S.A., state-of-art review.

1. Introduction

In 1988, 163 million tonnes of municipal solid waste (MSW) were generated in the United States (Franklin Associates Ltd 1990). Approximately 73% of this material was placed in over 6000 MSW landfills. Recycling and solid waste combustion will play increasingly important roles in future integrated waste management; however, projections show that dependence on landfilling for disposal of a significant portion of MSW will continue long into the future.

Once solid waste is placed in a landfill, a complex sequence of biologically, chemically and physically-mediated events occur which result in gaseous and liquid emissions. Leachate is produced as water percolates through the solid waste, leaching soluble components and degradation products from the refuse. Landfill gas is generated during stabilization of solid waste organic fractions. Volatile components of the buried solid waste tend to be transported out of the landfill with the evolving gas stream. Due to the long-term potential for production of contaminated gas and leachate, proposed U.S. federal landfill regulations call for monitoring of groundwater and landfill gas for 30 years (USEPA 1988*a*).

The contamination of groundwater by landfill leachates has been recognized by a variety of researchers (Reinhard *et al.* 1984, Schultz & Kjeldsen 1986, Sawney & Kozloski 1984). Organic chemicals found in 58 municipal and industrial landfills

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represented a broad range of chemicals with significant genotoxic potential (Brown & Donnelly 1988). Several researchers have found leachate to be quite toxic to rainbow trout and daphnia (Cameron & Koch 1980, Atwater *et al.* 1983) and to have some toxicological impact on laboratory mice (Raddi *et al.* 1987). In addition, some 22% of the sites placed on the U.S. National Priority List for hazardous waste site cleanup are closed municipal landfills (Repa 1988).

Approximately 200,000 tonnes of volatile organic compounds (excluding methane) are released from MSW landfills each year, including both odor nuisance and hazardous pollutants (USEPA 1988*a*). Unites States Environmental Protection Agency (USEPA) risk analysis of MSW landfill uncontroled gas emissions showed the risk of excess cancer incidents to be 100 to 10,000 per million exposed individuals (Minott 1989).

The sources of these gaseous and liquid hazardous contaminants include household hazardous wastes, illegally disposed regulated hazardous wastes, waste disposed by small quantity hazardous waste generators, hazardous wastes disposed of prior to enactment of hazardous waste regulations and otherwise innocuous wastes transformed during normal stabilization processes. These sources will be described in detail herein. It is anticipated that source identification will facilitate quantification, characterization and control of hazardous emissions from MSW landfills.

2. Leachate and gas characterization

As water passes through a landfill, contaminants are leached from the solid waste. Mechanisms of contaminant removal include leaching of inherently soluble materials, leaching of soluble products of chemical or biological reactions and washout of fines and colloids (Crawford 1985). The characteristics of the leachate are highly variable depending on the composition of the solid waste, rate of water application, refuse moisture content, and landfill design, operation and age (Pohland & Harper 1985).

2.1 Organic contaminants of leachate

Organic contaminants of leachate are primarily soluble refuse components of decomposition products of biodegradable fractions of municipal refuse. Organic compounds detected in 19 MSW landfill leachates or contaminated groundwater plumes included organic acids, ketones, aromatic compounds, chlorinated aromatic compounds, ethers, phthalates, halogenated aliphatic compounds, alcohols, aminoaromatic compounds, nitroaromatic compounds, phenols, heterocyclic compounds, pesticides, sulfur-substituted aromatic compounds, polyaromatic hydrocarbons, polychlorinated biphenyls and organophosphates (Brown & Donnelly 1988).

The class of organic compounds found at highest concentration in leachates is generally volatile fatty acids produced during the decomposition of lipids, proteins and carbohydrates (Albaiges *et al.* 1986, Schultz & Kjeldsen 1986). Aromatic hydrocarbons, including benzene, various xylenes and toluene, are also frequently found at lower concentrations (Schultz & Kjeldsen 1986, Harmsen 1983). These compounds were considered to be constituents of gasoline and fuel oils. Sawney & Kozloski (1984) reported that the presence of the more soluble, less volatile aromatic components of gasoline suggested that the more volatile components were being gas stripped from the landfill. Non-volatile classes of compounds such as phenolic compounds may be degradation byproducts of lignin. A small complex fraction found in several leachates contained nicotine, caffeine and phthalate plasticizers (Albaiges *et al.* 1986).

2.2 Heavy metals

A variety of heavy metals are frequently found in landfill leachates including zinc, copper, cadmium, lead, nickel, chromium and mercury. In several instances heavy metal concentrations in leachate exceed U.S. toxicity characteristic leaching procedures standards (Lu *et al.* 1985).

Heavy metal concentrations in leachate do not appear to follow patterns of organic indicators such as chemical oxygen demand (COD) or biochemical oxygen demand (BOD), nutrients or major ions (Lu *et al.* 1985). Heavy metal release is a function of characteristics of the leachate such as pH, flow rate and concentration of complexing agents.

2.3 Landfill gas

During solid waste stabilization significant portions of organic wastes are ultimately converted to gaseous end-products. The rate of gas production is a function of refuse composition, climate, moisture content, particle size and compaction, nutrient availability and buffering capacity. Reported production rates vary from 0.12–0.41 cubic meters of gas per kg dry waste (Pohland & Harper 1985). Landfill gas is typically 40–60% methane, with carbon dioxide and trace gases such as hydrogen sulfide, water vapor, hydrogen and various volatile organic compounds comprising the balance.

Because of their high vapor pressures and low solubilities, many toxic volatile organic compounds (VOCs) are observed in landfill gas. In a report by the State of California Air Resources Board (Bennett 1987), the average subsurface emission rate of hazardous chemicals from landfills was estimated to be 35 kg per million kg of refuse. Landfill gas trace constituents include halogenated aliphatics, aromatics, heterocyclic compounds, ketones, aliphatics, terpenes and alcohols, and have been characterized by several researchers (Siu *et al.* 1989, Young & Parker 1983, Wood & Porter 1987, LaRegina & Bozzelli 1986).

3. Source of hazardous pollutants

3.1 Household hazardous wastes

Household hazardous wastes refer to solid wastes discarded from homes or similar sources that, if discarded in significant quantities, would be regulated in the U.S.A. under the Resource Conservation and Recovery Act (RCRA) enacted in 1980. These wastes are either listed by the USEPA in 40 CFR, Parts 261.33 (e) or (f) or exhibit hazardous characteristics of ignitability, corrosivity, reactivity or toxicity as defined in 40 CFR Part 261.24. Despite their hazardous nature, wastes derived from households are exempt from RCRA regulation.

The existence of these wastes is a consequence of the introduction (largely since World War II) of modern convenience products such as cleaning compounds, pesticides, pharmaceuticals, plastics, synthetic textiles and coatings. One consequence of the availability of these products has been the release of hazardous substances during product manufacture, use and/or disposal. Management options for hazardous household wastes primarily include recycling, disposal in public sewers and burial in hazardous or municipal landfills.

Provided in Table 1 is a list of household hazardous wastes which might be found in MSW landfills. Over 100 synthetic organic chemicals are present in household products as well as a variety of potentially toxic heavy metals. The more common and most toxic

TABLE 1
Common household hazardous wastes

Household and cleaning products	Automotive products
Bleach	Motor oil
Drain opener	Oil filters
Window cleaners	Radiator sealers
Metal polish	Anti-freeze
Oven cleaners	Brake fluids
Charcoal lighters	
Glue	
Paint products	Insecticides, herbicides and pesticides
Paint	Insect sprays
Paint thinner	Germicides
	Weed killers
Personal items	
Butane fuel	
Hair spray	
Suntan oil	
Deodorants	
Peroxide	

household hazardous wastes include pesticides, paints, household cleaners and automotive products. Pesticide wastes are potential sources of chlorinated organic compounds, carbamates and organophosphates. Paint solvents include toluene, 1, 1, 1-trichloroethane, tetrachloroethene, alcohols, ketones, esters and petroleum distillates. Wood preservatives may be the source of chlorinated phenols and creosote. Household cleaners are composed of a mixture of complex synthetic compounds and may include chlorinated phenolic compounds (disinfectants), acids and bases (such as hydrochloric acid, sodium hydroxide, oxalic acid and sodium hypochlorite), dichlorobenzene (mothballs), glycols (antifreeze, disinfectants, cleaners), various surfactants (detergents, wetting agents, air fresheners), chelating agents and propellants (including isobutane, dichlorodifluoromethane, propane, trichlorotrifluoroethane and methylene chloride).

Several surveys have attempted to quantify and characterize household hazardous wastes. In 1984, the Los Angeles County Sanitation District sorted 3500 loads containing approximately 13,608 tonnes of MSW. From their studies, it was estimated that household hazardous wastes accounted for 0.00147% of the total municipal waste (Commonwealth of Virginia n.d.). The University of Arizona identified 100 containers of hazardous items per household per year in a survey conducted from 1973 through 1986 (Freeman 1989). The City of Albuquerque, New Mexico, examined 726 tonnes of MSW generated by 96,300 households in 1983 and concluded that hazardous wastes constituted less than 0.5% of the wastes (Freeman 1989). During a USEPA study conducted by SCS Engineers at six Michigan counties, a total of 135 tonnes of wastes were sorted over a 1 week period in each of the four seasons. Household hazardous wastes represented between 0.0–0.3% of the wastes, averaging 0.08% (Commonwealth of Virginia n.d.).

An extensive study of nonregulated hazardous wastes in municipal refuse generated in King County, Washington was conducted by Cal Recovery Systems Inc. (1985). This study provided important insights into the characteristics and sources of these wastes.

The King County study identified four potential sources of nonregulated wastes: residential, commercial, industrial and self-haul. Two types of samples were collected and analysed, discrete samples (cans, bottles, boxes) and dispersed samples, to identify hazardous substances which had been dispersed throughout the wastes. A total of 30.6 tonnes of wastes were examined.

Batteries were found to be the largest source of lead in King County. Mercury was found in thermostats, paints and containers from medical or dental clinics. Chromium and barium were detected in paints. The sources of several volatile organic compounds were identified as paints, solvents and, to a lesser extent, adhesives, pesticides, aerosols, cosmetics and furniture wax. Pesticides were discarded as specific products but also detected in paints as fungicides. The source of several heavy hydrocarbons was found to be oil and grease waste, while polyaromatic hydrocarbons and other simple aromatic compounds were detected in discarded roofing materials.

3.2 Small quantity generators

The 1980 amendments to RCRA set forth requirements for regulation of the transportation, storage, treatment and disposal of hazardous wastes in the U.S. Recognizing the limitations of the regulatory community, the U.S. Congress exempted small quantity generators (SQG) from most hazardous waste regulations. SQGs are defined as generating less than 1000 kg of hazardous waste in a calendar month. The 1984 Hazardous and Solid Waste Amendments to RCRA expanded the universe of regulated generators by identifying conditionally exempt SQGs (CESGQ) as those generating less than 100 kg of hazardous waste in a calendar month. As of 22 September 1986, those SQGs generating between 100–1000 kg of hazardous waste per month were required to meet most of the key requirements of the RCRA program, including use of permitted hazardous waste treatment and disposal facilities. In a 1984 study, USEPA estimated that there were between 600,000 and 660,000 small quantity generators of hazardous wastes in the U.S. (Abt Associates Inc. 1985). Some estimates put this number closer to 1,000,000 (Schwartz & Pratt 1990). These SQGs accounted for approximately 98% of the nation's hazardous waste generators, but contributed less than 0.4% of the hazardous waste generated. CESQGs represented 72% of the SQGs while generating less than 20% of the SQG hazardous waste. In 1985 it was estimated that approximately 940,000 tonnes of hazardous waste were generated by SQGs, of which approximately 825,760 tonnes were placed in MSW landfills (Abt Associates, Inc. 1985). This represents less than 1% of the waste disposed of in MSW landfills each year. With the promulgation of the regulations exempting only CESQGs, it is estimated that approximately 0.08% of the waste disposed of in MSW landfills is presently generated by SQGs (Carra & Coussu 1990).

SQG wastes may be potential sources of pesticides, heavy metals, acids, bases, oils and other petroleum derived materials and solvents. A recent Florida study identified 26 categories of SQGs generating a total of 117,042 tonnes (Herndon & Moerlins 1988). Approximately 26,762 tonnes of this material were placed in MSW landfills, representing about 0.2% of the total waste disposed. A breakdown of SQG hazardous wastes by type placed in Florida MSW landfills is provided in Table 2.

3.3 Illegal disposal

Improper management of hazardous wastes routinely occurs, as documented by the increasing frequency of state and federal enforcement actions against industrial firms

TABLE 2
Hazardous waste disposed in Florida sanitary landfills annually*

Waste type	% of total
Waste pesticides	0.15
Washing solutions	0.28
Empty pesticide containers	1.08
Spent solutions from dipping	0.00
Other pesticide solutions	0.09
Dust with heavy metals	3.72
Rinses with heavy metals	3.45
Sludges with heavy metals	4.92
Waste ink	0.47
Ignitable paint waste	1.89
Paint waste with heavy metals	1.20
Spent solvents	11.21
Solvent still bottoms	0.62
Dry cleaning filters	0.39
Cyanide wastes	0.10
Acidic or alkaline wastes	3.68
Spent plating wastes	0.19
Waste ammonia	0.02
Photographic wastes	0.94
Ignitable wastes	2.45
Wood preservatives	0.38
Waste formaldehyde	0.07
Lead-acid batteries	11.58
Waste explosives	0.03
Waste oils, lubricants	45.22
Other	5.87
Total	100

* From Herndon & Moerlins (1988).

convicted of such practice. Illegal disposal of hazardous wastes by SQGs is particularly prevalent. Waste management facility personnel estimate that from 30–50% (and perhaps as high as 90%) of SQGs may illegally dispose of their wastes (Schwartz & Pratt 1990). A study in Larimer County, Colorado, found that 90% of hazardous wastes generated by SQGs was improperly disposed of in sewers, septic tanks, vacant lots and MSW landfills, potentially resulting in the uncontroled release of hazardous substances to the environment. Illegal disposal can be attributed to uninformed generators, minimal enforcement of regulations and/or the high cost of proper hazardous waste management.

3.4 Disposed prior to hazardous waste regulation

A 1973 study of hazardous waste management in the U.S. concluded that the vast majority of hazardous wastes were improperly disposed (Dawson & Mercer 1986). Improper management included the disposal of hazardous wastes into landfills without bottom liners, leachate collection and treatment, or proper gas management and located in environmentally sensitive areas. One consequence of such disposal is the placement of

184 MSW landfills on the National Priority List (NPL) of the most severely contaminated uncontroled hazardous waste sites in the U.S. (Repa 1988). This represents approximately 22% of the NPL sites. All of the MSW landfills on the NPL were operated prior to the enactment of legislation regulating hazardous waste disposal and are presently closed. Only 1% of these landfills accepted exclusively MSWs. Approximately 84% of these sites reported releases to groundwater, 51% to surface water and 18% to the air. Pollutants released included halogenated organic compounds, aromatic compounds, metals, volatile organic compounds, pesticides and asbestos.

A recent study evaluated leachate data from 111 landfills with the objective of comparing releases of hazardous pollutants from landfills operated before the 1980 promulgation of hazardous waste regulations and to landfills operated after 1980 (USEPA 1988*b*). Surprisingly, little difference was observed between the concentration or the frequency of detection of inorganic and organic contaminants found in leachates from pre- and post-1980 MSW landfills. However, pre-1980 MSW landfills were found to exceed standards for five or more constituents more often than post-1980 landfills.

3.5 Transformation of waste components

Many components of the MSW stream contain potentially hazardous constituents. For example silver, chromium, lead, tin and zinc are used in surface coatings, galvanizing, solder and other surface applications. Metals are also used in pigments, inks, stabilizers for plastics, clay fillers, whiteners and photosensitizers. A typical MSW contains 7.6% by weight of ferrous metal, 1.1% aluminum, 0.06% copper-base metal and 0.14% zinc-base metal (Law & Gordon 1979). A USEPA study estimated that 213,000 tonnes of lead were present in the 1986 MSW stream, 80% in lead-acid batteries and the remainder in consumer electronics, glass, ceramics, plastics, soldered cans and pigments: Approximately 1800 tonnes of cadmium were disposed of in 1986 in rechargeable nickel–cadmium batteries, plastics, consumer electronics, appliances, pigments, glass and ceramics (Franklin Associates Ltd 1989).

Trichloroethene, a halogenated solvent, is found in drain and pipe cleaners, shoe polish, spot removal, paint removers, upholstery cleaners, septic tank cleaners (a significant source of groundwater contamination) and adhesives (Schaumburg 1990). Polyaromatic hydrocarbons are found in the carbon black used in newspaper ink. Phthalate esters are used as plasticizers in plastic manufacturing.

The majority of these hazardous materials are relatively unavailable for environmental release. It is estimated that only approximately 3–5% of the MSW mass is readily leachable (Cameron 1978). However, through physical, chemical and biological mechanisms such as dissolution, reduction, oxidation, hydrolysis and biotransformation, waste components can be transformed into significantly more mobile (and potentially toxic) forms.

Corrosion of elemental metals can lead to the release of metal ions to the leachate. Ferrous metal corrosion under anaerobic, acidic conditions involves the consumption of hydrogen ions and the release of ferrous ions as shown in the following reactions:

$$2H^+ + 2e^- \rightarrow H_2$$
$$Fe + 2H_2O \rightarrow Fe^{+2} + 2OH^- + 2H^+ + 2e^-$$

Many organic compounds detected in landfill leachates and gases are produced during the biotransformation of less mobile organic compounds. Several phenolic compounds are biodegradation products of lignin, a major component of plant tissue. Many

halogenated aliphatic compounds are transformed under anaerobic conditions. Vinyl chloride, an extremely mobile and toxic compound, can be an intermediate or end product of the transformation of several commonly used solvents including tetrachloroethene, trichloroethene and trichloroethane (McCarty 1991).

Plant tissue is also a significant source of the major inorganic ions found in leachates. Major components of plant tissue found after ashing include silicon, aluminum, iron, calcium, potassium, sodium, magnesium, nitrogen, phosphorus, sulfur and chlorine (Bohn *et al.* 1985). Many of these ions are released following lysing of plant cells. While these components are generally not considered hazardous, they do contribute to the ionic strength of leachate and may play a role in the solubility of both inorganic and organic toxic pollutants.

4. Fate of toxic pollutants in MSW landfills

From the above discussion, it is apparent that hazardous materials are frequently codisposed with MSW. Presumably, the fate of these compounds is determined by the operative processes inherent to the natural stabilization phases occurring within the landfill. Contaminants tend to partition among aqueous, solid and gaseous phases of the landfill Contaminant mobility and fate are largely determined by the magnitude of the preference for one phase relative to another which is a function of the physical chemical characteristics of both the contaminant and the phases present.

Figure 1 depicts the transport transformation phenomena which may affect the environmental fate of a landfilled contaminant. Mechanisms of mobility and transformation include biotransformation, volatilization, dissolution and advection, sorption and chemical reactions such as precipitation, reduction, oxidation and hydrolysis. Biotransformation and chemical reaction can reduce contaminant mass, however, a more toxic and or mobile compound may be produced. Dissolution and advection results in the movement of the compound with the bulk flow through the refuse pore spaces Similarly, volatilization and transport by the product gas can remove the more volatile contaminants from the landfill. Sorption and precipitation can retard contaminant movement as the compound interacts with the solid phase. Transport can be influenced by compound complexation or chelation which can either retard movement if the complex becomes associated with the solid phase or enhance mobility if the compound "piggybacks" on a more soluble complexing agent. A more complete description of operative fate mechanisms in the landfill environment is provided elsewhere (Reinhart 1991).

5. Solid waste management trends

The U.S. Congressional Office of Technology Assessment recently recommended a comprehensive national policy toward the reduction of MSW toxicity and quantity (Levenson 1990). Toward that end, numerous solid waste management policies and activities have been proposed or are presently in effect which will reduce emissions of hazardous substances from landfills. Several examples are identified below.

- *Collection of household hazardous wastes.* Since 1981 hundreds of household hazardous waste (HHW) collection programs have been conducted in over 30 states. Permanent HHW disposal facilities are being provided at many landfill sites. Public awareness of HHW disposal concerns is increasing throughout the country as a result of the collection programs.

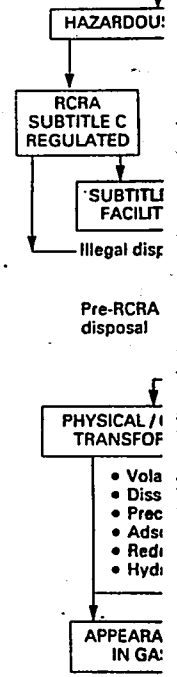


Fig. 1. O

- *Collection load i*
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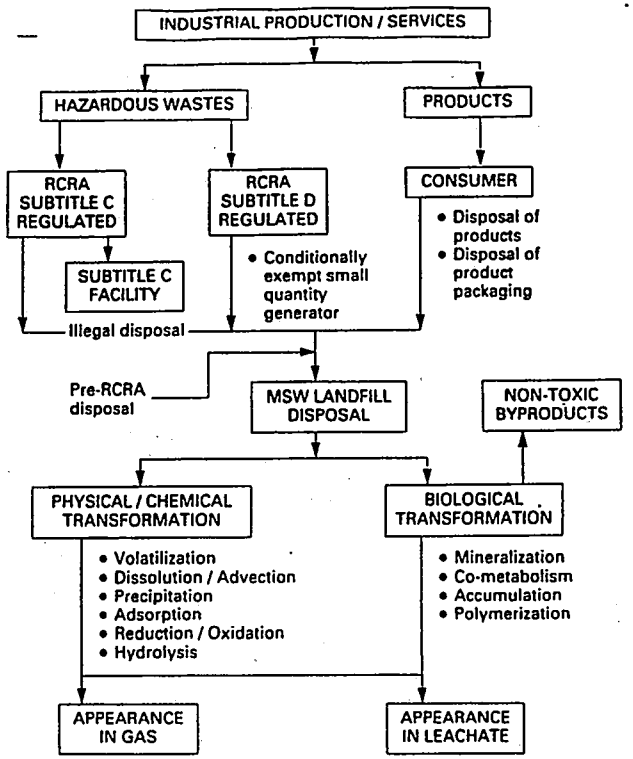


Fig. 1. Origin, pathways and fate of hazardous pollutants in U.S. MSW

- *Collection load inspection.* Federal and state MSW landfill regulations and require routine random inspection of incoming loads for regulated hazardous wastes.
- *Enforcement actions.* Increased enforcement of hazardous waste management regulations on the local, state, and federal level is minimizing illegal disposal of regulated hazardous wastes in MSW landfills.
- *Regulating small quantity generators.* Several states are regulating all generators of hazardous wastes, requiring disposal of these wastes in permitted hazardous waste disposal facilities.
- *Product reformation.* Many changes by manufacturers in product composition have reduced toxicity. Examples include the reduction of mercury in alkaline batteries

(expected to reach near zero by 1993 (Amos 1991)), elimination of lead from paints, reduction of lead use in can soldering, elimination of tetrachloroethene in fabric sprays and trichloroethene in typographical correction fluid and the elimination of mercury as a fungicide in paint.

- *Hazardous waste minimization.* The USEPA has adopted a policy of promoting hazardous waste minimization over end-of-pipe treatment through better housekeeping practices, product reformation, recycling and changes in raw materials and processing equipment.
- *Landfill design.* Design of MSW landfills to optimize waste biodegradation, leachate collection and treatment, gas collection and treatment will minimize release of toxic pollutants. Entombment of MSW will only delay the release of these materials.
- *Related Federal regulations.* Passage of the U.S. 1990 Clean Air Act Amendments requires reduction in toxic releases from industry which may necessitate reformulation of products and process modifications. The U.S. Federal Insecticide, Fungicide and Rodenticide Act has banned or regulated use of many pesticides.

6. Summary and conclusions

The presence of hazardous materials in MSW has been confirmed by the potential toxicity of liquid and gaseous releases from MSW landfills, as well as the known contamination of groundwater, air and surface water near these landfills. The sources of these wastes include household hazardous wastes, small quantity generators, illegal disposal practices and transformation of wastes during waste stabilization. Once placed in a MSW landfill, hazardous substances are subject to the same physical, chemical and biological processes as all waste types, which may lead to their volatilization, dissolution and advection, precipitation, sorption, reduction, oxidation and or biotransformation.

Recent trends in product manufacturing and solid waste management foretell a likely reduction in the concentrations of hazardous components from landfill emissions with obvious benefits to environmental quality. These new measures include collection of household hazardous wastes, load inspections, improved enforcement of hazardous waste regulations, product reformulation and improved landfill design and operation. With the regulation of small quantity generators generating more than 100 kg of hazardous wastes per month in 1986, over 72% of SQG wastes once permitted in MSW landfills are now prohibited from MSW landfill disposal.

Wastes placed in landfills in the past, present and future will, in some manner, influence the environment for many decades. Control measures which reduce the adverse impact of hazardous wastes present in MSW landfills may include landfill gas capture and treatment, impermeable landfill caps and liners, leachate collection, recirculation and treatment (depending on climatic conditions) waste composition and facility size and design characteristics. Minimizing future adverse environmental impacts from MSW landfilling requires both public and private diligence to reduce the toxicity of solid waste and to ensure proper collection, handling and disposal of the waste once it is generated.

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The Toxic Time Bomb: Municipal Liability for the Cleanup of Hazardous Waste

Steven Ferrey*

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Introduction

> For fundamental and deeply rooted psychological reasons, as well as more mundane utilitarian considerations, it is characteristic of man to bury that which he fears and wishes to rid himself of. In the past, this engrained pattern of behavior has generally proven harmless and, indeed, has often led man to restore to the earth the substances he had removed from it. In today's industrialized society, however, the routine practice of burying highly toxic chemical wastes has resulted in serious threats to the environment and to public health. . . . The dangers are especially acute when buried chemical wastes threaten to contaminate the underground aquifers, upon which half of the nation relies for its supply of drinking water.[1]

In the eight years since its utterance, Judge Stanley S. Brotman's forecast has been the prologue to a national environmental crisis triggered by the prevalence of toxic contamination. No one is in control of the nation's hazardous waste. As many as 50,000 sites may require hundreds of billions—perhaps even trillions—of dollars

1. United States v. Price, 523 F. Supp. 1055, 1057 (D.N.J. 1981), *aff'd*, 688 F.2d 204 (3d Cir. 1982).

to render them environmentally safe and to protect drinking water supplies.[2] Only the tip of the toxic iceberg is now visible.

The United States Environmental Protection Agency (EPA) may be misallocating this monumental cleanup burden in contravention of the law by excusing too many of those entities liable under the Superfund statute and thereby increasing the burden on other potentially liable parties. The question of who underwrites the most expensive and sweeping waste cleanup in the nation's history is at issue, and the intricacies of this legal controversy will dominate the toxic debate into the future.

At issue is municipal and regional governmental liability for the handling and disposal of municipal solid waste—backyard garbage. The EPA shifts an immense share of the cost of toxic waste cleanup from the public to the private sector by excusing from prosecution governmental entities that dump hazardous garbage at privately operated sites. This Article analyzes this widespread practice and argues that under the current statute it violates federal hazardous substances laws.

Section I dissects the municipal waste stream, assessing the volume, toxicological, and hazardous constituents of those substances America discards as waste. This section traces waste from the garbage pail to its entry into the nation's drinking water supply. During the process, many of the elements of common household products are transformed into toxic ghosts that will haunt the American future.

Section II evaluates federal regulation of hazardous waste and reveals how today's waste control solutions are destined to become tomorrow's environmental crises. Section III examines the practical implications at the Charles George Superfund site, illustrating in graphic and real terms the conflict posed by the EPA enforcement position regarding municipal solid waste.

Section IV describes the regulatory framework of the federal Superfund, illustrating the hue and texture of the Comprehensive Environmental Response, Compensation and Liability Act's (CERCLA's or the Superfund's) statutory canvas. Section V analyzes the developing federal common law strictly defining liability associated with the disposal of hazardous substances, with particular emphasis on municipalities and municipal solid waste. Section VI examines the Superfund and the abrogation of Eleventh Amendment sovereign immunity, concluding that although recent precedent partly penetrates the shield of sovereign immunity, new legislative amendments leave doubt as to whether sovereign immu-

2. Ferrey, *A Liability Cost Cities Can't Throw Away*, L.A. Times, Oct. 20, 1986, pt. II, at 5.

nity remains intact. In addition, this section explores theories under which municipalities may be able to avail themselves of the sovereign shield, thereby avoiding hazardous waste liability.

Section VII analyzes the exercise of EPA prosecutorial discretion in federal hazardous waste enforcement. A "Catch-22" grips hazardous waste law and disadvantages a class of parties who are left with no interlocutory judicial review.

Section VIII unravels the intertwined double helix of the Resource Conservation and Recovery Act (RCRA) and the Superfund. The legal chemistry of this relationship allows the government to allocate billions of dollars of waste cleanup responsibility to both private and municipal parties. The legality of this allocation is an explosive toxic liability issue confronting both the American legal community and American policymakers.

Finally, Section IX sets out criteria for the administration of an environmental decision rule that would allow a flexible and fair approach to municipal liability. Currently, the EPA often exempts municipalities from prosecution concerning private hazardous waste sites on policy grounds. Although municipalities are legally and practically distinct from private entities, creative and equitable allocation schemes are preferable to an administrative grant of prosecutorial immunity that finds no support in the underlying statute.

I. *Beyond the Pail: The Hazardous Constituents of Municipal Solid Waste*

The industrial nations are neck-deep in waste. All waste, whether liquid, gaseous, or solid, is characterized as "solid" waste. Some solid wastes are "sanitary," although others are hazardous. Municipal garbage collected from households is designated as municipal solid waste (MSW) and is appropriately disposed of in sanitary landfills.

About one third of the total wastes collected in some communities are "household wastes."[3] Detailed surveys indicate that only about three percent of MSW is recycled; the remainder is thrown out.[4] In 1976, the United States officially produced and placed in landfills more than 360 million tons of solid waste created by municipal, commercial, and industrial sources.[5] On a per capita basis, each

3. *See* CAL. RECOVERY SYS., INC., NORTH SANTA CLARA COUNTY COMPREHENSIVE WASTE CHARACTERIZATION STUDY (1982-83): FINAL SUMMARY REPORT, REP. NO. 83-10, at 12 (discussing constituents of household waste). This study analyzes seasonal samples of a variety of waste streams in California. *See id.*

4. Glaub, Savage & Henderson, *Comprehensive Waste Characterization on a Quarterly Basis*, in 1984 NATIONAL WASTE PROCESSING CONFERENCE, AMERICAN SOCIETY OF MECHANICAL ENGINEERS 198 (copy on file at the *George Washington Law Review*)

5. Griffin, Shimp, Steele, Ruch, White & Hughes, *Attenuation of Pollutants in Municipal Landfill Leachate by Passage Through Clay*, 10 ENVTL. SCI. & TECH. 1262 (1976) [hereinafter *Attenuation of Pollutants*]. This disposal had an annual cost of more than $1.5 billion. Additionally, each day Americans flush an estimated 6.8 billion gallons of sewage. Licht & Johnson, *Without a Paddle*, 17 ENVTL. ACTION 10, 13 (1985).

American is responsible for the creation of approximately 2.5 to 4 pounds of MSW each day.[6] This amount varies depending on the degree of urbanization,[7] the season,[8] the average income level,[9] and level of economic activity.[10] In 1984, 133 million tons of this waste were MSW.[11]

Estimates of the amount of this and other waste that is hazardous vary. Annually, in the United States more than 4 billion tons of hazardous materials, including gasoline and radioactive materials, are transported by land, sea, and air.[12] In turn, the EPA estimates that these hazardous materials generate about 40 million tons of hazardous wastes annually in the United States,[13] although the United States Office of Technology Assessment (OTA), a congressional agency, places the amount at approximately 255 to 275 million tons

6. BUREAU OF SOLID WASTE DISPOSAL, DEP'T OF ENVTL. QUALITY ENG'G, COMMONWEALTH OF MASS., WASTE COMPOSITION STUDIES 6 (1986) (copy on file at the *George Washington Law Review*). This definition of MSW includes residential and commercial waste, including discarded appliances and tires. Reported MSW generation ranges from about 2.3 to 6.58 lbs./capita/day, (2,400 lbs./capita/year). When residential waste can be separately identified, it ranges from about 1.4 to 2.8 lbs./capita/day. *Id.*

7. *Id.* at 7-8. To account for the effect of community size on waste generation, a desktop study of materials recovery in Vermont and New Hampshire assumed that generation was 2.4 lbs./capita/day in communities of fewer than 4,500 persons, and 2.8 lbs./capita/day in communities larger than 4,500 persons. *Id.* A Dane County, Wisconsin Solid Waste Plan also found that generation rates were lower in rural areas than in urban areas. To calculate overall county generation rates, the Dane County planners assumed the following generation rates: 2.2 lbs./capita/day in urban areas of 10,000 or more; 1.6 lbs./capita/day in towns of 2,500 to 10,000; 1.0 lb./capita/day in rural areas with incorporated places; .85 lbs./capita/day in very rural areas with one or fewer incorporated places of 1,000 or less. *Id.*

In another study, Delaware landfill records showed annual waste generation of 2.4 lbs./capita/day (880 lbs./capita/year) in rural areas, and 6.6 lbs./capita/day (2,400 lbs./capita/year) in wealthy coastal areas. *Id.* at 8.

8. *Id.* A study of waste generation in Portland, Maine found that total waste generation could vary from 80 to 120% of the average monthly rate depending on the season. The study reasoned that the seasonal recreational population may cause extensive seasonal variation. *Id.*

9. *Id.* Although noting that income levels cannot provide a simplistic explanation for waste generation, the Milwaukee Garbage Project reported that lower income households appear to generate more household waste than middle- or upper-income households. This was attributed to different consumption patterns that resulted in the use of more packaging. *Id.*

10. *Id.* The Dane County Plan noted a correlation between the rate of increase of the GNP and per capita solid waste generation rates. *Wastepaper: The Future of a Resource*, a 1982 report, also found an increase in per capita waste generation with time. Nationwide, the authors of this report estimated combined residential and commercial waste generation at 3.29 lbs./capita/day in 1971, and 3.47 lbs./capita/day in 1980. This report projected continuing increases, estimating that waste generation will rise to 3.66 lbs./capita/day by 1990. *Id.*

11. *EPA Study Finds Older, Unlined Landfills More Likely to Adversely Affect Environment*, 17 Env't Rep. (BNA) 1221, 1222 (Nov. 21, 1986).

12. U.S. OFFICE OF TECHNOLOGY ASSESSMENT, TRANSPORTATION OF HAZARDOUS MATERIALS: STATE AND LOCAL ACTIVITIES 3 (1986). This figure, however, does not represent all hazardous "wastes." *See id.*

13. S. EPSTEIN, L. BROWN & C. POPE, HAZARDOUS WASTE IN AMERICA 7 (1982).

per year.[14] This range represents an aggregate of 350 to 2,000 pounds of hazardous waste per person each year. That is, the OTA believes that six times more hazardous waste is being produced than the EPA thinks it is regulating.[15]

The EPA historically presumes that municipal solid waste is sanitary, non-hazardous rubbish.[16] Most people also believe that MSW constitutes old newspapers, leftover food, random household debris, and the occasional broken toy. The EPA historically assumes that the home trash barrel represents the outflow of only the supermarket or greengrocer, and that on the whole the resultant waste should be no worse than the sum of its parts.

Although the composition of residential waste varies seasonally,[17] as much as 50% is various paper products, 5-10% is plastics, 20-30% is yard waste, and 3-8% is food, while remaining shares are ferrous metals (3-6%), aluminum (0.6-1.3%), glass (4-11%), and miscellaneous inorganic matter (0.1-3%), as illustrated in Table 1.[18] About 74% of the gross volume of MSW would be suitable for combustion if, in lieu of landfilling, it became part of a waste-to-energy conversion process.[19] Table 2 illustrates the elemental share of organic materials in MSW.

Recent scientific data expose the fallacy of assuming that MSW is sanitary waste. The home garbage pail is a leaking sieve of toxic and potentially toxic chemical agents. Some of these chemicals are contained in the pesticides, paints, degreasers, preservatives, detergents, oven cleaners, insecticides, and even shampoos sold ubiquitously over the counter to consumers.[20] Other elements in household waste can become hazardous during the decay and decomposition process. Either alone or in chemical consort with other wastes in a landfill, the chemical outflow from the typical household is a ticking toxic time bomb.

Research conducted in Nassau County, New York estimates that

14. Mosher, *EPA Still Doesn't Know the Dimensions of Nation's Hazardous Waste Problem*, Nat'l J., Apr. 16, 1983, at 796.

15. *Id.* EPA officials in 1983 claimed to regulate only 40-45 million tons of hazardous waste. *Id.* at 797. Inadequate recordkeeping makes it impossible for the EPA to tell whether waste generation is increasing or decreasing. *See Data on Waste Generation, Management Said Inadequate for Key Policy Decisions*, 17 Env't Rep. (BNA) 1784, 1784 (Feb. 20, 1987).

16. *See infra* text accompanying notes 102-40.

17. In warmer months yard waste increases, food waste decreases, and other wastes show various fluctuations in volumes. CAL. RECOVERY SYS., INC., *supra* note 3, at 21; Glaub, Savage & Henderson, *supra* note 4, at 204.

18. *Cf.* Glaub, Savage & Henderson, *supra* note 4, at 199-202 (finding similar composition of residential waste). The organic share is approximately 42% carbon and 40% oxygen. *Id.* at 210.

19. *Id.* at 198. Residential solid waste has a heating value of about 4,200 BTU per pound. *Id.* at 208. Given the "tipping fee" that municipalities will pay to a refuse-driven fuel facility to take MSW, it becomes very competitive to treat MSW as a prime fuel source compared to conventional fossil fuels.

20. *See generally* EPA, REP. NO EPA-600/2-80-128, SOURCES OF TOXIC COMPOUNDS IN HOUSEHOLD WASTEWATER (August 1980) (suggesting that the identification and concentration of toxic pollutants resulting from consumer products and discharged in domestic wastewater must be studied further).

Table IV-3. Comparison of Residential Waste Composition in the State of California (Weight Percent)

TABLE 1

Component	North Santa Clara County				Santa Cruz Co.[a]	Richmond[b]	San Diego[c]	Santa Monica[d]
	Summer 1979	Autumn 1982	Winter 1983	Spring 1983	Summer 1983	Winter 1983	Spring 1982	Spring 1981	Summer 1980
Mixed Paper	15.6	20.2	19.9	14.1	12.5	15.8	30.6	25.4	11.1
Newspaper	14.0	10.1	12.2	14.6	15.3	8.7	9.0	9.1	12.3
Corrugated	10.6	18.0	16.1	12.9	12.7	14.6	11.7	5.5	18.2
Plastic	4.7	9.6	5.6	5.7	5.6	9.4	6.2	6.5	7.7
Yard Waste	26.9	26.5	20.8	24.2	31.6	9.8	13.7	22.6	16.7
Food Waste	4.4	3.1	8.5	6.5	4.1	13.6	NM	NM	7.6
Other Organic	6.4	2.3	1.6	5.4	5.0	9.4	4.8	15.9	6.8
Ferrous	6.0	3.4	2.9	4.1	3.1	5.1	5.3	4.0	5.6
Aluminum	0.7	0.9	1.3	0.9	0.6	1.3	1.2	1.0	1.0
Glass	10.6	4.4	8.2	9.8	8.5	9.7	14.6	8.8	12.2
Other Inorganic	0.1	1.5	2.9	1.8	1.0	2.6	2.9	1.2	0.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

a) Reference 10.
b) Reference 9.
c) Reference 11.
d) Reference 12.
NM = Not Measured.
Source. Cal. Recovery Systems, Inc., "North Santa Clara County Comprehensive Waste Characterization Study" (1982-83), January 1984, at T1:24.

TABLE 2

Table VI-11. Comparison of Elemental Analyses of Organic Fraction of MSW (Oven-Dry Basis)

Element	North Santa Clara County[a]	San Diego[b]	Ames RDF[c]
Aluminum	3,700	—	13,600
Antimony	<70	3	25
Arsenic	7	10	—
Barium	110	—	—
Beryllium	< 0.3	—	—
Bismuth	10	—	—
Boron	< 5	—	—
Cadmium	< 3	10	6
Calcium	5600	—	4,900
Cerium	<24	—	—
Chromium	21	—	34
Cobalt	< 6	—	—
Copper	450	—	572
Gallium	<11	—	16
Germanium	<13	—	2
Gold	< 3	—	—
Iron	1,880	—	4,200
Lanthanum	< 0.8	—	—
Lead	49	354	613
Lithium	< 0.4	—	—
Magnesium	730	—	—
Manganese	130	—	194
Mercury	2.0	0.4	—
Molybdenum	<13	23	—
Nickel	<15	—	14
Platinum	<12	—	—
Potassium	4,300	—	3,200
Selenium	< 0.4	0.5	8
Silicon	22,000	—	29,200
Silver	< 4	—	—
Sodium	2,000	—	—
Strontium	39	—	—
Thallium	< 4	—	—
Tin	<20	4	27
Vanadium	2.8	—	154
Zinc	310	871	769
Zirconium	< 2	—	—

a) Processable composite.
b) Reference 11.
c) Reference 15.
Source: Cal. Recovery Systems, Inc., "North Santa Clara County Comprehensive Waste Characterization Study" (1982-83), January 1984, at T2:52.

in that county alone, hardware, supermarket, department, and automotive stores annually sell 288,000 gallons of consumer products containing organic carcinogens, suspected carcinogens, or other harmful organic materials.[21] Consumers dump some of these

21. J. Dowling, Report on Survey of Consumer Products Containing or Suspected of Containing Harmful Organic Chemicals and Having the Potential of Contaminating the Groundwater of Nassau County, New York 4 (May 1979) (copy on file at the *George Washington Law Review*).

chemical compounds directly onto the ground, others are discharged into cesspools and escape into the ground, and still others are disposed of in household trash and are collected for disposal at municipal solid waste landfills.

Telephone surveys reveal that the most commonly used and discarded hazardous household substances, in descending order, are household cleaners, pesticides, auto and furniture polishes, paint and paint thinners, motor oil, chemical drain openers, antifreeze, wood preservatives, and herbicides.[22] Paint products, solvents, batteries, pesticides and herbicides, adhesives, aerosols, alcohols, oils and grease, polishes and waxes, cosmetics, and dyes contain dozens of metals as well as halogenated and nonhalogenated compounds,[23] all of which qualify as hazardous substances under federal law.[24] A number of elemental metals in significant concentrations are found in MSW,[25] and both soluble fluorides and chlorides are found at average concentrations of 1,900 parts per million (ppm).[26]

The organic fraction of MSW contains both pesticides and herbicides.[27] Some pesticides found in MSW are up to thirty years old

22. In Depth Summary of Selected Household Hazardous Waste Characterization Studies 3 [hereinafter Summary of Studies] (construing Association of Bay Area Governments, The Disposal of Hazardous Wastes by Small Quantity Generators (1985)) (copy on file at the *George Washington Law Review*); *see also* Cal. Recovery Sys., Inc., Characterization and Impacts of Nonregulated Hazardous Wastes in Municipal Solid Waste of King County 15, 17 (1985) (Executive Summary, First Draft) [hereinafter King County] (listing different categories of hazardous household substances and the estimated amount of each category in the King County waste stream); *How Hazardous are Municipal Wastes?*, Am. City & County 41, 41 (Mar. 1983) (construing a Los Angeles County Sanitation District's refuse sampling program, which classified discarded hazardous waste containers into six categories, in descending order of volume: household and cleaning products; automotive products; personal products; paint and related products; insecticides, pesticides, and herbicides; and other hazardous products).

23. King County, *supra* note 22, at 30-41 (providing tables listing metal and chemical breakdowns for hazardous wastes). Halogenated compounds include one of the following five elements: fluorine, chlorine, bromine, iodine, or astatine. Halogenated contaminants pose a greater risk to the environment.

24. *See* 42 U.S.C. § 9601(14) (Supp. IV 1986); *infra* notes 28-35 and accompanying text.

25. Cal. Recovery Sys., Inc., *supra* note 3, at 41-43. Metals detected in the parts per million (ppm) range (by volume) include aluminum, iron, barium, copper, manganese, magnesium, zinc, bismuth, chromium, lead, strontium, antimony, cerium, gallium, germanium, molybdenum, nickel, platinum, tin, arsenic, mercury, and vanadium. *Id.*; *see also* Glaub, Savage & Henderson, *supra* note 4, at 210 (providing an elemental analysis of MSW).

26. Cal. Recovery Sys., Inc., *supra* note 3, at 43; Glaub, Savage & Henderson, *supra* note 4, at 210.

27. *See* Glaub, Savage & Henderson, *supra* note 4, at 214-15 (providing a comprehensive pesticide and herbicide analyses of MSW). Chlorinated pesticides detected in relatively dilute concentrations include aldrin, BHC, chlordane, DDE, DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, kepone, methoxychlor, mirex, PCB, and

and have since been banned from commercial use.[28] These concentrations are displayed in Table 3.

TABLE 3

Table VI-7. Average Pesticide and Herbicide Analyses of Organic Fraction of MSW as a Function of Waste Type

Compound	Concentration (ppb)*			
	Rear Loader	Front Loader	Debris Box	Processable Composite
Chlorinated Pesticides				
Aldrin	28	40	62	43
BHC	214	87	104	134
Chlordane	<12	<59	<30	<35
DDE	<11	<110	<13	<45
DDT	<11	<207	<38	<92
Dieldrin	< 5	<220	< 8	<85
Endrin	< 5	<17	<10	<11
Heptachlor	23	22	<22	<23
Heptachlor Epoxide	< 4	<22	<16	<14
Kepone	< 6	<26	<12	<15
Methoxychlor	< 7	<32	<19	<20
Mirex	< 6	<29	<15	<17
PCB	<19	<80	<44	<49
Toxaphene	<75	<320	<190	<200
Phosphate Pesticides				
Diazinon	180	350	330	290
Ethyl Parathion	300	<1100	<180	<560
Malathion	<207	<1700	<460	<830
Methyl Parathion	<4500	<1813	<2600	<2930
Chlorinated Phenoxyacid Herbicides				
2,4-D	510	400	510	470
2,4,5-T	<23	<23	<23	<23
2,4,5-TP (Silvex)	<12	<12	<12	<12

*Results presented on an oven-dry basis. The < sign where used indicates the detection limit for individual samples and that no substance was found above the given detection limit.

Source: Cal. Recovery Systems Inc., North Santa Clara County Comprehensive Waste Characterization Study (1982-83), January 1984, at T3:46.

An examination of the waste stream in King County, Washington identified approximately 1,500 distinct potentially hazardous items in waste loads from ninety-one vehicles.[29] Very little effort is made to collect and contain household hazardous waste separately, and even when the effort is made, fewer than one percent of households

toxaphene. Phosphate pesticides detected in significant concentrations include diazinon, ethyl parathion, malathion, and methyl parathion (this last in the parts per million range). Chlorinated phenoxyacid herbicides detected include: 2,4-D; 2,4,5-T; and 2,4,5-TP. *Id.*

28. King County, *supra* note 22, at 22.

29. *Id.* at 3.

typically participate.[30] Such low participation rates will not begin to remove hazardous waste from the MSW stream.

Volatile organic solvents (VOCs) are a group of organic compounds of low molecular weight, and are common in many household products. The EPA lists many of these chemical compounds as priority pollutants, subject to direct regulation as toxic chemicals.[31] VOCs evaporate quickly when exposed to air at normal temperatures; however, when saturated in soil or blended with groundwater streams, VOCs remain present for extended periods of time.[32] VOCs in the ground pose a special threat when they become mobile in the soil and reach the groundwater.[33]

If dumped in a municipal solid waste landfill, these chemicals can seep or "leach"[34] into the ground and into the groundwater. After a thorough examination of hazardous constituents in household waste, one research team concluded that "[t]he volatile organic chemical species likely to contaminate groundwater enter the waste stream primarily in the form of paint and paint products, solvents, and cosmetics. The lead enters the waste stream primarily in the form of paint and paint products and in the form of batteries."[35]

The stability of VOCs in the ground is influenced by temperature,

30. Special Wastes Branch, Office of Solid Waste, EPA, Rep. No. EPA/530-SW-86-038, A Survey of Household Hazardous Wastes and Related Collection Programs 1-3 (1986) [hereinafter Household Hazardous Waste Survey] (noting that "[f]ew programs can boast participation of even 1 percent . . . and several programs report participation less than 0.2 percent"). Only one percent of Massachusetts households in a target community participate in hazardous waste material collection days. Executive Office of Envtl. Affairs, Massachusetts State House Press Files (Aug. 12, 1985).

31. *See* 40 C.F.R. § 302.4 (1988); *see also* P. Wood, R. Lang & I. Payan, Anaerobic Transformation, Transport and Removal of Volatile Chlorinated Organics in Groundwater (Sept. 1981) (unpublished research paper) (stating that many VOCs included on the EPA's priority pollutant list are found in contaminated groundwater sites) (copy on file at the *George Washington Law Review*). Typical low-solubility volatile organics found in contaminated wells include aliphatics (including propane, straight, or branched chain hydrocarbons), aromatics (benzene, toluene, ethylbenzene, etc.), chlorinated aromatics (mono- and dichlorobenzenes, etc.), halogenated alkanes (chloroethane, mythelene chloride, 1,1- and 1,1,1- chloroethanes, trihalomethanes), and chlorinated ethenes (vinyl chloride, vinylidene chloride, cis- and trans-1,2-dichloroethylene, trichloroethylene, tetrachloroethylene). *Id.*

32. *See* Sabel & Clark, *Volatile Organic Compounds as Indicators of Municipal Solid Waste Leachate Contamination*, 1984 Waste Mgmt. & Res. 119, 119 (copy on file at the *George Washington Law Review*).

33. VOCs are mobile under most soil and pH conditions, although they vary as to their solubility in water. Even the most immiscible VOCs are rendered more soluble in water if dissolved organic compounds are present. *Id.*; *see also* Council on Envtl. Quality, Contamination of Ground Water by Toxic Organic Chemicals (1981) (discussing the contamination of groundwater by the movement of waste from industrial and municipal landfills).

34. "Leachate" is liquid or water soluble contaminated substances that migrate away from the point source of contamination in groundwater or surface water, often influenced by rain and normal water table activities. Such a phenomenon is described as a "leaching" of contaminants.

35. King County, *supra* note 22, at 28.

light, soil composition, moisture, sedimentation, and the presence or absence of oxygen.[36] VOCs are not readily biodegraded or absorbed into the soil, and they can move rapidly through soil to groundwater.[37] In low concentrations these compounds can be degraded anaerobically, but not aerobically.[38]

VOCs are now present in a large number of groundwater drinking supplies nationwide. The ingestion of VOCs, even in small quantities, causes significant public health risks because many of the halogenated organic chemicals found in groundwater are suspected or confirmed carcinogens or mutagens.[39]

Contamination of groundwater at and surrounding sanitary MSW landfills has been documented in recent studies. Research of groundwater samples from twenty MSW landfills in Minnesota found that nineteen or more distinct organic pollutants were present at twelve of the landfills.[40] Of particular importance, the Minnesota data indicate that there is no chemical distinction between the type and amount of organic pollutants present at the rural—in regions where there is no manufacturing waste—and urban landfills surveyed.[41] The rural landfills, which contain only *household* waste, therefore pose contamination problems identical to the urban landfills, which contain both household and industrial (supposedly hazardous) waste. An OTA study surveying MSW facilities leaching hazardous substances revealed that "[g]enerally the contaminants found at the [sanitary] facilities and their frequency resemble what has been found at all [Superfund] sites. . . . All the information suggests that solid waste sites on the NPL [National Priority List] score similarly to NPL sites that dealt solely with hazardous wastes."[42]

Several other examples present similar findings. In Norman,

36. J. Dowling, *supra* note 21, at 6.

37. Sabel & Clark, *supra* note 32, at 121 (relying on an unpublished 1983 research report on groundwater contamination for the Minnesota Pollution Control Agency); Bouwer, Rittman & McCarty, *Anaerobic Degradation of Halogenated 1- and 2-Carbon Organic Compounds*, 15 Envtl. Sci. & Tech., 596, 596 (1981); *see also* Parsons & Lage, *Chlorinated Organics in Simulated Groundwater Environments*, Res. & Tech., May 1985, at 52, 57-59 (concluding that some VOCs (e.g., chlorinated alkenes) are particularly resistant to biotransformation and are therefore troublesome pollutants because they persist in the groundwater).

38. Bouwer, Rittmann & McCarty, *supra* note 37, at 599. For a discussion of the prevalence of anaerobic transformation of parent-daughter volatile organic compounds, see P. Wood, R. Lang & I. Payan, *supra* note 31, at 2-4.

39. *See* Bouwer, Rittmann & McCarty, *supra* note 37, at 596. Population groups exhibit a higher incidence of various forms of cancer from exposure to low levels of VOCs. For example, the incidence of gastrointestinal cancers increases when population groups are exposed to chlorinated water containing VOCs. Sabel & Clark, *supra* note 32, at 120.

40. Sabel & Clark, *supra* note 32, at 120-21 & Table 1.

41. *Id.* at 123.

42. Office of Technology Assessment, Superfund Strategy 131 (1985) [hereinafter Superfund Strategy]. By late 1984, the EPA had listed 538 sites on the NPL. Office of Solid Waste & Emergency Response, EPA, Extent of the Hazardous Release Problem and Future Funding Needs: CERCLA Section 301(a)(1)(C) Study 1-5 (1984). The EPA classified 163 of these sites as containing municipal refuse or as municipally owned landfills. *Id.* at 5-6. The remaining NPL sites include: commercial/industrial landfills, RCRA Subtitle C hazardous waste facilities, mining waste sites, leaking underground storage tanks, and radioactive waste sites. *See id.* at 5-2 to 5-11.

Oklahoma, the groundwater surrounding a municipal landfill, which never received appreciable amounts of industrial waste, contains hazardous substances.[43] Leachate from municipal waste landfills in the Central Valley of California contains volatile organic contaminants.[44] Sixty-seven percent of representative landfills in New Hampshire show evidence of groundwater contamination.[45] Groundwater studies in Wisconsin and New York further corroborate the presence of widespread organic contamination of groundwater.[46]

As of 1978, a comprehensive program on Long Island, New York, designed to monitor all 440 public water wells in Nassau County, established that more than sixteen percent of the wells tested were contaminated by at least one or more of the six organic chemicals monitored.[47] Although some organic compounds are not soluble in water, they are soluble in other organic compounds which are themselves water soluble.[48] Certain compounds may become carriers of other organic pollutants, allowing the pollutants to intermix with groundwater supplies.

If soil exhibits a low pH (high acidity), there may be less microbial activity, slowing the biological transformation of VOCs into daughter compounds.[49] The presence of exotic forms of chlorinated organic compounds in groundwater raises significant concern regarding the long-term impact of VOCs which penetrate the ground.[50] For example, in areas of Florida where industries use degreasing compounds that are not discovered in the well water, their progeny (in the form of daughter compounds) are nonetheless

43. Municipality of Metro. Seattle, The Problem of Household Hazardous Waste Disposal 8 (1986) (discussion materials assembled by D. Galvin, Senior Water Quality Planner).

44. *Id.*

45. *Id.* at 11 (Figure 4: Summary of Compliance Shortfalls: Representative New Hampshire Landfills and Districts (reproduced from The Landfill Threat to New Hampshire's Drinking Water: Findings and Proposals for Action (1986))). Moreover, 95% of New Hampshire landfills operate in violation of applicable law. *Id.*

46. *See* Sabel & Clark, *supra* note 32, at 125-26 (citing data from MSW leachate studies conducted in New York and Wisconsin).

47. Geraghty & Miller, Inc., Supplemental Report to the Nassau-Suffolk Regional Planning Board on the Current Status of Ground-Water Investigations for Organic Chemicals in the Nassau-Suffolk Area at 3, 6 & Table 2 (Feb. 1979) (unpublished study) (copy on file at the *George Washington Law Review*). The Nassau County monitoring wells tested positive for the following organic chemicals, in decreasing order of prevalence: 1,1,1-trichloroethane, trichloroethylene, tetrachloroethylene, chloroform, carbon tetrachloride, 1,1,2-trichloroethane, and trifluorotrichloroethane. *Id.* at 7 (Table 3).

48. Sabel & Clark, *supra* note 32, at 121; *see also supra* note 33. For example, the compounds trichloroethylene and tetrachloroethylene are not particularly soluble in water. However, more soluble compounds such as alcohol or benzene increase the solubility of the former, thereby increasing the synergistic contamination of groundwater sources when these chemicals are present in combination. *Id.*

49. *See* Parsons & Lage, *supra* note 37, at 59.

50. *Id.* at 52.

prevalent in well water.[51] This data strongly suggests that chlorinated organic solvents may be anaerobically transformed in the groundwater to exotic daughter compounds.[52] Chlorinated organic compounds can transform themselves in both sterile environments and environments where bacteria are present,[53] and recent research now suggests that VOCs can be transformed by both chemical and biological processes.[54] Viewed in its entirety, this evidence strongly supports the argument that the constituents in ordinary household wastes alone are toxic and are capable of contaminating groundwater.

Although there are fewer toxic constituents per unit of volume of MSW than industrial waste, the enormous tonnage of MSW landfilled annually yields large quantities of potentially toxic elements. There is no definitive survey measuring the percentage of household waste that is hazardous, yet a waste analysis by one of the most experienced American waste consulting teams indicates that "[h]azardous wastes make up less than 0.1% by weight of the municipal waste stream."[55] In a more detailed 1984 study, the Los Angeles County Sanitation Districts estimated that 0.00147% of all refuse discarded at five of its municipal facilities qualified as hazardous.[56] These estimates, however, may be low.[57]

Today's household waste, routinely discarded, is dissolved, cloned, and transformed in the nation's dumps. Its toxic progeny return through the tap as contaminated drinking water. The biological circle is complete. The long-term impact of MSW spills beyond the pail.

51. *Id.* That is, studies show the presence of vinyl chloride, cis- and trans-1,2-dichloroethene, and vinylidene chloride in municipal wells in areas where these substances are not used, indicating that these exotic compounds could result from transformation of chlorinated organic solvents. *Id.*

52. *Id.*; Kobayashi & Rittmann, *Microbial Removal of Hazardous Organic Compounds*, 16 ENVTL. SCI. & TECH. 17OA (1982); *see* Esaac & Matsumura, *Metabolism of Insecticides by Reductive Systems*, 9 PHARMACOLOGY & THERAPEUTICS 1 (1980); Parsons, Wood & DeMarco, *Transformations of Tetrachloroethene and Trichloroethene in Microcosms and Groundwater*, RES. & TECH., Feb. 1984, at 56.

53. Bouwer & McCarty, *Transformation of 1- and 2-Carbon Halogenated Aliphatic Organic Compounds Under Methanogenic Conditions*, 45 APPLIED & ENVTL. MICROBIOLOGY 1286, 1292 (1983). The authors observed that under methanogenic conditions, 1,2-dichloroethane, carbon tetrachloride, and chloroform were oxidized to carbon dioxide. In addition, reductive dechlorination transformed tretrachloroethene and 1,1,2,2-tetrachloroethane. *Id.* at 1286, 1293.

54. *Id.* at 1293; Parsons & Lage, *supra* note 37, at 53, 56.

55. SUMMARY OF STUDIES, *supra* note 22, at 12 (construing a 1985 project feasibility report prepared for the Northern Santa Clara County Solid Waste Management Authority based on the study by Glaub, Savage & Henderson, *supra* note 4).

56. HOUSEHOLD HAZARDOUS WASTE SURVEY, *supra* note 30, at 4-7. The Los Angeles municipal waste stream that was analyzed included some commercial as well as residential waste. *Id.* In Albuquerque the presence of hazardous waste in the residential waste stream is estimated to be 0.5 %. *Id.* at 4-11.

57. The Los Angeles project was concerned with identifying commercial size quantities, and therefore looked only for containers greater than one gallon or whole boxes containing hazardous waste. *See id.* at 4-7. This tends to undercount the actual volume of hazardous constituents.

II. Landfill Overspill: The Failure of Federal Regulation

The great bulk of hazardous waste in the United States is dumped in landfills.[58] About two thirds of this hazardous material, however, is improperly disposed of, and therefore continues to pose a potential health threat.[59] A significant part of this dumping occurs in an unregulated and unreported manner, as most regulated facilities fail to comply with the hazardous waste disposal laws.

In a study conducted for the Office of Management and Budget, the EPA found that more than sixty percent of the nation's known hazardous waste facilities fail to comply with federal groundwater monitoring requirements,[60] and more than twenty percent of inspected landfills are cited for contaminating either the air or the water.[61] Experts also posit that the liners placed in landfill sites to protect against leakage are more permeable than anticipated, resulting in potential leachate migration problems.[62]

The OTA projects that cleaning up just 10,000 of the 50,000 possibly contaminated hazardous waste (or Superfund) sites will cost several hundred billion dollars over fifty years.[63] This estimate of 10,000 possible cleanup sites does not include as many as 100,000 currently leaking underground storage tanks, and these may number as many as 350,000 within five years.[64] This multi-billion dollar price tag will be divided principally among those who own or operate the disposal sites and those who generated the hazardous substances which lie buried beneath them.[65]

58. *See* OFFICE OF TECHNOLOGY ASSESSMENT, SERIOUS REDUCTION OF HAZARDOUS WASTE 17 (1986) [hereinafter SERIOUS REDUCTION].

59. *See* S. EPSTEIN, L. BROWN & C. POPE, *supra* note 13, at 9 (Table 1-2).

60. Mosher, *supra* note 14, at 796.

61. For instance, 2,428 of 11,540 landfill facilities inspected in 1984 were cited for violations of air or water quality contamination. *EPA Study Finds Older, Unlined Landfills More Likely to Adversely Affect Environment*, 17 Env't Rep. (BNA) 1221, 1222 (Nov. 21, 1986). Forty percent of Massachusetts landfills pollute or threaten to pollute groundwater. BUREAU OF SOLID WASTE DISPOSAL, COMMONWEALTH OF MASS., EXECUTIVE OFFICE OF ENVTL. AFFAIRS, DEP'T OF ENVTL. MANAGEMENT, ACTIVE LANDFILL REPORT (preface) (1985).

62. Anderson, *Does Landfill Leachate Make Clay Liners More Permeable?*, CIVIL ENGINEERING-ASCE, Sept. 1982, at 66, 66-69. Anderson explains that the permeability of clay liners is usually tested only with relatively pure water. Actual leachates generated in landfills, however, may be highly contaminated or contain organic liquids, greatly increasing the permeability of the clay liners. *Id.*

63. SUPERFUND STRATEGY, *supra* note 42, at 3, 61. Cost estimates vary from a low range of $5.6-$33.8 billion to clean up 1,270-2,546 sites, as estimated by the General Accounting Office, to a high value of $29-92 billion to remediate 2,200-7,000 sites, projected by the National Audubon Society. The latter estimates that this cleanup could take as long as 84 years. *Id.* at 14, 62.

64. D. Feliciano, Leaking Underground Storage Tanks: A Potential Environmental Problem (Jan. 11, 1984) (unpublished report, released only to members of Congress by the Congressional Research Service, Washington, D.C.).

65. According to the OTA, more than 99% of all federal and state environmental spending is devoted to controlling pollution after the waste is generated, rather than on

In assessing the responsibility of owners and operators, the federal government has only recently acknowledged the hazardous potential of MSW landfills. In 1984, the EPA identified municipal landfills as an emerging problem area that will require intensive discovery and investigation.[66] Municipal landfills may have received hazardous wastes prior to 1980; further, unregulated small-quantity hazardous-waste generators continue to dispose of their wastes in municipal landfills, and landfills also continue to receive household solvents, cleaning materials, and pesticides.[67] Similarly, in reauthorizing the Resource Conservation and Recovery Act (RCRA)[68] in 1984, Congress took notice of the real and imminent danger of hazardous contamination at MSW sanitary landfills:

> Subtitle D facilities are the recipients of unknown quantities of hazardous waste and other dangerous materials resulting from the disposal or [sic] household waste, small quantity generator wastes and illegal dumping. Since construction, siting, and monitoring standards for these facilities are either nonexistent or less restrictive than those governing hazardous waste disposal facilities, environmental and health problems caused by Subtitle D facilities are becoming increasingly serious and widespread. A high proportion of sites listed on the National Priority List were sanitary landfills. Without the additional environmental protection that the implementation of this provision will provide, even more Subtitle D facilities are destined to become Superfund sites.[69]

About twenty percent of the National Priority List (NPL) Superfund sites are or were MSW disposal facilities.[70] This is particularly revealing given significant pressure to keep MSW sites off the NPL. This pressure originates at the state level, because designation of a government-owned and operated MSW disposal site on the NPL requires the state to pay at least fifty percent of the remediation costs and one hundred percent of the operation and

reducing the volume of hazardous waste. The latter alternative is more economical and less hazardous to human health and the environment. All hazardous wastes are amenable to waste reduction techniques and processes. SERIOUS REDUCTION, *supra* note 58, at 9, 11.

66. OFFICE OF SOLID WASTE & EMERGENCY RESPONSE, *supra* note 42, at ii, 5-1.

67. *Id.* at 5-6. Studies prepared by or for the EPA that corroborate the hazardous nature of MSW landfills include: MUNICIPAL ENVTL. RESEARCH LABORATORY, OFFICE OF RESEARCH & DEV., EPA, REP. NO. EPA-600/2-80-128, SOURCES OF TOXIC COMPOUNDS IN HOUSEHOLD WASTEWATER (1980) (authored by S. Hathaway); ENVIRONMENTAL EFFECTS LABORATORY, U.S. ARMY ENG'R WATERWAYS EXPERIMENT STATION, REP. NO. EPA-600/2-78-096, CHEMICAL AND PHYSICAL EFFECTS OF MUNICIPAL LANDFILLS ON UNDERLYING SOILS AND GROUNDWATER (1978) (R. Landreth, Project Officer); OFFICE OF WATER SUPPLY, OFFICE OF SOLID WASTE MANAGEMENT PROGRAMS, EPA, THE REPORT TO THE CONGRESS: WASTE DISPOSAL PRACTICES AND THEIR EFFECTS ON GROUND WATER (1977).

68. Pub. L. 94-580, 90 Stat. 2795 (1976) (codified as amended at 42 U.S.C. §§ 6901-6987 (1982 & Supp. IV 1986)). For a discussion of the Resource Conservation and Recovery Act, see *infra* notes 384-416 and accompanying text.

69. H.R. CONF. REP. No. 1133, 98th Cong., 2d Sess. 117 (1984).

70. SUPERFUND STRATEGY, *supra* note 42, at 11 (Table 1.1) (listing 550 Superfund sites as of 1985). The National Priorities List currently contains 797 listed sites and 378 sites proposed for listing, for a total of 1,175 sites. Telephone Inquiry to Superfund Hotline (Dec. 22, 1988) (telephone: (202) 382-3000).

management expenses incurred by the cleanup.[71] Although the state may recover this share from any municipality or county that owned or operated the facility, ultimately the assessment adversely impacts the local tax base. Similarly, the EPA—already confronting a number of states that have failed to raise the ten percent required matching funds for cleanup of privately owned sites—is reluctant to add more municipal sites to the NPL because this would raise the state's matching share to fifty percent.[72]

The OTA expects that half the future Superfund priority sites will be municipal landfills.[73] The EPA could also add sanitary waste sites that are not currently disposal sites for hazardous wastes to the growing number of Superfund sites.[74] More than fifty waste disposal facilities licensed under the RCRA interim status regulations[75] were among the first 500 sites placed on the NPL.[76] This track record does not engender confidence in the long-term security of licensed sanitary waste sites.

An EPA study reveals that only eleven percent of landfills have any type of bottom liner, only four percent employ a leachate collection and removal system, and only nineteen percent monitor the adjacent groundwater for contamination.[77] Between 1980 and 1985, the EPA closed one third of the nation's landfills because they threatened to contaminate nearby groundwater supplies, therefore failing to meet federal requirements.[78] And in 1985, the OTA concluded that "many, if not most, solid waste facilities have [posed]

71. *See* 42 U.S.C. § 9604(c)(3) (Supp. IV 1986). The state pays only 10% of remediation costs, plus all operation and maintenance expenses, if the facility was not directly or indirectly operated by the state at the time of the hazardous disposal. *Id.*; *see also infra* notes 168-70 and accompanying text (discussing the state's required contribution).

72. *See, e.g.*, SUPERFUND STRATEGY, *supra* note 42, at 27 (discussing the Seymour, Indiana site as an illustration of the problem of states being unable to meet their matching payment requirement).

73. *Id.* at 5.

74. Sanitary waste facilities are regulated under RCRA Subtitle D, 42 U.S.C. §§ 6941-6949 (1982 & Supp. IV 1986). These facilities are presumed to have accepted no hazardous wastes. RCRA Subtitle D regulates sanitary wastes at the disposal facility, rather than at the generation of sanitary waste. The mechanism for regulation is the promulgation of standards for disposal facilities and the requirement that state and regional authorities develop, subject to EPA approval, solid waste management plans. *Id.*

75. 40 C.F.R. § 265 (1987) (defining interim status standards for owners and operators of hazardous waste treatment, storage, and disposal facilities); *see also id.* § 270.70 (addressing qualifications for interim status). Interim status was a mechanism at the 1976 passage of RCRA to "grandfather" the temporary operation of existing facilities until EPA issued a permit. *See* 42 U.S.C. § 6925(e) (Supp. IV 1986).

76. SUPERFUND STRATEGY, *supra* note 42, at 138.

77. *EPA Study Finds Older, Unlined Landfills More Likely to Adversely Affect Environment*, 17 Env't Rep. (BNA) 1221, 1222 (Nov. 21, 1986).

78. *EPA Survey Finds RCRA Waste Facilities Have Declined Markedly in Number Since 1981*, 17 Env't Rep. (BNA) 1418, 1418 (Dec. 19, 1986). As of 1987, after six years of effort, only 19 of 523 hazardous waste land disposal facilities had received required EPA permits, three quarters had not yet completed applications. *Data on Waste Generation,*

and will continue to pose threats associated with the release of hazardous substances into the environment."[79]

Exclusions in federal hazardous waste regulation continue to allow disposal of some hazardous wastes at supposedly sanitary MSW disposal facilities. The Congressional Budget Office estimates that in 1983 alone over 26 million tons of hazardous waste were disposed of in what were supposed to be sanitary landfills.[80] In many municipalities wastewater treatment plant sludges are also disposed of at sanitary landfills; these sludges can remobilize at landfills to contaminate the groundwater.[81] EPA data suggest that at 169 sites surveyed where groundwater contamination occurred, sixty-five percent were forced to abandon their use of the groundwater and replace it with costly piped water.[82]

The OTA now acknowledges that hazardous substances are leaching from a significant percentage of sanitary solid waste facilities, and concludes that household waste is a source of these hazardous substances.[83] It is unclear whether a contaminated underground aquifer can ever be restored to yield drinkable water.[84]

Today's solutions are destined to become tomorrow's crises. Even total compliance with RCRA's groundwater protection standards[85] does not alleviate the significant public health and environmental risks posed by landfilling MSW. First, both MSW and industrial landfill facilities leak; the EPA estimates that more than half of the 2,000 interim-status land disposal waste facilities are leaking and will require remediation.[86] Second, RCRA imposes no sanctions against permitted hazardous facilities provided the facilities are *designed* not to leak, although they may in fact be leaking with impunity.[87] Third, owners of RCRA-permitted facilities remain liable for only thirty years after the facility is closed.[88] The EPA has concluded that it is "inevitable" that landfills will eventually leak;[89] however, after thirty years they leak at public rather than private expense. Fourth, a number of substances trigger legal liability under the federal cleanup statute (CERCLA)[90] that are neither monitored nor regulated by the federal long-term waste management statute (RCRA).[91] Moreover, on a practical level hazardous chemicals could be leaking into the groundwater from RCRA-permitted MSW facilities without violating the RCRA permit in any way. However, their spill, leakage, or even threat of leakage would trigger CERCLA's remedial mechanisms and penalties.[92]

Stated another way, RCRA does not require the monitoring of these CERCLA "hazardous substances" because under RCRA they are not deemed "hazardous wastes."[93] Further, RCRA regulations specify groundwater contamination detection levels that are far more lenient, sometimes one thousand times more lenient, than comparable CERCLA groundwater detection standards.[94] Yet if any of these hazardous chemicals leaks in excess of the reportable

Management Said Inadequate for Key Policy Decisions, 17 Env't Rep. (BNA) 1784, 1784 (Feb. 20, 1987).

79. SUPERFUND STRATEGY, *supra* note 42, at 133.

80. *Id.* at 126. Only two percent of all hazardous waste is incinerated. SERIOUS REDUCTION, *supra* note 58, at 17.

81. BOARD ON OCEAN SCIENCE AND POLICY, COMM'N ON PHYSICAL SCIENCES, MATHEMATICS, AND RESOURCES, NAT'L RESEARCH COUNCIL, DISPOSAL OF INDUSTRIAL AND DOMESTIC WASTES 166 (1984).

82. N. NEELY, D. GILLESPIE, F. SCHAUF & J. WALSH, EPA REP. NO. 430-9-81-005, REMEDIAL ACTIONS AT HAZARDOUS WASTE SITES: SURVEY AND CASE STUDIES 6 (1981).

83. SUPERFUND STRATEGY, *supra* note 42, at 11 & n.3.

84. *Id.* at 13 n.5.

85. 42 U.S.C. § 6924 (Supp. IV 1986).

86. *See EPA to Require 60% of Land Disposal Facilities to Clean Up Groundwater*, 5 INSIDE EPA 3, 3 (Feb. 17, 1984). A 1977 EPA study estimated that the actual number of facilities leaking into the groundwater could be closer to 90%. OFFICE OF SOLID WASTE, EPA, REP. NO. 530-SW-634, THE PREVALENCE OF SUBSURFACE MIGRATION OF HAZARDOUS CHEMICAL SUBSTANCES AT SELECTED INDUSTRIAL WASTE LAND DISPOSAL SITES at appendix A (1977).

87. Although RCRA authorizes the promulgation of regulations establishing standards for the design and construction of hazardous waste facilities, 42 U.S.C. § 6924(a), the regulations enacted thereunder provide: "[A] landfill liner which has been designed not to leak does not violate the design standards if the liner fails at some future time." 47 Fed. Reg. 32,390 (1982). Federal regulations allow the facility to continue operating without fixing the leak, requiring only that the facility clean up any pollution that reaches the groundwater. *Id.* Unsaturated zone monitoring requirements are contained at 40 C.F.R. § 264.279 (1988).

88. 40 C.F.R. §§ 264.117, 265.117 (1988).

89. 46 Fed Reg. 11,126, 11,128 (1981).

90. 40 C.F.R. § 302.4 (1988).

91. 40 C.F.R. § 261.33 (1988). The most hazardous of these chemicals include carbofuran, chlorpyrifos, diazinon, dichlone, alpha-endosulfan, beta-endosulfan, endosulfan-sulfate, endrin aldehyde, guthion, mercaptodimethur, mevinphos, and naled. SUPERFUND STRATEGY, *supra* note 42, at 148.

92. *See infra* notes 195-218 and accompanying text for a discussion of CERCLA's remedial provisions.

93. SUPERFUND STRATEGY, *supra* note 42, at 148.

94. *Id.*

Using combined data, the OTA lists the following examples of hazardous chemicals with groundwater detection levels that are higher under RCRA than under CERCLA:

Pollutant	CERCLA detection levels (ng/l) + + +	RCRA detection levels (ng/l)
dieldrin	5	2,500 +
DDT	10	4,700 +
DDE	5	5,600 +
DDD	10	2,800 +
heptachlor	5	1,900 +
heptachlor epoxide	5	2,200 +
aldrin	5	1,900 +
antimony	20,000	32,000 + +
arsenic	10,000	53,000 + +
cadmium	1,000	4,000 + +
lead	5,000	42,000 + +
selenium	2,000	75,000 + +
thallium	10,000	40,000 + +

+ U.S. Environmental Protection Agency, *Test Methods for Evaluating Solid Waste Physical/Chemical Methods*, SW 846, 2d ed. (Washington, DC: Office of Solid Waste, EPA, 1982).

quantity under CERCLA,[95] CERCLA requires that the leak be reported, cleaned up, and disposed of by a RCRA-licensed hauler at a RCRA-licensed facility.[96]

This means that a number of MSW disposal facilities that presently comply with RCRA standards could eventually become Superfund sites subject to CERCLA.[97] Nationwide, there are more than 14,000 operating municipal and sanitary landfills, and about 42,000 closed municipal and sanitary landfills.[98] In addition, the OTA estimates that there are 75,000 operating and 150,000 closed industrial landfills, and 176,242 operating and 4,731 closed surface impoundments.[99] Of these 621,000 open and closed solid waste facilities, the OTA conservatively estimates that 17,400 to 34,800 MSW sites may eventually require cleanup under Superfund.[100] This estimate is eight to seventeen times larger than the EPA's projected 2,000-site NPL.[101] The problem is immense. The common law jurisprudence struggles to embrace the technical reality of a landfill crisis of national scope.

III. Playing the Numbers: Charles George Roulette

Nowhere is this phenomenon more dramatically illustrated than at the privately owned Charles George Landfill, now an EPA Superfund site. This large dumpsite is situated on approximately seventy acres, primarily in the town of Tyngsboro in northeastern Massachusetts.[102] Like many landfills and dumps, the Charles George Landfill is located on relatively low-lying swampy marsh, which is not well-suited for residential or commercial use. The landfilling of waste materials in these verdant areas readily allows

++ Lee M. Thomas, Assistant Administrator, U.S. Environmental Protection Agency, Memorandum to the Administrator proposing additional test methods for reference 17, Oct. 17, 1983.

+++ U.S. Environmental Protection Agency, "Statement of Work, Organics Analysis, Contract Laboratory Program" (Washington, DC: EPA, September 1983). U.S. Environmental Protection Agency, "Statement of Work, Inorganics Analysis, Contract Laboratory Program" (Washington, DC: EPA, May 1982).

Id.

95. 40 C.F.R. § 302.4 (1988). Many of the chemicals listed in note 91 are reportable to the EPA should even one pound leak. *Id.*

96. *See* SUPERFUND STRATEGY, *supra* note 42, at 148.

97. *See infra* notes 156-94 and accompanying text (discussing the Superfund and identification of cleanup sites).

98. SUPERFUND STRATEGY, *supra* note 42, at 134.

99. *Id.* at 134, 136.

100. *Id.* at 137. A study by JRB Associates conducted for the EPA estimates an even worse problem; however, this report has been suppressed under protective orders, without distribution, by the government.

101. *See id.*

102. EPA, SUPERFUND RECORD OF DECISION: CHARLES GEORGE, MA 1 (July 11, 1985) [hereinafter CHARLES GEORGE ROD]. Technically the site is owned by the Charles George Land Reclamation Trust. *Id.* It is located on approximately 60 acres in the southwest corner of Tyngsboro and on nine adjoining acres in Dunstable, Massachusetts. *Id.* The owner also purchased 45 acres of forest land as a buffer to the south, between the landfill and the Cannongate Condominiums. *Id.*

the percolation of liquid leachate into the water-course and water table.

About half of the existing site was opened in 1955 as a privately owned dump for the disposal and burning of Tyngsboro's municipal refuse, operating under contract with the town.[103] Mr. Charles George purchased the dumpsite in July 1967, and within thirty months acquired adjacent parcels which expanded the contiguous land area to seventy acres.[104] The site continued to operate as a municipal dump, and in 1973 the Commonwealth of Massachusetts issued a permit allowing it also to accept hazardous wastes.[105] In accordance with its annually renewed license, from January 1973 to about June 1976 the Charles George landfill accepted drummed and bulk liquid hazardous wastes and municipal refuse.[106] The EPA estimates that during this four-year period, the landfill accepted approximately 2,500 cubic yards of hazardous chemical wastes.[107]

In 1974, during the period of hazardous waste disposal, the town of Tyngsboro issued permits for development of the Cannongate Condominiums adjacent to the Charles George Landfill, and granted permission to the developers to sink water wells for the condominiums.[108]

In May 1977, after all disposal of hazardous wastes had ceased, the Tyngsboro Board of Health rescinded the permits and disal-

103. *Id.* at 3, app. A at A-1. This dump was limited to accepting municipal refuse for the town of Tyngsboro. Evidence exists that between 1955 and 1967, although supposedly authorized to operate on 30 acres, municipal waste disposal actually took place on 63.3 acres.

104. *Id.* app. A at A-1. Interestingly, this expansion of land area to the west was away from Flint Pond, bordering wetlands and the Merrimack River. Formal approval to use the entire 63.3 acres was provided by Tyngsboro on May 25, 1976, although no public hearing was held until Sept. 21, 1976, after the decision. *Id.* at A-3.

105. *Id.* at 3. Beginning in May 1973, Charles George submitted monthly operating reports, which detailed the landfill operations, to the Massachusetts Hazardous Waste Board, Division of Water Pollution Control. *See id.* app. A at A-1.

106. *Id.* at 3. The operator submitted to the commonwealth monthly hazardous waste operations reports through calendar year 1979. *Id.* app. A at A-2 to A-6.

107. *Id.* at 3. There are no precise records revealing where on the 70 acre site the hazardous wastes were disposed. There are, however, persuasive indications that the hazardous chemical wastes were buried in the western segment of the site. During the time the permit was in effect, the landfill was operated only on the westernmost 38 acres of the current site. *See id.* app. A at A-3. It is therefore suspected that the chemical waste was buried in this area. Aerial photographs of the Charles George Landfill taken in 1973 and 1976 indicate trenches at the site's western end that may have been used for landfilling chemical waste. ECOLOGY & ENV'T, INC., FIELD INVESTIGATION OF UNCONTROLLED HAZARDOUS WASTE SITES/FIT PROJECT 2-3 (1982) (hydrogeologic study of Charles George Landfill vicinity prepared for EPA) (copy on file at the *George Washington Law Review*).

108. These condominiums comprise 96 units located about 500 feet south of the landfill. Other single-family residences are also within a 500 foot radius of the site. All were originally supplied by private drinking water wells. CHARLES GEORGE ROD, *supra* note 102, at 1.

lowed any dumping at the landfill.[109] Nonetheless, landfill operations continued to accommodate Tyngsboro's refuse. To remedy repeated alleged violations of Massachusetts environmental statutes, Charles George entered into a consent decree with the commonwealth requiring George to provide for leachate control, thereby allowing the site to continue operating as a sanitary MSW landfill.[110] In May 1979, based on water samples, the Tyngsboro Board of Health revoked its existing permits for the ninety percent of the site that operated within town boundaries and ordered the dump to close immediately.[111] However, there was apparently no enforcement of this order and the site continued to operate as a refuse dump, accepting garbage from Tyngsboro.[112]

In December 1980, volatile organic compound contamination was discovered in the wells serving the Cannongate Condominiums, and later contamination was discovered in numerous groundwater monitoring wells.[113] In October 1981, during CERCLA's first year of operation, the Charles George Landfill was listed as an EPA Superfund site.[114] Yet the site still continued to operate as a solid waste refuse dump for Tyngsboro. In April 1982, based on continuing alleged violations, some dating back to 1976 when the first government inspections were conducted,[115] the Tyngsboro Board of Health unanimously suspended the Charles George Landfill license until the landfill could remedy the outstanding violations.[116]

The commonwealth closed the Cannongate Condominium drinking water wells in July 1982.[117] Private water supplies were provided to residents, first by Charles George and later by an aboveground extension of a municipal water system.[118]

The landfill finally ceased accepting municipal waste in June

109. *Id.* app. A at A-4 (meeting of May 7, 1977).

110. *Id.* at A-5 (discussing the Consent Judgment of March 30, 1978). The decree provided for implementation of leachate control measures and development of an approved engineering plan for operation of the landfill. *Id.* The plan was approved by the Massachusetts Department of Environmental Quality Engineering (DEQE) on June 22, 1978. *Id.* at A-6.

111. *See id.* A June 18, 1980 letter from the Massachusetts DEQE noted a host of environmental violations, including open burning of trash, improper control of surface water runoff, improper compacting of refuse, and failure to cover slopes of refuse with surface cover. *Id.* at A-7. The Department initiated legal action for failure to comply with the consent judgment. *Id.*

112. *See id.* at A-6. In June and July of 1980, active acceptance of refuse was terminated temporarily because of a fire at the site. *Id.* at A-7. In July, the bond required for the landfill expired. Despite these occurrences, the landfill reopened for operation in August 1980. *Id.* at A-7 to A-8.

113. *Id.* at A-8 to A-10.

114. *Id.* at A-10.

115. *See id.* at A-3.

116. *Id* at A-11.

117. *Id* at A-12 (citing DEQE order taking effect on July 31, 1982).

118. *Id.* at A-13. Water is currently supplied by an overland pipe connected to the North Chelmsford, Massachusetts Water District. *Id* at 3. The system is designed to serve 675 persons at an average consumption of 100 gallons per capita per day. Fay, Spofford & Thorndike, Inc., WATER SUPPLY ALTERNATIVE, CANNONGATE AREA, TYNGSBORO, MASSACHUSETTS part 2, at 6 (Oct. 1983) (study conducted by a consulting firm for EPA Region I) (copy on file at the *George Washington Law Review*).

1983.[119]

Hazardous leachate from the Charles George Landfill flows into a brook that feeds a marshy pond, which recharges the area aquifer and flows into the Merrimack River. The Merrimack River is the drinking water source for three downstream communities.[120] The landfill site exhibits exposed MSW on a mottled terrain of steep slopes and valleys; the lack of cover allows for precipitation and infiltration of surface waters and generates an estimated 36 million gallons of leachate annually.[121] An on-site leachate collection system often malfunctions.

The EPA estimates that more than 9,300 pounds of VOCs and more than 188,000 pounds of toxic heavy metals annually migrate off-site into neighboring groundwater.[122] This leachate contains heavy concentrations of organic contaminants, along with inorganic contaminants at levels in excess of EPA drinking water standards, including arsenic, iron, aluminum, and manganese.[123] Additionally, gas venting from the landfill emits a wide range of VOCs, including known human carcinogens such as vinyl chloride and benzene.[124]

The EPA is pursuing site remediation that encompasses capping and grading of the site,[125] surface water collection and diversion,[126] venting of gas,[127] collection of leachate, and removal of remaining

119. CHARLES GEORGE ROD, *supra* note 102, at 4.

120. *Id.* at 2. Within the immediate site vicinity are several surface water resources that are affected by contamination at the site: Dunstable Brook, Bridge Meadow Brook, and Flint Pond. Sampling data of Dunstable Brook, west of the site, indicates the presence of contaminants from the landfill. Dunstable Brook flows in a southerly direction before flowing into Bridge Meadow Brook, which discharges into Flint Pond Marsh, which in turn supplies Flint Pond. Flint Pond is a shallow pond immediately east of the landfill. The total flow distance from the confines of Bridge Meadow Brook and Dunstable Brook to the tail water of Flint Pond is about two-thirds of a mile. Sample results indicate contamination of the marsh, which is the headwater for Flint Pond proper. Flint Pond is used for recreational purposes, such as fishing, boating, and swimming. Moreover, there are 16 residences along the northern shore that use shallow wells next to the pond as their drinking water supply. The outlet of the pond discharges into the Merrimack River, further east of the site, which is the drinking water source for the downstream communities of Lowell, Lawrence, and Methuen. *See generally id.* at 1-2 (describing the landfill location and nearby water sources).

121. *Id* at 4-5.

122. *Id* at 5.

123. *See id* at Table 1 (Summary of Leachate Contaminants, Charles George Site). Organic contaminants include vinyl chloride, methylene chloride; acetone; 1,1-dichloroethane; trans-1,2-dichloroethane, 2-butanone, 4-methyl, 2-pentanone; toluene; ethyl benzene; phenol; 4-methylphenol, and benzoic acid

124 *Id* at 12

125 *Id*

126 *Id* The site employs a surface water collection system to gather precipitation not absorbed by the roots of the vegetative cover, and the system will divert surface water to off-site locations *Id*

127 *Id* at 12-13 The gas venting system collects gas that builds up under the impermeable membrane and vents it either into the atmosphere or into a collection system. *Id*

solid waste dumpsters.[128] Faced with several options, the EPA elected to cap the entire site with an expensive, untried, synthetic membrane,[129] which the EPA estimates will cost $12 million.[130] The cost of the other remediation measures is estimated to be almost $2 million, plus about $70,000 annually in operation and maintenance expenses.[131] The potentially responsible parties at this site estimate that the cost of remediation will approach $30 million.[132]

The EPA identified more than thirty potentially responsible parties (PRPs) who allegedly generated the 2,500 cubic yards of hazardous industrial waste disposed at the landfill between January 1973 and July 1975.[133] The EPA demanded that these private PRPs pay the entire cost of site remediation, provide alternative water supplies, and cover the cost of putting a synthetic cap over the entire seventy-acre site. The PRPs raised a number of engineering and economic objections to the EPA's decision to require the PRPs to put an untried synthetic membrane over the entire site, and also raised legal, factual, and equitable objections to the EPA's assignment of liability.[134]

In their factual objections the PRPs pointed out that only 0.06% of the volume of waste at Charles George qualifies as privately contributed hazardous industrial waste;[135] 99.9% of the volume is MSW generated primarily by Tyngsboro or other communities. The EPA has not allowed the PRPs to isolate the geographic region in which the hazardous wastes were likely buried,[136] but rather has proceeded with remediation. In addition, the EPA has failed to name as defendants the Town of Tyngsboro or any other contributors of MSW or commercial refuse.[137] Confronted with lone responsibility as a consequence of contributing less than 0.1% of the gross volume of waste, the PRPs have refused to settle with the EPA, pointing out

128. *Id.* at 13. The leachate collection system employs a peripheral slotted pipe which collects leachate and transports it to two collection dumps, where it is trucked offsite to a licensed treatment facility. *Id.*

129. *Id.* at 17-19. The high-density polyethylene membrane cap, proposed for use in lieu of clay or soil, could tear when the landfill differentially settles over time. *See* SOURCE — ORIENTED FEASIBILITY STUDY: EXECUTIVE SUMMARY 18-19 (Mar. 1985) [hereinafter FEASIBILITY STUDY] (evaluating remedial actions for the Charles George Landfill) (copy on file at the *George Washington Law Review*). Repairing breaches in a synthetic membrane could pose significant problems.

130. CHARLES GEORGE ROD, *supra* note 102, at 22. In making its decision the EPA must weigh cost, environmental impact, and acceptable engineering practices. 40 C.F.R. § 300.68(h)(1)-(3) (1988). There is virtually no historical experience with synthetic membranes used on landfills on this scale. FEASIBILITY STUDY, *supra* note 129, at 19.

131. *See* CHARLES GEORGE ROD, *supra* note 102, at 21-22 (tables tabulating costs for annual operation and capital costs of recommended alternatives). The closure of the facility must comply with regulatory requirements for closure and post-closure. 40 C.F.R. § 264 (1988).

132. *See* Ferrey, *Toxic Shell Game*, 9 AMICUS J. 7, 9 (1987).

133. Letter of Charles George site PRPs to Jamie Katz, Office of the Regional Counsel, EPA, Region I, 1-2 (Apr. 28 1986) (draft) [hereinafter Katz Letter] (copy on file at the *George Washington Law Review*).

134. *Id.* at 2-7.

135. *Id.* at 2.

136. *See supra* note 107 (setting forth evidence of the hazardous waste burial site).

137. *See* Katz Letter, *supra* note 133, at 5, 7 (urging the EPA to pursue public entity solid waste generators for remediation costs).

that waste disposal at Charles George was always subject to state licensed permission and supervision.[138] Although no court has yet directly confronted the issue, there is reason to believe that if this issue proceeds to trial, the outcome may be contrary to EPA's position.

If MSW were a hazardous substance, the court would be required to apportion the cleanup share equitably between the public (municipalities) and private concerns.[139] Assuming that household waste is 0.1% hazardous by volume,[140] the hazardous component of the four million cubic yards of MSW at Charles George would net about 4,000 cubic yards, almost twice the volume of hazardous industrial waste contributed by the private PRPs. A sixty-forty MSW-private waste split of a possible $30 million cleanup responsibility at the Charles George site would still impose a significant economic burden on the more than thirty private PRPs, and would cripple Tyngsboro or even a combination of municipalities.

The Charles George case presents a graphic illustration of the real-world implications of the debate over MSW liability. At stake in this numbers game are millions of dollars of liability at thousands of sites across the nation. More fundamentally, whether public treasuries from Texas to Tyngsboro will be opened to clean up the nation's hazardous waste in a game of toxic roulette is also at stake.

IV. Absorbing Toxic Shock: The Legal Fabric

A. RCRA and CERCLA

The basic legal guidelines for regulating hazardous waste sites are embodied in two federal statutes: the Resource Conservation and Recovery Act of 1976 (RCRA)[141] and the Comprehensive Environmental, Response, Compensation and Liability Act of 1980 (CERCLA), commonly known as the "Superfund."[142] While RCRA regulates the handling of solid and hazardous waste from its generation to final disposal,[143] CERCLA authorizes the government to impose and allocate the costs incurred for the cleanup of designated hazardous sites.[144]

Most RCRA waste management regulations apply solely to pres-

138. *See* Ferrey, *supra* note 132, at 9.

139. Although legal liability at Superfund sites is joint, several, and strict, principles of equitable contribution also apply. *See infra* text accompanying notes 352-62.

140. *See supra* text accompanying notes 55-56.

141. Pub. L. No. 94-580, § 2, 90 Stat. 2795 (1976) (codified as amended at 42 U.S.C. §§ 6901-6987 (1982 & Supp. IV 1986)).

142. Pub. L. No. 96-510, 94 Stat. 2767 (1980) (codified as amended at 42 U.S.C. §§ 9601-9657 (1982 & Supp. IV 1986)).

143. *See* 42 U.S.C. §§ 6921-6934 (1982 & Supp. IV 1986).

144. *Id.* §§ 9601-9607.

ent and future disposal activities, and not to prior waste disposal activities at inactive sites that cause current problems.[145] However, RCRA section 7003, as amended in 1984,[146] allows the EPA to seek restitution for all cleanup response costs incurred to remedy current imminent hazards due to "past or present" activities.[147] Therefore, recent court decisions hold that RCRA may apply to inactive sites when current releases constitute a present danger.[148]

CERCLA was enacted in response to increasing concern over the problems of hazardous waste disposal.[149] CERCLA supplements RCRA by giving the government a means to take action against current problems created by past improper disposal practices.[150] CERCLA section 104[151] authorizes a government response when those responsible for a hazardous waste site are unavailable or the site is abandoned.[152] CERCLA section 107[153] allows the EPA to recover response costs for the cleanup of hazardous waste disposal which occurred at any time.[154] As one court has explained:

> There can be little doubt that [CERCLA] sections 104 and 107(a) were intended to apply retroactively. A brief review of the case law and legislative history clearly supports this proposition. It was the precise inadequacies resulting from RCRA's lack of applicability to inactive and abandoned hazardous waste disposal sites that prompted the passage of CERCLA.[155]

145. *E.g.*, United States v. Waste Indus., 556 F. Supp. 1301, 1307 (E.D.N.C. 1982) (holding that RCRA is not applicable to inactive or abandoned sites); Comment, *Private Response-Cost Recovery Actions Under CERCLA*, 34 U. KAN. L. REV. 109, 110 & n.11 (1985); *see also* Note, *The Role of Injunctive Relief and Settlements in Superfund Enforcement*, 68 CORNELL L. REV. 706, 709 (1983) (stating that RCRA does not provide a comprehensive solution to the hazardous waste problem because it does not address past dumping practices nor mandate cleanup of present dangerous waste sites).

146. 42 U.S.C. § 6973 (1982 & Supp. IV 1986).

147. *Id.*; *see also* United States v. Northeastern Pharmaceutical & Chem. Co. (*NEPACCO II*), 810 F.2d 726, 739-40 (8th Cir. 1986) (concluding that the 1984 legislative amendments make clear that Congress intended RCRA § 7003(a) "to apply to present conditions resulting from past activities"), *cert. denied*, 108 S. Ct. 146 (1987); United States v. Conservation Chem. Co., 619 F. Supp. 162, 217 (W.D. Mo. 1985) (stating that the 1984 amendments to RCRA "clear up any lingering doubts . . . by amending the language of Section 7003 to explicitly apply to past, non-negligent off-site generators").

148. *E.g.*, *NEPACCO II*, 810 F.2d at 741; United States v. Ottati & Goss, Inc., 630 F. Supp. 1361, 1389-1400 (D.N.H. 1985); United States v. Price, 523 F. Supp. 1055, 1072 (D.N.J. 1981), *aff'd*, 688 F.2d 204 (3d Cir. 1983); United States v. Solvents Recovery Serv., 496 F. Supp. 1127, 1140 (D. Conn. 1980).

149. McChesney, *EPA Proposes Court-Ordered Contingency Plan Revisions Under "Superfund"; Stresses "Flexible" Cleanup Standards*, 12 Envtl. L. Rep. (Envtl. L. Inst.) 10,040, 10,040 (1982) (citing Comment, *Superfund at Square One: Promising Statutory Framework Requires Forceful EPA Implementation*, 11 Envtl. L. Rep. (Envtl. L. Inst.) 10,101 (1981)).

150. *See* H.R. REP. No. 1016 (pt. I), 96th Cong., 2d Sess. 1, 17, *reprinted in* 1980 U.S. CODE CONG. & ADMIN. NEWS 6119, 6120; Grad, *A Legislative History of the Comprehensive Environmental Response, Compensation and Liability ("Superfund") Act of 1980*, 8 COLUM. J. ENVTL. L. 1, 2 (1982). Discussing the need for CERCLA, the House Report noted that "a major new source of environmental concern has surfaced: the tragic consequences of improperly, negligently, and recklessly hazardous waste disposal practices known as the 'inactive hazardous waste site problem.'" H.R. REP. No. 1016, at 17, *reprinted in* 1980 U.S. CODE CONG. & ADMIN. NEWS at 6120.

151. 42 U.S.C. § 9604 (1982 & Supp. IV 1986).

152. *See id.*; Comment, *supra* note 145, at 110.

153. 42 U.S.C. § 9607 (1982 & Supp. IV 1986).

154. *Id.*

1. The Superfund

CERCLA established the Hazardous Substance Response Trust Fund, commonly known as the "Superfund."[156] The Superfund is used to pay for governmental response to actual and threatened releases of hazardous substances, necessary response costs incurred by any other person, and natural resource damage claims.[157] Under section 104 the government may use the Superfund whenever (1) any hazardous substance is released or there is a substantial threat of release; or (2) there is a release or substantial threat of release of any "pollutant or contaminant" that may present an imminent and substantial danger to the public health or welfare.[158] If the President determines, however, "that such [remedial] action will be done properly and promptly by the owner or operator of the facility" from which the release or threat of release emanates, or by any other responsible party, he may allow such party to carry out the action.[159]

Revenues for the original $1.6 billion trust fund were derived from sales taxes on chemical corporations, although one eighth of the Superfund's financing came from general appropriations.[160] With the passage of the Superfund Amendments and Reauthorization Act of 1986 (SARA),[161] Congress provided an $8.5 billion five-year reauthorization for the Superfund, and also expanded the

155. United States v. Northeastern Pharmaceutical & Chem. Co. (*NEPACCO I*), 579 F. Supp. 823, 839 (W.D. Mo. 1984) (applying CERCLA to past generators and transporters), *aff'd in relevant part, rev'd in part*, 810 F.2d 726 (8th Cir. 1986), *cert. denied*, 108 S. Ct. 146 (1987); *see also* Ohio *ex rel.* Brown v. Georgeoff, 562 F. Supp. 1300, 1314 (N.D. Ohio 1983) (applying CERCLA to past transporters); Jones v. Inmont Corp., 584 F. Supp. 1425, 1428 (S.D. Ohio 1984) (holding that CERCLA imposes liability on past generators of hazardous waste); *cf.* United States v. Northeastern Pharmaceutical & Chem. Co. (*NEPACCO II*), 810 F.2d 726, 749 (8th Cir. 1986) (holding that response costs incurred prior to CERCLA's enactment are also recoverable), *cert. denied*, 108 S. Ct. 146 (1987); United States v. Wade, 14 Envtl. L. Rep. (Envtl. L. Inst.) 20,437 (E.D. Pa. Mar. 22, 1984) (holding that CERCLA imposes liability for response costs incurred before promulgation of the National Contingency Plan (NCP), but not prior to CERCLA's enactment).

156. 42 U.S.C. § 9631(a) (1982), *repealed by* Superfund Amendments and Reauthorization Act of 1986 (SARA), Title V, § 517(c)(1), 100 Stat. 1613, 1774. For a discussion of SARA's implications for the Superfund, see *infra* notes 161-62 and accompanying text.

157. *See* 42 U.S.C. § 9611 (1982 & Supp. IV 1986). The Superfund is not used for natural resource damage claims in any year when the Superfund is needed to respond to public health threats. *See id.* § 9611(c) (Supp. IV 1986).

158. *Id.* § 9604(a)(1).

159. *Id.*

160. ALI-ABA COURSE OF STUDY, HAZARDOUS WASTES, SUPERFUND, AND TOXIC SUBSTANCES 31-32 (1983); Comment, *supra* note 145, at 114.

161. Pub. L. No. 99-499, 100 Stat. 1613 (codified as amended in scattered sections of 42 U.S.C. and the I.R.C.).

Superfund's tax base.[162] The Superfund enables the EPA, when necessary, to respond quickly to a hazardous waste release.[163] The government then acquires the right, subject to a lien on the affected property, to seek reimbursement from PRPs for costs incurred for cleanup, oversight, administration, legal removal, and resource restoration.[164] The reimbursed money is used to replenish the Superfund.[165]

Before the EPA is allowed to spend Superfund monies for remedial action, certain conditions must be met. First, the site must be included on the National Priority List (NPL).[166] Operating under the National Contingency Plan (NCP), the NPL lists facilities that are priorities for remedial action and, as much as practicable, for removal action.[167]

Second, the affected state must enter into a cooperative agreement to pay at least ten percent of the costs of the remedial action.[168] However, if the site is owned and operated by the state or one of its political subdivisions or contractors, the state or subdivision must pay at least fifty percent of the response costs, or a greater amount as the President deems appropriate considering the degree of state or subdivision responsibility for the release.[169] In addition,

162. SARA § 111, 42 U.S.C. § 9611 (Supp. IV 1986). The new tax is composed of a $2.75 billion petroleum excise tax, *id.* § 512, I.R.C. § 4611; a $1.4 billion excise tax on feedstock chemicals, *id.* § 515, I.R.C. §§ 4661-4662; a $57 million tax on imported chemical derivatives, *id.* § 515, I.R.C. §§ 4671-4672; a new $2.5 billion environmental tax on corporate alternative minimum taxable income, *id.* § 516, I.R.C. § 59A; $1.25 billion from general revenues, *id.* § 517, I.R.C. § 9507; plus a special $500 million tax on gasoline and motor fuels to fund correction of leaking underground storage tanks, *id.* §§ 521-522, I.R.C. §§ 4081, 9508. *See generally* H.R. CONF. REP. No. 962, 99th Cong., 2d Sess. 344 (containing a table of estimated revenues from the 1986 Superfund Amendments for fiscal years 1987-1992), *reprinted in* 1986 U.S. CODE CONG. & ADMIN. NEWS 3276, 3437.

163. CERCLA does not authorize governmental response to releases from consumer products. ALI-ABA COURSE OF STUDY, HAZARDOUS WASTES, SUPERFUND, AND TOXIC SUBSTANCES 6 (1982) [hereinafter 1982 ALI-ABA COURSE OF STUDY].

164. 42 U.S.C. §§ 9607(l)-(m), 9612(c)(1)-(3) (1982 & Supp. IV 1986). This lien is subordinate to preexisting liens perfected before notice or filing of the government lien. *Id.* § 9607(l) (Supp. IV 1986).

165. *Id.* § 9612(c)(3) (1982).

166. 40 C.F.R. § 300.66(c)(2) (1988); *see also id.* pt. 300, app. B (listing sites included on the NPL); McChesney, *supra* note 149, at 10,042 (citing 47 Fed. Reg. 10,992 (1982) (codified at 40 C.F.R. § 300.67(a) (1988))).

167. 42 U.S.C. § 9605(a)(8)(A) (Supp. IV 1986). The states are primarily responsible for deciding which releases are priorities. Upon submission of these priority lists to the EPA, the EPA consolidates them into the NPL. At least one site from each state will, as far as practicable, be ranked in the top 100. *Id.* § 9605(a)(8)(B). The criteria for determining priority are based on

> [the] relative risk or danger to public health or welfare or the environment . . . taking into account to the extent possible the population at risk, the hazard potential of the hazardous substances at such facilities, the potential for contamination of drinking water supplies, the potential for direct human contact, the potential for destruction of sensitive ecosystems . . . State preparedness to assume State costs and responsibilities, and other appropriate factors.

Id. § 9605(a)(8)(A).

168. *Id.* § 9604(c)(3)(C)(i).

169. *Id.* § 9604(c)(3)(C)(ii). As a practical matter, the EPA demands no more than the applicable 10% or 50% share. If a federal facility is responsible for the release of hazardous waste, however, Superfund monies may not be used for remedial action. 1982 ALI-ABA COURSE OF STUDY, *supra* note 163, at 11.

170. 42 U.S.C. § 9604(c)(3)(A)-(B) (Supp. IV 1986). The federal government is increasingly categorizing more expenses as "remedial" rather than "maintenance" to alleviate any cash burden on states.

171. *See* 42 U.S.C. § 9605 (Supp. IV 1986); Exec. Order No. 12,580, 3 C.F.R. 193 (1987) (delegating responsibility for revision of the NCP and other duties under § 9605 to the EPA), *reprinted in* 42 U.S.C. § 9615 app. note at 1054 (Supp. IV 1986).

172. *See* OFFICE OF EMERGENCY & REMEDIAL RESPONSE, EPA, THE EFFECTIVENESS OF THE SUPERFUND PROGRAM: CERCLA SECTION 301(a)(1)(A) STUDY 1-5, 1-8 (1984) (Final Report). As of 1984, 10,700 sites had preliminary assessments completed; 3,600 sites had inspection completed; and 1,700 sites were scored for NPL ranking. *Id.* at E-3.

About five percent of the CERCLIS sites are placed on the NPL and become eligible for cleanup. *See id.* at 1-13 (stating that as of 1984, 538 sites from CERCLIS's inventory of 10,700 were listed on the NPL). The CERCLIS inventory, as of February 1989 containing slightly over 30,000 sites, continues to grow as new sites are investigated. Telephone Inquiry to CERCLIS Hotline (Feb. 10, 1989).

CERCLIS, originally known as the Emergency and Remedial Response Information System (ERRIS), is an information tracking system for potentially hazardous sites. There is no formal publication of this tracking system. One may gain access to CERCLIS data either by contacting the EPA headquarters or regional offices, or by calling the CERCLIS hotline at (202) 252-0056.

173. By the end of fiscal year 1982, the EPA had initiated only 54 remedial investigations and feasibility studies (RI/FSs); by the end of fiscal year 1984, a total of 315 RI/FSs were begun, of which over 82% had been initiated since the beginning of fiscal year 1983. OFFICE OF EMERGENCY & REMEDIAL RESPONSE, EPA, *supra* note 172, at 1-27 & Exhibit 1-5 (Superfund Program: Remedial Investigation and Feasibility Studies). In fiscal year 1982, EPA initiated 57 removal actions; in fiscal year 1984, 204 were initiated. *Id.* at 2-22 (Exhibit 2-5. Superfund Removals Initiated by Fiscal Years). By the end of fiscal year 1984, the Superfund financed remedial design activities at 34 sites and remedial construction at 29 sites. In addition, PRPs initiated remedial design and construction at 22 sites. *Id.* at 1-32 to 1-33.

174. SARA § 116, 42 U.S.C. § 9616 (Supp. IV 1986). It is expected that the President will add 1,600-2,000 sites to the NPL by 1988. H.R. CONF. REP. No. 962, 99th Cong., 2d Sess. 229 (1986). Within 36 months of SARA's October 1986 passage, 275 RI/FSs are to be commenced. 42 U.S.C. § 9616(d) (Supp. IV 1986). Within 36 months the President is also directed to begin remediation at an additional 175 sites; within 24

the state must assume all future site maintenance costs and must provide a proper hazardous waste disposal facility in-state to receive any transported hazardous substances.[170]

2. *EPA Administration*

The EPA is charged with assessing all potential hazardous waste sites for remedial action.[171] The EPA performs a preliminary assessment off-site to determine general priorities among sites, and the information is filed in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), an EPA inventory of hazardous waste sites.[172] Although the EPA's pace has accelerated, the Superfund program has been slow to initiate and complete remedial actions,[173] even though the recent Superfund amendments impose stringent time schedules.[174]

The EPA employs a Hazard Ranking System (HRS) to score the

potential risk presented by various sites to determine which qualify for priority ranking on the NPL.[175] This score assigns to each site a relative numerical value, based on the risk posed by hazardous substances and the imminence of that risk.[176] Only when a site is placed on the NPL by virtue of a high HRS score is it eligible for EPA remedial action.[177]

Although the NCP provides extensive guidance for selecting an appropriate remedial action plan, it does not dictate how clean a site must become to satisfy Superfund criteria.[178] The 1986 Superfund Amendments, for the first time, mandate that the extent of cleanup must meet or exceed the standards applicable to other federal public health and environmental statutes.[179] If material is removed for disposal off-site, the material must be handled and contained in a manner consistent with RCRA;[180] containment on-site must comply with the Clean Air Act,[181] the Clean Water Act,[182] and the Safe

months after this, the President is expected to commence on-site remediation at 200 additional sites. *Id.* § 9616(e).

175. OFFICE OF EMERGENCY & REMEDIAL RESPONSE, EPA, *supra* note 172, at 1-11 to 1-12. The 1986 Superfund amendments require the President, within 24 months, to promulgate new hazardous ranking system (HRS) procedures proposed by the EPA. 42 U.S.C. § 9605 (Supp. IV 1986). The proposed revision of HRS is presented at 52 Fed. Reg. 11,513 (1987). The HRS must adequately evaluate toxicity, quantity, and concentration of wastes under the 1986 Amendments. *Id.*

176. An HRS score of 28.5, which reflects a combined value of three categories of ranking for ground water, surface water, and air threat, is sufficient to place a site on the NPL in its rank order. If a leaking site is close to surface water, buildings, or populations, its HRS score is increased. These criteria are proxies, if inexact proxies, for the threat posed to human health and the environment. *See* OFFICE OF EMERGENCY & REMEDIAL RESPONSE, EPA, *supra* note 172, at 1-11 to 1-13 & n.5; *see also* 42 U.S.C. § 9605(c) (Supp. IV 1986) (establishing the hazard ranking system to assess the relative degree of risk posed by sites under review).

177. Office of Emergency & Remedial Response, EPA, *supra* note 172, at 1-16.

178. When a site is placed on the NPL, the EPA may have only a rudimentary data base about the nature of the problem presented by the site. The EPA will also have done little or no work in determining which type of cleanup actions may be appropriate at the site. This knowledge base is acquired during the Remedial Investigation, which may well follow after the site is designated an NPL site. *See generally* 40 C.F.R. § 300.68(d) (1988) (requiring a Remedial Investigation/Feasibility Study (RI/FS) to gather sufficient information to determine the nature of the threat and the extent of necessary remedial action); *infra* notes 184-86 and accompanying text (discussing the RI/FS procedures).

179. SARA § 121, 42 U.S.C. § 9621(d) (Supp. IV 1986). The Superfund Amendments direct the President to ensure compliance with the Safe Drinking Water Act, Pub L. No. 93-527, 88 Stat. 1660 (1974) (codified as amended predominantly in scattered sections of 42 U.S.C.), and the Clean Water Act, 33 U.S.C.A. §§ 1251-1387 (West 1986 & Supp. 1988). *See* SARA § 121, 42 U.S.C. § 9621(d) (Supp. IV 1986).

180. *See* SARA § 121, 42 U.S.C. § 9621(d)(3) (Supp. IV 1986); *see also infra* text accompanying notes 384-404 (outlining RCRA's provisions).

181. 42 U.S.C. §§ 7401-7642 (1982 & Supp. IV 1986). This Act regulates only a few of the scores of chemicals present at Superfund sites. The Act regulates only chemicals that, via the medium of air, pose a risk through inhalation. *See also* SARA § 121, 42 U.S.C. § 9621(d)(2) (Supp. IV 1986) (providing that hazardous substances remaining onsite must meet the standards of the Clean Air Act).

182. 33 U.S.C.A. §§ 1251-1387 (West 1986 & Supp. 1988). This Act regulates only chemicals present in surface water. However, leaking hazardous waste landfills pose an additional risk to groundwater. *See* SARA § 121, 42 U.S.C. § 9621(d) (Supp. IV 1986) (providing that remedial action must meet the water quality criteria of the Clean Water Act).

Drinking Water Act.[183] Although each of these federal statutes provides specific standards, each affects only one medium and route of exposure to hazardous constituents; there is no comprehensive multi-media regulation.

The EPA conducts a Remedial Investigation/Feasibility Study (RI/FS) for each site.[184] The RI/FS consists of two studies: the first characterizes environmental conditions at the site;[185] the second details a series of engineering alternatives for site remediation.[186] Based on alternatives developed in the RI/FS, the EPA must select an appropriate cleanup option after considering cost, technology, reliability, and their relevant effects on public health.[187] This determination is set forth in the EPA Record of Decision (ROD).[188] If PRPs negotiate a voluntary cleanup with the EPA, they can conduct and control much of the work which would otherwise be undertaken by the EPA.[189] There can be significant cost-savings to PRPs who voluntarily assume the cleanup responsibility.[190]

Under CERCLA section 104, as amended by SARA, remedial or removal actions are not required if the President determines that such actions will be done properly by any "responsible" party.[191] Furthermore, in the absence of state cost-sharing, the EPA must cease its response action after either $2 million has been spent or twelve months have passed since the response was initiated.[192]

183. Pub. L. No. 93-527, 88 Stat. 1660 (1974) (codified as amended predominantly in scattered sections of 42 U.S.C.). This Act sets standards only for drinking water supplies, which are not always affected at Superfund sites, and then only for compounds that cause significant risk to human health through a pathway of ingestion. The health advisories issued under the Act consider short-term impacts, and do not consider long-term carcinogenic results. The 1986 Superfund Amendments take special cognizance of protecting drinking water supplies. *See* SARA §§ 118, 121, 42 U.S.C. §§ 9618, 9621 (Supp. IV 1986).

184. 40 C.F.R. § 300.68(d) (1988).

185. The Remedial Investigation indentifies the source and extent of contamination and pathways of possible migration or release into the environment. It also identifies the potential environmental or human risks. *Id.*

186. The Feasibility Study details alternatives for cleanup, with estimates of costs and environmental impact. *Id.*

187. *Id.* § 300.68(i).

188. The ROD selects an alternative and then subjects it to public comment before finalizing the choice. *Id.* § 300.67(d).

189. *See* 42 U.S.C. §§ 9604, 9622 (Supp. IV 1986); 50 Fed. Reg. 5034-44 (Feb. 5, 1985); Stoll & Graham, *Need for Changes in EPA's Settlement Policy*, 1 NAT. RESOURCES & ENV'T 7, 7 (1985).

190. According to a September 1986 report by the EPA Inspector General, the EPA experiences serious cost-control problems when it oversees remediation. *Current Developments*, 18 Env't Rep. (BNA) 4, 4-5 (May 1, 1987); *see also* Anderson, *Negotiation and Informal Agency Action: The Case of Superfund*, 1985 DUKE L.J. 261, 301-02 (noting that cleanup costs incurred by EPA might average 30-40% more than those incurred by PRPs).

191. 42 U.S.C. § 9604(a)(1) (Supp. IV 1986)

192. SARA § 104(c), 42 U.S.C. § 9604(c)(1) (Supp. IV 1986) (doubling the dollar amount and time for response that existed in CERCLA as originally enacted).

However, these limits are extended if the EPA determines that "(i) continued response actions are immediately required to prevent, limit, or mitigate an emergency, (ii) there is an immediate risk to public health or welfare or the environment, and (iii) such assistance will not otherwise be provided on a timely basis."[193] In addition, section 104 empowers the EPA to investigate and demand any information needed to determine the extent of the problem.[194]

B. *CERCLA's Legal Tools*

CERCLA's legal mechanisms are activated when there is a release[195] or threatened release of a hazardous substance[196] from a waste facility, which causes the "incurrence of response costs."[197] Persons in charge of a facility must notify the National Response Center (NRC) as soon as they are aware of any hazardous substance release that equals or exceeds the reportable quantity established for that substance under CERCLA section 103.[198] The NRC need not be notified if such release is a federally permitted release,[199] although state and federal permits may require the reporting of certain releases to the NRC.[200] A fine in accordance with U.S. Code title 18 or imprisonment for up to three years (or up to five years for a second or subsequent conviction) is imposed for failure to provide

193. *Id.*.

194. *Id.* § 9604(e)(2). PRPs are required to respond to information requests from the EPA. *Id.*; *see also* United States v. Charles George Trucking Co., 624 F. Supp. 1185, 1187-88 (D. Mass. 1986) (discussing the permissible scope of information requests under 42 U.S.C. § 9604(e)(2)).

195. CERCLA defines "release" as "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment." 42 U.S.C. § 9601(22) (Supp. IV 1986).

196. Hazardous substances are broadly defined to include those chemicals listed as hazardous under provisions other environmental statutes, namely: RCRA, 42 U.S.C. § 6903(5), 6921 (1982); the Clean Water Act; 33 U.S.C. § 1321 (b)(2)(A) (1982); the Clean Air Act, 42 U.S.C. § 7412(a)(1) (1982); the Toxic Substances Control Act, 15 U.S.C. § 2602(2)(A), (9) (1982); and CERCLA, 42 U.S.C. § 9601(14) (Supp. IV 1986). The EPA may designate as hazardous additional substances if their release "may present substantial danger to the public health or welfare or the environment." *Id.* § 9602(a).

197. 42 U.S.C. § 9607(a)(4) (Supp. IV 1986). The term "facility" includes:

> (A) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, or aircraft, or (B) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any vessel.

Id. § 9601(9); *see also infra* note 223 (discussing the broad construction of the term "facility").

198. 42 U.S.C. § 9603(a) (1982); *see* 40 C.F.R. § 302.6 (1988); 50 Fed. Reg. 13,456, 13,456-65 (1985). Final regulations for all reportable quantities must be published by April 30, 1988. SARA § 102, 42 U.S.C. § 9602 (Supp. IV 1986).

199. *See* 40 C.F.R. § 302.6 (1988); 50 Fed. Reg. at 13,456-65; *see also* 42 U.S.C. § 9601(10) (Supp. IV 1986) (defining "federally permitted release").

200. For example, discharge permits issued pursuant to the Clean Air Act, 42 U.S.C. §§ 7401-7642 (1982 & Supp. IV 1986), or the Clean Water Act, 33 U.S.C.A. §§ 1251-1387 (West 1986 & Supp. 1988), can require the reporting of releases in excess of those allowed by the permit.

timely notice.[201]

CERCLA endows the EPA with two primary tools for responding to the release or threatened release of a hazardous substance. The EPA may either (1) commence a response action under section 104,[202] or (2) initiate an enforcement action under section 106.[203]

1. *EPA Response Actions: Section 104*

Under section 104 the EPA is authorized to take direct actions, consistent with the NCP, to abate the pollution from a release or substantial threatened release of a hazardous substance,[204] or from a release or substantial threatened release of any "pollutant or contaminant."[205] Before the government may initiate a response action, however, there must exist an imminent and substantial threat to the public health or welfare.[206] If a responsible party is later found, both the federal and state governments, or any other person incurring cleanup costs consistent with the NCP, may seek reimbursement under section 107.[207]

The EPA is given broad authority under section 104.[208] The EPA may take short-term removal action[209] to stop the immediate threat

201. 42 U.S.C. § 9603(b) (1982 & Supp. IV 1986); *see also* SARA § 109(c), 42 U.S.C. § 9609 (Supp. IV 1986) (authorizing various civil penalties and awards).

202. 42 U.S.C. § 9604 (Supp. IV 1986). "'[R]esponse' means remove, removal, remedy, and remedial action." *Id.* § 9601(25). For the definition of "removal action," see *infra* note 209.

203. *Id* § 9606. *See generally CERCLA 1985: A Litigation Update*, 15 Envtl. L. Rep. (Envtl. L. Inst.) 10,395, 10,396 (1985) [hereinafter *CERCLA 1985*] (describing the injunctive relief available under CERCLA section 106 and the penalties for noncompliance).

204. 42 U.S.C. § 9604(a)(1) (Supp. IV 1986). The 1986 Superfund amendments clarify that "release" includes "the abandonment or discarding of barrels, containers, and other closed receptacles containing any hazardous substance or pollutant or contaminant." SARA § 101(22), 42 U.S.C. § 9601(22) (Supp. IV 1986).

205. 42 U.S.C. § 9604(a)(1) (Supp. IV 1986). The term "pollutant or contaminant" includes, but is not limited to:

> any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring; except that the term "pollutant or contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under [section 9601(14)(A)-(F)] and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

Id § 9601(33).

206. *Id* § 9604(a)(1).

207. *Id* § 9607(a).

208. *See CERCLA 1985*, *supra* note 203, at 10,397-98.

209. Removal actions are defined as:

posed by the release,[210] long-term remedial action to remedy the entire environmental contamination,[211] or a combination of both. These long- and short-term cleanup measures, however, must comport with the NCP.[212]

2. *EPA Imminent Hazard Authority: Section 106*

The imminent hazard authority of CERCLA section 106 provides

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the cleanup or removal of released hazardous substances from the environment, such actions as may be necessary taken in the event of the threat of release of hazardous substances into the environment, such actions as may be necessary to monitor, assess, and evaluate the release or threat of release of hazardous substances, the disposal of removed material, or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release.

42 U.S.C. § 9601(23) (Supp. IV 1986). In addition, the term "removal action" includes "action taken under section 9604(b) of this title." *Id.*; *see also* SARA § 104(b), 42 U.S.C. § 9604(b) (Supp. IV 1986) (providing that the EPA may make additional studies and investigations in connection with hazardous releases or threats thereof).

210. 42 U.S.C. § 9604(a)(1) (Supp. IV 1986). Actions taken under section 104(b) of CERCLA, as incorporated in the definition of "removal actions," include:

> [u]ndertak[ing] such investigations, monitoring, surveys, testing, and other information gathering as [the President] may deem necessary or appropriate to identify the existence and extent of the release or threat thereof, the source and nature of the hazardous substances, pollutants or contaminants involved, and the extent of danger to the public health or welfare or to the environment. In addition, the President may undertake such planning, legal, fiscal, economic, engineering, architectural, and other studies or investigations as he may deem necessary or appropriate to plan and direct response actions, to recover the costs thereof, and to enforce the provisions of this chapter.

Id. § 9604(b)(1).

Given this broad definition of "removal actions" and its inclusion in the statutory section authorizing "response," the courts have found the following to be "response costs" recoverable under section 107(a):

(1) The costs of investigations, monitoring, and testing to identify the nature and extent of the release or threatened release, *see* New York v. Shore Realty Corp., 759 F.2d 1032, 1043 (2d Cir. 1985); United States v. Conservation Chem. Co., 619 F. Supp. 162, 186 (W.D. Mo. 1985); Colorado v. ASARCO, Inc., 616 F. Supp. 822, 829 (D. Colo. 1985); New York v. General Elec. Co., 592 F. Supp. 291, 297-99 (N.D.N.Y. 1984); United States v. Northeastern Pharmaceutical & Chem. Co. (*NEPACCO I*), 579 F. Supp. 823, 850 (W.D. Mo. 1984), *aff'd in relevant part, rev'd in part*, 810 F.2d 726 (8th Cir. 1986), *cert. denied*, 108 S. Ct. 146 (1987);

(2) The costs of investigations, monitoring, and testing to identify the extent of the danger to public health or welfare or the environment, *see Shore Realty Corp.*, 759 F.2d at 1043; *Conservation Chem. Co.*, 619 F. Supp. at 186; *NEPACCO I*, 579 F. Supp. at 850; and

(3) The costs of planning and implementing the response action, *see Shore Realty Corp.*, 759 F.2d at 1043; *Conservation Chem. Co.*, 619 F. Supp. at 186; *NEPACCO I*, 579 F. Supp. at 850.

211. 42 U.S.C. § 9604(a)(1) (Supp. IV 1986); *see id.* § 9601(24) (defining "remedy" and "remedial action"). Long-term remediation efforts undertaken by the EPA must involve only those sites on the National Priority List. *See Shore Realty Corp.*, 759 F.2d at 1046. This long-term method is favored by the recent Superfund Amendments. *See* SARA § 121, 42 U.S.C. § 9621(b) (Supp. IV 1986).

212. 42 U.S.C. § 9604(a)(1) (Supp. IV 1986). The burden is on the complaining party to demonstrate that an EPA action is not consistent with the NCP. *Cf.* United States v. Northeastern Pharmaceutical & Chem. Co. (*NEPACCO II*), 810 F.2d 726, 747-48 (8th Cir. 1986) (stating that response costs incurred by the government are conclusively presumed to be "reasonable," because CERCLA § 107(a)(4)(A), 42 U.S.C. § 9607(a)(4)(A) (Supp. IV 1986) "does not refer to 'all *reasonable* costs' but simply to 'all costs'" (emphasis supplied by the court)), *cert. denied*, 108 S. Ct. 146 (1987).

the EPA with a second principal enforcement tool.[213] Upon the EPA's determination that an "imminent and substantial endangerment to the public health or welfare or the environment" is posed by "an actual or threatened release of a hazardous substance from a facility," the EPA is authorized to take such action "as may be necessary to protect public health and welfare and the environment," after the affected state is notified.[214] Under section 106, therefore, the EPA may compel responsible parties to abate releases or threatened releases of hazardous materials, by requesting the Attorney General to seek relief in federal district court (section 106 civil action), or by issuing such orders as may be necessary to protect the public (section 106 administrative orders).[215]

It is the EPA's practice, whenever possible, to allow those responsible for a release or threatened release to undertake the cleanup, thereby preserving limited CERCLA funds for other problem sites.[216] The district court may fine those who willfully violate or fail to comply with a section 106 order up to $25,000 per day.[217] In addition, responsible parties who, "without sufficient cause," fail to comply with a section 104 or 106 order may be held liable for punitive damages three times the amount of response costs incurred by the government as a result of the failure to comply.[218]

Although not originally specified in CERCLA, the EPA in practice employs a third alternative. Because of the considerable power granted to the government under sections 106 and 107, the EPA is in a strong position to encourage voluntary cleanups through informal negotiations and settlement.[219] This additional enforcement method embodies the EPA's policy of forcing those responsible for hazardous substance releases to take voluntary action as often as possible.[220]

3. *CERCLA Liability: Section 107*

Section 107, CERCLA's liability provision, attaches liability for (1) all removal or remedial costs incurred by federal or state governments that are not inconsistent with the national contingency plan;[221] (2) "any other necessary costs of response incurred by any

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213. 42 U.S.C. § 9606 (1982 & Supp. IV 1986).

214. *Id.* § 9606(a) (1982).

215. *Id.* Section 106 directs the federal courts to use their equitable powers to cause those responsible to abate the danger caused by the release or threatened release. *Id.*

216. EPA, GUIDANCE MEMORANDUM ON USE AND ISSUANCE OF ADMINISTRATIVE ORDERS UNDER SECTION 106(A) OF CERCLA, *reprinted in* 1982 ALI-ABA COURSE OF STUDY, *supra* note 163, at 168, 171.

217. 42 U.S.C. § 9606(b) (Supp. IV 1986).

218. *Id.* § 9607(c)(3) (1982).

219. *CERCLA 1985*, *supra* note 203, at 10,396.

220. *Id.*

221. 42 U.S.C. § 9607(a)(4)(A) (Supp. IV 1986). Cost recovery actions by states com-

other person consistent with the national contingency plan;" and (3) "damages for injury to, destruction of, or loss of natural resources, including the reasonable costs" for damage assessment.[222]

Section 107 designates four categories of "persons" potentially liable under CERCLA for these costs. (1) current owners or operators of facilities,[223] (2) owners or operators of facilities at the time of hazardous substance disposal,[224] (3) anyone who arranged in any way for the disposal, treatment, or transport of hazardous substances (generators of the hazardous substances),[225] and (4) those who transport hazardous substances to a chosen site "from which there is a release, or a threatened release which causes the incurrence of response costs, of a hazardous substance."[226] The definition of "person" includes individuals, all forms of business enterprises, and governmental entities.[227]

monly occur. *CERCLA 1985*, *supra* note 203, at 10,399 (citing, for example, New York v. Shore Realty Corp., 759 F.2d 1032 (2d Cir. 1985)). Further, at least one court has held that a municipality qualifies as a state. *Id.* (citing Mayor of Boonton v. Drew Chem. Corp., 15 Envtl. L. Rep. (Envtl. L. Inst.) 20,962 (D.N.J. 1985)).

222. 42 U.S.C. § 9607(a)(4)(B)-(C) (Supp. IV 1986); *see also* 43 C.F.R. § 11 (1987) (providing procedures to assess and determine compensation for natural resource damages).

223. 42 U.S.C. § 9607(a)(1) (Supp. IV 1986). For the definition of "facility," see *supra* note 197. The definition of "facility" is intentionally expansive: "[T]he definition of 'facility' is necessarily a broad one. It explicitly defines facility as, among other things, any site or area where a hazardous substance has been deposited, stored, disposed of, or otherwise come to be located." 126 CONG. REC. 31,967 (1980) (remarks of Rep. Florio); *see also* United States v. Conservation Chem. Co., 619 F. Supp. 162, 185 (W.D. Mo. 1985) (stating that the term facility "includes every place where hazardous substances come to be located"); United States v. Ward, 618 F. Supp. 884, 895 (E.D.N.C. 1985) (holding that the term "facility" includes roadside ditches where contaminated oil was spread); New York v. General Elec. Co., 592 F. Supp. 291, 296 (N.D.N.Y. 1984) (finding a congressional intent to reach any site containing hazardous wastes and not merely a particular category of disposal sites); *cf.* United States v. Metate Asbestos Corp., 584 F. Supp. 1143, 1148 (D. Ariz. 1984) (requiring a plaintiff to show that a hazardous substance has been placed or is located in an area for the area to be considered a facility).

224. 42 U.S.C. § 9607(a)(2) (Supp. IV 1986). CERCLA gives "disposal" the broad meaning set forth in section 1004 of the Solid Waste Disposal Act, 42 U.S.C. § 6903(3) (1982): the "discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such . . . waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters." 42 U.S.C. § 9601(29) (Supp. IV 1986) (cross-referencing 42 U.S.C. § 6903).

225. *Id.* § 9607(a)(3).

226. *Id.* § 9607(a)(4). CERCLA's definition of "release" encompasses any movement of a hazardous substance into the environment: "'release' means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing *into the environment*." *Id.* § 9601(22) (emphasis added). The coordinate definition of "environment" is equally broad: "'[E]nvironment' means (A) the navigable waters, the waters of the contiguous zone, and the ocean waters . . . and (B) any other surface water, ground water, drinking water supply, land surface or subsurface strata, or ambient air within the United States or under the jurisdiction of the United States." *Id.* § 9601(8).

227. *Id.* § 9601(21). "'Person' is defined as an "individual, firm, corporation, association, partnership, consortium, joint venture, commercial entity, United States Government, State, municipality, commission, political subdivision of a State, or any interstate body." *Id.* "It is well established that a state or local government may be an owner or operator under CERCLA." *CERCLA 1985*, *supra* note 203, at 10,401; *see, e.g.*, Artesian Water Co. v. Government of New Castle County, 605 F. Supp. 1348, 1354 (D. Del. 1985) (holding that the county government falls within CERCLA's definition of "person"). Earlier drafts of CERCLA also included municipalities and governmental entities

Municipalities typically engage in one or more of four primary relationships when handling the solid waste generated within their borders. Municipalities may (1) collect and transport MSW to disposal sites or landfills; (2) collect MSW from residences, unload it at a transfer station, and contract with a third party to transport the MSW in large-load quantities to a disposal site or landfill; (3) contract with third parties for curbside collection and transport of MSW to a disposal site or landfill; or (4) provide no collection or transport services, requiring residents to self-haul MSW.

The waste handled by municipalities can be strictly residential, or a combination of residential and commercial collection. If MSW were characterized as a hazardous substance for purposes of CERCLA, the mix of refuse contributed to a landfill could have significant repercussions for municipalities. As discussed below, however, MSW may fall within a CERCLA exemption.[228]

A municipal or county governmental entity may own a landfill where MSW is disposed, or a municipal agency may operate an MSW landfill as either owner or assignee. The extent of a municipality's MSW role—generating, handling, or arranging for disposal of MSW on one hand, or actually owning or operating the disposal facilities on the other—determines potential municipal liability. Emerging federal law defines the boundaries of this liability.

V. Mending the Fabric: The Common Law of Liability

CERCLA was a quickly passed compromise bill that left many unanswered questions with respect to its liability scheme.[229] More than any other American pollution statute, CERCLA is shaped by the common law.[230] Congress left a key gap in the statutory

in their definitions of "person." *See, e.g.*, S. 1325, 96th Cong., 1st Sess. § 2, 125, CONG. REC. 14,389 (1979) (defining "person" to mean "an individual, firm, corporation, association, partnership, joint venture, or government entity"); S. 1480, 96th Cong., 1st Sess. § 2, 125, CONG. REC. 17,989 (1979) (defining "person" as defined in section 502 of the Clean Water Act). As amended, S. 1480 also included "municipality" in its definition of "person." S. 1480, 96th Cong. 2d Sess. § 101, 125, CONG. REC. 30,917 (1980) (as amended).

228. *See infra* notes 274-78 and accompanying text.

229. *See* Grad, *supra* note 150, at 1-2. For a discussion of the perhaps deliberate vagueness drafted into CERCLA to gain initial adoption, see Rogers, *The Generators' Dilemma in Superfund Cases*, 12 Envtl. L. Rep. (Envtl. L. Inst.) 15,049, 15,049-50 (1982).

230. This is due in part to the lack of detail in drafting. The heart of CERCLA, its liability provision, was deleted in the rush for enactment before the end of both the 96th Congress and the Carter presidency. United States v. A & F Materials Co., 578 F. Supp. 1249, 1253 (S.D. Ill. 1984). Congress looked to the common law developed under other statutes, and this reliance emerged as the federal district courts interpreted CERCLA. *See, e.g.*, Dedham Water Co. v. Cumberland Farms Dairy, Inc., 805 F.2d 1074, 1084 (1st Cir. 1986) (noting that Congress expanded the jurisdiction of the courts in response to a perceived gap in the CERCLA jurisdictional scheme). This is also due in part to the rushed compromise and last minute amendments that ensured the Act's passage:

> CERLCA was enacted on December 11, 1980 in the last days of the 96th

language describing the bases for imposing liability: whether a strict liability or negligence standard should apply, and whether liability is joint and several or individual. The government, as plaintiff, has argued that joint, several, and strict liability should attach through a de minimus or attenuated showing of causation.[231]

The government as plaintiff is compiling a successful record of CERCLA enforcement. Because CERCLA incorporates by reference section 311 of the Clean Water Act,[232] which holds violators strictly liable for damages,[233] courts have overwhelmingly held that strict liability applies to PRPs for cost recovery actions under CERCLA section 107, regardless of any negligence by owners, operators, transporters, or generators.[234] Although the final version of

Congress. The final version of the Act was conceived by an ad hoc committee of Senators who fashioned a last minute compromise that enabled the Act to pass. As a result, the statute was hastily and inadequately drafted. *A & F Materials Co.*, 578 F. Supp. at 1253. This rapid birth process left little authoritative legislative history, and a resultant statutory ambiguity to be interpreted by the courts.

231. *See, e.g.*, United States v. Bliss, 667 F. Supp. 1298, 1309-10 (E.D. Mo. 1987) (adopting the government's argument that traditional tort notions, such as proximate cause, do not apply, and that CERCLA requires only a relaxed standard of causation); United States v. Conservation Chem. Co., 619 F. Supp. 162, 236-37 (W.D. Mo. 1985) (upholding the government's assertion that it is unnecessary to "fingerprint" a particular generator's waste to establish liability; one need only show that the defendant's waste was disposed of at the site and that the substance that makes the waste hazardous is also present at the site); *cf.* City of New York v. Exxon Corp., 633 F. Supp. 609, 620 (S.D.N.Y. 1986) (requiring the city to show a causal connection between hazardous substances in defendant's waste and the response costs incurred at the city's landfills).

232. 33 U.S.C.A. § 1321 (West 1986 & Supp. 1988); 42 U.S.C. § 9601(32) (Supp. IV 1986) (providing that liability under CERCLA shall be construed as the standard of liability under title 33, section 1321).

233. *See* 33 U.S.C.A. § 1321 (West 1986 & Supp. 1988). As one senator explained:

> Unless otherwise provided in this act, the standard of liability is intended to be the same as that provided in section 311 of the Federal Water Pollution Control Act (33 U.S.C. 1321). I understand this to be a standard of strict liability.
>
> It is intended that issues of liability not resolved by this act, if any, shall be governed by traditional and evolving principles of common law. An example is joint and several liability. Any reference to these terms has been deleted, and the liability of joint tort feasors will be determined under common or previous statutory law.

126 CONG. REC. 30,932 (1980) (remarks of Sen. Randolph); *see also id.* at 31,965 (statement of Rep. Florio) ("With respect to strict liability, this bill contains no significant change from that in our earlier bill. . . . Thus, the absence of negligence is not a defense to liability.").

234. *See* Bulk Distrib. Centers, Inc. v. Monsanto Co., 589 F. Supp. 1437, 1443 n.15 (S.D. Fla. 1984); United States v. Conservation Chem. Co., 589 F. Supp. 59, 62 (W.D. Mo. 1984); United States v. Northeastern Pharmaceutical & Chem. Co. (*NEPACCO I*), 579 F. Supp. 823, 843-44, 847 (W.D. Mo. 1984), *aff'd in relevant part, rev'd in part*, 810 F.2d 726 (8th Cir. 1986), *cert. denied*, 108 S. Ct. 146 (1987); United States v. Argent Corp., 21 Env't Rep. Cas. (BNA) 1354, 14 Envtl L. Rep. (Envtl. L. Inst.) 20,616 (D.N.M. 1984); United States v. South Carolina Recycling & Disposal, Inc. (*SCRDI*), 653 F. Supp. 984, 991 n.2 (D.S.C. 1984); United States v Ottati & Goss, Inc., 630 F. Supp 1361, 1392-93 (D.N.H. 1985); United States v. Price, 577 F. Supp. 1103, 1113-14 (D.N.J 1983); United States v. Chem-Dyne Corp., 572 F. Supp. 802, 804-07 (S.D. Ohio 1983); Philadelphia v. Stepan Chem. Co., 544 F. Supp. 1135, 1140 n.4 (E.D. Pa. 1982); *cf* United States v. Cauffman, 21 Env't Rep. Cas. (BNA) 467, 15 Envtl. L. Rep. (Envtl L. Inst.) 2016 (C.D. Cal. 1984) (stating that the government need not prove proximate cause); United States v. Wade, 546 F. Supp. 785, 793-94, (E.D. Pa. 1982) (finding a non-negligent off-site generator not liable), *appeal dismissed*, 713 F.2d 49 (3d Cir. 1983).

CERCLA deleted all reference to joint and several liability,[235] courts have determined that PRP liability is joint and several if there is no basis for dividing the responsibility for the injury.[236] Plaintiffs are therefore not required to link their response costs with particular releases by particular defendants, because to require such "fingerprinting" of wastes would eviscerate CERCLA's liability provisions and would be inconsistent with Congress's intent.[237]

Moreover, courts have not required a showing of proximate cause to impose liability on the generators of wastes sent to Superfund sites,[238] despite legislative history suggesting that proof of causation is required before liability may be imposed.[239] Courts have held that sufficient causation exists if the generators' wastes are on site, and a threatened release of *any* hazardous substance requires some EPA response action.[240] Thus, once plaintiffs show that a hazardous substance was released from a "facility," and that they incurred "response costs" to address a hazardous substance of the type released, plaintiffs have established the requisite causation. Moreover, for purposes of CERCLA's cleanup requirements, the EPA can compel remediation on a showing of potential endangerment although no

235. *See* 126 CONG. REC. 31,965 (1980).

236. *See* Colorado v. ASARCO, Inc., 608 F. Supp. 1484, 1486 (D. Colo., 1985); United States v. Ward, 618 F. Supp. 884, 893 (E.D.N.C. 1985); United States v. Stringfellow, 20 Env't Rep. Cas. (BNA) 1905, 1909, 14 Envtl. L. Rep. (Env't L. Inst.) 20,381, 20,385 (C.D. Cal. 1984); *Bulk Distrib. Centers, Inc.*, 589 F. Supp. at 1443; *NEPACCO I*, 579 F. Supp. at 845; *Conservation Chem. Co.*, 589 F. Supp at 63; *SCRDI*, 653 F. Supp. at 994; *Chem-Dyne Corp.*, 572 F. Supp. at 810; United States v. Wade, 577 F. Supp. 1326, 1338-39 (E.D. Pa. 1983). *But see* New York v. Shore Realty Corp., 759 F.2d 1032, 1042 (2d Cir. 1985) (stating that joint and several liability is not absolute under certain circumstances).

237. *See* Violet v. Picillo, 648 F. Supp. 1283, 1292 (D.R.I. 1986) (stating that to establish waste and the harm caused by the release at a particular site, "CERCLA only requires that the plaintiff prove . . . that the defendant deposited his hazardous waste at the site and that the hazardous substances contained in the defendant's waste are also found at the site"); *Wade*, 577 F. Supp. at 1332-33 (to same effect); *see also Shore Realty*, 759 F.2d at 1044-45 (declining to find a causation requirement in CERCLA § 107(a)).

238. *SCRDI*, 653 F. Supp. at 992; *Wade*, 577 F. Supp. at 1333-34; *see* 126 CONG. REC. 26,786 (1980) (statement of Rep. Stockman).

239. The House Report states:

> The Committee intends that the usual common law principles of causation, including those of proximate causation, should govern the determination of whether a defendant "caused or contributed" to a release or threatened release. . . . The Committee intends that for liability to attach under this section, the plaintiff must demonstrate a causal or contributory nexus between the acts of the defendant and the conditions which necessitated response action under section 3041.

H.R. REP. NO. 1016, 96th Cong., 2d Sess., pt. 1, 33-34, *reprinted in* 1980 U.S. CODE CONG. & ADMIN. NEWS 6119, 6136-37.

240. *See* United States v. Ottati & Goss, Inc., 630 F. Supp. 1361, 1393-94 (D.N.H 1985); *Wade*, 577 F. Supp. at 1332-34; *see also* United States v. Hardage, 18 Env't Rep. Cas. (BNA) 1685, 1686, 13 Envtl. L. Rep. (Envtl. L. Inst.) 20,188, 20,189 (W.D. Okla. 1982) (finding strict liability for persons contributing to the handling, transportation or disposal of hazardous wastes that substantially endanger health or the environment).

actual harm is present.[241]

Any quantity, level, or concentration of a hazardous substance as defined by CERCLA, is sufficient to trigger liability for any class of PRP generators.[242] Indeed, one court has held that there is no requirement to show that a defendant's waste remains on site to hold the defendant liable for remediation.[243]

Recently, courts have also held that a showing of proximate cause is not required before liability may be imposed on current or former owners or operators of disposal sites.[244] Under section 107 lessors of Superfund sites during the time of disposal may also be held liable for cleanup costs.[245] A showing of proximate cause is required, however, before imposing liability on transporters of hazardous substances, whom both the statute[246] and a few cases[247] link to cleanup costs only if they were responsible for selecting the disposal site. In one instance transporter liability was found to attach to a party who cleaned up one contaminated site by transporting wastes to a second site which subsequently became contaminated.[248]

CERCLA authorizes imposing liability on those having no ongoing relationship with a contaminated site, and courts have generally held that this retroactive liability does not violate the requirements

241. *See, e.g.*, United States v. Mirabile, 15 Envtl. L. Rep. (Envtl. L. Inst.) 20,992, 20,993 (E.D. Pa. Sept. 4, 1985) (stating that a threatened release is sufficient to compel remediation); *see also* cases cited *supra* note 240.

242. Eagle-Picher Indus. v. EPA, 759 F.2d 922, 927 (D.C. Cir. 1985); United States v. Conservation Chem. Co., 619 F. Supp. 162, 238 (W.D. Mo. 1985); United States v. Carolawn Co., 21 Env't Rep. Cas. (BNA) 2124, 2126 (D.S.C. 1984). *Contra* United States v. Ottati & Goss, Inc., 8 Chemical & Radiation Waste Litigation Rep. 674, 677 (D.N.H. July 25, 1984) (finding that trace amounts of heavy metals below EPA threshold levels for hazardous wastes are not "hazardous substances" for CERCLA purposes).

243. *See* United States v. South Carolina Recycling & Disposal, Inc. (*SCRDI*), 653 F. Supp. 984, 992 (D.S.C. 1984).

244. *See* New York v. Shore Realty Corp., 759 F.2d 1032, 1043-44 (2d Cir. 1985); United States v. Cauffman, 21 Env't Rep. Cas. (BNA) 2167, 2168 (C.D. Cal. 1984); *see also* United States v. Price, 523 F. Supp. 1055, 1073-74 (D.N.J. 1981) (holding subsequent landowners liable merely by virtue of "studied indifference" to hazardous condition), *aff'd*, 688 F.2d 204 (1st Cir. 1982).

Section 107 authorizes imposing liability on former owners and operators of disposal sites. *See* 42 U.S.C. § 9607(a) (Supp. IV 1986) (as modified by SARA § 101(f), 42 U.S.C. § 9601(35) (Supp. IV 1986)). However, former owners and operators during a period when no hazardous substances were disposed may logically avail themselves of third-party defenses. *See infra* note 257.

245. United States v. Northeastern Pharmaceutical & Chem.Co. (*NEPACCO I*), 579 F. Supp. 823, 840-43 (W.D. Mo. 1984), *aff'd in part, rev'd in part*, 810 F.2d 726 (8th Cir. 1986), *cert. denied*, 108 S. Ct. 146 (1987); *SCRDI*, 653 F. Supp. at 1003; United States v. Argent, 21 Env't Rep. Cas. (BNA) 1354, 1356, 14 Envtl. L. Rep. (Envtl. L. Inst.) 20,616, 20,617 (D.N.M. 1984).

246. 42 U.S.C. § 9607(a)(4) (Supp. IV 1986).

247. United States v. Ottati & Goss, Inc., 630 F. Supp. 1361, 1402-05 (D.N.H. 1985); *SCRDI*, 653 F. Supp. at 1005; *see* United States v. Conservation Chem. Co., 619 F. Supp. 162, 191 (W.D. Mo. 1985); *NEPACCO I*, 579 F. Supp. at 847.

248. United States v. South Carolina Recycling & Disposal, Inc. (*SCRDI*), 653 F. Supp. 984, 1005-06 (D.S.C. 1984). This continuing liability is limited by the recent Superfund amendments. Contractors who undertake response actions in a non-negligent manner are granted immunity from federal (though not state) CERCLA liability. The EPA can also grant limited immunity to contractors who are not able to obtain liability insurance on reasonable terms. *See* SARA § 119, 42 U.S.C. § 9619(a)(1), (c)(1)-(14) (Supp. IV 1986).

of due process.[249] Although a municipality may have ceased to generate or transport MSW to a Superfund site prior to CERCLA's enactment, this alone will not relieve the municipality from liability. Former generators of any hazardous substance remain liable.[250] Even if the wastes, once safely disposed of, are subsequently and perhaps illegally removed to a second site where contamination occurs, the original generator remains liable.[251]

Former transporters of hazardous substances who selected the disposal site also remain liable.[252] Former owners who owned the site at any time when hazardous substances were disposed of remain liable as well.[253] However, former owners who did not own the site during a period of hazardous waste disposal, who did not know that any hazardous substance was disposed at the site, and who exercised due care, are not liable under section 107.[254] The sale of a site, which subsequently poses a threat, leaves liable both the former owner who owned the site during the period of hazardous waste disposal, and the current owners purchasing with actual or constructive knowledge of likely contaminants, whether or not current disposal occurs.[255]

Former owners and operators of abandoned hazardous waste dis-

249. *SCRDI*, 653 F. Supp. at 997 (citing Usery v. Turner Elkhorn, 428 U.S. 1 (1976)); *Ottati & Goss, Inc.*, 630 F. Supp. at 1398; *Conservation Chem. Co.*, 619 F. Supp. at 221-22; United States v. Shell Oil Co., 605 F. Supp. 1064, 1072 (D. Colo. 1985); *NEPACCO I*, 579 F. Supp. at 839-43; Ohio v. Georgeoff, 562 F. Supp. 1300, 1307 n.7 (N.D. Ohio 1983).

250. Missouri v. Independent Petrochemical Corp., 610 F. Supp. 4, 5 (E.D. Mo. 1985); Jones v. Inmont Corp., 584 F. Supp. 1425, 1428-29 (S.D. Ohio 1984); United States v. A & F Materials, 578 F. Supp. 1249, 1257 (S.D. Ill. 1984); United States v. Northeastern Pharmaceutical & Chem. Co. (*NEPACCO I*), 579 F. Supp. 823, 839, 847; United States v. Stringfellow, 20 Env't Rep. Cas. (BNA) 1912, 1915, 14 Envtl. L. Rep. (Envtl. L. Inst.) 20,388, 20,389 (C.D. Cal. 1984); United States v. Wade, 546 F. Supp. 785, 793 (E.D. Pa. 1982).

251. *Independent Petrochemical Corp.*, 610 F. Supp. at 5; *see also* Violet v. Picillo, 648 F. Supp. 1283, 1285 (D.R.I. 1986) (finding generator liable for the ultimate disposal of waste diverted by the transporter from the site selected by the generator to a second site); United States v. Conservation Chem. Co., 619 F. Supp. 162, 234 (W.D. Mo. 1985) (stating that generators are liable for waste trans-shipped to unknown second sites). In the Cannons superfund litigation the EPA has alleged that generators are liable for all costs where a disposal site owner illegally moved waste to two other locations and thereby caused contamination. *See infra* note 272 and accompanying text.

252. *NEPACCO I*, 579 F. Supp. at 846-47; *Georgeoff*, 562 F. Supp at 1309-14.

253. United States v. Carolawn Co., 14 Envtl. L.Rep. (Envtl. L. Inst.) 20,699, 20,700 (D.S.C. 1984); United States v. Reilly Tar & Chem. Co., 546 F. Supp. 1100, 1113 (D. Minn. 1982).

254. *See* 42 U.S.C. § 9607(b)(3) (1982); SARA § 101(35), 42 U.S.C. § 9601(35) (Supp. IV 1986).

255. The 1986 Superfund Amendments created an "innocent owner" defense to CERCLA liability for defendants who acquired the disposal site after the disposal or placement of the hazardous material, provided: (1) the defendant did not know or have reason to know of the hazardous material at the time the property was acquired; (2) the defendant is a governmental entity and acquired the property by escheat, involuntary

posal sites also remain potentially liable.[256] Unless PRPs can avail themselves of one of the extremely limited defenses provided by statute,[257] or equitable defenses developed at common law such as laches,[258] estoppel,[259] unclean hands,[260] and others,[261] liability is

transfer, eminent domain, or the like, or (3) the defendant inherited the property. SARA § 101(l), 42 U.S.C. § 9601(35) (Supp. IV 1986).

Under CERCLA the corporate veil can also be pierced. Corporate officers of a generator company, if they personally arranged for disposal of waste or had direct supervision, are liable under sections 106 and 107. *See, e.g.*, United States v. Northeastern Pharmaceutical & Chem. Co. (*NEPACCO II*), 810 F.2d 726, 744 (8th Cir. 1986) (holding that an individual who participated in conduct that violated CERCLA may be held personally liable), *cert. denied*, 108 S. Ct. 146 (1987); United States v. Conservation Chem. Co., 619 F. Supp. 162, 190 (W.D. Mo. 1985) (holding that corporate officials who actively participate in the management of a disposal facility may be held personally liable); *Carolawn Co.*, 14 Envtl. L. Rep. (Envtl. L. Inst.) at 20,700 (stating that ownership, control, authority, or participation in management results in individual liability); Escude Cruz v. Ortho Pharmaceutical Corp., 619 F.2d 902, 907 (1st Cir. 1980) (stating that personal liability may be found when the corporate officer was the guiding spirit behind the wrongful conduct). Shareholders also can be held liable under section 107(a) in certain circumstances. New York v. Shore Realty Corp., 759 F.2d 1032, 1039, 1052 (2d Cir. 1985) (holding stockholder of corporation that purchased the dump site liable when such stockholder had been warned about potential problems); United States v. Mottolo, 605 F. Supp. 898, 913-14 (D.N.H. 1985) (imposing individual liability on president/shareholder who participated in disposal activities); United States v. Northeastern Pharmaceutical & Chem. Co. (*NEPACCO I*), 579 F. Supp. 823, 848-49 (W.D. Mo. 1984) (imposing liability when stock ownership plus active management were present), *aff'd in part, rev'd in part*, 810 F.2d 726 (8th Cir. 1986), *cert. denied*, 108 S. Ct. 146 (1987).

256. 42 U.S.C. § 9607(a)(2) (Supp. IV 1986); *see also* SARA § 101, 42 U.S.C. § 9601(35)(c) (Supp. IV 1986) (providing that the amended section on defenses for new owners shall not diminish the liability of former owners or operators); *Shore Realty Corp.*, 759 F.2d at 1044 (noting that under CERCLA, former owners or operators are liable "only if they owned or operated the facility 'at the time of disposal of any hazardous substance'" (quoting CERCLA § 107(a))).

257. *See* 42 U.S.C. § 9607(b) (1982). These defenses are available when releases of hazardous substances are caused by (1) acts of war, (2) acts of God, or (3) acts of unrelated third parties with whom a PRP has no direct or indirect contractual link, where the PRP exercises due care with respect to any hazardous substances. *See id.* The recent Superfund Amendments clarify the conditions of a contractual relationship pertaining to this third defense. *See* SARA, §§ 101(35), 119, 42 U.S.C. §§ 9601(35), 9619 (Supp. IV 1986). Analogous precedent exists under similar statutory provisions of section 311 of the Clean Water Act, 33 U.S.C.A. § 1321(i)(1) (West 1986 & Supp. 1988). *See* Minneapolis Park & Recreation Bd. v. United States, 231 Ct. Cl. 738, 739 (1982); Travelers Indem. Co. v. United States, 230 Ct. Cl. 867, 868-69 (1982).

258. The equitable doctrine of laches may be applied if a plaintiff is responsible for undue delay in asserting his legal rights, resulting in prejudice to the defendant. *E.g.*, Cobb v. Prokop, 557 F. Supp. 391, 397 (D. Mass. 1983). Section 107(b) does not prohibit, inter alia, defenses such as laches. *Conservation Chem. Co.*, 619 F. Supp. at 206 (citing Mardan Corp. v. C.G.C. Music, Ltd., 600 F. Supp. 1049, 1056 n.9 (D. Ariz. 1984), *aff'd*, 804 F.2d 1454 (9th Cir. 1986)). A "'determination of whether the doctrine of laches should bar a claim requires consideration of all the circumstances of a particular case.'" *Id.* (quoting United States v. Reilly Tar & Chem. Corp., No. 4-80-469, slip. op. at 5 (D. Minn. June 14, 1984)). Laches is also a defense to a section 107(a) suit, which is essentially an equitable claim seeking reimbursement for monies spent. *See* United States v. Mottolo, 605 F. Supp. 898, 909 (D.N.H. 1985) (dictum).

The United States Supreme Court has held that the defense of laches is not available against the government, even in equitable actions, if the government is enforcing a public right or protecting a public interest. Utah Power & Light Co. v. United States, 243 U.S. 389, 409 (1917). Lower courts have therefore recognized that this defense may not be asserted against the government in a CERCLA action. *See Mottolo*, 605 F. Supp. at 909; *see also* United States v. Dickerson, 640 F. Supp. 448, 451 (D. Md. 1986) (granting government's motion to strike defendants' affirmative defense of laches in a CERCLA suit).

Given the strong public interest in government prosecution of CERCLA violations, it

joint, several, and strict.[262] When the dump site owner or operator is a municipality, county, or state agency, CERCLA treats the entity as a private person.[263]

seems unlikely that laches could be asserted successfully by a defendant PRP in a section 106 or section 107 action brought by the government. However, this does not rule out its use as a defense by a defendant PRP against a private party bringing a section 107 cost recovery action, or in contribution actions brought by other PRPs.

259. The basic standard for a valid estoppel is articulated in Bergeron v. Mansour, 152 F.2d 27 (1st Cir. 1945): "A person is estopped from denying the consequences of his conduct where that conduct has been such as to induce another to change his position in good faith or such that a reasonable man would rely upon the representations made." *Id.* at 30. Reliance is reasonable if the party claiming the estoppel neither knew nor should have known that its adversary's conduct was misleading. Heckler v. Community Health Servs., 467 U.S. 51, 59 (1984).

Although the equitable defense of estoppel has not been reviewed by the courts in CERCLA cases, the district court in *Conservation Chem. Co.* stated in dictum that estoppel would be an appropriate defense in section 107 actions. *Conservation Chem. Co.*, 619 F. Supp. at 206.

The Supreme Court has left open the question of whether equitable estoppel may be used against the government. *Heckler*, 467 U.S. at 60. Traditional equitable estoppel "does not apply fully in cases of estoppel against the Government. For the Government to be estopped, it is necessary not only that the party relied on the Government's conduct—the basis of the traditional doctrine—but also that the Government have engaged in "'affirmative misconduct.'" Akbarin v. INS, 669 F.2d 839, 842 (1st Cir. 1982).

It is not clear, from decisions to date, what constitutes "affirmative misconduct" for purposes of an estoppel. Neither neglect of duty, nor a failure to be of assistance, nor a failure by a government agency to respond to inquiries, constitutes sufficient "affirmative misconduct" by the government to warrant an estoppel. Simon v. Califano, 595 F.2d 121, 125 (9th Cir. 1979) (neglect of duty); Lavin v. Marsh, 644 F.2d 1378, 1384 (9th Cir. 1981) (failure to assist); Precious Metals Assocs., Inc., v. Commodity Futures Trading Comm'n, 620 F.2d 900, 909 (1st Cir. 1980) (failure to respond). Moreover, even when affirmative misconduct and reasonable reliance occur, it is not clear that the government should be estopped. The Supreme Court has indicated that if estoppel would threaten a public interest, courts should be reluctant to apply this defense. *Heckler*, 467 U.S. at 60-61; *see Akbarin*, 669 F.2d at 842.

260. *See* Kalik v. Allis-Chalmers Corp., 658 F. Supp. 631, 637-38 (W.D. Pa. 1987); Mardan Corp. v. C.G.C. Music Ltd., 600 F. Supp. 1049, 1057-58 (D. Ariz. 1984). Courts have recognized that the defense of unclean hands may be asserted against the government, but have suggested that the doctrine is unlikely to bar successfully the government's claims under CERCLA. *See Conservation Chem. Co.*, 619 F. Supp. at 206; *Mardan*, 600 F. Supp. at 1057.

261. As a defense, 42 U.S.C. § 9612(d) (Supp. IV 1986) provides a statute of limitations allowing three years from discovery for the initiation of damage actions and six years after completion of response action for cost recovery actions. As another defense, most courts agree that Congress has not authorized nationwide service of process for CERCLA actions. *See, e.g., In re* Acushnet River & New Bedford Harbor Proceedings Re Alleged PCB Pollution, 675 F. Supp. 22, 29 & n.7 (D. Mass. 1987); Welmer v. Syntex Agribusiness, Inc., 616 F. Supp. 27, 28 (E.D. Mo. 1985); Violet v. Picillo, 613 F. Supp. 1563, 1573 (D.R.I. 1985). Only one court has found that CERCLA authorizes nationwide service of process for abatement actions under section 106. *See* United States v. Bliss, 108 F.R.D. 127, 134-35 (E.D. Mo. 1985).

Finally, it may be possible to interpose the defense of unjust enrichment to prevent a landowner from obtaining contribution or indemnification. *Cf.* Gould v. American Hawäiian S.S. Co., 387 F. Supp. 163, 171 (D. Del. 1974) (denying contribution in a federal securities action on unjust enrichment grounds), *vacated on other grounds*, 535 F.2d 761 (3d Cir. 1976).

262. *See supra* text accompanying notes 234-36.

263. 42 U.S.C. § 9601(21) (Supp. IV 1986); *see, e.g.*, Artesian Water Co. v. Govern-

A municipality may also find itself in the unenviable position of currently or formerly owning a sanitary landfill where hazardous industrial or commercial waste was illegally dumped. Under CERCLA precedent, "by virtue of their studied indifference to the hazardous condition," an otherwise innocent owner remains subject to CERCLA liability.[264] If a governmental entity is a co-owner or co-operator of a waste disposal facility and not directly prosecuted as a PRP, the entity may still be liable for indemnification or contribution costs to the co-owners.[265] Municipal owners and operators of landfills are jointly, severally, and strictly liable for all cleanup costs, including those incurred prior to CERCLA's enactment.[266]

Municipalities have a dual role under CERCLA. First, by virtue of their inclusion in the definitional section, municipalities as defendants can be held liable for threats posed by hazardous substances for which they are responsible as generators, transporters, owners, or operators.[267] Second, municipalities as plaintiffs can also recover the costs they incurred in their cleanup efforts. CERCLA section 107 authorizes recovery by a state government for natural resources damages, and courts have upheld a municipality's possible status as both plaintiff and defendant.[268]

Obviously, municipalities and municipal officials in their official capacities do not "generate" or create MSW or its potentially hazardous constituents. However, municipalities do conduct, sanction, or arrange for the collection and disposal of MSW. The degree of municipal responsibility for waste disposal ranges from a limited role in which the municipality contracts away its disposal responsi-

ment of New Castle County, 605 F. Supp. 1348, 1355 (D. Del. 1985) (finding that Congress did not intend to differentiate between governmental and nongovernmental entities for purposes of CERCLA liability).

264. United States v. Price, 523 F. Supp. 1055, 1073 (D.N.J. 1981), *aff'd*, 688 F.2d 204 (3d Cir. 1982); *see also* City of Philadelphia v. Stepan Chem. Co., 544 F. Supp. 1135, 1143 (E.D. Pa. 1982) (dictum) (hypothesizing that a municipality might be liable to federal or state governments for response costs even if the city did not voluntarily permit hazardous waste disposal on its property).

265. Velsicol Chem. Corp. v. Reilly Tar Chem. Corp., 21 Env't Rep. Cas. (BNA) 2,118, 2,121, 15 Envtl. L. Rep. (Envtl. L. Inst.) 20,103, 20,105-06 (E.D. Tenn. 1984). Cost recovery actions can be maintained by any PRP who incurs cleanup costs against other non-contributing PRPs. *See* United States v. New Castle County, 642 F. Supp. 1270, 1276 (D. Del. 1986); United States v. Medley, 17 Envtl. L. Rep. (Envtl. L. Inst.) 20,297, 20,298 (D.S.C. 1986); Pinole Point Properties v. Bethlehem Steel Corp., 596 F. Supp. 283, 290-91 (N.D. Cal. 1984).

266. United States v. Shell Oil Co., 605 F. Supp. 1064, 1079 (D. Colo. 1985); Mayor of Boonton v. Drew Chem. Corp., 621 F. Supp. 663, 668 (D.N.J. 1985); *cf.* United States v. Northeastern Pharmaceutical & Chem. Co. (*NEPACCO II*), 810 F.2d 726, 741 (8th Cir. 1986) (stating that off-site generators and transporters of hazardous waste are strictly liable for cleanup costs, including those resulting from activities prior to CERCLA's enactment), *cert. denied*, 108 S. Ct. 146 (1987).

267. *See* 42 U.S.C. § 9601(21) (Supp. IV 1986) (including municipality in the definition of a "person" under CERCLA). *But cf. id.* § 9601(20)(D) (providing state or local government limitation to definition of "owner or operator" if ownership was acquired involuntarily through bankruptcy, tax delinquency, abandonment, or other sovereign functions).

268. *See Drew Chem. Co.*, 621 F. Supp. at 667 (construing the definition of "state" in CERCLA to include municipalities for purposes of both liability and standing to sue); *Stepan Chem. Co.*, 544 F. Supp. at 1141-43 (indicating that municipality can be either plaintiff or defendant).

bility to private companies in some communities, to a total pail-to-dump control in others.[269] In no event is either municipal solid waste or its hazardous components formally "owned" by the municipality. However, these distinctions do not necessarily absolve a municipality from liability for hazardous constituents found in MSW for which the municipality arranges disposal. Under CERCLA section 107 possession or arranging for the treatment or disposal of hazardous substances is a sufficient nexus to establish liability as a "generator" of these substances.[270]

CERCLA is ambiguous regarding whether, in order to be characterized a "generator" of hazardous waste, the municipality must select the disposal site for MSW containing hazardous constituents. Some cases suggest that generator liability attaches only if the PRP arranged to dispose of the hazardous substances at a particular site that is later found to be contaminated.[271] Other cases, however, suggest that if the PRP arranged to send the waste somewhere for disposal, liability attaches regardless of where the hazardous substances are ultimately disposed of, provided the threatened release of the substances poses an actionable public health threat.[272] Thus, one court recently held that generators remain strictly liable for the adverse impacts of the wastes they created; defenses such as lack of negligence or exercise of due care against transporter or site owner, or operator diversion of the wastes, may not be used to avoid liability, although such defenses may be relevant to apportionment of liability.[273]

One possible defense to liability exists if MSW is recycled as an input into a refuse-derived-fuel or waste-to-energy facility. Such facilities escape RCRA regulation.[274] In *United States v. A & F Materials*

269. *See supra* text following note 227.

270. 42 U.S.C. § 9607(a)(3) (Supp. IV 1986).

271. *See supra* notes 246-48 and accompanying text.

272. The EPA has negotiated with more than 380 PRPs for contributions to cleanup costs at four Cannons Engineering Corporation Superfund sites under this theory. In the Cannons matter, the owner of the disposal facility, licensed by the state of Massachusetts, illegally dumped excess waste at two unowned out-of-state locations. The EPA entered a settlement with all but two dozen PRPs to undertake cleanup at the original and the unauthorized contaminated sites. *See* 19 Env't Rep. (BNA) 615 (Aug. 12, 1988). *See generally* Ferrey, *supra* note 132 (suggesting that all PRPs remain liable for costs of cleanup and damages).

273. United States v. Conservation Chem. Co., 619 F. Supp. 162, 204 (W.D. Mo. 1985).

274. RCRA provides that a resource recovery facility will not be subject to standard RCRA regulation if it burns only household waste plus other non-hazardous waste and does not accept hazardous wastes as defined in RCRA. 42 U.S.C. § 6921(i) (Supp. IV 1986).

Unsuccessful legislation was introduced in 1987 and 1988 by Representative Florio that would require the EPA to regulate MSW incineration under RCRA. *See* H.R. 4902, 100th Cong., 2d Sess. (1988); H.R. 2787, 100th Cong., 1st Sess. (1987); H.R. 2517, 100th Cong., 1st Sess. (1987); H.R. 2516, 100th Cong., 1st Sess. (1987). The EPA pro-

Co.,[275] the district court suggested that, although conventional wastes can be sold for reprocessing, generator liability remains with the seller if the seller knows that some hazardous wastes will require disposal after reprocessing.[276] Although no court has yet addressed the issue of liability for reprocessed or recycled MSW, the court's reasoning in *A & F Materials Co.* suggests that cities and towns that incinerate their MSW, knowing that hazardous substances will remain in the bottom ash, may still be held liable if the hazardous residue is not disposed of properly.

By contrast, communities that convert their MSW to energy using state-of-the-art gasification technologies[277] apparently escape generator liability under the court's reasoning in *A & F Materials Co.*, because a municipality is excused from generator liability if the hazardous substance is sold as a product.[278] The substance must, therefore, be considered a product rather than a waste for the governmental entity to escape liability under the *A & F Materials Co.* rationale.

VI. The Shield of the Sovereign

States and municipalities are created pursuant to sovereign powers. This benign birth shields states and muncipalities, in certain circumstances, from the slings and arrows of outrageous legal fortune. In assessing the extent of CERCLA liability, it is therefore critical that courts determine whether Congress has abrogated state sovereign immunity, whether that immunity extends to municipalities, and whether there are independent bases in state law for municipal immunity.

A. State Sovereign Immunity

CERCLA on its face appears to include in its liability scheme all governmental entities as "persons" and imposes liability on any generator of a hazardous substance, or on the owner or operator of a facility from which there has been a release or threatened release of a hazardous substance that causes the incurrence of response

posed requiring pollution control devices on new and (eventually) on existing municipal incinerators. *See* 52 Fed. Reg. 25,399 (1987) (to be codified at 40 C.F.R. pt. 60); Wall St. J., July 2, 1987, at 30.

275. 582 F. Supp. 842 (S.D. Ill. 1984).

276. *Id.* at 845. The court distinguished the situation where a party sells the hazardous substance for use in a manufactured product without arranging for the disposal of the hazardous substance or end-product. In this instance, there is no disposal and therefore no liability. *See id.*

277. For example, Power Recovery Systems, Inc., in Cambridge, Massachusetts, developed advanced gasification technologies to use refuse-derived-fuel to drive internal combustion engines or boilers, with virtually no pollution emitted and no hazardous quantities in the residue.

278. United States v. Westinghouse Elec. Corp., 22 Env't Rep. Cas. (BNA) 1,231, 1,233, 14 Envtl. L. Rep. (Envtl. L. Inst.) 20,483, 20,484 (S.D. Ind. 1983) (stating that a manufacturer of a hazardous *product* that eventually turns up in waste is not liable as a generator); *cf.* New York v. General Elec. Co., 592 F. Supp. 291, 297 (N.D.N.Y. 1984) (stating that sale of *waste* products does not remove liability from generator).

costs.[279] Such sweeping liability is consistent with the fundamental objective of CERCLA, which courts have interpreted as the abatement of hazardous substance threats "by placing the ultimate financial burden upon those responsible for the danger."[280] CERCLA appears to include governmental entities as potentially responsible parties unless there is a sovereign immunity bar.

Section 107(g) of CERCLA expressly waives *federal* sovereign immunity for cleanup actions brought against federal agencies.[281] However, CERCLA and its legislative history are silent with respect to state sovereign immunity otherwise granted by the Eleventh Amendment.[282]

Read literally, the Eleventh Amendment appears to protect a state only from suits brought in federal court by individuals who are not citizens of that state.[283] Through a long history of judicial interpretation, however, the states enjoy more extensive immunity from suit than the literal interpretation of the Eleventh Amendment would suggest.[284] The Eleventh Amendment is interpreted as a plenary

279. *See supra* text accompanying notes 223-27.

280. City of Philadelphia v. Stepan Chem. Co., 544 F. Supp. 1135, 1142-43 (E.D. Pa. 1982). For further discussion of potential liability under CERCLA, see FMC Corp. v. Northern Pump Co., 668 F. Supp. 1285, 1289 (D. Minn. 1987); Artesian Water Co. v. Government of New Castle County, 659 F. Supp. 1269, 1280-81 (D. Del. 1987); Idaho v. Bunker Hill Co., 635 F. Supp. 665, 671 (D. Idaho 1986); and United States v. Conservation Chem. Co., 628 F. Supp. 391, 417-20 (W.D. Mo. 1985).

281. CERCLA § 107(g), 42 U.S.C. § 9620(a)(1) (Supp. IV 1986), states in pertinent part:

> Each department, agency, and instrumentality of the United States (including the executive, legislative, and judicial branches of the government) shall be subject to, and comply with, this chapter in the same manner and to the same extent, both procedurally and substantively, as any nongovernmental entity, including liability under section 9607 of this title.

Id.

282. U.S. CONST. amend. XI. The Eleventh Amendment states: "The Judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by Citizens of another State, or by Citizens or Subjects of any Foreign State."

283. Fletcher, *A Historical Interpretation of the Eleventh Amendment: A Narrow Construction of an Affirmative Grant of Jurisdiction Rather than a Prohibition Against Jurisdiction*, 35 STAN. L. REV 1033, 1060 (1983).

284. *See, e.g.*, Pennhurst State School & Hosp. v. Halderman, 465 U.S. 89 (1984) (holding that a federal court cannot award injunctive relief against state officers on the basis of state law); Edelman v. Jordan, 415 U.S. 651 (1974) (holding that the Eleventh Amendment bars retroactive payment from public funds in the state treasury when the state has not consented to suit); Hans v. Louisiana, 134 U.S. 1, 20-21 (1890) (stating that the state's consent to suit is required unless the suit involves a state contract conferring property or rights). Some scholars argue that the Eleventh Amendment was never intended to reach cases involving federal question jurisdiction, but rather only diversity jurisdiction. *See, e.g.*, Amar, *Of Sovereignty and Federalism*, 96 YALE L.J. 1425, 1474-75 (1987) (arguing that the Eleventh Amendment was adopted to eliminate two categories of diversity jurisdiction, i.e., "those involving noncitizen or foreign plaintiffs and state defendants," but was not designed to bar jurisdiction in federal question and admiralty cases). The present CERCLA issues devolve from federal question jurisdiction and a construction of the Commerce Clause, U.S. CONST. art. I, § 8, cl. 3. If correct, this

grant of sovereign immunity to the states as parties to private actions brought in federal court.[285] The doctrine of sovereign immunity therefore precludes a litigant from asserting an otherwise meritorious claim against a party with sovereign attributes unless the sovereign consents to be sued.[286]

The Supreme Court requires an explicit showing of congressional intent before finding a statutory abrogation of state sovereign immunity: "Because of the Eleventh Amendment, States may not be sued in federal court unless they consent to it in unequivocal terms or unless Congress, pursuant to a valid exercise of power, unequivocally expresses its intent to abrogate the [state's sovereign] immunity."[287]

For purposes of CERCLA liability, the question raised is whether the definition of "person" in CERCLA section 101(21),[288] which includes a "state,"[289] indicates an unequivocal expression of congressional intent to abrogate state sovereign immunity.

1. Union Gas *and* Conservation Chemical

The Court of Appeals for the Third Circuit recently answered this question in a different fashion before and after enactment of the 1986 Superfund Amendments. Initially, in *United States v. Union Gas Co. (Union Gas I)*,[290] a majority of a three-judge panel declared that states are immune from private cost recovery suits for monetary damages initiated under CERCLA.[291] In this case, the Union Gas Company (Union Gas) had argued that CERCLA sections 107(a) and 101(21), read together, clearly indicated that Congress intended to abolish state sovereign immunity.[292] In rejecting this argument, the *Union Gas I* majority stated:

> The United States is included in the definition of person in § 9601(21); therefore, if § 9607(a) were indeed an abrogation of states' sovereign immunity then that section would waive the United States' immunity as well. However, a separate CERCLA provision, § 96[20(a)] explicitly waives federal sovereign immunity. This implies that § 9607(a) does not waive federal immunity, for otherwise § 96[20(a)] would be superfluous.[293]

Because abrogation of a state's sovereign immunity requires a clear showing of congressional intent, the court concluded that CERCLA sections 107(a) and 101(21) did not permit the private cost recovery suit initiated by Union Gas.[294]

In a vigorous dissent, Judge Higginbotham argued that Congress's intent to abrogate state sovereign immunity in CERCLA cost recovery actions was clear:

> When a statute in its definitional section declares unequivocally that the term "person" includes a *State* . . . the explicit language of Congress should not be disregarded where there is no legislative history suggesting that Congress did not mean what they said when they used the word "state." Instead of giving Congress the presumption that they know what a state is, the majority seems to assume that judges have a better mastery and understanding of the English language than does Congress, and thus they roam through inconclusive legislative history to "demonstrate" that Congress did not mean state when they included that specific phrase in the key definitional section of the statute.[295]

With the passage of the 1986 Superfund Amendments, the Supreme Court vacated the decision below and remanded to the Third Circuit for reconsideration.[296] In *United States v. Union Gas Co. (Union Gas II)*,[297] the Third Circuit concluded that the new definition of "owner or operator" in CERCLA after the SARA amendments[298] compelled the unmistakable conclusion that Congress intended to abrogate state sovereign immunity so that states would be subject to suit as would any other party.[299]

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would support an argument that the Eleventh Amendment is inapplicable in this case. *See also* Tribe, *Intergovernmental Immunities in Litigation, Taxation, and Regulation: Separation of Powers Issues in Controversies About Federalism*, 89 HARV. L. REV. 682, 686 (1976) (stating that "in ratifying the constitutional plan, the states surrendered sovereign immunity from suits testing the constitutional limits of state action" (footnote omitted)).

285. *Pennhurst*, 465 U.S. at 98-99.

286. *Id.*; *see also* Franchise Tax Bd. v. United States Postal Serv., 467 U.S. 512, 525 (1983) (holding that the statutory provision that the Postal Service can "sue and be sued" waives soverign immunity in administrative proceedings as well as in federal court); United States v. Mitchell, 445 U.S. 535, 539 (1980) (noting that the United States, as sovereign, is immune from suit absent its consent), *aff'd*, 463 U.S. 206 (1983).

287. Green v. Mansour, 474 U.S. 64, 68 (1985) (citing Pennhurst State School & Hosp. v. Halderman, 465 U.S. 89, 99 (1984)).

288. 42 U.S.C. § 9601(21) (1982 & Supp. IV 1986).

289. *Id.*

290. 792 F.2d 372 (3d Cir. 1986).

291. In *Union Gas I*, the United States sued the Union Gas Company (Union Gas) in federal court under CERCLA to recoup $450,000 in response costs and under the Clean Water Act to recover $270,000 in damages. As to the amount claimed under CERCLA, Union Gas filed a third-party complaint against the state and the borough, claiming that they "negligently caused, or contributed to, the discharge of coal tar into Brodhead Creek" by their recent excavation and earlier construction of levees and dikes, and thus were liable for the cleanup costs. *Id.* at 374-75.

292. *Id.* at 379. The argument proceeds as follows: (1) section 107(a) states that "any person who owns or operates a hazardous waste site is liable for clean-up costs;" (2) "the state owns the land . . . where the hazardous waste is deposited;" (3) section 101 specifies that "a state is a person for purposes of CERCLA;" therefore (4) "the state is jointly liable for the costs of the clean-up." *Id.*

293. *Id.*

294. *Id.* at 380.

295. *Id.* at 383. The provision in CERCLA waiving federal immunity was originally codified at 42 U.S.C. § 9607(g). Due to later amendments, however, that provision can be found at 42 U.S.C. § 9620(a). 42 U.S.C. §§ 9607(g), 9620(a) (1982 & Supp. IV 1986).

296. Union Gas v. Pennsylvania, 479 U.S. 1025 (1987).

297. 832 F.2d 1343 (3d Cir. 1987).

298. SARA § 101(b)(1), (f), 42 U.S.C. § 9601(20)(D) (Supp. IV 1986).

299. *Union Gas II*, 832 F.2d at 1350. The court was critical of the fact that the congressional waiver of states' sovereign immunity was found in a definitional section rather than in the body of the Act. However, the court concluded that the definition evidenced a clear congressional intent. *See id.* at 1348-49.

The fact that Congress did not specifically waive state sovereign immunity from citizen suits to enforce CERCLA convinced the court in *Union Gas II* that Congress otherwise intended immunity to be waived. The court found that SARA's legislative history corroborated this view[300] and dismissed any problem with the new law's retroactive application.[301] At the state's request, the Supreme Court on March 21, 1988 granted certiorari to again review this decision.[302] Seventeen states joined Pennsylvania's request.[303]

Although decided prior to SARA's enactment, the district court in *United States v. Conservation Chemical Co*[304] reached the same conclusion as the court in *Union Gas II*. In *Conservation Chemical*, the court concluded that CERCLA's legislative history indicated a clear congressional intent to abrogate state immunity in citizen suits to enforce CERCLA.[305] In that case the original generator defendants had become third-party plaintiffs seeking a ruling that would hold other responsible parties, including the state, liable to the defendants for a portion of the response costs that they would incur.[306] Following the recommendations of a Special Master, the court construed CERCLA sections 107(a) and 101(21) and found that Congress, when passing CERCLA, intended to waive both state and federal governmental immunity.[307]

2. *The 1986 Superfund Amendments (SARA)*

The 1986 Superfund Amendments, enacted after both *Union Gas I* and *Conservation Chemical*, contain two provisions affecting the survival of Eleventh Amendment immunity.[308] First, the general sav-

300. *Id.* at 1349; *see* H.R. CONF. REP. No. 962, 99th Cong., 2d Sess. 185-86, *reprinted in* 1986 U.S. CODE CONG. & ADMIN. NEWS 3276, 3278-79. However, this legislative history contains, at best, an implied rather than an express waiver of sovereign immunity.

301. *Union Gas II*, 832 F.2d at 1356-57. The law in effect at the time of appeal is to be applied, even if it has evolved or is contrary to the law at the time of original trial court decision. *Id.*; *see* United States v. Schooner Peggy, 5 U.S. (1 Cranch) 103, 110 (1801); Dedham Water Co. v. Cumberland Farms Dairy, Inc., 805 F.2d 1074, 1084 (1st Cir. 1986).

302. Pennsylvania v. Union Gas Co., 108 S. Ct. 1219 (1988).

303. *See Supreme Court to Hear Pennsylvania Case Disputing States' Immunity Under CERCLA*, Toxics L. Rep. (BNA) 1183, 1183 (Mar. 30, 1988).

304. 9 Chemical & Radiation Waste Litigation Rep. 945 (W.D. Mo. Mar. 13, 1985) (denying third party defendants' motions to dismiss on the basis of sovereign immunity).

305. *See id.* at 950 (Special Master's recommendation regarding the sovereign immunity motions). The Special Master's recommendation was independently reviewed and adopted by the court. *Id.* at 945. For a recent decision *contra*, see United States v. Freeman, 680 F. Supp. 73, 77-78 (W.D.N.Y. 1988) (holding that Congress has no power to abrograte Eleventh Amendment immunity under the Commerce Clause).

306. *Conservation Chem. Co.*, 9 Chemical & Radiation Waste Litigation Rep. at 947. All four governmental entities which were joined as third-party defendants—the City of Wichita, Kansas, the City of Pleasant Hill, Missouri, the University of Kansas, and the curators of the University of Missouri—filed motions to dismiss the third-party complaint on grounds of sovereign immunity. *Id.*

307. *See id.* at 950 (Special Master's recommendation) (concluding that the "explicit inclusion of states and their political subdivisions as 'persons' potentially liable to private parties under § 107 is clear evidence of Congress's intent to abrogate Eleventh Amendment protection"); *see also id.* at 945 (adopting the Special Master's recommendation).

308. The legislative history of SARA is silent on both of these contradictory decisions. *See generally* H.R. CONF. REP. No. 962, 99th Cong., 2d Sess. 183, *reprinted in* 1986 U.S. CODE CONG. & ADMIN. NEWS 3276 [hereinafter SARA CONFERENCE REPORT].

309. SARA § 321, 42 U.S.C. § 11041 (Supp. IV 1986).

310. *See* SARA CONFERENCE REPORT, *supra* note 308, at 302, *reprinted in* 1986 U.S. CODE CONG. & ADMIN. NEWS at 3395.

311. SARA § 101(b)(1), 42 U.S.C. § 9601(20)(D) (Supp. IV 1986).

312. *Id.*

313. *See* SARA CONFERENCE REPORT, *supra* note 308, at 185-86, *reprinted in* 1986 U.S. CODE CONG. & ADMIN. NEWS at 3278-79; *see also* S. REP. No. 11, 99th Cong., 1st Sess. 42 (1985) ("Under current law . . . the same liability standards may be applied to these entities as is [sic] applied to private parties who are responsible for a spill or other release of a hazardous substance, pollutant or contaminant.").

314. SARA CONFERENCE REPORT, *supra* note 309, at 185-86, *reprinted in* 1986 U.S. CODE CONG. & ADMIN. NEWS at 3278-79.

315. SARA § 206, 42 U.S.C. § 9659 (Supp. IV 1986).

316. *See* Great Northern Life Ins. Co. v. Read, 322 U.S. 47, 54 (1944).

ings clause in the 1986 Superfund Amendments provides that nothing in the Amendments "shall . . . affect or modify in any way the obligations or liabilities of any person under other Federal law."[309] The Conference Report does not explain this provision.[310] This could be read to reinforce the *Union Gas I* majority's demand for an express unequivocal waiver of state sovereign immunity.

Second, the 1986 Superfund Amendments enunciate that state or local governments are not liable as owners or operators if they inherit the site in their capacity as sovereign, assuming they do not in any way contribute to contamination at the site.[311] The amendments do add, however, that a

> State or local government which has caused or contributed to the release or threatened release of a hazardous substance from the facility . . . shall be subject to the provisions of this Act in the same manner and to the same extent, both procedurally and substantively, as any nongovernmental entity, including liability under section 107.[312]

SARA's legislative history sheds little light on Congress's reasons for adding these provisions.[313] However, these modifications appear to support the contention that Congress intended to waive sovereign immunity under CERCLA, although there is no express waiver of immunity in this language. Rather, such waiver is implied by the affirmative statement of local liability if there is any causal contribution by a governmental entity. The SARA Conference Report confirms that state and local governments that dispose of their wastes at a site are liable for contribution under section 113.[314] In a later section of the amendments, citizen suits are authorized to the extent permitted by the Eleventh Amendment.[315] Whether Congress waived Eleventh Amendment state sovereign immunity, therefore, remains in some dispute.

By their own actions, states may also waive their Eleventh Amendment immunity.[316] In *United States v. Mottolo*,[317] a New Hampshire

district court found an implied waiver of sovereign immunity when the state initiated suit as party plaintiff against PRP defendants, thereby impliedly waiving its Eleventh Amendment immunity as to any related counterclaim or defense arising out of the same event.[318] Therefore, the state, by initiating or joining prosecution, may not assert sovereign immunity as a defense to a related counterclaim to its own liability.[319] The waiver in *Mottolo*, however, would not extend to a private PRP seeking contribution where damages are owed solely to the United States as plaintiff or to unrelated affirmative claims.[320]

B. *Municipal and Local Governmental Immunity*

Sovereign immunity under the Eleventh Amendment extends to state agencies and departments.[321] Some non-state agencies exercising state power are also permitted to invoke the Eleventh Amendment to protect the state treasury from liability that would have essentially the same practical consequences as a judgment against the state itself.[322] Whether the state is "the real party in interest" is a question of federal law in Eleventh Amendment cases, and federal courts must examine the powers, characteristics, and relationships created by state law in order to determine whether the suit is, in reality, against the state itself.[323] Local governmental entities could, in limited circumstances, be considered an arm of the state, thereby invoking the protection of the state's Eleventh Amendment immunity.[324] To determine whether the suit is against the state, and therefore barred by the Eleventh Amendment, courts typically consider the degree of local autonomy and control and whether the funds to defray an award would be derived from the state treasury.[325]

The Supreme Court has consistently refused to construe the Eleventh Amendment as affording protection to political subdivisions such as counties and municipalities, although such entities exercise a "slice of state power."[326] Similarly, one district court ruled that Eleventh Amendment sovereign immunity does not extend to independent political entities of the state, municipalities, or local enti-

317. 605 F. Supp. 898 (D.N.H. 1985).
318. *Id.* at 910-11.
319. With only one district court opinion as precedent, however, other states could dispute this implied waiver concept.
320. *Mottolo*, 605 F. Supp. at 910.
321. Pennhurst State School & Hosp. v. Halderman, 465 U.S. 89, 100 (1984).
322. *See* Edelman v. Jordan, 415 U.S. 651, 653-71 (1974); Ford Motor Co. v. Department of Treasury, 323 U.S. 459, 464 (1944).
323. *See* Mount Healthy City School Dist. Bd. of Educ. v. Doyle, 429 U.S. 274, 280 (1977).
324. *See* Sessions v. Rusk State Hosp., 648 F.2d 1066, 1069 (5th Cir. Unit A Nov. 1981).
325. *E.g.*, Moore v. Tangipahoa Parish School Bd., 594 F.2d 489, 493-94 (5th Cir. 1979); Campbell v. Gadsden County Dist. School Bd., 534 F.2d 650, 656 (5th Cir. 1976).
326. *See Mount Healthy*, 429 U.S. at 279-81; Moor v. County of Alameda, 411 U.S. 693, 717-21 (1973); Lincoln County v. Luning, 133 U.S. 529, 530 (1890).

ties created by municipal authority in CERCLA actions.[327] By its terms, Eleventh Amendment protection is only available to "one of the United States."[328] A municipality that owns or operates a hazardous waste site should not be able to raise Eleventh Amendment immunity as a defense to a private action initiated under CERCLA to recover cleanup expenses.[329]

No independent source of municipal sovereign immunity exists, notwithstanding the Eleventh Amendment. In the early nineteenth century, local governmental officials claimed that counties, cities, and other municipal corporations should benefit from sovereign immunity to protect these local governments from suits in the federal courts. The Supreme Court has held on numerous occasions that political subdivisions do not have the benefit of sovereign immunity.[330] Local governments are considered municipal corporations; they exist at the pleasure of the state and have never been considered sovereigns in their own right.[331] As such, they may sue and be sued. Moreover, outside the realm of CERCLA liability, the Supreme Court has concluded that there is no tradition of immunity for municipal corporations and that neither history nor policy supports granting immunity to municipalities when a statute is otherwise silent.[332] A municipality should therefore not be afforded governmental immunity as a defendant in a CERCLA suit.

Although a municipality may not have independent sovereign immunity, two doctrines exist that afford municipalities, in limited situations, protection from tort liability by affording them protection under the state's immunity.[333] The first doctrine distinguishes be-

327. United States v. Conservation Chem. Co., 9 Chemical & Radiation Waste Litigation Rep. 945, 948 (W.D. Mo. Mar. 13, 1985) (Special Master's recommendation regarding sovereign immunity motions, adopted by the court after independent review).
328. U.S. CONST. amend. XI.
329. This lack of Eleventh Amendment immunity from suits by third parties is distinct from municipalities' rights as plaintiffs under CERCLA. State, and in some cases municipal, governmental entities exerting enforcement powers can recover expenditures under CERCLA section 107. *See* New York v. Shore Realty Corp., 759 F.2d 1032, 1047 (2d Cir. 1985). One court construed municipalities as "states" for purposes of plaintiff cost recovery based on a broad reading of the remedial goals of CERCLA. Mayor of Boonton v. Drew Chem. Corp., 621 F. Supp. 663, 665 (D.N.J. 1985). Another court, however, found that municipalities could not avail themselves of "state" status, but still allowed them to recover costs as would a private plaintiff who incurred cleanup expenses under CERCLA. City of Philadelphia v. Stepan Chem. Co., 544 F. Supp. 1135, 1140-43 (E.D. Pa. 1985).
330. Cowles v. Mercer County, 74 U.S. (7 Wall.) 118, 121 (1868); Levy Court v. Coroner, 69 U.S. (2 Wall.) 501, 507-08 (1864); Weightman v. Washington, 66 U.S. (1 Black) 39, 49-52 (1861).
331. Cooper, *The Supreme Court on Governmental Liability*, 16 ADMIN. & SOCIETY 259, 273 (1984).
332. *See* Owen v. City of Independence, 445 U.S. 622, 638 (1980) (holding that municipalities may not assert "good faith" qualified immunity under the Civil Rights Act of 1873, 42 U.S.C. § 1983 (1982)).
333. *See generally Owen*, 445 U.S. at 644-50 (discussing the application of two common

tween a municipality's "governmental" and "proprietary" functions.[334] A city is immune from suit for actions undertaken in its governmental capacity; however, when exercising its proprietary functions, a city is held to the same standards of liability as those applied to private corporations.[335] The second doctrine provides a municipality with absolute immunity from suits stemming from its "discretionary" or "legislative" activities, but affords qualified immunity from suits arising from "executive" or "ministerial" activities.[336]

These two doctrines do not serve to immunize municipalities from liability for their share of cleanup costs under CERCLA. First, garbage collection services provided by cities are not traditionally considered exclusively governmental functions.[337] Rather, a city is acting more properly in its proprietary capacity when it provides such services. Second, garbage collection services do not involve any legislative or discretionary action by cities or municipalities, but are rather ministerial services provided by local governments. Third, CERCLA liability is not conventional tort liability. States and municipalities that handle solid or hazardous wastes are not immune from regulation or liability under the reservation-of-rights guaranteed to the states by the Tenth Amendment.[338] The exceptions that may otherwise shield municipal activities therefore do not apply to a municipality's handling and disposal of solid and hazardous waste.

If a state enacts a statute attempting to exempt a political subdivision from liability for CERCLA offenses, that statute is ineffective. In *Lincoln County v. Luning*,[339] the Supreme Court correctly held that a state statute purporting to exempt a county from amenability to suit, except in the courts of the county, cannot defeat the federal jurisdiction granted by the Constitution.[340] By granting jurisdiction to the federal courts, CERCLA allows the courts to impose liability on political subdivisions, notwithstanding any state or local laws to the contrary.

In *Artesian Water Co. v. Government of New Castle County*,[341] a Delaware district court held that CERCLA mandated the legal responsibility of political subdivisions for the response costs incurred in taking removal or remedial action at sites owned or operated by these subdivisions.[342] In its defense, the county argued that the Delaware Tort Claims Act immunized it from an action for cleanup

law doctrines providing for municipal immunity and the policy behind each of these doctrines); Cooper, *supra* note 331, at 263-64 (same).

334. *Owen*, 445 U.S. at 644.

335. *Id.*; Cooper, *supra* note 331, at 643.

336. *See Owen*, 445 U.S. at 644; Cooper, *supra* note 331, at 643.

337. *See* Little, *Section 1983 Liability of Municipalities and Private Entities Operating Under Color of Municipal Law*, 14 STETSON L. REV. 565, 581 (1985).

338. In particular, liability under neither the Clean Water Act nor RCRA is shielded by the reservation of rights guaranteed by the Tenth Amendment. *See* United States v Duracell Int'l, 510 F. Supp. 154, 156-57 (M.D. Tenn 1981).

339. 133 U.S. 529 (1890).

340. *Id.* at 531.

341. 605 F. Supp. 1348 (D. Del. 1985).

342. *Id.* at 1354-55.

cost recovery under CERCLA.[343] The court found that the Delaware Tort Claims Act conflicted with the liability provisions of CERCLA, and that the Act was preempted under the Supremacy Clause of the United States Constitution.[344] Therefore, the county was not allowed to interpose the defense of state tort immunity as a bar to Artesian's claims under CERCLA. The court distinguished its decision from *Union Gas I*, because in *Artesian Water* the county conceded that it was not protected by the Eleventh Amendment, whereas in *Union Gas I* the state maintained that it was protected by Eleventh Amendment sovereign immunity.[345]

CERCLA authorizes the United States to initiate legal action against states in federal court notwithstanding the guarantees of the Eleventh Amendment.[346] The Third Circuit's decision in *Union Gas I* only protects states from being sued by private third parties. Municipalities, however, have no immunity; therefore the shield of the sovereign does not shelter municipalities that generate solid wastes from liability under CERCLA.

VII. Catch 22: When Separate is Not Equal

Without the shield of sovereign immunity at the local level, a municipality would face joint, several, and strict liability should the hazardous constituents in MSW trigger the liability provisions of CERCLA. However, there still remain a number of procedural hurdles to be surmounted before a private PRP can reach a municipality. These hurdles are not presented to the same degree when the EPA decides to prosecute municipalities.

The EPA includes municipalities as PRP-defendants when a municipality is either the current owner or operator of a dumpsite containing hazardous substances, or the previous owner or operator at the time of hazardous waste disposal.[347] The EPA does not, however, name as PRP-defendants municipal generators of MSW if the dumpsite was privately owned and received both municipal solid *and* industrial hazardous waste.[348] This category includes a significant

343. *Id.* at 1353.

344. *Id.* The Supremacy Clause requires that where state and federal law conflict, state law must yield. *See* Michigan Canners & Freezers Assoc., Inc. v. Agricultural Mktg. & Bargaining Bd., 467 U.S. 461 (1984). State law is preempted to the extent it actually conflicts with federal law, that is, when it is impossible to comply with both state and federal law, Florida Lime & Avocado Growers, Inc. v. Paul, 373 U.S. 132, 142-43 (1963); or where state law stands as an obstacle to the accomplishment of the full purposes and objectives of Congress, Hines v. Davidowitz, 312 U.S. 52, 67 (1941).

345. *Artesian Water*, 605 F. Supp. at 1355.

346. *See* 42 U.S.C. § 9601(21) (Supp. IV 1986).

347. *See supra* notes 228-29 and accompanying text.

348. *See supra* notes 102-40 (discussing the EPA's position regarding the cleanup of the Charles George Superfund site).

percentage of the Superfund sites included on the NPL.[349]

In those situations in which the EPA initiates prosecution, it is possible to consolidate all private and public PRPs in a single action. Yet the courts allow the EPA the discretion to name PRPs as defendants in litigation. PRPs who are not sued are not "indispensable parties" for the purpose of Rule 19 of the Federal Rules of Civil Procedure.[350] Instead, joinder of PRPs under Rule 14 impleader is possible, although permissively granted by the courts.[351] Although defendants may not succeed in forcing the EPA to name municipalities as PRPs, Rule 14 impleader and contribution actions can be utilized to bring municipalities into litigation and to impose liability on them. Indeed, the 1986 Superfund Amendments explicitly establish a right to contribution.[352]

There appears to be little long-term consequence of the EPA's

349. About 75% of the sites on the NPL will have fewer than 50 PRP generators; as many as 25% will exhibit more than 50 PRP generators. Presentation by Lee M. Thomas, EPA Assistant Administrator for Solid Waste Emergency Response & Gene A. Lucero, Director, EPA Office of Waste Programs Enforcement, Aspen Institute Conference on Superfund, Wye River Plantation, Maryland (Nov. 29-30, 1985).

350. New York v. Shore Realty Corp., 759 F.2d 1032, 1044 (2d. Cir. 1985); United States v. Conservation Chem. Co., 619 F. Supp. 162, 225 (W.D. Mo. 1985); United States v. Northeastern Pharmaceutical & Chem. Co., Inc. (*NEPACCO I*), 579 F. Supp. 823, 845 n.26 (W.D. Mo. 1984), *aff'd in part, rev'd in part*, 810 F.2d 726, 741 (8th Cir. 1986), *cert. denied*, 108 S. Ct. 146 (1987); United States v. A & F Materials Co., 578 F. Supp. 1249, 1261 (S.D. Ill. 1984); United States v. Cauffman, 15 Envtl. L. Rep. (Envtl. L. Inst.) 20,161, 20,161-62 (C.D. Cal. Oct. 23, 1984). In *Conservation Chem. Co.*, the court refused joinder of 46 other alleged contributing generators under Rule 19, citing the traditional rule that "one tortfeasor may not compel the joinder of other alleged joint tortfeasors." United States v. Conservation Chem. Co., 589 F. Supp. 59, 63 (W.D. Mo. 1984).

351. *See A & F Materials*, 578 F. Supp. at 1261. Joinder is permissive where liability is joint and several. *See* FED. R. CIV. P. 20. Joinder of the United States involuntarily is not permitted in CERCLA actions. *See* New Jersey Dep't of Envtl. Protection v. Gloucester Envtl. Management Servs., Inc., 26 Env't Rep. Cas. (BNA) 1443, 1445 (D.N.J. 1987); *In re* Hemingway Transport, Inc., 25 Env't Rep. Cas. (BNA) 1791, 1795 (Bankr. D. Mass. 1987).

352. 42 U.S.C. § 9613(f)(1) (Supp. IV 1986). This statute provides that

> Any person may seek contribution from any other person who is liable or potentially liable under section 9607(a) of this title, during or following any civil action under section 9606 of this title or under section 9607(a) of this title. Such claims shall be brought in accordance with . . . the Federal Rules of Civil Procedure, and shall be governed by Federal law. In resolving contribution claims, the court may allocate response costs among liable parties using such equitable factors as the court determines are appropriate. . . .

Id. The 1986 amendments provide a three-year statute of limitations for private contribution actions, running from either the date of judgment in a cost recovery action or the date of an administrative order regarding de minimus or other settlement. *Id.* § 9613(g)(3); *see also id.* § 9622(g)-(h) (providing settlement authority).

Even before CERCLA was amended, several courts and commentators had suggested that a right to contribution is consistent with CERCLA's statutory scheme. *Conservation Chemical*, 619 F. Supp. at 227-29; Wehner v. Syntex Agribusiness, Inc., 616 F. Supp. 27, 31 (E.D. Mo. 1985); United States v. South Carolina Recycling & Disposal, Inc. (*SCRDI*), 653 F. Supp. 984, 995 & n.8 (D.S.C. 1984) (dicta); United States v. Chem-Dyne Corp., 572 F. Supp. 802, 807 n.3 (S.D. Ohio 1983) (dicta); Smith, *A Right to Contribution in Superfund Cost-Recovery Actions*, 8 Chemical & Radiation Waste Litigation Rep. 41, 50 (1984); Note, *The Right to Contribution for Response Costs Under CERCLA*, 60 NOTRE DAME L. REV. 345, 357-61 (1985). The original legislative history of CERCLA also evidences a congressional concern for equitable rights of contribution. *See* 126 CONG. REC. 26,781-87, 30,932-33, 31,930-44 (1980).

prosecutorial habit of naming private, but not municipal, solid waste generators as PRPs for the cleanup of Superfund sites. The right to contribution appears to offer the possibility for all PRPs, either by cross-claims or in a later contribution action, to spread damages equitably among all those responsible.[353] Yet named defendants have several difficulties to overcome before they can successfully obtain contribution.

To begin, defendants have the burden of proving the divisibility of damages.[354] In one case, the defendants sought to apportion damages and base divisibility on waste volume; yet because the court could not determine the exact amount of chemicals or noxious matter attributable to each defendant, the court decided that the defendants' liability was joint, several and indivisible.[355] Three courts, in dicta, have also indicated that waste volume alone is not an appropriate basis for the division of damages.[356] These courts suggest that the division of damages must be based on risk, toxicity, and migratory potential.[357] This may be a difficult, if not impossible, burden for a PRP to sustain.

Defendants seeking contribution may also be thwarted by several affirmative defenses. Although CERCLA recognizes only three statutory defenses,[358] *all* equitable defenses should be fully available in contribution actions for purposes of apportioning liability.[359] Con-

353. 42 U.S.C. § 9613(f)(1) (Supp. IV 1986).

354. *SCRDI*, 653 F. Supp. at 994; United States v. Ottati & Goss, Inc., 630 F. Supp. 1361, 1395-96 (D.N.H. 1985); Colorado v. ASARCO, Inc., 608 F. Supp. 1484, 1487-91 (C.D. Colo. 1985); United States v. Wade, 577 F. Supp. 1326, 1337-39 (E.D. Pa. 1983); United States v. Chem-Dyne Corp., 572 F. Supp. 802, 810-11 (S.D. Ohio 1983); *see* United States v. Dickerson, 640 F. Supp. 448, 453 (D. Md. 1986); United States v. Conservation Chem. Co., 619 F. Supp. 162, 199 (W.D. Mo. 1985); *cf.* United States v. A & F Materials Co., 578 F. Supp. 1249, 1255-57 (S.D. Ill. 1984) (adopting Gore amendment legislative history for apportionment).

355. *Ottati & Goss*, 630 F. Supp. at 1396. *But see* Advance Circuits, Inc. v. Carriere Properties, No. C8-87-1436 (Minn. Ct. App. Feb. 9, 1988) (unpublished opinion) (LEXIS, States library, Minn file) (apportioning liability for costs among site owners and generators).

356. *See SCRDI*, 653 F. Supp. at 994-95; *A & F Materials*, 578 F. Supp. at 1256; *Chem-Dyne Corp.*, 572 F. Supp. at 811.

357. In *A & F Materials*, 578 F. Supp. at 1255-57, the court makes reference to the amendment proposed by Representative Gore that was not enacted. The Gore amendment would have permitted a court to divide liability according to criteria of due care exercised, toxicity and volume of waste, direct responsibility of the PRP in the disposal activity, and other factors. *Id.*

358. *See supra* note 257.

359. *Cf.* United States v. Conservation Chem. Co., 619 F. Supp. 162, 204-06 (W.D. Mo. 1985) ("Equitable defenses are proper under CERCLA in determining liability, the nature of the remedy and the amount of damage."); Marden Corp. v. C.G.C. Music Ltd., 600 F. Supp. 1049, 1057-58 (D. Ariz. 1984) (dismissing CERCLA claim on basis of equitable defense of unclean hands). *But see* Mola Dev. Corp. v. United States, 22 Env't Rep. Cas. (BNA) 1443, 1447 (C.D. Cal. 1985) (implying that only the three statutory defenses are available in private cost recovery actions). For a discussion of equitable defenses, see *supra* notes 257-61.

sequently, the litigation process of apportioning liability in a distinct contribution action among private and public PRPs may be more convoluted and less expeditious than in a section 107 cost recovery action pursued by the EPA against all PRPs.

Further, the ability of private PRPs to reach public PRPs has not been resolved. Private PRPs can avail themselves of third-party status under CERCLA section 107.[360] Yet if the public PRP against whom contribution is sought is entitled under the evolving common law to utilize the Eleventh Amendment shield of sovereignty, a contribution action may not be available to private PRPs. If the Court's rationale in *Union Gas I* prevails,[361] state government PRPs will be able to assert their immunity to contribution claims, although municipal PRPs generally will not.

In addition, the Superfund Amendments provide the EPA with the ability to settle with selected PRPs, including the power to grant releases from additional prosecution or contribution actions.[362] This discretion, if not judiciously applied, can further compound the settlement and contribution imperfections and uncertainties facing named PRPs.

When the EPA designates selected PRPs without commencement of litigation, another dilemma confronts these named PRPs. Under CERCLA sections 104 and 106, the EPA can offer or demand that those jointly and severally liable PRPs undertake remediation activities at a contaminated site. Yet without litigation, the PRPs pursued by the EPA cannot maintain an action for contribution nor cross-claim against other PRPs ignored by the EPA. Until the named PRP incurs remediation costs consistent with the NCP, it appears that no contribution or other claim can be effectively pursued against unnamed PRPs.[363] Moreover, without litigation and the attendant discovery rights, the named PRP cannot effectively assess the strengths or weaknesses of its claims against unnamed PRPs, possible defenses, nor all the pertinent facts. It must therefore decide whether to comply with an EPA section 104 settlement offer or section 106 order in a partial vacuum.

In such a situation, a Catch-22 exists. If a named PRP elects not to engage voluntarily in early remedial actions, the remediation eventually imposed on the PRP by the EPA may be more expensive than necessary.[364] In addition, the PRP may be liable for treble

360. 42 U.S.C. § 9607(a)(4)(B) (Supp. IV 1986).

361. *See supra* text accompanying notes 290-94.

362. 42 U.S.C. §§ 9613(f)(2), 9622(f)-(g) (Supp. IV 1986).

363. Artesian Water Co. v. Government of New Castle County, 659 F. Supp. 1269, 1291-92 (D. Del. 1987), *aff'd*, 851 F.2d 643 (3d Cir. 1988); Pinole Point Properties, Inc. v. Bethlehem Steel Corp., 596 F. Supp. 283, 286, 289-90 (N.D. Cal. 1984); United States v. Northeastern Pharmaceutical & Chem. Co. (*NEPACCO I*), 579 F. Supp. 823, 850-51 (W.D. Mo. 1984), *aff'd in part, rev'd in part*, 810 F.2d 726 (8th Cir. 1986), *cert. denied*, 108 S. Ct. 146 (1987); Dedham Water Co. v. Cumberland Farms Dairy, Inc., 588 F. Supp. 515, 517-18 (D. Mass. 1983).

364. It is generally thought that EPA-initiated actions are more expensive than identical PRP-initiated cleanups. Yet to date, no district court has agreed to enjoin a cleanup action ordered by the EPA on the grounds that its costs were excessive or inappropriate.

damages due to the violation of an EPA administrative order.[365] On the other hand, it is difficult for a PRP to voluntarily commit to a remediation effort before knowing the capability and willingness of unnamed PRPs to contribute.

The lack of interlocutory review of EPA administrative decisions, statutorily enshrined by the 1986 Superfund amendments, compounds this dilemma.[366] Although PRPs in a section 107 cost recovery action may challenge any costs incurred for cleanup undertaken to comply with the EPA's directives,[367] the courts will not sanction this review until all cleanup costs are incurred.[368] To make informed and cost-effective settlement and remediation decisions at Superfund sites, a PRP needs to know at least two important facts: what the cost is and who will share in the payment of that cost. Without litigation, a PRP who ignores a section 104 offer or a section 106 demand does not know, and loses control over, eventual remediation costs. Conversely, a PRP who elects to effect remediation does not know how many other parties will share in the costs at the time critical cleanup decisions are made. Without both pieces of

Even when courts have found that EPA-imposed cleanup actions are arbitrary and capricious, they have refused to halt their completion. *See* Industrial Park Dev. Co. v. EPA, 604 F. Supp. 1136, 1143-44 (E.D. Pa. 1985) (denying plaintiff's motion for preliminary relief, in spite of plaintiff's strong showing of EPA's arbitrary and capricious behavior, because plaintiff failed to show that irreparable injury would occur absent injunctive relief). Instead, the court in *Industrial Park* held that the propriety of the EPA cleanup would be an issue for cost recovery against the PRP under section 106. *Id.* at 1145. For a discussion of EPA's cleanup actions priced at more than the least available cost, see *supra* note 190.

365. 42 U.S.C. §§ 9606, 9607(c)(3) (1982).

366. SARA § 113(c), 42 U.S.C. § 9613(h) (Supp. IV 1986). Several courts have heard preenforcement challenges to section 106 administrative orders as violative of fundamental due process rights under the statute. The courts reaching the question are split. The courts in United States v. Reilly Tar & Chemical Corp., 606 F. Supp. 412 (D. Minn. 1985), and in Wagner Electric Corp. v. Thomas, 612 F. Supp. 736 (D. Kan. 1985), found that PRPs raising good faith challenges to section 106 administrative orders have "sufficient cause" to obviate treble damages; other courts, notably Aminoil, Inc. v. EPA, 599 F. Supp. 69, 75 (C.D. Cal. 1984) and Industrial Park Development Co. v. EPA, 604 F. Supp. 1136 (E.D. Pa. 1985) (motion for summary judgment), found the statutory scheme of daily penalties and treble damages to have a coercive effect violative of fundamental due process.

Under RCRA, whose cleanup actions are not predicated on "imminent and substantial endangerment," one court suggests that preenforcement review may be appropriate. *See* E.I. duPont de Nemours & Co. v. Daggett, 610 F. Supp. 260, 263 (W.D.N.Y. 1985).

367. J.V. Peters & Co. v. Administrator, 767 F.2d 263 (6th Cir. 1985).

368. *Id.* EPA Records of Decisions, the government plan implementing cleanup, are not reviewable. Lone Pine Steering Comm. v. EPA, 600 F. Supp. 1487 (D.N.J.), *aff'd*, 777 F.2d 882 (3d Cir. 1985), *cert. denied*, 476 U.S. 1115 (1986); United States v. Outboard Marine Corp., 104 F.R.D. 405 (N.D. Ill. 1984), *aff'd*, 789 F.2d 497 (7th Cir.), *cert. denied*, 479 U.S. 961 (1986); *cf.* United States v. United Nuclear Corp., 610 F. Supp. 527 (D.N.M. 1985) (holding that the EPA determination that hazardous substances were being released was not final agency action and thus was not subject to judicial review). Similarly, conduct of the government's Remedial Investigation and Feasibility Study (RI/FS) is not independently reviewable. *Id.* at 528; Wheaton Indus. v. EPA, 15 Envtl. L. Rep. (Envtl. L. Inst.) 20,950 (D.N.J. July 11, 1985).

...formation, an effective and equitable settlement and remediation process is hampered.

VIII. Household Waste: RCRA Doublespeak

If municipalitites arranging for disposal of MSW can be PRPs under CERCLA, the factual and legal issue remains: Is MSW a legally hazardous substance?[369] As a matter of prosecutorial discretion, the EPA uniformly answers this question in the negative in scores of prosecutions nationwide. The EPA's answer allocates responsibility for hundreds of billions of dollars of long-term liability solely to private PRPs at mixed public/private sites. This Article contends that the EPA's interpretation of this critical CERCLA enforcement responsibility is legally unsound.

As a general rule, the EPA's construction of CERCLA's liability provisions should be accorded deference by a reviewing court.[370] When sufficiently reasonable, the EPA's construction should be respected absent clear congressional intent to the contrary.[371] However, an agency's reversal of its internal enforcement position mitigates against judicial deference to the agency's position.[372] As demonstrated below, the EPA has taken contradictory enforcement positions on the issue of municipal liability for hazardous constituents in MSW.[373] In light of this conflict, there is no uniform agency interpretation to which a court can properly defer.

In the absence of clear statutory guidance, courts should determine congressional intent.[374] CERCLA's original legislative history, however, contains no language clarifying the liability status of municipalities.[375] Although there is a vague reference to municipal liability in the 1986 Superfund Amendments, the legislative history of the amendments fails to explain this reference.[376] The Supreme Court has stated that "[s]ubsequent legislation declaring the intent of an earlier statute is entitled to great weight in statutory construction."[377] However, if that subsequent legislation is equally ambiguous, it provides little guidance.[378] Moreover, according to the Supreme Court, " '[i]t is the intent of the Congress that enacted [the section] that controls' " and not the intent of a subsequent Congress.[379] A reviewing court must therefore fashion congressional intent from the whole cloth of the originally enacted CERCLA.

369. *See generally* Gaynor, *Municipalities as PRPs: Changing the Dynamics of Selecting the Remedy*, Toxics L. Rep. (BNA) 375 (Aug. 17, 1988) (discussing EPA's increased attention to the emerging problems that municipal landfills and the treatment of municipalities present in the Superfund program).

370. *See* Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc., 467 U.S. 832, 842-66 (1984); Bulk Distrib. Centers, Inc. v. Monsanto Co., 589 F. Supp. 1437, 1448 (S.D. Fla. 1984).

371. Investment Co. Inst. v. Camp, 401 U.S. 617, 626 (1971); *see Chevron*, 467 U.S. at 844-45.

372. International Bhd. of Teamsters v. Daniel, 439 U.S. 551, 566 (1979); Morton v. Ruiz, 415 U.S. 199, 237 (1974); Espinoza v. Farah Mfg. Co., 414 U.S. 86, 93-94 (1973).

373. *See infra* notes 405-20 and accompanying text.

374. *E.g.*, United States v. Ward, 618 F. Supp. 884, 898 (E.D.N.C. 1985).

375. Because the Senate accepted the House of Representatives' version of CERCLA, there was no conference committee report to aid in intepretation. Committee reports produced pertain to earlier versions of the legislation before critical changes were made to the bill. *See* S. REP. No. 848, 96th Cong., 2d Sess. (1980); H.R. REP. No. 1016, 96th Cong., 2d Sess., *reprinted in* 1980 U.S. CODE CONG. & ADMIN. NEWS 6119; H.R. REP. No. 172, 96th Cong., 1st Sess., *reprinted in* 1980 U.S. CODE CONG. & ADMIN. NEWS 6160; 126 CONG. REC. 30,897 (1980).

376. *See supra* text accompanying notes 311-15.

377. Red Lion Broadcasting Co. v. FCC, 395 U.S. 367, 380-81 (1969).

378. In determining the relative weight courts should afford subsequent legislation and the legislative history of such legislation, the Supreme Court stated:

> With respect to subsequent *legislation*, . . . Congress has proceeded formally through the legislative process. A mere statement in a conference report of such legislation as to what the committee believes an earlier statute meant is obviously less weighty. [S]ubsequent legislative history will rarely override a reasonable interpretation of a statute that can be gleaned from its language and legislative history prior to its enactment.

Consumer Prodts. Safety Comm'n v. GTE Sylvania, Inc., 447 U.S. 102, 118 n.13 (1980); *see also* United States v. Price, 361 U.S. 304, 310 (1969) (holding that congressional refusal to amend a statute does not constitute acceptance of the statute's judicial interpretation).

379. Oscar Mayer & Co. v. Evans, 441 U.S. 750, 758 (1979) (quoting International Bhd. of Teamsters v. United States, 431 U.S. 324, 354 n.39 (1977) (latter alterations by *Oscar Mayer* Court)).

A. CERCLA's Additive Definition of "Hazardous Substance"

In its haste for passage, Congress avoided fashioning a prescriptive definition of "hazardous substances" that CERCLA would regulate. Rather, Congress chose to include by reference all substances that the EPA deemed hazardous pursuant to four existing statutes. This also vested the EPA with lead agency administrative responsibilities.[380]

CERCLA's definition of a hazardous substance is additive. Any substance that falls within one of five definitional references is a hazardous substance for CERCLA purposes.[381] Moreover, even if a substance is purposely excluded from the hazardous substance defi-

380. For examples of delegation of lead agency responsibility, see TSCA § 26, as amended, 15 U.S.C. § 2625 (1982 & Supp. IV 1986); Federal Water Pollution Control Act, § 501, 33 U.S.C.A. § 1361 (West 1986 & Supp. 1988); RCRA § 3008, 42 U.S.C. § 6928 (1982 & Supp. IV 1986); CERCLA § 106, 42 U.S.C. § 9606 (1982 & Supp. IV 1986).

381. CERCLA defines a hazardous substance as:

> (A) any substance designated pursuant to section 1321(b)(2)(A) of title 33, (B) any element, compound, mixture, solution or substance designated pursuant to section 9602 of this title, (C) any hazardous waste having the characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act [42 U.S.C. 6921] (but not including any waste the regulation of which under the Solid Waste Disposal Act [42 U.S.C. 6901 et seq.] has been suspended by Act of Congress), (D) any toxic pollutant listed under section 1317(a) of title 33, (E) any hazardous pollutant listed under section 112 of the Clean Air Act [42 U.S.C. 7412], and (F) any imminently hazardous chemical substance or mixture with respect to which the Administrator has acted pursuant to section 2606 of title 15.

42 U.S.C. § 9601(14) (Supp. IV 1986).

nition under one reference, it is still a hazardous substance under CERCLA if it is included by another.[382]

By far the most comprehensive list of hazardous substances that CERCLA incorporates by reference is that maintained pursuant to RCRA.[383] RCRA and CERCLA are interwoven in a helix legal definition: RCRA forms the messenger RNA that carries the definitional lifecode to CERCLA enforcement actions.

1. CERCLA's Incorporation of RCRA's Provisions

RCRA is a complex statute. Enacted in 1976 to protect the public health and to encourage the recycling, reuse, and treatment of hazardous wastes,[384] RCRA requires that anyone who generates,[385] transports,[386] treats, stores, or disposes[387] of hazardous wastes must notify the EPA and comply with RCRA requirements.[388]

a. RCRA's Regulatory Structure

The EPA's primary responsibilities under RCRA are ministerial, including issuing permits for the handling, transportation, storage, and disposal of hazardous wastes,[389] as well as inspection, testing,

382. *See infra* text accompanying notes 431-42. By statute, the term "hazardous substance" does not include: "petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance . . . and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas)." *Id* § 9601(14) (Supp. IV 1986).

383. *Id* §§ 6901-6987 (1982 & Supp. IV 1986).

384. *Id* § 6902 (Supp. IV 1986). In RCRA section 1003, as amended, Congress declares it to be the national policy that, "wherever feasible, the generation of hazardous waste is to be reduced or eliminated as expeditiously as possible. Waste that is nevertheless generated should be treated, stored, or disposed of so as to minimize the present and future threat to human health and the environment." *Id* § 6902(b).

385. *Id* § 6922. RCRA section 3002, as amended, states that the EPA "shall promulgate regulations establishing such standards applicable to generators of hazardous waste . . . as may be necessary to protect human health and the environment." *Id* § 6922(a). These standards are set forth in 40 C.F.R. § 262 (1988).

386. 42 U.S.C. § 6923 (1982 & Supp. IV 1986). RCRA section 3003, as amended, requires the EPA to promulgate standards to govern transporters of hazardous waste. *Id.* § 6923(a). These standards are set forth in 40 C.F.R § 263 (1988).

387. 42 U.S.C. § 6924 (Supp. IV 1986). RCRA section 3004, as amended, authorizes the EPA to establish regulations applicable to owners and operators of hazardous waste treatment, storage and disposal facilities. The regulations require that accurate records be kept of the types of hazardous wastes that are treated, stored and disposed of at the facility, and that the manner in which these hazardous wastes are treated, stored and disposed conform to methods approved by the EPA. In addition, the location, design and construction of the facilities must meet with EPA's approval. The owners and operators of such facilities are also responsible for adequately training personnel and having the financial assets available for corrective action when necessary. *Id* § 6924(a)

388. §§ 6902, 6922-6924 (1982 & Supp. IV 1986)

389. *Id* § 6925. RCRA section 3005, as amended, requires the EPA to "promulgate regulations requiring each person owning or operating an existing facility or planning to construct a new facility for the treatment, storage or disposal of hazardous waste" to obtain a permit. *Id.* § 6925(a) (Supp. IV 1986). This section also allows the EPA to determine what information an applicant for a permit must provide, including information concerning estimates of the "composition, quantities and concentrations of hazardous waste . . . proposed to be disposed of, treated, transported or stored," as well as the frequency and rate at which such operations will take place. *Id* § 6925(b) (1982). Under this section, permits are to be issued for a fixed term (not to exceed ten years).

and monitoring.[390] The EPA has delegated its primary enforcement responsibility to state environmental protection agencies in thirty-eight states,[391] where state RCRA programs impose standards that are at least as strict as federal standards. Although RCRA in its pure form is a waste management statute, RCRA as modified by Congress increasingly reflects the failure of past waste management efforts.

Due to persistent groundwater contamination problems near landfills, the 1984 amendments to RCRA[392] require a complete ban on land disposal of untreated hazardous wastes to be in effect by 1990, unless specifically exempted by the EPA after review.[393] The 1984 amendments additionally require the retrofitting of operational and existing hazardous waste surface impoundments with a double-liner, a leachate collection and groundwater monitoring system,[394] minimum technology requirements for new land disposal facilities,[395] and waste minimization and reduction efforts.[396] With

and provisions for the EPA to review an operation and its permit and to make necessary modifications to the permit are outlined. *Id* § 6925(c) (Supp. IV 1986). The EPA's regulations for such permits are set forth in 40 C.F.R § 270 (1988).

390. 42 U.S.C. § 6927 (1982 & Supp. IV 1986). RCRA section 3007, as amended, provides that any EPA representative or any representative from a state with an authorized waste program may request information and records of any person who generates, stores, treats, transports, or handles hazardous waste, and that information must be furnished. *Id* § 6927(a) (1982). To enforce the provisions of this chapter, officers, employees, or representatives of the EPA may inspect and obtain samples of hazardous wastes from places where it has been generated, stored, treated, disposed of, or transported from. *Id*

This section also establishes a schedule for inspections by the EPA of various facilities: the EPA must annually inspect facilities owned or operated by a state or federal agency, *id* § 6927(c)-(d) (Supp. IV 1986), and it must inspect at least every two years every facility that has been issued a permit under RCRA section 3005, as amended, *id* § 6927(e)(1)

RCRA section 3013, 42 U.S.C. § 6934 (1982), provides that if the EPA receives information indicating that hazardous waste exists at a facility or site that may present a substantial hazard to human health or the environment, the EPA may issue an order requiring the owner or operator to monitor, test and analyze such conditions and report them to the EPA. *Id* § 6934(a).

391. *See* E.R.C, RCRA HANDBOOK 12-13 (2d ed. 1986) (Figure A: States with Final Authorization), *see also* 42 U.S.C. § 6926 (1982 & Supp. IV 1986).

392. The Hazardous and Solid Waste Amendments of 1984, Pub. L. No. 98-616, 98 Stat. 3221 (codified in scattered sections of 42 U.S.C.).

393. 42 U.S.C. § 6924(g)-(h) (Supp. IV 1986). EPA must review its lists of hazardous wastes at a rate of one-third by August 8, 1988, two-thirds by June 8, 1989, and all by May 8, 1990. *Id* § 6924(g)(4)

394. *Id* § 6924(o)

395. *Id* Regulations promulgated pursuant to this section must be revised from time to time to take into account technological advances made in the control and management of hazardous wastes. *Id*

396. *Id* § 6922(b). This amendment requires a generator to certify that it has a program in place to reduce the volume and toxicity of hazardous waste to the degree determined by the generator to be economically practicable. *Id* The 1984 amendments represent the first congressional statement on hazardous waste minimization. Although the amendments require companies to report on their current and planned waste reduction efforts, no standards are mandated. This represents an attempt to encourage alter-

age, RCRA is evolving into a more prophylactic and comprehensive waste management statute.

The legal applicability of RCRA is launched on a triple trigger. First, the specific requirements of RCRA apply to any "person," which includes an individual, federal agency, government corporation, state, municipality, commission, political subdivision of a state or interstate body.[397]

Second, only persons generating at least de minimus quantities of hazardous waste are subject to RCRA's requirements. At a particular site, hazardous waste must be created in amounts greater than 100 kilograms per month in order to invoke RCRA's primary coverage.[398] Small quantity generators exempted by this threshold include an estimated ninety-two percent of all hazardous waste generators in the nation, and they generate at least five percent of the total volume of hazardous waste.[399] Generators and transporters exceeding these threshold amounts must keep a manifest system to track wastes and must follow strict labeling, recordkeeping, and groundwater monitoring requirements.[400] A different set of standards and recordkeeping requirements applies to owners and operators of hazardous waste treatment, storage, and disposal sites.[401] Both civil[402] and criminal[403] penalties may be imposed for violations of RCRA requirements.

Third, only certain substances are defined as hazardous wastes subject to the full scope of RCRA regulation. As explained below, a

natives to land disposal of hazardous wastes. *See* 40 C.F.R. pt. 262 (1988); 50 Fed Reg. 28,702 (1985); SERIOUS REDUCTION, *supra* note 58, at 45, 158.

Ten states have currently established waste reduction programs: California, Connecticut, Georgia, Illinois, Minnesota, New York, North Carolina, Pennsylvania, Tennessee and Wisconsin. SERIOUS REDUCTION, *supra* note 58, at 34-35. A study of source reduction possibilities for southern California has been proposed. *See Two-Year, $600,000 Source Reduction Study Planned by EDF, Southern California Utility*, 17 Env't Rep. (BNA) 1794 (Feb. 20, 1987).

397. 42 U.S.C. § 6903 (1982).

398. *Id.* § 6921(d)(6) (Supp. IV 1986). Section 6921(d) requires the EPA to promulgate standards under sections 6922, 6923, and 6924 to govern small quantity generators. A small quantity generator is a "person" who generates a total quantity of hazardous waste greater than 100 kilograms (about 220 pounds or one half of a 55-gallon drum) but less than 1000 kilograms during a calendar month. Although one who generates less than 100 kilograms of hazardous waste per calendar month is not subject to mandatory regulation, the EPA Administrator is left discretion to regulate the waste practices of such persons if necessary to protect the public health and environment. *Id.* § 6921(d); *see* 40 C.F.R. pts. 260-265, 270-271 (1988).

399. SUPERFUND STRATEGY, *supra* note 42, at 11.

400. 42 U.S.C. §§ 6922-6923 (1982 & Supp. IV 1986); *see supra* notes 385-86.

401. 42 U.S.C. § 6924 (Supp. IV 1986); *see supra* note 388.

402. 42 U.S.C. § 6928 authorizes the EPA to issue an order assessing civil penalties for past or present violations, including suspension or revocation of one's permit to handle hazardous wastes. The EPA may also commence a civil action against a violator in U.S. district court for appropriate relief, such as a temporary or permanent injunction. Fines may also be assessed up to $25,000 for each day that the violation exists. 42 U.S.C. § 6928(a), (c) (Supp. IV 1986).

403. 42 U.S.C. § 6928(d) provides that one who knowingly violates the requirements of RCRA is subject to a fine of up to $50,000 for each day of violation, or imprisonment of up to two years, or both, for their first conviction. If one is convicted more than once, the maximum punishment is doubled with respect to both fine and imprisonment. *Id.* § 6928(d).

substance must first qualify as a "solid waste" or as a combination of "solid wastes" to be classified as a hazardous waste under RCRA.[404]

b. RCRA and the EPA: Defining "Hazardous Waste"

RCRA defines "hazardous waste" as "a solid waste, or combination of solid wastes," which might contribute to increased mortality or illness, or might pose a substantial hazard to human health or the environment.[405] In turn, "solid waste" is defined to include "any garbage, refuse, sludge . . . and other discarded material."[406] This definition of solid waste includes waste in gaseous or liquid forms.[407]

RCRA instructs the EPA to "develop and promulgate criteria for identifying the characteristics of hazardous waste, and for listing hazardous waste."[408] Since RCRA's passage in 1976, however, the definition of "hazardous waste" has confounded the EPA. The definition has important implications that reach beyond the EPA's regulatory authority under RCRA. Designation of a substance as a hazardous waste under RCRA automatically triggers CERCLA liability when a release is threatened or occurs.[409]

The EPA proposed regulations for further defining hazardous wastes in December 1978[410] and published interim final regulations in May 1980.[411] The May 1980 interim final regulations defined solid waste as "any garbage, refuse, sludge, or any other waste material."[412] Pursuant to its statutory mandate,[413] the EPA issued further regulations specifically listing approximately 1000 chemicals and chemical compounds that have been determined to create present or potential risks prohibited by statute.[414] This list includes a number of compounds that are identified with leachate from MSW,

404. 42 U.S.C. § 6903(5) (1982).

405. *Id.*

406. *Id.* § 6903(27).

407. *See id.*

408. *Id.* § 6921 (1982 & Supp. IV 1986). Pursuant to this authority, EPA has: (1) listed generic and specific waste streams as hazardous, 40 C.F.R. §§ 261.3, 261.32 (1988); (2) listed certain commercial chemical products as hazardous if discarded or intended for discard, *id.* § 261.33; and (3) established four "characteristic" tests to assess the ignitability, corrosivity, reactivity, and toxicity of all other wastes, *id.* pt. 261, subpart C.

409. 42 U.S.C. § 9601(14)(C) (Supp. IV 1986).

410. 43 Fed. Reg. 58,946 (Dec. 18, 1978).

411. 45 Fed. Reg. 33,066, 33,093 (proposed May 19, 1980). The regulations were later revised in April 1983. 48 Fed. Reg. 14,472 (1983). The final rule was published in January 1985. 50 Fed. Reg. 614 (Jan. 4, 1985) (codified at 40 C.F.R. § 261.3 (1988)).

412. 45 Fed. Reg. 33,066, 33,093 (May 19, 1980). This definition is still in effect.

413. *See supra* text accompanying note 408.

414. 40 C.F.R. §§ 261.31, 261.32, and 261.33 list hazardous wastes from non-specific and specific sources which include organic chemicals, inorganic chemicals, inorganic pigments, pesticides, explosives, and petroleum refining by-products. 40 C.F.R. §§ 261.31-.33 (1988).

such as dichloroethylene, methylene chloride, trichloroethylene, and vinyl chloride.[415] Additionally, in certain circumstances MSW could qualify as ignitable, reactive, toxic, or corrosive—generic characteristics of any solid hazardous waste—depending upon the chemical constituents in the MSW.[416]

RCRA's provisions, as further delineated by the EPA's regulations, therefore include as hazardous waste the primary constituents of MSW. Consequently, municipalities that generate and collect MSW, owners and operators of MSW landfills, and transporters of MSW are required to comply with all applicable RCRA requirements, provided they handle more than a de minimus amount of waste.

c. The EPA's Exclusion of Household Waste

The EPA assumes that individual households generating hazardous MSW fall under the "small quantity" generator exception for RCRA compliance.[417] If a municipality is viewed as a "non-arranging" transporter of waste for a household, then arguably it is also exempt from RCRA transporter regulations. However, the small quantity generator exception would not apply to municipalities. Although individual households do not fall within RCRA reporting requirements, municipalities that collect and amass this same waste for disposal do not escape RCRA regulation.

However, the full sweep of RCRA is mitigated by regulatory exclusions that temper the broad statutory definition of hazardous waste. Among these exclusions is "household waste," defined as "any material (including garbage, trash and sanitary wastes in septic tanks) derived from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds and day-use recreation areas)."[418] This exemption encompasses household waste that has been "collected, transported, stored, treated, disposed, recovered (e.g., refuse-derived fuel) or reused."[419]

This regulatory exclusion can be read to exempt MSW from RCRA regulations entirely, regardless of the volume of hazardous waste generated as a constituent of MSW. The EPA's use of the modifier "any" to denote the types of household wastes excluded appears to place any hazardous constituents of household waste beyond RCRA's reach, notwithstanding that they appear separately on the itemized RCRA list of hundreds of hazardous or acutely hazardous constituents. RCRA's legislative history sheds no light on Congress's intent either to include or exclude MSW from RCRA's requirements.

The EPA consistently takes the position that, despite the threat to the public, municipalities and transporters that generate and transport MSW to private landfills are exempt from responsibility for cleanup costs or damages under both RCRA and CERCLA.[420] Premising its conclusion on RCRA's regulatory exclusion of "household waste," the EPA's discretionary enforcement of RCRA excuses from CERCLA prosecution thousands of municipal, county, and state governmental entities at sites they do not own or operate.

2. Drawing the Line: CERCLA Substance Over RCRA Waste

Expanding RCRA's household waste exclusion to preclude EPA enforcement under CERCLA is legally and factually unsupportable under the existing statute. The drafters of CERCLA elected to include only a single citation to RCRA to incorporate by reference four external statutory lists of hazardous waste constituents.[421] Although Congress could have incorporated by reference larger portions of RCRA to effectuate and define CERCLA's purposes, Congress sought to incorporate only the RCRA hazardous waste list, without adopting the operative provisions of RCRA.

Of critical importance is the semantic distinction between RCRA and CERCLA in their designations of hazardous waste components. RCRA speaks in terms of "hazardous waste," from which the definition of "household waste" is regulatorily excluded.[422] CERCLA, on the other hand, addresses "hazardous substances," as incorporated by reference to the hazardous substance lists of four other statutes, including RCRA.[423] These four statutes defined their "hazardous" substance lists exclusively for internal regulatory purposes, without considering CERCLA or its ramifications. The "household waste" exclusion in RCRA is necessary to exempt MSW from burdensome RCRA recordkeeping requirements for hazardous "solid wastes."

CERCLA, however, does not recognize "wastes," but speaks only of "substances." For CERCLA purposes, there are no such things as "waste," "municipal solid wastes," "solid wastes," or "hazardous wastes." For CERCLA purposes one drop of a "hazardous substance" compels action, whereas under RCRA's principal requirements only large quantity generators merit plenary regulation.[424] Case law makes clear that it was not Congress's purpose when en-

415. *Id.* §§ 261.30-.33.
416. *See supra* note 408.
417. HOUSEHOLD HAZARDOUS WASTE SURVEY, *supra* note 30, at 3-1 (1986). Small quantity generators are those generating less than 100 kilograms of hazardous waste per month. *See supra* note 399 and accompanying text. This exception does not exclude used oil. 40 C.F.R. §§ 261.5(j)-.4 (1988).
418. *Id.* § 261.4(b)(1).
419. *Id.*
420. For an example, see the discussion of the Charles George Landfill, *supra* text accompanying notes 102-40.
421. *See supra* note 380.
422. *See supra* text accompanying notes 405 & 418.
423. *Id.*
424. *See supra* note 91.

acting CERCLA to exclude minimum quantities of hazardous substances from regulation.[425]

The "household waste" exclusion in RCRA, however, is a regulatory invention rather than an exclusion contemplated by Congress. Nowhere in the statutory scheme or legislative history of RCRA are there exemptions for "household wastes," MSW, or any of its constituents. The RCRA regulatory exemption for "household waste" had not been promulgated in its final form when CERCLA was initially considered by Congress,[426] although the exemption does predate CERCLA's final passage.[427] In discerning Congress's intent, courts have stated that Congress is presumed to have knowledge of the legal interpretations accorded preexisting statutes.[428] However, Congress apparently neither recognized nor accepted the inclusion of the RCRA "household waste" exclusion as part of the design and structure of CERCLA, and indeed contemplated that the plenary scope of CERCLA would reach the household garbage pail.[429]

425. In a CERCLA action the government must prove only that the defendant's substance was deposited at the site in question. United States v. Conservation Chem. Co., 619 F. Supp. 162, 185 (W.D. Mo. 1985); United States v. Wade, 577 F. Supp. 1326, 1332 (E.D. Pa. 1983). The defendant's waste is hazardous if it contains any amount of a substance listed as hazardous under the various definitional statutes incorporated by reference in CERCLA. *See Conservation Chemical*, 619 F. Supp. at 228; *Wade*, 577 F. Supp. at 1339-40. No specific amount of a hazardous constituent is necessary to qualify waste as a hazardous substance under CERCLA. *See* 42 U.S.C. § 9601(14) (Supp. IV 1986).

426. The regulation containing the "household waste" exclusion was promulgated on May 19, 1980, 45 Fed. Reg. 33,084, to be effective on November 19, 1980.

427. CERCLA was signed by President Carter on December 11, 1980. 126 CONG. REC. 34,415 (1980).

428. United States v. Stringfellow, 20 Env't Rep. Cas. (BNA) 1905, 1909 (C.D. Cal. 1984); *see also* United States v. Medley, 24 Env't Rep. Cas. (BNA) 1856, 1857 (D.S.C. 1986) (noting that in enacting CERCLA, Congress was aware that a majority of states allow a right to contribution when joint and several liability exists); United States v. Conservation Chem. Co., 619 F. Supp. 162, 199 (W.D. Mo. 1985) (stating that courts may presume that Congress is aware of common law interpretations of statutes).

429. In a critical floor statement, Representative David Stockman presented his understanding that CERCLA would apply to MSW and to many household products:

> The point is, there are no standards at all, and the coverage, the scope of this bill, is plenary. It covers every waste site, every junk yard, every municipal dump in the country, including those on private property.
>
> . . . .
>
> . . . The point is that by defining the scope of the act [by reference to the Resource Conservation and Recovery Act] what we do is incorporate the definition of hazardous material from the existing Resources Recovery and Conservation Act [sic] . . . . I do not believe that very many of my colleagues have looked at the list of 1,165 different materials, chemical compounds, and trade names that are on the RCRA list . . .
>
> . . . I would like to take a minute of the time of the House this afternoon just to read and put in the RECORD some of the materials that are considered hazardous under RCRA, and which are found in every waste site, every dump site, every municipal landfill, in the country.
>
> First, let us start with some household names that are going to end up in any municipal landfill:
>
> Mole Death; Mouse-Nots; Mouse-Bid; Mouse-Tox; Pied Piper Mouse Seed; Rat and Mice Bait; Rat-A-Way; Rat-B-Gon; Rat-O-Cide, Rat Guard, Rat-Kill; Rat-Mix; and Rats-No-More.
>
> The list goes on and on. This is household refuse, but under the definition of RCRA it is hazardous material, and by incorporation into this act, if it is found in any site, then the superfund authorities take effect.

To interpret the possible reach of CERCLA to MSW, one must decide whether RCRA overrides CERCLA. If the MSW exemption in RCRA regulations is incorporated in CERCLA, there is a defensible argument that CERCLA also exempts MSW from its coverage. On the other hand, if CERCLA only incorporates by reference certain limited waste definitions of RCRA, MSW contains potentially hazardous substances subject to CERCLA. This interpretation must be one or the other: CERCLA either does or does not universally apply to MSW.

A substance is hazardous under CERCLA if it is included in any definitional reference and not otherwise specifically excluded by CERCLA. RCRA's exclusion of household hazardous waste does not appear to exempt hazardous constituents of household waste from CERCLA prosecution. Congress has made no mention of exempting household waste from CERCLA's reach.

B. Judicial Constructions of RCRA and CERCLA

Courts have not yet addressed whether CERCLA section 101(14), which incorporates by reference RCRA's list of hazardous wastes, adopted only the hazardous waste component list or whether CERCLA also adopted RCRA's regulatory exclusion of MSW from recordkeeping requirements. Legislative history does not support the view that Congress intended to transfer regulatory exclusions when it incorporated by reference specific statutory provisions in CERCLA.[430] This question closely parallels the debate over whether RCRA's statutory exclusions for generic materials such as "fly ash," "mining wastes," or "coal tar"[431] also exclude these materials from CERCLA regulation if they contain hazardous constituents listed in other statutes. To date, the courts have held that CERCLA imposes liability regardless of RCRA exemptions.

In *Eagle-Picher Industries, Inc. v. EPA*,[432] petitioners argued that their waste materials, including mining waste and fly ash from large boilers, were not a "hazardous substance" for purposes of CERCLA remediation liability.[433] They based their argument on the fact that CERCLA draws its definitions from reference to other statutes, in-

126 CONG. REC. 26,759 (1980) (statement of Rep. Stockman).

Stockman went on to discuss the disposal of methanol (rubbing alcohol), naphthalene (mothballs), formaldehyde and saccharin (all RCRA hazardous wastes) in municipal landfills. *Id.*

430. *See generally* Dedham Water Co. v. Cumberland Farms Dairy, Inc., 805 F.2d 1074, 1080 (1st Cir. 1986) ("CERCLA has acquired a well deserved notoriety for vaguely drafted provisions and an indeterminate, if not contradictory, legislative history.") (quoting United States v. Montello, 605 F. Supp. 898, 902 (D.N.H. 1985)).

431. *See* 42 U.S.C. § 6921(b)(3)(A) (1982).

432. 759 F.2d 922 (D.C. Cir. 1985).

433. *Id.* at 926-27.

cluding the Solid Waste Disposal Act.[434] This statute specifically excludes both mining waste and fly ash from RCRA regulation.[435] Petitioners argued that this exemption under RCRA was imposed upon CERCLA because CERCLA's list of hazardous substances was defined by reference to RCRA.[436] CERCLA's reference to RCRA statutorily excludes "any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress."[437]

The EPA, however, argued that this exclusion applies only to hazardous substances so designated by the Solid Waste Disposal Act.[438] Seeking to include regulation of the compounds under CERCLA, the EPA argued that this exclusion " 'speaks only to the question whether mining wastes (and other "suspended" wastes) are CERCLA "hazardous substances" *because they are regulated under RCRA.*' "[439] Thus, a question of statutory interpretation was at issue, guided only by the sparse legislative history accompanying a hastily passed statute.

In *Eagle-Picher*, the D.C. Circuit held that, unless ambiguous, the plain language and structure of CERCLA's statutory scheme must control the court's interpretation of congressional intent.[440] In this case, the plain language and structure of CERCLA restricted a statutory exclusion relevant to only the definitional section. If a chemical compound qualifies under one of the three other statutes referenced by CERCLA section 9601(14) to define hazardous substances, the exclusion from one statute does not control the others.[441] Thus, should any chemical or compound qualify as a hazardous substance under one of the four statutes referenced by CERCLA's definition, it is not controlling that the substance is statutorily excluded as a hazardous substance under another.[442]

The definitional provision of CERCLA is therefore a multiple trigger. Inclusion of a substance in any one of the definitional reference statutes is sufficient to define the substance as hazardous, notwithstanding the substance's exclusion elsewhere.[443] Two courts have

434. 42 U.S.C. §§ 6901-6991(i) (1982 & Supp. IV 1986).
435. *Id.* § 6921(b)(3)(A)(i)-(ii).
436. *Eagle-Picher*, 759 F.2d at 926-27.
437. 42 U.S.C. § 9601(14)(C) (Supp. IV 1986)
438. *See Eagle-Picher*, 759 F.2d at 927.
439. *Id.* at 928 (quoting EPA Brief at 73) (emphasis in original).
440. *Id.* at 929.
441. *See id.* at 930.
442. Recently, the court in Idaho v. Bunker Hill Co., 653 F. Supp. 655 (D. Idaho 1986), endorsed and followed the reasoning of *Eagle Picher*. *See id.* at 672; *see also* United States v. Union Gas Co., 586 F. Supp. 1522 (E.D. Pa. 1984) (holding that exclusion by reference to RCRA does not bar inclusion by reference to another statute), *aff'd*, 792 F.2d 372 (3d Cir. 1986); United States v. Metate Asbestos Corp., 584 F. Supp. 1143, 1146-48 (D. Ariz. 1984) (same); *cf.* United States v. Wade, 11 Envtl. L. Rep. (Envtl. L. Inst.) 20,440, 20,441 (E.D. Pa. Apr. 27, 1984) (refusing to hold that EPA "delisting" of biological sludge as hazardous under RCRA precludes such sludge being a hazardous substance under CERCLA).
443. In *Union Gas* the court concluded that ethyl benzene, fluoranthene, pentanthrene pyrene, naphthlene and xylene are hazardous substances under CERCLA, because of listing under the Clean Water Act, notwithstanding their exemption pending study under RCRA section 3001(b)(A)(ii), 42 U.S.C. § 6291(b)(3)(A)(ii) (1982). *Union Gas*, 586 F. Supp. at 1522-25.
444. *Eagle Picher*, 759 F.2d at 930; *Union Gas*, 586 F. Supp. at 1522-25; *see supra* note 443 and text accompanying notes 432-42.
445. *See* United States v. Wade, 577 F. Supp. 1326, 1339 (E.D. Pa. 1983) (noting that CERCLA liability for hazardous substances regulated by the Federal Water Pollution Control Act, 33 U.S.C.A. §§ 1251-1387 (West 1986 & Supp. 1988), will be dependent upon concentration levels listed by CERCLA).
446. *Eagle Picher*, 759 F.2d at 927-28.
447. *See* United States v. Carolawn Co., 14 Envtl. L. Rep. (Envtl. L. Inst.) 20,696, 20,697 (D.S.C. 1984).
448. For example, VOCs (hazardous under RCRA and the Clean Water Act), asbestos containing building materials, and lead (hazardous under the Clean Air Act). *See also supra* (text accompanying notes 31-39 (discussing the toxicity of VOCs found in household refuse), *supra* note 429 (citing several household products that are RCRA hazardous wastes).
449. *See* Bulk Distrib. Centers, Inc. v. Monsanto Co., 589 F. Supp. 1437, 1445 (S.D. Fla. 1984) (emphasizing that CERCLA must be interpreted in such a manner so as to avoid conflicting results).

now held that an operative exclusion in one definitional reference section of a statute does not imply a general congressional intent to exempt that substance from CERCLA regulation.[444] The presence at a site of any quantity or concentration of a hazardous substance included in any of the statutes referenced by CERCLA's definition section therefore triggers CERCLA liability.[445]

The *Eagle-Picher* court adopted the EPA's argument that any hazardous *substance*, even though contained within a statutorily exempted *compound*, still subjects the material containing that hazardous substance to CERCLA regulation.[446] Similarly, another court has noted that if trace amounts of chemicals designated as toxic under the Clean Water Act are present, these chemicals are "hazardous substances" under CERCLA, regardless of whether they are regulated or exempted by RCRA.[447] In essence, the EPA has successfully asserted that any element of a hazardous substance is sufficient to trigger CERCLA liability, notwithstanding that element's exclusion from regulation under other statutes. Section 101(14) is considered an additive section: Any designation of a substance as hazardous subordinates an exclusion of that same substance contained in another definitional reference.

C. *Implications for Municipal Solid Waste*

Many components of MSW are hazardous under the Clean Air Act, the Clean Water Act, and the Toxic Substances Control Act.[448] The EPA should be held to a consistent interpretation of its enforcement position. Because the RCRA *statutory* exclusions of fly ash, mining wastes, and coal tar do not transfer to CERCLA, the RCRA *regulatory* exclusion for MSW should not contradict CERCLA's statutory intent.[449] The litigation position of the EPA with respect to the

former issue should dispose of the latter.

1. *CERCLA's Independent Basis for Regulating MSW*

By its own terms, CERCLA can include MSW without reference to RCRA or to any of its sister definitional references. As an alternative category to "hazardous substances," CERCLA's designation of those materials eligible for NPL site remediation includes any "pollutant or contaminant."[450] CERCLA defines "pollutant or contaminant" to include any substance that could cause harm to the environment or to human health from almost any exposure medium.[451] CERCLA provides an independent basis for regulating pollutants or contaminants.

As the court recognized in *Eagle-Picher*, the EPA's power to regulate a "pollutant or contaminant" is separate and independent from its power to regulate hazardous substances.[452] The exemption of a substance from the category of hazardous substances does not, therefore, diminish the EPA's ability under CERCLA to regulate pollutants or contaminants.[453] Unless expressly excluded from the definition of "pollutant or contaminant," a hazardous substance may not be excluded from the sweep of this definition.[454] MSW and its constituent elements, therefore, may not be excluded from this definition.

The consequences of this distinction are important in sculpting the contours of liability. The EPA is legally incorrect in exempting MSW from CERCLA liability at private Superfund sites. Moreover, even if the EPA's position were legally tenable, it would not be factually supported given the reality of MSW collection, typically commingling commercial and residential waste as explained below. The EPA's RCRA exclusion applies only to "household waste," and this definition does not include waste collected from commercial establishments.[455]

MSW collection practices are seldom so discreet that the entire waste stream consists of pure "household waste." Waste collection practices in many communities create a mix of household, commercial, and non-household wastes.[456] Small communities may commingle household waste with other waste at trash transfer stations, and there is no guarantee that the trash actually arriving at the MSW disposal facility will fall entirely within the definition of "household waste."[457] Some municipalities allow commercial haulers to mix commercial waste with household MSW before its final disposal.[458] Municipalities may contract with private firms for the collection, transport, and disposal of their "household waste," and the private hauler may commingle "household waste" collected in one community with a broad array of waste from other communities or from commercial clients. Once the wastes are commingled and brought to a landfill, none of the entire amalgam can be considered "household waste."

Additionally, CERCLA does not require that a material be a hazardous substance at the time it is deposited in a landfill in order for liability to attach. CERCLA speaks of hazardous substances in the present tense.[459] If a substance at a site becomes hazardous at any time, it is subject to a CERCLA remediation action. Evidence indicates that various chemicals typically found in MSW, under anaerobic conditions present in landfills, are transformed to daughter compounds.[460] Although the release of the original material may not pose a risk to human health or to the environment, the daughter compound can be considered a "hazardous substance" as defined by the EPA.

2. *The EPA's Enforcement Position*

With respect to MSW, the EPA takes an arbitrary and inconsistent enforcement position. If it furthers the purpose of prosecution, the EPA will alter its general position of exempting MSW from CERCLA's liability provisions. A number of communities have

450. 42 U.S.C. § 9605 (Supp. IV 1986).

451. According to the statute, "Pollutant or contaminant"

> includes any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformations, in such organisms or their offspring.

42 U.S.C. § 9601(33) (Supp. IV 1986).

452. Eagle-Picher Indus., Inc. v. EPA, 759 F.2d 922, 926 n.4, 931 (D.C. Cir. 1985).

453. Under CERCLA section 107, the owner of a facility is not liable for the cleanup of a released "pollutant or contaminant," while an owner is liable for the cleanup of a released "hazardous substance." 42 U.S.C. § 9607 (1982 & Supp. IV 1986). The court in *Eagle-Picher* reasoned that it would be illogical for Congress to exempt a substance from the latter definition, only to include it in the former. *Eagle-Picher*, 759 F.2d at 932.

454. In *Eagle-Picher* the court held that exemptions from the definition of "hazardous substance" could not be read into the definitions for exemptions from "pollutant or contaminant." *Eagle-Picher*, 759 F.2d at 932.

455. *See* 40 C.F.R. § 261.4(b)(1) (1988).

456. For example, in Massachusetts MSW collection of residential waste, because the routing is geographically determined, will include the occasional "mom and pop" commercial establishment existing as a nonconforming use within a residential zone. It will also often include "city waste," generated by city hall or other government offices. Collection of either of these types of waste renders the entire municipal waste stream outside RCRA's definition of "household waste."

457. *Cf.* BUREAU OF SOLID WASTE DISPOSAL, COMMONWEALTH OF MASS., SOLID WASTE RESOURCE RECOVERY FOR HAMPSHIRE COUNTY 3-3 to 3-7 (June 1986) (unpublished report prepared by Hayden/Wegman Consulting Engineers) (discussing the mechanics of design and operation of transfer/transport waste stations).

458. The author, in his work with municipalities confronting this problem, finds it not uncommon for a community to allow commercial haulers, for a fee, to mix commercial waste into MSW before it is transported to cogeneration facilities or landfilled.

459. *See* 42 U.S.C. § 9601(14) (Supp. IV 1986).

460. *See supra* text accompanying notes 51-54.

therefore instituted household hazardous waste collection programs in an effort to extract hazardous waste from the MSW stream.[461] By virtue of the EPA's regulation exempting "household waste,"[462] collection program sponsors are exempt from RCRA regulation, but only if the collected waste is not commingled with any other commercial or industrial waste designated as hazardous.[463]

The EPA cannot, however, exempt these collection program sponsors from CERCLA's liability provisions.[464] An internal EPA memorandum states that neither RCRA's small quantity generator exemption[465] nor its "household waste" exemption apply when determining liability under CERCLA.[466] The EPA has concluded that potential CERCLA liability attaches "regardless of whether the material was picked up as part of a community's routine trash collection service or was gathered as part of a special collection day program."[467]

These internal EPA policy guidelines clearly elucidate a legal position that would subject generators, transporters, and owners of disposal sites of MSW containing *any* hazardous substances to liability under CERCLA. As the EPA posits: "[W]ith respect to household hazardous waste, such waste would clearly qualify as a 'hazardous substance' if it contains any substance listed in Table 302.4 of 40 CFR Part 302."[468]

Internally, the EPA goes beyond the *Eagle-Picher* holding[469] and administratively answers a question that the courts have yet to reach. Under this internal interpretation of CERCLA, all MSW is hazardous unless it is deliberately and effectively purged of all hazardous substances. Even the best organized household hazardous waste collection efforts have only a minimal impact on siphoning hazardous substances from a community's household waste stream.[470] Under the EPA's internal view, all MSW carries with it the potential for CERCLA liability.

461. *See supra* note 30.
462. *See supra* text accompanying notes 417-20.
463. *See* Memorandum to Basil G. Constantelos, Director, Waste Management Division, Region V, EPA, from John P. Lehman, Director, Waste Management and Economics Division, EPA (Jan. 28, 1986) [hereinafter Constantelos memo] (copy on file at the *George Washington Law Review*); Memorandum from Assistant Administrator Lee M. Thomas, EPA, to the Deputy Administrator (May 18, 1984) (copy on file at the *George Washington Law Review*).
464. *See* Constantelos memo, *supra* note 463, at 1.
465. *See supra* text accompanying notes 418-20.
466. Constantelos memo, *supra* note 465, at 1.
467. *Id* at 2.
468. *Id* The substances listed in Table 302.4 are those deemed hazardous by the EPA pursuant to its regulatory authority under 42 U S C § 9602(a) (Supp IV 1986) *See* 40 C.F.R. § 302.4 (1988).
469. *See supra* notes 432-41 and accompanying text.
470. Grants for these purposes are awarded under section 8001 of RCRA, 42 U S C. § 6981 (1982). There are 530 such programs in 32 states, which achieve about one percent local participation. 17 Env't Rep. (BNA) 1254-55 (Nov 28, 1986). Some programs achieve significantly less than one percent participation These programs cost $2 $9 per pound of hazardous waste collected—an expensive price. *EPA Says Household Waste Collection Efforts Provide Benefits but Have Low Participation*, 17 Env't Rep (BNA) 1222 23 (Nov 21, 1986); *see* HOUSEHOLD HAZARDOUS WASTE SURVEY, *supra* note 30, at 7 1 to 7 6

In light of this internal enforcement position, the EPA's failure to prosecute municipal generators of MSW is confounding. In isolated instances the EPA has even provided written assurances that it will not prosecute, under CERCLA, nonprofit sponsors of household hazardous waste collection efforts,[471] although as a general policy the EPA does not pledge in advance that it will take no action against one who handles hazardous substances.[472]

In at least one situation, the EPA took the position that MSW does impose CERCLA liability. In an affidavit Dr. Kirk Brown, an EPA consultant, testified that numerous toxic chemicals discovered at the private multiple-source Flemington Landfill in North Carolina were "typical of those found in leachate of municipal solid waste landfills . . . [and that] municipal solid waste could have been the sole source of or contributed to the contamination found in the groundwater downgradient from the Flemington Landfill."[473] Although twenty percent of NPL sites are municipal-only landfills,[474] the EPA does not generally interpret its jurisdiction to allow it to prosecute MSW generators or dumpers at private Superfund sites.

In view of the EPA's position in other cases, and in view of the contrary judicial determinations of this issue, the EPA's exemption for MSW is legally inconsistent. There is simply no dispute that MSW qualifies as a solid waste and, as a matter of course, that EPA pleads its authority under both RCRA section 7003 and CERCLA section 106 when initiating Superfund cleanups.[475] Therefore, MSW should be routinely included in Superfund prosecutions, under any one of several legal authorities.

Congress recently amended CERCLA to reinforce equitable considerations regarding PRPs. The 1986 Superfund amendments officially sanction discretionary settlement "as promptly as possible"

471. *See, e g*, Letter from Michael DeLand, EPA Region I Administrator, to Dana Duxbury, League of Women Voters (May 4, 1984) (declining to take action against Massachusetts communities which might accidentally release hazardous substances during their own clean-up efforts) (copy on file at the *George Washington Law Review*).
472. *See* Memorandum from Courtney M. Price, Assistant Administrator for Enforcement and Compliance Monitoring, EPA, (Nov. 16, 1984) (copy on file at the *George Washington Law Review*)
473. Affidavit of Dr. Kirk W. Brown (Sept. 29, 1985) at 3-4, United States v. Waste Indus , Inc., 16 Envtl L. Rep. (Envtl L. Inst) 20,501 (E D N.C 1985) (No 80-4 CIV-7) (copy on file at the *George Washington Law Review*) These toxic chemicals included: benzene, 1,2-trans dichloroethylene, methylene chloride, tetrachloroethylene, tetrahydrofuran, trichloroethylene, vinyl chloride, cadmium, copper, lead, mercury, nickel, and zinc *See supra* note 414.
474 *See supra* note 70 and accompanying text
475 RCRA § 7003, 42 U S C § 6973 (1982 & Supp IV 1986), has been interpreted to impose no liability on generators no longer related to a threatening site. United States v A & F Materials Co , 578 F Supp 1249, 1258 59 (S D Ill 1984), United States v Wade 546 F Supp 785, 788 92 (E D Pa 1982) CERCLA § 106, 42 U S C. § 9606 (1982 & Supp IV 1986) has been interpreted more broadly *See* United States v South Carolina Recycling & Disposal, Inc , 653 F Supp 984, 996 (D S C 1984)

between the EPA and "de minimus" generators at Superfund sites.[476] In return for early settlement, often before completion of the RI/FS and usually at a premium price over a pro rata share,[477] de minimis PRPs that settle receive a complete release from liability (and possibly a covenant not to sue) as site remediation is undertaken.[478] Although the new legislation does not define what constitutes a de minimis PRP, the statute requires that the toxic substances contributed by a de minimis PRP must be "minimal in comparison to other hazardous substances at the facility."[479]

This new statutory emphasis on including de minimis PRPs in prosecution and settlement makes it easier for the EPA to include all parties associated with hazardous waste disposal in contribution and resolution. There is now an official mechanism by which a de minimis PRP can extricate itself from the enforcement action at an early stage, although de minimis contributors do not escape responsibility. Despite the mounting technical evidence that any party who contributes MSW at a Superfund site is a PRP, the EPA's enforcement position has not reflected this status.

476. SARA § 122(a), 42 U.S.C. § 9622(g) (Supp. IV 1986). The settlement policy in section 122 seeks in general to avoid unnecessary delays and excessive transaction costs, and in particular recognizes that "[a]llowing minor responsible parties to cash out . . . avoids the imposition of unnecessary negotiation or litigation costs on such parties," in addition to streamlining negotiations. H.R. REP. No. 253 (III), 99th Cong., 1st Sess. 32 (1985), *reprinted in* 5 U.S. CODE CONG. & ADMIN. NEWS 3038, 3055 (1986) [hereinafter HOUSE JUDICIARY REPORT].

In addition, these provisions explicitly contemplate de minimis settlements at an early stage of a Superfund proceeding. New subsection 122(g)(3) requires the Administrator of the EPA to reach settlements in these cases as soon as the necessary information is available to establish the party's de minimis status. It is the clear intention of Congress that such settlements should be expedited and that every effort be made to reach them at the earliest possible moment. Section 122(g) contemplates that site conditions do not have to be known or allowed for in a de minimis settlement. Congress contemplated that a de minimis settlement may take place before completion of an RI/FS. *Id.* at 30-32, *reprinted in* 5 U.S. CODE CONG. & ADMIN. NEWS at 3055-57.

477. *See* 42 U.S.C. § 9622(g) (Supp. IV 1986). There is no clear statutory directive as to how much of a premium should be paid by de minimis PRPs to settle early in litigation, while other largers PRPs remain. Some of this premium reflects saved transaction and legal expenses. *See* Butler, DeSmidt & Brooks, *Sue or Settle? A Method for Evaluating Superfund Settlement Proposals*, 7 Chemical & Radioactive Waste Litigation Rep. 785, 795 (1984).

478. Section 122(g)(2) expressly authorizes final releases or "covenants not to sue" for any PRP that has entered into a de minimis settlement under section 122(g). 42 U.S.C. § 9622(g)(2) (Supp. IV 1986). Although section 122(f)(6), which applies to covenants not to sue generally, provides that most covenants not to sue must have a reopener for future liabilities arising out of unknown conditions, de minimis settlements under section 122(g) are expressly exempted from this requirement. *Id.* § 9622(f)(6). Section 122(b)(4) of SARA allows a de minimis settlement to be entered using either a consent decree or an administrative order. 42 U.S.C. § 9622(b)(4) (1982 & Supp. IV 1986).

479. *Id.* § 9622. "De minimis" is a relative term. The House Judiciary Committee Report reiterates that, to be eligible for settlement under section 122(g), a party's contribution in terms of volume and toxic effect "must be minimal compared to the other substances at the facility." HOUSE JUDICIARY REPORT, *supra* note 476, at 31, *reprinted in* 5 U.S. CODE CONG. & ADMIN. NEWS at 3054. The term "toxic effect" is also relative. *Cf.* EPA Draft Hazardous Waste Settlement Policy at 3, 50 Fed. Reg. 5034, 5037 (1985) (stating that volumetric allocation is appropriate where "the properties of all wastes at the site are relatively equal").

IX. Conclusion and Policy Implications

A. Municipalities: Special Treatment?

It is a policy choice as to whom Congress allocates the responsibility for the cleanup of hazardous wastes in America. One can agree or disagree with the congressional decision to cast the net of legal responsibility over all parties associated in any direct manner with the generation, transportation, and disposal of any hazardous substance, whether public or private. Yet the place to wage that debate is in the Congress. If Congress wishes to exempt municipalities from liability for the cleanup of hazardous substances originating in the MSW stream, it can do so explicitly.

Congress, however, has not explicitly exempted municipalities from liability. There appears to be no congressional concern for special treatment of MSW in the legislative history of CERCLA. The EPA practice of exempting municipalities from CERCLA enforcement at private, mixed waste sites is fashioned from whole cloth at the agency. The exemption appears to be cut from practical expediency and convenience rather than along legal lines.

The EPA's discretionary action allowing this "exemption" does not comport with either legal or factual realities. Legally, neither the small quantity generator nor the "household waste" exceptions in RCRA apply to CERCLA liability for MSW, and factually, most MSW would not fall within the "household waste" exclusion. The 1986 Superfund Amendments underscore the intended liability of public and de minimis contributors of hazardous substances.

Although CERCLA does not provide legal distinctions for different entities, there may be some factual and legal distinctions for municipalities. There are 39,000 units of independent local government; more than three quarters have fewer than 3,000 citizens and more than half have fewer than 1,000 citizens. The resultant distinctions include:

(1) Municipalities may have even greater difficulty than businesses in obtaining any type of insurance coverage;

(2) Some role of municipalities in the handling of MSW is inevitable, and MSW disposal is a required public activity in most communities;

(3) The ability of municipalities to quickly respond to a settlement option is constrained by the democratic decisionmaking processes employed in town government;

(4) The transaction costs of participating in the Superfund settlement process can be substantial for small PRPs, including municipalities;

(5) The role of the state, vis-a-vis municipalities, may make some

municipalities more practically akin to a subsidiary parent relationship.

Without considering the merits of such distinctions, the EPA assumes contradictory prosecutorial positions on a case by case basis. The EPA's prosecution decisions shift billions of dollars of cleanup responsibilities to parties that CERCLA designates as jointly and severally liable, thereby entirely excusing some municipalities and imposing their cleanup share on private parties. The Charles George Superfund site saga illustrates the potential inequity of such discretion.

The policy repercussions of this reality loom large. A shift of hundreds of millions of dollars of PRP liability onto the municipal sector affects all parties. For many municipalities these costs would translate directly into higher property tax levies. As a result, current property taxpayers would indemnify PRP municipalities for past waste disposal practices, raising intergenerational equity issues. In some situations, this burden on the municipal fisc would spill over into requests for state assistance. Yet some states are already having difficulty in expeditiously raising their minimum ten percent matching share required on expenditures from the federal Superfund.

B. A Choice of Rules

There is a fundamental policy choice that is made when allocating Superfund liability: Should an environmental decision rule or an ability-to-pay equity rule apply to the liability allocation process? The distinction is between treating differently situated entities similarly or differently at Superfund sites. With an environmental decision rule, Superfund liability is allocated based on some measure of cleanup responsibility, without consideration of PRP size or ability to pay. Such a rule causes any PRP to internalize the actual risk of liability in its waste handling and management practices.

In contrast, an ability-to-pay rule distinguishes ultimate Superfund responsibility based on the identity of the PRP, rather than on the proportionate share of remediation costs or damages. Although offering the potential for a more flexibly crafted settlement policy, this procedure does not result in an efficient allocation of responsibility in a market-driven economy. The EPA's Interim Settlement Policy discusses settlement criteria that would accommodate either an environmental decision or an ability-to-pay rule. Through which of these alternative templates one cuts its Superfund liability is a fundamentally distinct policy choice.

With an environmental decision rule, private PRPs would experience some relief from the percentage share of cleanup responsibility they bear. In most situations, this shifting of costs to the public sector will not in itself affect aggregate PRP funding of remediation activities. In most, but not all, situations, PRPs as a group are financially capable of making remediation payments if they so choose.

The issue is one of equity. At mixed sites, an equitable allocation of cleanup costs among private and public PRPs may actually promote private PRP willingness to contribute to cleanup settlements. The perception of equity in the allocation of removal and remediation costs influences the perceived legitimacy of the CERCLA liability scheme. A perception of fairness will promote private PRP settlement, in lieu of litigation.

CERCLA and its legislative history provide no guidance as to how to apportion liability among generators, transporters, owners, and operators, as well as among contributors of different hazardous substances at contaminated sites.[480] The allocation of liability is ad hoc and inconsistent from site to site. The practical difficulty in making such allocations motivated the Congress in 1986 to empower the EPA to become more involved in apportioning liability for voluntary settlements.[481]

As some scholars note, the common law doctrine of "restorative restitution" should inform the ultimate allocation of responsibility for CERCLA remediation.[482] This restitution would allow a party who bears a remediation responsibility disproportionate to traditional concepts of common law liability to initiate an action for costs prior to restoration of the property.[483] This doctrine is akin to an action to abate a public nuisance.[484] Economically, this doctrine also internalizes costs on the parties most capable of controlling their own hazardous substance contributions.

The application of an environmental decision rule is the only rule of prosecution and settlement that can earn support as fair and equitable from all quarters. The magnitude of potential cleanup liability, coupled with the severity of the "joint and several" rule when not fairly applied, demand a prosecutorial posture that is regarded as fair. For the long-term viability of hazardous waste remediation, this reputation for fairness is essential to spur prompt, voluntary

480. 42 U.S.C. § 9607(a) (Supp. IV 1986).

481. The EPA is empowered by SARA to issue nonbinding preliminary allocations of responsibility and to aid PRPs in reaching an allocation of responsibility for purposes of settlement. 42 U.S.C. § 9622(e)(3) (Supp. IV 1986). These nonbinding allocations are inadmissible as evidence. *Id.*

482. *See, e.g.*, Baker & Markoll, *By Products Liability: Using Common Law Private Actions to Clean Up Hazardous Waste Sites*, 10 HARV. ENVTL. L. REV. 99, 100 (1986) (providing an excellent treatment of common law doctrine applicable to hazardous waste remediation).

483. Baker and Markoll note that "restoration restitution" is consistent with the rationale employed in *Spur Industries v. Del E. Webb Development Co.*, 108 Ariz. 178, 494 P.2d 700 (1972). Baker & Markoll, *supra* note 482, at 119. The authors further explain that *Spur* turns on concepts of unjust enrichment to the prevailing party for the abatement of the other party's nuisance. Therefore, the question of abatement of a nuisance or a hazard is distinct from the question of who bears the cost of such abatement. *Id.* at 120. Restitutionary remedies allow this latter question to be addressed separately from the former CERCLA imposed responsibilities. *Id.* at 121.

484. *Id.* at 120.

remediation. To the degree that this rule burdens public PRPs, its application can be tempered to reduce municipal liability.

C. *Available Options to Assist Municipalities*

There are several policy options in Superfund settlement situations that would reduce the aggregate amount of municipal liability.

(1) Mixed funding from the Superfund could be used to pay some or all of the cost attributable to municipalities;

(2) Municipalities could be treated as de minimis generators, perhaps by netting only the hazardous substances in the MSW;

(3) Municipalities could be credited for efforts at household hazardous waste collection recycling or other waste minimization activities;

(4) To the degree that a municipality could be deemed a transporter rather than a generator of waste, its liability could be characterized as contingent or secondary;

(5) Municipalities could be allocated only the marginal cost of site remediation attributable to the presence of MSW (either on a volumetric, toxicity, or combined basis);

(6) In certain circumstances a Superfund site could be geographically isolated to segregate the locus of MSW disposal from hazardous waste disposal and liability apportioned;

(7) A credit policy could be implemented to reduce the liability of municipalities handling MSW on a nonprofit basis;

(8) Municipalities could be exempted from contributing to "orphan" shares of liability allocated by the EPA under the theory of joint liability when certain PRPs cannot be located or are bankrupt; or

(9) Because of the large volume of MSW and its relatively low toxicity by volume, only certain costs (such as site capping costs but not groundwater remediation costs) could be allocated to municipal PRPs.

It should be noted that these options do not eliminate nor excuse municipal PRP liability but merely reduce the aggregate amount of liability. As a practical matter, the EPA does not appear anxious to employ the limited resources of the Superfund to bail out municipalities in the status of either owner-operator or generator-transporter. Municipalities in the status of owner-operator must comply with site closure plans under RCRA.[485] For the EPA to use the Superfund to accomplish cleanup of municipally owned and operated landfills is equivalent to use of the Superfund as a grant to subsidize RCRA site closure.

It is unlikely that many municipalities, especially the smallest ones, will voluntarily negotiate a settlement of their PRP liability. For financial or administrative reasons, or both, before contributing

485. 42 U.S.C. § 6903(15) (1982) (defining persons to whom RCRA applies to include any "state, municipality, . . . political subdivision of a state, or any interstate body."); *see also supra* text accompanying note 69

toward remediation, municipalities will await an order to pay resulting from a contribution action instituted by the EPA or other PRPs. However, in return for settlement, the EPA can offer municipalities a release from subsequent suits by private PRPs.[486]

As in many environmental matters, when there is scientific and factual uncertainty, the allocation of the burden of proof is critical: Should plaintiffs retain the burden of demonstrating that each municipality disposed of hazardous substances in MSW at each site? Should there be a presumption that MSW contains hazardous substances, which shifts the burden to a municipality to rebut this presumption? Would such a presumption flow from generalized national data, or should it be site-specific based on sampling? Whichever side—the public sector or private sector PRPs—ultimately inherits the final burden of proof is likely to lose in any legal confrontation.

A correct allocation of CERCLA remediation responsibility among private and public parties may ultimately call for state or even federal direct or indirect subsidies of municipal liabilities. Already there is cost sharing among governmental entities when the Superfund is tapped to perform cleanup activities.[487] Although subsidizing municipal CERCLA liability by state or federal governmental entities is a somewhat different proposition, the placement of financial responsibility on those who generate the hazardous substances, even when payment is made from tax revenues (where MSW contributes the hazardous substances), is the economically and legally correct demarcation point for any discussion of waste policy.

At the very least, this argues for inclusion of municipal PRPs at the initial stages of Superfund site negotiation, prior to litigation. The EPA should issue section 104 notice letters and requests for information to municipal PRPs, whether their status is that of owner, operator, generator, or transporter. This will bring municipal PRPs into the process at an early stage, promote the sharing of information, broaden the debate among parties, and promote a perception of equity in enforcement. In turn, this will heighten the chance of cleanup settlement. Refusing to bring in municipalities retards the realization of these goals.

MSW poses a massive long-term challenge. The dominant current practice of landfilling waste is shortsighted and is the precursor to future problems. Within the legislated rubric of American haz-

186. SARA § 122(g), 42 U.S.C. § 9622(g) (Supp. IV 1986), *see supra* note 478

187. 42 U.S.C. § 9601(c)(3)(C) (Supp. IV 1986). The states pay either a 10% share of remedial action costs borne by the fund or a 50% or greater share of remedial action costs where the state or its political subdivision owned the disposal site during the period of disposal. *See supra* notes 168-69 and accompanying text

arde waste law, however, municipalities stand in the same shoes as p[illegible] entities. Selective and inconsistent enforcement practices in enforcing CERCLA's provisions portends a major legal struggle for the allocation of cleanup responsibility. This allocation issue will dominate the future course of Superfund navigation through the legal straits.

might have been helpful, but in a case this complex the information falling within the broad purview of federal discovery is almost without limit. In this light it is hard to fault the district court for placing limitations on discovery. Given the circumstances of this case, we see no abuse of discretion either in its discovery orders or its decision rejecting the appellants' Rule 56(f) motions.

D. *Expert Opinion*

A final contested issue common to most of the claims involved in the instant case concerns the district court's evaluation of the scientific expert opinion of Dr. Kirk W. Brown, a Professor of Soil and Crop Sciences at Texas A & M University. The coalitions relied on Dr. Brown's affidavit as crucial evidence in opposing the appellees' summary judgment motions. Before discussing the district court's assessment of Dr. Brown's affidavit, a brief review of the contents of the affidavit is necessary.

1. *Expert's Credentials and Methodology*

Dr. Brown holds a masters degree from Cornell University and a doctorate in agronomy from the University of Nebraska. He has written more than 150 scholarly, scientific articles and a book dealing with the disposal and treatment of hazardous waste substances. His professional qualifications make him an expert witness, and the district court so found. *See Murtha II*, 815 F.Supp. at 543.

Dr. Brown submitted an affidavit in support of the coalitions' position that appellees were potentially responsible parties at both landfill sites. In preparing this sworn statement, he reviewed numerous reports including, most significantly, six reports relating to the Laurel Park landfill and three reports discussing the Beacon Heights landfill.[5] After examining these reports, the expert was of the opinion that "there [were] CERCLA hazardous substances present in each and every leachate sample from these landfills." Dr. Brown did not personally visit the landfills or dig up any shovelfuls of waste, but he was not required to do so.

He studied EPA reports concerning municipal and industrial landfills in the United States and he set forth the types of hazardous substances found in waste streams generated by households, commercial establishments, institutions, and industries. He used these reports to generate lists of the wastes and CERCLA hazardous substances routinely discarded by typical households, commercial establishments, institutions, and industries during the time period relevant to this case. After comparing the concentrations of hazardous substances in the leachates from the two landfills with the concentrations generally found in municipal solid waste landfills in the United States, he concluded, in his expert opinion, that the waste streams disposed of in the two landfills were similar to the landfills he had studied and that they contained CERCLA hazardous substances.

Further, Dr. Brown read the statements that the various appellees made in their deposition testimony and read other documents relevant to the kind of waste disposed of by each appellee. His comments varied for each appellee. Based on the available information, he meticulously linked the types of wastes, including identification of specific products discarded by each defendant, with specific CERCLA hazardous substances. His analysis relied on a series of studies and reports that showed which known CERCLA hazardous substances are in specific waste products. This allowed him to correlate the specific wastes disposed of by each appellee to specific hazardous substances.

For example, when a party admitted to disposing of tire products, Dr. Brown explained which hazardous substances are found in normal tire products. Although he could not swear with absolute certainty that the tire products disposed by a specific appellee were similar to normal tire products, such absolute certainty is not required to oppose successfully a summary judgment motion, rather, at the summary judgment stage, the trial judge must decide only whether a reasonable jury could find liability by a preponderance of the evidence. Further, when the appellees failed to submit any evidence to distinguish the products of which they disposed from those addressed by Dr. Brown in his affidavit, Dr. Brown's probabilistic evidence stands largely uncontradicted. Moreover, each and every type of product disposed of need not contain hazardous substances. Any amount of such substances is sufficient to create liability.

5. Some appellees claimed that Brown never studied the two landfills involved in this litigation or that he failed to investigate the landfill wastes. This is patently wrong. Particularly mendacious is the implicit claim by Manafort Brothers, Inc., Eric Arsan Refuse, NRS Carting, and Zollo Drums that none of the studies used by Dr. Brown dealt with the relevant landfills. This contention is wholly contradicted by the record.

2. *Admissibility of Brown Affidavit*

Although the district court agreed that Dr. Brown was an expert, and that his evidence could be admissible against certain parties, it apparently did not place much weight on the affidavit. It ruled that the expert's sworn statement was not controlling for non-municipal generators, *id.* at 544, and that it could not be applied to the municipal generators because no adequate foundation for its acceptance had been laid. *Murtha III*, 840 F.Supp. at 189. More specifically, the district court added, Dr. Brown's "references to facts, without specification, in various documents relied on, are insufficient to make his opinions relevant." *Id.* It therefore rejected the affidavit as lacking "probative merit" because it did not rely on "direct evidence." *Id.* at 184. In addition, the court expressly weighed the affidavit against the backdrop of the EPA Municipal Policy, according to which the EPA made certain enforcement decisions. *Id.* at 188.

[16, 17] Our view of this affidavit and its probative worth differs dramatically from that of the district court. This is partly because it is difficult for us to imagine an expert with more experience and knowledge in the hazardous substances field than Dr. Brown, and partly because we find his affidavit to be carefully researched, detailed, and directly relevant to this case. As will become clear when we consider each appellee's case individually, we think the trial court assessed the weight of conflicting proof, in effect substituting its judgment for that of the jury. *See In Re Joint Eastern & Southern Dist. Asbestos Litig.*, 52 F.3d 1124, 1133 (2d Cir.1995) (applying the rule prohibiting such a practice). Environmental science, like epidemiology, "is ill-suited to lead a factfinder toward definitive answers, dealing as it does in statistical probabilities." *Id.* Here there was only one expert opinion before the court, and the court was obliged not to ignore it. Because Dr. Brown reviewed nine studies concerning the subject landfills, his affidavit was laid on a proper foundation.

[18–22] When deciding a motion for summary judgment, only admissible evidence may be considered. *Tamarin v. Adam Caterers, Inc.*, 13 F.3d 51, 53 (2d Cir.1993). Where scientific knowledge will assist a trier of fact to determine an issue of fact, an expert witness "may testify ... in the form of an opinion or otherwise." Fed.R.Evid. 702. Summary evidence is admissible when the underlying documents are admissible and are made available to the adverse party. *Tamarin*, 13 F.3d at 53. Here, where the reports used by Dr. Brown are of the sort ordinarily relied on by experts in forming opinions within their field of expertise, the reports need not be admissible at trial, *see* Fed.R.Evid. 703, and need not actually be attached to the affidavit to satisfy Fed. R.Civ.P. 56(e). *See Iacobelli Constr., Inc. v. County of Monroe*, 32 F.3d 19, 25 (2d Cir. 1994). An expert's testimony, in order to be admissible under Rule 705, need not detail all the facts and data underlying his opinion in order to present that opinion. *See* Fed. R.Evid. 705; *Ambrosini v. Labarraque*, 966 F.2d 1464, 1469 (D.C.Cir.1992). At any rate, the Brown affidavit does provide the specific facts required by Rule 56(e), *see id.* at 1470, when he explains which specific hazardous substances are found in each waste disposed of by each appellee.

[23] Nor is the Brown affidavit "junk science" of the sort that should be rejected under *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 113 S.Ct. 2786, 125 L.Ed.2d 469 (1993). Dr. Brown relied on the methodology and data typically used and accepted in these sorts of cases, *see Iacobelli*, 32 F.3d at 25, and his testimony would therefore be admissible under *Daubert*, [illegible] U.S. at 592–95, 113 S.Ct. at 2796–98. Moreover, if

cates dispute the cost figure contending that it assumes that EV costs will never come down.

OES Releases New Draft of Uniform Hazmat Inventory Form

The Office of Emergency Services (OES) has released a revised draft of regulations establishing a uniform format to be used by all businesses reporting their hazardous materials inventories under the state's Hazardous Materials Release Response Plans and Inventory Act (Health and Safety Code Chapter 6.95; sections 25500 et. seq.). The uniform format is mandated by 1992 legislation (AB 1524 -Killea) designed to eliminate industry complaints about inconsistent requirements imposed by the various local agencies who administer the Act on a local level. The new form will take the place of all local forms and is also designed to meet reporting requirements under the federal Emergency Planning and Community Right-to-Know Act [42 USC section 11002]. However the format contemplates that local agencies can require additional information beyond the minimum required under the state and federal acts.

A previous draft of the regulations was released for public comment in December (CEI December 31, 1994). The latest draft makes a number of changes based on comments received on that draft. The most significant of these is the addition of an addendum designed to meet the requirements of section 80.103(c) of the Uniform Fire Code. This will discharge OES's obligation under another piece of legislation (AB 1777-O'Connell). OES is still required to comply with a third piece of legislation (AB 1451-Umberg) which requires adoption of a uniform format for meeting emergency planning requirements under Chapter 6.95 (see CEI Special Report, August 31, 1994).

In addition to working on the above regulations, OES has begun the development of a computer program that may be used when reporting the inventory information electronically. The database was created using Filemaker Pro and will be available for Apple and DOS computer systems. If all goes as planned, the software will be distributed free of charge, sometime in 1996, by OES to any administering agency or business that is interested.

Although it has not scheduled a public hearing on the latest draft, OES will consider comments on the entire package through August 25. For information contact Tracey Vardas or Terry Keel at (916) 262-1750.

Expansion of Dump is a Taking by County

In a decision which may chill local governments throughout the state, a San Diego County Superior Court judge has ruled that the expansion of the San Marcos landfill in 1990 constituted inverse condemnation of nearby residential properties. The decision by Judge Morgan Lester resulted from a lawsuit filed by approximately 20 neighbors of the landfill who contended that noise, odors, and heavy equipment comings and goings associated with the expansion, substantially reduced the value of their properties. Although a jury still has to determine the amount of the loss, estimates by experts for both sides range from $1.2 to $3.5 million.

The County began expansion of the landfill in 1990 after a hard fought battle with the neighbors who ultimately lost an appellate court decision on whether the County had violated the California Environmental Quality Act. The landfill had been operated since 1978 and was originally scheduled to be closed when it reached an elevation of 750 feet. Because the County was unable to find another location for a new landfill, it obtained a permit from the San Diego Regional Water Board allowing it to expand both vertically and horizontally. In late 1990 the County began holding meetings with the neighbors which included offers to appraise their properties. As part of these discussions the County indicated it might be willing to purchase the properties. According to Judge Lester these meetings, combined with the November 13 certification of the EIR for the expansion, created a "pall" over the properties. The result was that those residents that wanted to sell had trouble even finding brokers with whom to list their properties and those that did list them were forced to reduce their asking price. The judge noted one specific instance where a potential buyer discovered the possible impacts of the expansion and decreased his purchase price offer by $35,000.

Aside from the market value damage, Judge Lester found that during the actual expansion the resident plaintiffs were subjected to adverse physical impacts which created "another separate basis for inverse condemnation." These included odors of garbage and mulching operations, excessive dust coming onto the properties, the noise coming from the heavy equipment involved in constructing the actual expansion, and the noise and dust created from about 350 trucks making daily trips to dump garbage. The judge specifically singled out the beeping noise made by the earth moving and other heavy equipment as it worked on the expansion. Because of all of this the residents "use and enjoyment" of their properties was substantially interfered with. The County argued that one of the plaintiffs should be treated separately since he did not live on his property but used it as an avocado grove. However judge Lester found that the owner was on the property often and therefore suffered the same loss of use as the others.

The County also argued that the taking was "temporary" because the City of San Marcos has revoked the land use permit for the dump effective in March of 1997. Judge Lester however noted that the work associated with closing the landfill after that date, is likely to drag on well after the year 2000 and thus the taking should be considered permanent.

A jury trial to determine the amount of the plaintiffs' losses is currently scheduled to begin on September 5. The assessed value of all of the parcels involved is about $10 million. Experts for the plaintiffs have estimated that the

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San Diego Dump

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dump caused a decline in value of about 35% while experts for the County put it at 12%.

Paul McKee et al. v. County of San Diego, #N59587-1 (San Diego County Superior Court).

First Expedited Cleanup Application Approved

As we discussed in our last issue, a site selection committee has approved the application of the Santa Fe Railroad to have the first site remediated under the states new Expedited Remedial Action Program (ERAP)—also known as the SB 923 program after the legislation that authorized it. The ERAP program is a pilot project under which 30 sites will be selected to go through an expedited remediation process which relies on a number of variations to the state's normal contaminated property cleanup process—including the possibility of site-cleanup standards that are less stringent than would otherwise be required and are tailored to the proposed use of the property. The program is administered by the Department of Toxic Substances Control.

The Santa Fe site is located in Vernon California and consists of a 10 acre parcel which was used as a truck terminal from May 1955 until March 1990. It is currently vacant. Santa Fe does not actually yet own the site. It is acquiring it through an eminent domain proceeding. The company has received a court order under that proceeding allowing it to take possession of the site which, under DTSC's SB 923 regulations, give it the requisite "indicia of ownership" to allow it to apply for the program. While it is able to gain the benefits of the program, as a "bonafide prospective purchaser", Santa Fe is not considered a "responsible person" for purposes of the Department's apportionment of liability for cleanup costs. However the company is required to agree with DTSC to pay any cleanup costs which are not otherwise covered by responsible parties or by the trust fund set up under SB 923. DTSC's Megan Cambridge indicates that this means more than likely that Santa Fe will end up paying for the cleanup.

Past remediation activities at the site included the removal of two 10,000-gallon underground fuel tanks and a 1,000-gallon waste oil tank in 1991. As a result of the underground tanks and a gasoline spill onsite, 2,600 cubic yards of hydrocarbon contaminated soil had to be excavated. The excavated soil was treated onsite using bioremediation and vapor extraction systems. The treated soil was then backfilled onsite. Those remediation activities were overseen and approved by the City of Vernon's Health and Environmental Control Department.

In order to have its application accepted, Santa Fe was required to prepare and get DTSC staff approval of a Preliminary Endangerment Assessment (PEA). The site is covered with asphalt that is underlain by an average of seven feet of fill material comprised, at least in part, of foundry sand containing elevated levels of lead and copper. The PEA concluded that the fill material does not pose a threat to groundwater and that the site overall does not pose a significant risk to public health and the environment; a necessary finding for the SB 923 process. DTSC concurred with this conclusion but determined that further remedial action is required. This will include removal of onsite structures and construction of a low permeable cap extending across the entire site. Santa Fe intends to incorporate the site into an existing intermodal facility located in the immediate area.

The second of the two applications that have been filed, involving the California Steel (CSI) site in Fontana, is scheduled to be considered by the site-selection committee in early August. DTSC's Megan Cambridge told CEI that these are the only two formal applications received, although several more are allegedly being prepared. Applications for the program are still being accepted.

For further information contact Ms. Cambridge at (916) 255-3727.

Waste Board Seeks to Clarify Authority Over Recycling Facilities

In addition to debating its jurisdiction over contaminated soil (discussed in our last issue), the Integrated Waste Management Board at its June 28th meeting also dealt with a sticky, even more controversial jurisdictional issue—its authority to regulate facilities engaged exclusively or primarily in recycling activities. The authority of the Board and local governments over recycling operations has been a much debated issue in the last few years leading to one Supreme Court case (the Rancho Mirage Decision). As we indicated last issue the Board's legal staff has taken the position that the Rancho Mirage decision should not limit the Board's authority to regulate a particular material. Nevertheless the Board action on June 28th attempts to deal with its authority over recycling facilities without really answering the question dealt with in Rancho Mirage: where does the definition of "solid waste" begin and end.

As was the case with contaminated soil the Board approved a staff position paper. The staff's position is that jurisdiction over recycling facilities should depend on whether they are handling "source-separated recycles with a minimal amount of residual." If a facility can meet this test it is outside Board jurisdiction. The Board's position is based on the fact that the definition of "solid waste facility" includes transfer and processing stations [Pub. Resources Code §40194]. Public Resources Code §40200 then excludes from the definition of transfer or processing facility anyone whose "principal function" is to receive or process wastes that have been "separated for reuse." Under this definition most recyclers will be outside of the Board's regulation. These include drop-off centers, buy-back centers, curbside collection processing facilities, community recycling centers, commercial paper recyclers, and scrap metal recyclers. This assumes that these facilities have procedures in-place that

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COMMUNITY PROFITS FROM ITS WASTE
Phoenix Gazette (PG) - MONDAY, August 29, 1994
By: Victor Dricks, THE PHOENIX GAZETTE
Edition: Final Section: Metro Page: B1
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TEXT:
It takes 11 weeks to accomplish, but the residents of Pinetop-Lakeside can do something with sewage sludge and household garbage that few communities can.

They can turn waste into compost, which they sell.

"We were looking for an environmentally friendly way of disposing of all of our solid and liquid waste, and I think we've come up with it," said John Snyder, sanitation district manager for the Pinetop-Lakeside community on the Mogollon Rim.

Several years ago, Snyder said, his community was searching for a way to comply with federal waste disposal standards. Stricter regulations have prompted municipalities from San Diego to Milwaukee to build expensive landfills with plastic liners capable of storing hazardous waste without leakage.

"We wanted to do something different," Snyder said. "It really didn't make much sense for us to build a landfill to handle the waste from 5,000 households."

Pinetop-Lakeside could have trucked its waste to a landfill in Joseph City, 80 miles to the northeast.

Instead, Snyder contacted Bedminster Bioconversion Corp. of Cherry Hill, N.J., which developed a technique of turning sewage sludge and household garbage into compost. The company's first plant was built in Big Sandy, Texas, in 1972. Pinetop-Lakeside opened its plant in 1991 and a third recycling facility began operating in Sevier County, Tenn., in 1992. Several others are planned or under construction across the country.

For municipalities trying to keep their heads above a rising tide of [illegible] waste, converting trash into money.

"The best part is we can sell our compost to a company in Taylor for $7.85 per cubic meter, which generates about $15,000 a year in revenues for us," Snyder said.

The Taylor company uses the compost in potting soil.

At that rate, it costs Pinetop-Lakeside about $24 per ton to dispose of its waste, half the cost of using a landfill. But Snyder said there are advantages to recycling that cannot be measured strictly in terms of dollars.

"The project enjoys the support of the community because it takes two waste streams and combines them to produce a desired product," Snyder said.

"This is the wave of the future," said Nelson Widell, Bedminster executive vice president. "For decades, it's been part of our frontier mentality that we thought we could just throw everything away. But we can't continue to do that. We've been despoiling the environment and wasting valuable resources."

Seventy percent of the solid waste that goes into Bedminster's plant is converted into compost. Only 30 percent of the community's waste has to be put in a landfill, Widell said.

And how do you make a trash cocktail?

Just combine 10 tons of household garbage -- metal cans, coffee grounds, glass bottles, plastic containers, food packaging, table scraps and all -- with five tons of liquid sewage. Place this in a chambered steel vessel 70 feet long and 10 feet in diameter that spins slowly, and let time -- and microbes -- go to work.

The high carbon content of household garbage and the high nitrogen content of sewage sludge make composting possible. Special conditions created in the vessel accelerate the conversion of solid, organic wastes to humus, the primary nutrient of topsoil.

"We can do in a few weeks what would take months or years for nature to accomplish," Snyder said. "We just load our garbage into a giant steel vessel that rests on its side and pump our sewage sludge in, making sure to keep a 2-to-1 ratio.

"After three days we run this stuff through a sieve, which removes anything larger than an inch and a quarter, load the stuff back into the steel cylinder and repeat the process."

The compost then is formed into large piles set inside in an enclosed building, heated and aerated for 11 weeks while microbes continue the conversion process.

And how does this stuff smell?

Not too bad. Snyder swears only a "light, earthy aroma" is detectable from the compost because the facility in which this process occurs is well-ventilated and air within the building is screened with special biofilters.

CAPTION:
Garbage is loaded into a steel chamber in Pinetop-Lakeside on way to becoming compost.

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EXH. 85

JUL-31-95 MON 11:47

FINANCES OF INCINERATION AND LANDFILL FACILITIES

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Notes for a presentation to a forum organized by the Recycling Council of Ontario on Energy from Waste Incineration, Sheraton Centre, Toronto, May 4, 1995

THE ENVIRONMENT IS MORE IMPORTANT THAN FINANCES

1. Environmental protection, not finances, should normally be the main consideration in the selection of waste disposal facilities.

2. Finances should be an important consideration only when high costs make the use of an environmentally superior method impracticable or when the greater investment can be better applied elsewhere.

MUCH WASTE WILL REQUIRE DISPOSAL

3. Even with aggressive waste diversion—well beyond present provincial targets—some 8,000 tonnes of Greater Toronto Area (GTA) waste will require disposal each day during the first few decades of the next century.

4. Of this amount, about 80 per cent (i.e., more than 6,000 tonnes a day) will be suitable for incineration.

5. Incinerating the residual waste that can be incinerated, and landfilling the remainder, will reduce needed landfill capacity by about 70 per cent, i.e., from 8,000 tonnes to 2,400 tonnes a day.

6. Moreover, the 2,400 tonnes of waste a day to be landfilled will be essentially inert and thus environmentally benign.

THE COSTS OF LANDFILL AND INCINERATION ARE SIMILAR

7. Table 1 on Page 2 provides comparisons between the costs of GTA landfill sites, actual and proposed, and two operating incinerators, one large and one relatively small. Costs have been made comparable, as explained in the Notes on Page 3.

8. A reasonable conclusion from Table 1 is that the net costs of landfill and incinerator facilities are similar, mostly in the range of $50 to $75 per tonne of waste received. Landfill and incineration both permit substantial economies of scale.

9. After 20 years (when debts are paid off and the landfill sites are full), incineration becomes much cheaper. If well maintained and updated, an incinerator can last for a further 20 years or more with much reduced capital costs and resulting lower net costs.

10. If less waste is received than anticipated both landfill and incinerator facilities can encounter problems with debt retirement. The solution is proper sizing of facilities.

11. Waste feed for incinerators can be supplemented with waste reclaimed from closed landfill sites that are considered hazardous.

12. Table 2 on Page 4 summarizes the key differences between landfill and incinerator facilities from a financial perspective.

TABLE 1. COMPARISON OF LANDFILL AND INCINERATOR FACILITIES

(superscript numbers refer to the numbered notes on the next page)

	Landfill facilities[1]				Incinerators[2]	
	Halton site	Durham site	Peel site	York-Metro site	Fairfax	Lancaster
Status	In operation	Proposed	Proposed	Proposed	In operation	In operation
Site area (hectares)	59.0	119.0	122.0	270.0	9.3	22.7
Site capacity (millions of tonnes)	4.0	6.6	10.3	39.2	n.a.	n.a.
Annual waste receipts (tonnes)[3]	60,000	330,000	515,000	1,960,000	844,600	337,570
Daily waste receipts (tonnes)[4]	290	1,200	1,875	7,125	2,300	925
Project costs (millions of dollars)[5]	50.0	86.8	95.4	371.7	268.0	140.0
Maximum energy generation (megawatts)	n.a.	n.a.	n.a.	n.a.	60.0	35.7
Energy revenues per megawatt-hour[6]	n.a.	n.a.	n.a.	n.a.	51.38	83.57
Capital costs per tonne[7]	75.00	29.17	20.04	21.16	35.11	56.62
Operating and other costs per tonne[8]	37.00	46.95	40.63	30.58	45.96	61.29
Revenues per tonne[9]	n.a.	n.a.	n.a.	n.a.	28.62	46.05
Net costs per tonne[10]	112.00	76.12	60.68	51.73	52.45	71.86
Disposal fees charged per tonne	150.00	n.a.	n.a.	n.a.	72.45	84.55
Surcharges per tonne[11]	38.00	n.a.	n.a.	n.a.	20.00	12.69

NOTES

[1] The four operating and proposed landfill sites are in the Greater Toronto Area. The Halton site is owned and operated by the Region of Halton. The Durham, Peel, and York-Metro sites are those proposed by the Ontario government's Interim Waste Authority (IWA). Information about the Halton site was provided by the Region. Information about the IWA sites was adapted from the source indicated in Note 12 below, which was based in part on the *Environment Protection Act* documentation filed by the IWA. How the IWA sites will be owned and operated has not yet been determined.

[2] The Fairfax incinerator is in Fairfax County, Virginia. It was constructed and is owned and operated by Ogden Martin Systems Inc. and comprises four 680-tonne-per day furnaces. The Lancaster incinerator is in Lancaster County, Pennsylvania. It is owned by the Lancaster County Solid Waste Management Authority and was constructed and is managed under contract by Ogden Martin Systems Inc.. It has three 364-tonne-per-day furnaces. Both incinerators have dry flue gas scrubbers and fabric filter baghouses. All information given here is in the public domain and represents actual current operations; sources were Ogden Martin and the respective County administrations. Dollar values are in Canadian dollars. Conversions from U.S. currency and measures are as follows: US$1.00 = C$1.37; 1 hectare = 2.47 acres; 1 tonne = 1.102 short tons.

[3] The current annualized amount of waste being received is shown for the Halton facility. It is much less than the anticipated amount of 200,000 tonnes on account of waste export (see the source in Note 12). Hence the high costs per tonne for this facility. The expected amounts of waste are given for the three proposed IWA facilities although, as explained in the source in Note 12, these amounts may not be realized, thus raising costs per tonne. Rated capacities are given for the two incinerators; actual waste receipts are close to rated values.

[4] Daily waste receipts were estimated on the basis of 275 days a year of landfill operation and 365 days a year of incinerator operation.

[5] Project costs include all capital costs incurred or required up to one year after the commissioning date. Subsequent capital costs, including provision for post-closure care, are considered here as operating costs. Project costs for the three proposed IWA sites are those projected and explained in the source in Note 12 rather than those given by the IWA, whose projections did not take many essential items into account. Project costs are given in dollars of the years of construction—in 1993 dollars for the IWA's proposed sites. Other monetary items in this table are in 1995 dollars.

[6] Yearly average figures are given for energy revenues. Actual contracts with generating utilities can be complex and involve both fixed capacity payments and payments for power supplied that vary according to need. Revenue per megawatt-hour in Ontario could be lower than the lower value noted here.

[7] These amounts represent the principal and interest charges in respect of debt incurred to meet project costs (defined in Note 5 above).

[8] All facility costs not represented in the previous row are represented in this row, including operating, maintenance, administration, ash disposal, post-closure costs, and many others.

[9] Landfill gas or energy generated using landfill gas can be a source of revenue for landfill facility operators. Net revenues from such energy sales are more likely to be in the order of $1.50 per tonne of current waste received rather than the $25-$50 per tonne received from sales of electric power generated by energy-from-waste incinerators. Revenue data for incinerators shown here includes revenue from sales of reclaimed ferrous materials and other revenue; revenue from energy sales is generally well over 90 per cent of total revenue. In both cases considered here, 90 per cent of energy revenues accrue to the respective County authority, 10 per cent to the plant operator.

[10] Net costs per tonne comprise capital, operating, and other costs per tonne less revenue per tonne. The net costs shown for the IWA's sites are 3.0 per cent higher than the estimates given in the source in Note 12 because 1995 dollars are used here rather than 1993 dollars.

[11] Surcharges per tonne comprise disposal fees per tonne less net costs per tonne. The surcharges are used for a variety of purposes including management of transfer stations, subsidization of other disposal facilities and 3Rs programs, and public education about 3Rs.

[12] Richard Gilbert and Ray Bremner, *Overview of Waste Management in the Greater Toronto Area: 1990-1997*, April 26, 1995. [Copies are available from Richard Gilbert at (416) 923-8839.]

JUL-31-95 MON 11:46

TABLE 2. GENERALIZED FINANCIAL COMPARISONS OF LANDFILL AND INCINERATOR FACILITIES

ITEM	INCINERATION VS. LANDFILL	COMMENTS
Site acquisition costs	●●●	Landfill facilities require about 10 times as much land as incinerators per tonne handled, even more if necessary buffer zones are included.
Construction costs	□□	The other capital costs of incinerators are two to three times higher per tonne than those of landfill facilities.
Operating costs	□	Gross operating costs of incinerators are generally higher per tonne than those of landfill facilities.
Revenues	●●●	Incinerator revenues (where there is energy recovery) are generally 20 times or more per tonne of waste handled than energy revenues from landfill facilities.
Net costs (first 20 years)	—	Where there is energy recovery, the net costs per tonne of landfill and incinerator facilities are similar for the first 20 years of operation (i.e., during the lifetimes of the landfill facilities and the period of retirement of the debts incurred for project costs).
Net costs after 20 years	●●●	If well maintained and updated, incinerators can be used for a further 20 years or more, with much reduced capital costs and resulting lower net costs. Landfill facilities, on the other hand, become a liability when they are full.

□□□ / □□ / □ Comparison favours landfill facilities ●●● / ●● / ● Comparison favours incinerators

JUL-31-95 MON 11:45

EDISON ADVANCED INTEGRATED RECYCLING
(AIR)
PROJECT DESCRIPTION

Introduction

The Advanced Integrated Recycling (AIR) of refuse is a highly advanced technology which may provide an environmentally beneficial process for combatting growing problems associated with solid waste disposal. Through the AIR process, refuse is reduced by at least 90% of its original volume, recyclables are reclaimed, and a clean synthesis gas is produced with no air emissions. Landfill volume reduction may be further enhanced by development of products which utilize the ash produced in the AIR gasifier process. This technology is projected to be commercially demonstrated by 1996.

The purpose of the AIR Project is to test and commercially demonstrate this technology to convert refuse into a clean fuel gas. The AIR Project was conceived to help provide a solution to refuse disposal problems in sensitive air quality areas where incineration is not acceptable.

Background - The Environmental Problem

Solid waste disposal is approaching crisis levels across the country including Southern California. Approximately 50,000 tons of refuse are being generated each day in Los Angeles County alone. Within Edison's service territory the quantity of refuse is 70,000 tons per day. Landfill capacity close to the source of waste generation is being exhausted. New capacity is difficult to site due to public opposition and regulatory constraints. These factors are exerting enormous pressure to reduce landfill usage and are forcing landfills to be located in remote areas necessitating significant transportation expense.

Partial solutions to this waste disposal problem come in the form of source reduction (generating less waste), recycling, and possible hauling of refuse by rail to remote desert landfills. Landfill volume reduction achievable through source reduction and recycling is mandated by AB 939 beginning in 1995. Other options include waste-to-energy technologies.

Commercialized Waste-To-Energy Alternatives

Commercial burning of refuse by existing combustion processes is not a desirable technology in the South Coast Air Basin. These processes result in large NOx emissions which exceed limitations for power plants set by the South Coast Air Quality Management District (SCAQMD). Only two existing waste-to-energy facilities are currently operating in Southern California under earlier

SCAQMD regulations. No emission control technology currently exists that will allow direct refuse combustion to meet the new SCAQMD standards being imposed on Edison power plants. In addition, the Environmental Protection Agency (EPA) has begun tightening emission regulations nationwide. This trend will continue and will place extreme restrictions on refuse incineration. The alternative to direct burning of refuse is gasification of "refuse derived fuels" (RDF). It represents a potential solution to the refuse disposal vs. air quality dilemma. Gas produced from refuse gasification can be cleaned prior to combustion resulting in very low emissions, similar to natural gas. The most promising technology for RDF gasification is called fluidized bed gasification. It has been used commercially for wood waste gasification and tested at a pilot scale using refuse. Because of its efficiency and its capability to gasify a wide variety of waste products, this technology was selected for the AIR Project.

AIR Process Description

The Advanced Integrated Recycling Demonstration Project (AIR) will utilize 150 tons per day of RDF. Considering California's minimum goal of recycling 25 percent of the waste stream, at least 200 tons per day of municipal solid waste will be processed at a Material Recovery Facility (MRF) to produce the required RDF tonnage. The refuse will be processed mechanically to remove recyclable materials for return to the marketplace. The refuse will pass through a trommel which is a large cylindrical drum with holes sized to separate out the heavy fraction of the waste stream which contains metals, glass, rocks, dirt, etc. The lighter material remains in the trommel and is further processed to remove more metals and other inert materials. Finally, the remaining non-recyclable refuse is shredded, to below 2 inches is size. This final product is a "refuse derived fuel" (RDF) (Figure 1). The RDF is placed in large transfer trailers and delivered to the project site. The RDF is delivered inside a receiving building which is equipped with odor and dust control. Here the RDF is stored until needed for the gasifier. The building will hold enough RDF for up to two days of gasifier operation.

The RDF is then loaded onto a conveyor by a front end loader. The conveyor delivers the RDF to a live bottom storage hopper which will hold enough RDF for three hours of operation. The RDF is automatically removed from the bottom of the hopper and delivered into an air tight feed screw which meters the RDF into the bed of the gasifier.

The gasifier is a vertically standing cylindrical vessel, partially filled with sand. The sand is fluidized by air through ports in the bottom of the gasifier which make the sand appear to boil. As RDF enters the gasifier it is immediately

entrained with the sand and rises with the sand in the gasifier. The RDF reacts with the hot sand, driving off the volitiles to form a gas. The gas, sand and RDF particles rise in the gasifier to the top where they exit and pass through a cyclone. The cyclone separates the solids from the gas returning the sand and ungasified RDF back to the lower portion of the gasifier (Figure 2). The process continues until the carbon in the RDF is converted to a gas, leaving a light, dry ash. The ash remains with the gas as it exits the cyclone and is finally separated from the gas in a second cyclone. Heavy ash particles which contain more inerts than the fly ash settle to the bottom of the gasifier and are removed.

The gas which has exited the second cyclone where fly ash was removed passes through a heat exchanger to cool the gas. The cooled gas then enters a wet scrubber where impurities are washed from the gas. Any condensable oils and tars which precipitate out at this point are recycled back to the gasifier where they are converted into a gas. The gas finally enters sulphur removal equipment which cleans the gas of sulphur. The gas is now cleaned to a level virtually as clean as natural gas, the cleanest fossil fuel in widespread use.

The scrubber wash water is recycled back to the scrubber after the impurities are concentrated and separated. This concentrated scrubber waste water is processed to remove contaminants. The remaining purified water is conveyed to the generating station waste water retention basin for ultimate discharge to an industrial sewer along with other plant wastes.

It is planned to test several methods of using the ash directly as an aggregate in asphaltic or portland cement concrete. In this case, long term leaching tests will be required to verify that this method of use meets EPA guidelines for prevention of release of potentially hazardous substances. Other methods of treatment may also be explored. One such method involves placing the ash in an electric glass making furnace where high temperatures melt the ash into a vitreous or glassy inert material. This vitrified material can be recycled into an aggregate for road base.

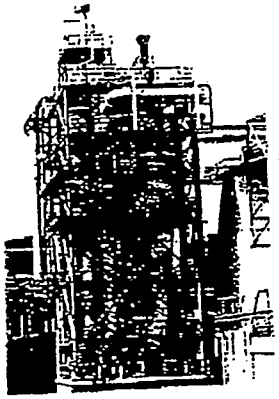
Summary

The 200 tons per day of refuse will be processed to yield 150 tons of RDF which will be gasified to produce 50 million Btu's per hour of a clean gas containing about 115 Btu's per cubic foot. Natural gas, by comparison, contains about 1000 Btu's per cubic foot. This low Btu gas made from refuse can be combusted in a utility boiler, industrial boiler, or internal combustion engine. In these applications it will displace 50 million Btu's per hour of natural gas, with no

new emissions. When converted to electricity, this gas will generate 5 Mw, which will provide enough energy for 5000 households.

6/29/93





AIR — The Advanced Integrated Recycling Project will utilize 200 tons per day of household and commercial refuse. The refuse will be processed mechanically to remove recyclable materials for return to the marketplace. The remaining refuse will be shredded into a refuse-derived fuel (RDF). The RDF will be delivered into a gasifier where it will be converted into gas and then passed through a scrubber to remove contaminants. The clean gas will replace natural gas in the existing Edison electric generating station. This will be the first facility in the world to convert refuse to energy without air emissions.

Advanced Integrated Recycling — AIR

Edison firmly believes that gasification technology is the best environmental and economic solution to municipal waste disposal in Southern California. Recycling and waste reduction are both required to diminish the problem, yet there will always be some waste requiring ultimate disposal. The waste gasification concept enhances recycling while converting the remainder of the waste into a clean fuel gas.

Edison began development of the first commercial scale municipal waste gasification facility in the world in 1991. Construction could begin in 1994, with operation of the demonstration phase to begin in 1995. The demonstration project will be known as the AIR (Advanced Integrated Recycling) Project.

Environmental Benefits

Fluidized bed gasification will provide an environmentally acceptable solution to other waste disposal alternatives in Southern California. The use of the product gas in electrical generation equipment will not increase air emissions. If a commercial gasification project can be sited adjacent to a utility boiler, the low-Btu gas can be used to displace natural gas and result in overall NO_x reduction.

This demonstration will provide valuable technical and environmental information to air quality management agencies, the waste disposal industry and electric utilities. It is designed to demonstrate that gasification of waste is a superior alternative to combustion in sensitive air quality areas, and to landfilling in heavily populated areas.

How It Works

The demonstration will involve the processing of 200 tons per day of municipal waste (trash) to remove recyclables, leaving only the organic portion of the waste stream called refuse-derived fuel (RDF). The RDF is fed into a fluidized bed gasifier which contains hot sand. The hot sand reacts with the RDF to form a gas. The product gas is cooled and cleaned to remove any contaminants carried over from the gasification process. The clean gas then can be burned in a power plant boiler, producing 5 MW, or in an industrial boiler. The product gas, because of its lower Btu content, burns cleaner than natural gas, thus reducing emissions.

The scrubber waste water is cleaned to remove the contaminants and is delivered to the power plant waste water system. The ash from the gasifier can be stabilized for use as a recyclable product.

The gasifier technology is modular, ideal for small to large communities and does not require any smoke stack since nothing is released into the atmosphere from the gasification process.

EXH. 87

Solid Waste Report
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FACILITY OVERSIGHT: SEMINAR SPOTLIGHTS CURRENT, PENDING EPA REGULATIONS AFFECTING LANDFILLS

Landfill managers, who already must comply with an array of federal rules, will face more regulations in the next few years, a panel of experts told participants at Waste Expo '97.

EPA Office of Water official John Tinger led off the session with a review of the agency's rulemaking on effluent limitations from landfills. Tinger highlighted the proposal that EPA unveiled April 21 (SWR, April 24, p. 1). "The effluent limitations are based on specific technology, but don't require the use of specific technology. How a landfill achieves the standard is up to the manager," he said.

Tinger also noted that EPA considered requiring some technologies, such as reverse osmosis, "but the costs of reverse osmosis didn't justify the benefits."

Douglas Cloud, an attorney with the Atlanta, Ga., firm of Alston & Bird LLP, followed with an assessment of recent regulatory development in the Clean Air Act (CAA). He began by discussing the two major permits of concern to landfill managers: New Source Performance Standards (Title V operating permits) which deal with emissions standards, and New Source Review (NSR) construction permits.

Whether a CAA permit is required, Cloud said, depends on several factors, including:

- The types and quantities of air emissions expected from the facility;

- The planned activity (constructing a new landfill or modifying an operating landfill);

- Whether the facility is located in a CAA attainment area (an area that meets national ambient air quality standards) or CAA nonattainment area.

In building a new landfill, managers must figure out the site's potential to emit certain pollutants. "It's not what you actually emit," Cloud noted. "You have to calculate your worst-case scenario."

Similarly, landfill managers wishing to make a major modification to their facilities are required to conduct a two-step analysis. First, they must determine whether the change constitutes either "routine maintenance, repair or replacement," or an increase in hours of operation or rate of production. Landfills conducting either of these types of changes are exempt from new permit requirements. In addition, landfills installing gas or energy collection and control systems may be eligible for a pollution control project exemption.

"It's a definition by exclusion," Cloud said, noting that virtually any other change will trigger CAA requirements.

Second, facility managers must figure their "significant net emissions increase" from the modification, using a specific formula.

Finally, landfill operators must consider the type of area in which the facility operates. Environmental regulators in nonattainment areas cannot allow a new major source of pollution without offsetting reductions from another source. There is a minimum offset ration of 1:1, but state officials can demand stricter ratios from new emissions sources.

"You have companies literally buying up other businesses [that are sources of emissions] just to shut them down," Cloud said.

When asked whether a new landfill compactor could trigger CAA requirements, Cloud responded, "Routine repair and replacement is exempted. You could make a reasonable argument that just replacing a piece of equipment is not subject to NSR. But it depends on whether it will increase your emissions."

MORE REGULATIONS TO COME

Paul Cassidy, an environmental engineer with the EPA Office of Solid Waste, wrapped up the discussion with a look at several major EPA regulations in the pipeline. For example, a final rule currently being reviewed by the White House Office of Management and Budget would provide regulatory flexibility for small, dry, remote (SDR) landfills. EPA tried to exempt these facilities from ground water monitoring requirements in 1991, but a legal challenge from the Sierra Club resulted in a court decision vacating the exemption.

Congress acted in March 1996 to provide regulatory relief to SDR facilities with passage of the Land Disposal Program Flexibility Act. In response, EPA reinstated the groundwater monitoring exemption for these sites last September. A final agency rule providing additional flexibility on such requirements as daily cover is scheduled for release before October, Cassidy said.

The agency also is hammering out a final rule on financial

assurance requirements for companies and local governments on landfill closure and post-closure care. A final rule is slated for release in August.

A rule on lead-based paint debris that contractors generate will cover municipal solid-waste landfills, according to Cassidy. The EPA Office of Pollution and Prevention and Toxics will determine whether this debris can go to Subtitle D (nonhazardous) landfills, or whether it must be sent to Subtitle C (hazardous) landfills. The agency will release a proposal in the fall.

Cassidy concluded by noting that EPA had released a report on greenhouse gas emissions in April and is seeking public comments (SWR, May 8, p. 151). Contacts: John Tinger, EPA Office of Water, (202) 260-4992,; Douglas Cloud, Alston & Bird LLP, (404) 881-7894.

EXH. 88

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

October 21, 1994

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Classification of Emissions from Landfills for NSR Applicability Purposes

FROM: John S. Seitz, Director
Office of Air Quality Planning and Standards (MD-10)

TO: Director, Air, Pesticides and Toxics Management Division, Regions I and IV
Director, Air and Waste Management Division, Region II
Director, Air, Radiation and Toxics Division, Region III
Director, Air and Radiation Division, Region V
Director, Air, Pesticides and Toxics Division, Region VI
Director, Air and Toxics Division, Regions VII, VIII, IX and X

The EPA has recently received several inquiries regarding the treatment of emissions from landfills for purposes of major NSR applicability. The specific issue raised is whether the Agency still considers landfill gas emissions which are not collected to be fugitive for NSR applicability purposes.

The EPA's NSR regulations define "fugitive emissions" to mean "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening" (40 CFR 51.165(a)(1)(x)). In general, where a facility is not subject to national standards requiring collection, the technical question of whether the emissions at a particular site could "reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening" is a factual determination to be

made by the permitting authority, on a case-by-case basis. In determining whether emissions could reasonably be collected (or if any emissions source could reasonably pass through a stack, etc.), "reasonableness" should be construed broadly. The existence of collection technology in use by other sources in the source category creates a presumption that collection is reasonable. Furthermore, in certain circumstances, the collection of emissions from a specific pollutant emitting activity can create a presumption that collection is reasonable for a similar pollutant-emitting activity, even if that activity is located within a different source category.

In 1987, EPA addressed whether landfill gas emissions should be considered as fugitive.[1] The Agency explained that for landfills constructed or proposed to be constructed with gas collection systems, the collected landfill gas would not qualify as fugitive. Also, the Agency understood at the time that, with some exceptions, landfills were not constructed with such gas collection systems. The EPA explained that "[t]he preamble to the 1980 NSR regulations characterizes nonfugitive emissions as '. . . emissions which would ordinarily be collected and discharged through stacks or other functionally equivalent openings'" (see 45 FR 52693, Aug. 7, 1980).[2] Based on the "understanding that landfills are not ordinarily constructed with gas collection systems," the Agency concluded that "emissions from existing or proposed landfills without gas collection systems are to be considered fugitive emissions." The Agency also made clear, however, that the applicant's decision on whether to collect emissions is not the deciding factor. Rather, it is the reviewing authority that makes the decision regarding

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[1] See memorandum entitled "Emissions from Landfills," from Gerald A. Emison, Director, Office of Air Quality Planning and Standards, to David P. Howekamp, Director, Air Management Division, Region IX, dated October 6, 1987 (attached). It is important to note that the interpretation contained in this memorandum was only applicable to landfills.

[2] In fact, the 1980 preamble language recognized the concern that sources could avoid NSR by calling emissions fugitives, even if the source could capture those emissions. The EPA's originally-proposed definition of fugitive emissions was changed in the final 1980 regulations to "ensure that sources will not discharge as fugitive emissions those emissions which would ordinarily be collected and discharged through stacks or other functionally equivalent openings, and will eliminate disincentives for the construction of ductwork and stacks for the collection of emissions." Id.

which emissions can reasonably be collected and therefore not considered fugitive.

The EPA believes its 1987 interpretation of the 1980 preamble may have been misunderstood, and in any case that its factual conclusions at that time are now outdated. Continued misunderstanding or application of this outdated view could discourage those constructing new landfills from utilizing otherwise environmentally- or economically-desirable gas collection and mitigation measures in order to avoid major NSR applicability.

Specifically with regard to landfill gas emissions, gas collection and mitigation technologies have evolved significantly since 1987, and use of these systems has become much more common. Increasingly, landfills are constructed or retrofitted with gas collection systems for purposes of energy recovery and in order to comply with State and Federal regulatory requirements designed to address public health and welfare concerns. In addition, EPA has proposed performance standards for new landfills under section 111(b) of the Clean Air Act and has proposed guidelines for existing landfills under section 111(d) that, when promulgated, will require gas collection systems for existing and new landfills that are above a certain size and gas production level (see 56 FR 24468, May 30, 1991). Under these requirements, EPA estimates that between 500 and 700 medium and large landfills will have to collect and control landfill gas. The EPA believes this proposal created a presumption at that time that the proposed gas collection systems, at a minimum, are reasonable for landfills that would be subject to such control under the proposal.

Thus, EPA believes it is no longer appropriate to conclude generally that landfill gas could not reasonably be collected at a proposed landfill project that does not include a gas collection system. The fact that a proposed landfill project does not include a collection system in its proposed design is not determinative of whether emissions from a landfill are fugitive. To quantify the amount of landfill gas which could otherwise be collected at a proposed landfill for NSR applicability purposes, the air pollution control authority should assume the use of a collection system which has been designed to maximize, to the greatest extent possible, the capture of air pollutants from the landfill.

In summary, the use of collection technology by other landfill sources, whether or not subject to EPA's proposed requirements or to State implementation plan or permit requirements, creates a presumption that collection of the emissions is reasonable at other similar sources. If such a system can reasonably be designed to collect the landfill's gas

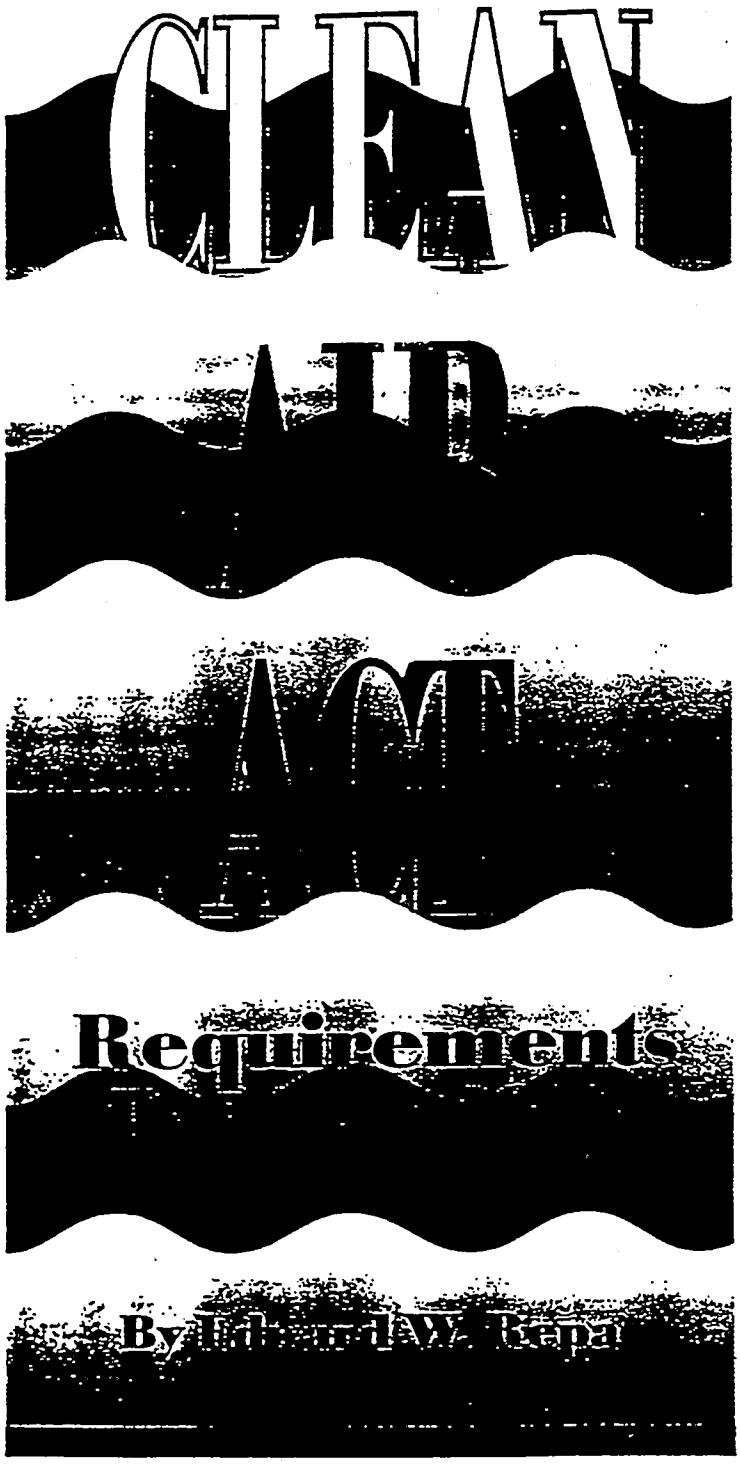
emissions, then the emissions are not fugitive and should be considered in determining whether a major NSR permit is required.

Today's guidance is applicable to the construction of a new landfill or the expansion of an existing landfill beyond its currently-permitted capacity. To avoid any confusion regarding the applicability of major NSR to existing landfills, EPA does not plan to reconsider or recommend that States reconsider the major NSR status of any existing landfill based on the issues discussed in this memorandum. Also, nothing in this guidance voids or creates an exclusion from any otherwise applicable requirement under the Clean Air Act and the State implementation plan, including minor source review.

The Regional Offices should send this memorandum, including the attachment, to States within their jurisdiction. Questions concerning specific issues and cases should be directed to the appropriate Regional Office. Regional Office staff may contact Mr. David Solomon, Chief, New Source Review Section, at (919) 541-5375, if they have any questions.

Attachment

cc: Air Branch Chief, Regions I-X
NSR Contacts, Regions I-X and Headquarters



A number of recent and anticipated U.S. EPA actions related to the Clean Air Act (CAA) rules will have a significant effect on landfill owners and operators, requiring compliance with existing, proposed, or soon-to-be-proposed CAA requirements. This article summarizes these actions and is the first of a series of articles on CAA requirements that will appear in Waste Age *throughout the year.*

Title I of the Clean Air Act (CAA) requires states with nonattainment areas for criteria pollutants (including ozone and oxides of nitrogen [NOx], to adopt a variety of programs to bring these areas into compliance with relevant standards. One of the programs is the New Source Review (NSR) program that requires "major sources" to obtain a preconstruction permit. These permits require facilities to:

- Meet the lowest achievable emission rates (LAER);
- Obtain emission offsets (i.e., enforceable emission reductions from other operations or facilities within the project that more than offset the increase in emis-

Repa is director, environmental programs, for the Environmental Industry Associations (Washington, D.C.).

sions from the proposed facility seeking the permit):

- Demonstrate that all major sources owned or operated by an applicant in the state are in compliance with CAA requirements; and
- Demonstrate that the benefits of the proposed source significantly outweigh environmental and social costs.

A new facility, or major modification to an existing facility, is considered a "major source" if its emissions, not counting fugitive emissions, exceed an applicable threshold (100 tons per year [tpy] in "marginal" and "moderate" ozone areas, 50 tpy in "serious" areas, 25 tpy in "severe" areas, and 10 tpy in "extreme" areas). Additionally, thresholds for major modifications may be lower.

A recent lawsuit filed by Ogden Martin Systems (Fairfield, N.J.), developers of municipal solid waste incinerators, against Browning-Ferris Industries' (BFI, Houston) New Morgan Landfill Co., Inc., in Pennsylvania raised legal issues regarding preconstruction air permitting for landfills. The suit claims that:

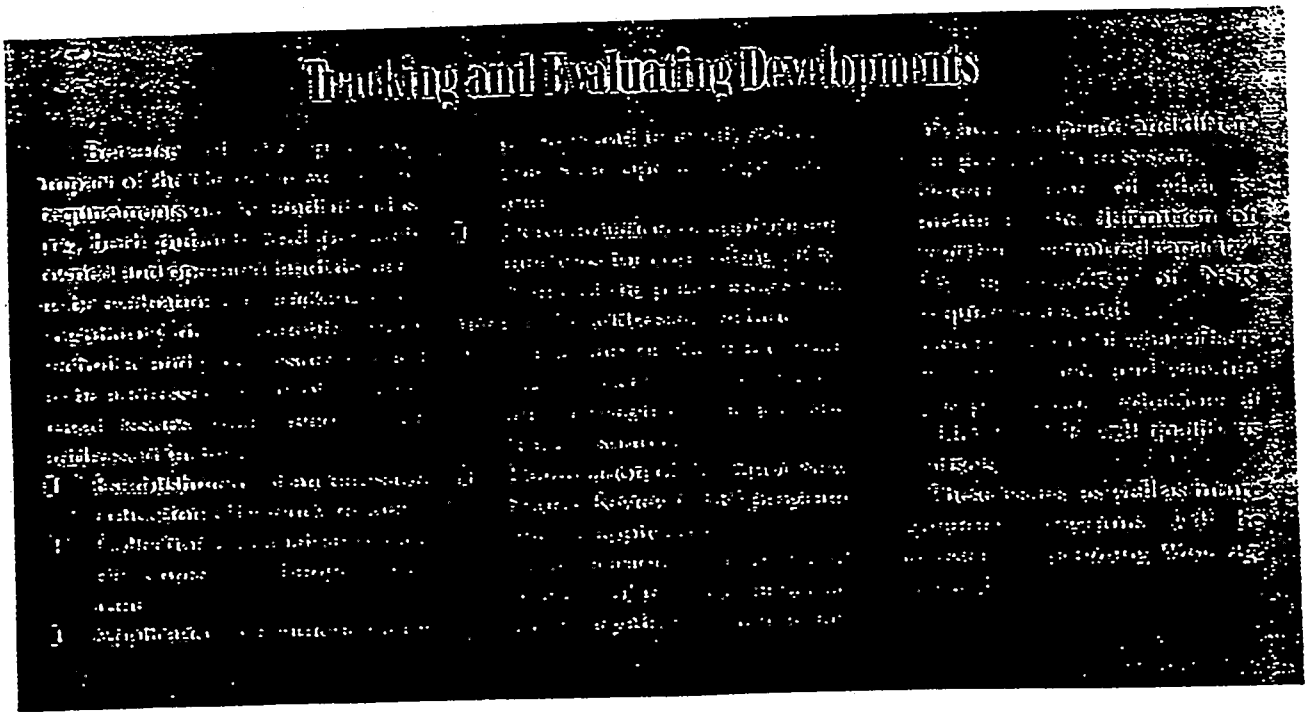
- The landfill is a "major emitting facility" because it has the potential to emit more than 50 tpy of volatile organic compounds (VOCs);
- Part D, Title I, of CAA prohibits the construction of a major VOC-emitting facility unless a permit to construct has been obtained; and
- The landfill has not obtained a permit to construct, and has constructed and begun operation in violation of CAA standards.

BFI believes that it has met all applicable permitting requirements in construction and operation of the landfill. While a court decision regarding the lawsuit has not occurred, it is important for landfill owners and operators to understand the requirements of CAA to prevent lawsuits that may or may not be justified.

New source review/1987 EPA guidance

In 1987, EPA Region IX requested guidance from EPA headquarters on the treatment of landfills under NSR (i.e., whether air emissions should be considered fugitive and therefore excluded from the calculations for the potential to emit for NSR purposes). Gerald Emison of the Office of Air Quality Planning and Standards responded to the region's request. EPA's position in 1987 was:

- Fugitive emissions are "those emissions which could not reasonably pass through [a] stack, chimney, vent, or other functionally-equivalent opening"



(40 CFR 51.165(a)(1)(x));

- Since landfills are not ordinarily constructed with gas collection systems, air emissions from existing or proposed landfills without gas collection systems are to be considered fugitive emissions and not included in the NSR applicability determination as a major source; and
- Landfill gas that was collected through some type of collection system and discharged to the atmosphere must be included in the source's potential to emit when calculating NSR applicability.

Therefore, based on this guidance, only those pollutants released from a flare, turbine, or other combustion system were to be counted toward the potential to emit as a major source.

As a result of [redacted] "rethinking" [redacted] applicability of the [redacted] Source Review (NSR) [redacted] to landfills, most larger landfills will have to consider NSR prior to construction or expansion beyond currently permitted capacity.

1994 EPA guidance

More recently, because of evolving technical, political, and regulatory issues, EPA received several inquiries regarding whether, and to what extent, EPA had changed its position since the 1987 memo. Specifically, EPA was asked whether it still considered uncollected landfill gas emissions to be fugitive for NSR applicability (i.e., guidelines established in the 1987 memo). In response, on Oct. 21, 1994, EPA issued a memorandum entitled "Classification of Emissions from Landfills for NSR Applicability Purposes." In summary, the 1994 EPA guidance memo states that:

- Because of advancements in gas collection and mitigation technologies since 1987 and the proposal of the "new source performance standards" (NSPS) for landfills in 1991 (scheduled to be promulgated in the summer of 1995), it is no longer appropriate to conclude generally that gas could not reasonably be collected at a proposed landfill project. The use of collection technology by other landfill sources—whether or not subject to EPA's proposed requirements, to an SIP [state implementation plan], or permit requirement—creates a presumption that collection of the emissions is reasonable at other similar sources.
- Gas collection systems should be assumed to be designed to maximize, to the greatest extent possible, the capture of air pollutants from the landfill for NSR applicability.
- Only those emissions from the gas collection system (i.e., nonfugitive) are considered when determining the applicability of NSR. Emissions from the landfill that are not collected by the gas control systems are still considered fugitive and are not considered for NSR applicability.
- The new guidance is applicable to the construction of a new landfill or the expansion of an existing landfill beyond its "currently permitted capacity."

As a result of EPA's "rethinking" on the applicability of NSR to landfills, most larger landfills will have to consider NSR prior to construction or expansion beyond currently permitted capacity. The definition of "currently permitted capacity" is not provided in the memorandum. In conversations with EPA, they indicated that currently permitted capacity could include all capacity covered under the original permit, even if cells have not yet been constructed.

State NSR issues

EPA's re-evaluation of this issue, however, only represents the federal interpretation of the requirements. State laws may be different and more stringent. For example, state law may require that fugitive emissions be included for NSR purposes.

Even if you do not have to proceed through major NSR, most states are required to have a minor NSR program as part of their SIP. Minor NSR refers to a variety of state programs regulating construction of new sources and modifications to existing sources that are located in nonattainment areas, but are not major sources, including exemptions from permitting. When EPA approves the state's minor NSR program as part of its plan to attain and maintain National Ambient Air Quality Standards, permits issued by the state are federally enforceable.

The advantage of having a federally enforceable per-

mit is that it can reduce the facility's potential to emit and thus affect the applicability of other CAA requirements. For example, if a facility in a non-attainment area can agree to emission limits that are below the major source threshold, it could avoid the need to obtain costly emission offsets and could obtain a five-year deferral from Title V permitting.

TABLE I

Existing Sources	Minimum MACT Floor
30 or more sources	Average emission limitations achieved by the best performing 12% of the existing sources in the category.
Fewer than 30 sources	Average emission limitations achieved by best performing five sources in the category.
New Sources	Emission control achieved by the best controlled similar source in the category.

A similar program that can ease the burden of CAA operating permits is the "synthetic minor," or federally enforceable state operating permits (FESOP), which many states have adopted. Synthetic minor permits are appropriate for sources with potential, but emissions are below the major source threshold. Sources can lower their emissions through limitations on operations or more stringent controls and thereby avoid Title V. This program may be more generally applicable to manufacturing facilities. However, FESOPs can be applied to landfill operations. A FESOP, or synthetic minor, will contain far fewer requirements than a Title V permit, and could result in a significant cost savings for a facility.

New source performance standards

After many years in development, EPA proposed new source and emission guidelines for MSW landfills under Section 129 of the CAA on May 30, 1991. EPA had been reviewing comments and additional data received on the issue, and has yet to promulgate final rules. EPA submitted a final rule to the Office of Management and Budget (OMB) for review in early fall of 1994, but retracted the rule because of OMB concerns over unfunded mandates. Apparently, EPA failed to perform this analysis prior to submittal to OMB, but has now performed the required analysis. The anticipated date for promulgation is now the summer of 1995.

The intent of the standards and guidelines is to require certain MSW landfills to control emissions to the level achievable by the "best demonstrated systems of continuous emission reduction," considering costs, non-air quality health, and environmental and energy impacts. The rules will apply to:

- New municipal solid waste (MSW) landfills for which construction, modification, or reconstruction commenced on or before May 30, 1991, or that began accepting waste on or after this date; and
- Existing MSW landfills for which construction commenced prior to May 30, 1991, and accepted waste after Nov. 8, 1987.

The NSPS will require affected landfills with design capacities of less than 1 million megagrams (Mg) or 1 million cubic meters to file a design capacity report. Affected landfills with design capacities greater than or equal to 1 million Mg or 1 million cubic meters will be required to determine their annual emissions of non-methane organic compounds (NMOC) using an air emission model developed by EPA. Emission data inputs range from default values to site-specific information collected during a field testing program. If emission levels exceed 50 Mg of NMOC per year, the landfill owner/operator will be required to install a gas collection and destruction system at the facility. EPA estimates that 8% of the existing and 10% of the new landfills (600-700 landfills) will have to install controls as a result of the rulemaking.

The emission control system installed will be based on a performance standard incorporating design flexibility. Default standards will be included for those facilities that do not elect to develop a site-specific design. Additionally, monthly monitoring of surface concentrations will be required. For a large landfill, EPA estimates that the average annual cost to the facility will be approximately $180,000 if flares are used as the combustion device.

Future requirements

Title III of CAA includes a substantially revised program to regulate hazardous air pollutants (HAPs) that may cause health or environmental effects at low concentrations. The list of HAPs contains 189 substances that are not regulated as criteria pollutants, but may be

TABLE 2

Category	Potential Annual Emissions
Attainment Areas	
Criteria Pollutant (SO_2, NOx, CO, VOC, PM10, and lead)	100 tons
Nonattainment Areas	
Carbon Monoxide	
Moderate	100 tons
Serious	50 tons
PM10	
Moderate	100 tons
Serious	70 tons
Ozone (VOCs & NOx)	
Marginal & Moderate	100 tons
Serious & Transport Regions	50 tons
Severe	25 tons
Extreme	10 tons
Air Toxics (189 hazardous air pollutants)	
One HAP	10 tons
Two or More HAPs	25 tons

regulated under other sections of CAA (e.g., VOC standards, and NSPS. These pollutants are regulated under CAA Section 112.

Title III defines a major source of HAPs as any stationary source, or group of stationary sources, located within a contiguous area that has the potential to emit 10 tons or more of any single HAP per year, or 25 tons or more of any two or more HAPs per year. The new HAP emission control program requires the installation of maximum achievable control technology (MACT), i.e., the maximum level of control achieved in practice within the industry (see Table 1).

MACT standards applicable to MSW landfills are scheduled for promulgation by Nov. 15, 2000. In order for EPA to meet this deadline, they must develop and propose the requirements at least a year in advance. A regulated source will have three years after its applicable MACT standard is promulgated to achieve compliance. However, even before the applicable MACT standard for landfills is finalized, states with an approved Title V program may impose case-by-case MACT on construction of major sources of HAPs or modifications of existing major sources. HAPs occur both in landfill gas and as a product of combustion in flares. Precise quantification of HAPs in landfill gas will be difficult. The air toxics programs count fugitive emissions as well as point-source emissions in determining whether a source is major.

CAA Title V

Title V establishes a program for issuing operating permits to all major sources (and certain other sources) of air pollutants in the U.S. These permits will incorporate in one document all applicable requirements, limitations, and conditions governing regulated air emissions. The key to determining a need for a federal operating permit is to know whether or not it is a major source.

The definition of a major source under Title V is broader than for NSR under Title I. A source is considered a major source and will need an operating permit if its potential yearly air emissions exceed those listed in Table 2.

Facilities will also need an operating permit if they are a source subject to an NSPS requiring an operating permit, acid rain provisions, or NESHAPs. However, states can grant a five-year deferral for minor sources.

Once an operating permit is required, the facility must address each and every regulated pollutant from each and every source regardless of how small the emissions. The facility must also account for all fugitive emissions. States will have the authority to set *de minimis* emissions levels for "insignificant activities" as part of their own permitting programs. Most states have included such a provision in their proposed Title V programs.

Permit application due dates vary from state to state. All covered facilities must submit their permit applications no later than one year following EPA's approval of the state's operating permit program. Most states, however, have established different time frames for different facilities. Some have relied on SIC codes while others have used geographic location to determine when permit applications are due. For example, Iowa, although its program has not yet been approved by EPA, called in all its permits on Nov. 15, 1994. Other states have yet to submit their programs to EPA for approval, while some have already received final approval. All this state activity is occurring even as EPA is revising the federal requirements for the state operating permit programs. ■

Electric Light & Power
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Thursday, February 1, 1996

Vol. 74, No. 2, ISSN: 0013-4120

IOU, municipal to pilot methane energy recovery program.

In an unprecedented partnership between the Town of Groton and Northeast Utilities (NU), a local landfill that emits methane gas will become a research site for a new energy technology developed in Connecticut. Representatives from the town and the utility recently signed a memorandum of understanding, formalizing their intent to move forward with the project, subject to permits, approvals and tests on the landfill gas.

Methane gas is a potent greenhouse gas, and municipal solid waste in landfills is its largest man-made source. However, new technology developed in South Windsor, Conn., by International Fuel Cells can keep the methane gas from escaping into the atmosphere and convert it to electricity.

The process, which has the added benefits of converting landfill gas into less-harmful compounds and also removing its odor-causing components, takes place inside a device called a fuel cell.

"We're particularly excited about the partnership aspect of this project," said Dolores Hauber, Groton's mayor. "It's an excellent situation for the town for financial and environmental reasons."

For its 18-month duration, the project will allow the town to avoid the expense of providing a permanent flare to bum off the escaping gases at the landfill.

For NU, which has invested over $8 million in fuel cell research over the past 25 years, this agreement provides an ideal forum to test the fuel cell as an environmentally responsible and viable energy resource. The project is expected to cost NU approximately $150,000 for installation and maintenance of the cell. The equipment is valued at about $1.5 million and is owned by the federal Environmental Protection Agency.

The unit planned for installation is expected to produce approximately 140 kW of electricity, which will be Youted onto the Connecticut Light and Power Co. (CL&P) distribution system. CL&P, a subsidiary of NU, serves 1.1-million residents and commercial/industrial customers in 149 communities in Connecticut. The fuel cell could provide enough electric energy for the average use of about 100 homes during the 18-month project.

"As a responsible utility, we are working to keep our commitment to the Climate Challenge by reducing greenhouse gas emissions throughout our system. We are also working to develop new, efficient means of generating electricity at lower costs. And, finally, we are working to develop partnerships, such as this one, that will benefit people and businesses throughout our service territory and place us on the leading edge of new technology. For those reasons, this project fits beautifully with the many goals NU has set as we move toward deregulation in the electric industry," said Kerry Kuhiman, CL&P's Eastern Region vice president.

The fuel cell planned for installation was originally developed to produce 200 kW when fueled by natural gas. The test in Connecticut follows a six-month trial of the system in Los Angeles, where it was tested with a landfill gas pretreatment system in a similar situation, producing 140 kW. According to NU, the primary goal of this project is to review the gas pretreatment system for modifications that will improve the performance of the cell and lower cost of future systems of this sort.

DISPOSAL AREA 1

PaDER AIR QUALITY APPLICATION TO CONSTRUCT/OPERATE AN AIR CONTAMINATION SOURCE

FEBRUARY 1995

Prepared For:

BFI Waste Systems
BROWNING-FERRIS INDUSTRIES

New Morgan Landfill
Company, Inc.
Conestoga Landfill
New Morgan Borough
Berks County, Pennsylvania

Prepared By:

BLAZOSKY
ASSOCIATES, INC.

205 EAST BEAVER AVENUE - SUITE 201
STATE COLLEGE, PA 16801
814-238-2060
FAX 814-238-7123

EXH. 91

Calculations were performed by BAI to determine the exit velocity, temperature and moisture content of the flare's exhaust gas. See Attachment 2 for these calculations.

4.2 Emissions Profile

As discussed in Section 3.3, the LFG management system is designed to accommodate 100 percent of the peak estimated LFG generation rate within the landfill. All LFG collected by the system will be routed through the enclosed ground-type flares for combustion.

In addition to the flare emissions, it is expected that there will be some fugitive LFG emissions notwithstanding the operation of the LFG management system. There are two reasons for this. First, although the system will be sized, when complete, to accommodate recovery of 100 percent of the LFG generated within the landfill, in practice LFG extraction systems are typically not 100 percent efficient; it is simply not possible, as an engineering matter, to ensure that all LFG produced by the landfill will in fact be captured by the extraction system. The collection efficiency of the LFG extraction system that will be installed at the Conestoga Landfill is expected to be within the range of 90 to 100%.

A second reason that there will be some fugitive emissions of LFG is that the extraction system must be installed in phases in conjunction with the development of the landfill. As a result, there will be areas of waste that may be producing LFG before it is possible to install extraction wells to serve those areas. For temporary periods during the installation of the extraction system, therefore, it will be technically not feasible to capture all LFG that may be produced.

Estimates of flare emissions of NO_x, CO and NMOC and contemporaneous fugitive emissions of NMOC are presented in Attachment 1. These estimates were developed by RMB utilizing LFG generation data based on the quantity of refuse in place for each phase of the landfill's development (see Attachment 3), the EMCON LFG Model, and the flare manufacturer's performance guarantees as discussed in Section 4.1. Table 1 of Attachment 1 shows the expected levels of emissions year-by-year assuming a LFG collection efficiency of 90%. Table 2 of Attachment 1 shows the expected levels of emissions year-by-year assuming a LFG collection efficiency of 100%. The actual emissions are expected to fall within the range of emissions reflected by these tables, depending on the actual LFG collection efficiency of the installed system.

6/30/97 Ariz. Republic 3

The Arizona Republic
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Monday, June 30, 1997

Glendale/Peoria Community

GARBAGE FEES TO RISE IN GLENDALE, BUT TAXES FALL AGAIN

Lori Baker, The Arizona Republic

Sanitation fees for Glendale residential and commercial customers will increase starting Tuesday.

Residential sanitation fees will be $10.75 a month, up 25 cents from the previous rate. The commercial fees will rise an average of 3 percent.

In addition, the city's commercial recycling service fees will increase to $14.75 per month, up from $10.70.

City Manager Martin Vanacour said the reduced market value of recyclables and increased processing costs due to contamination are the reasons for the fee increase. He said the higher fees will allow the city to break even on recyclables collection.

Although other fees are increasing, the city is reducing the cost of disposal of clean loads of green and wood waste from $26.25 to $16.50 per ton.

Vanacour said the city wants to encourage customers to separate green waste from other types of refuse because that will result in airspace savings and a reduction in landfill gas production.

The new sanitation rates are part of a $301 million budget adopted by the City Council last week for fiscal year 1997-98, which begins Tuesday. Water and sewer rates will not change.

At a special council meeting at 7 p.m. Tuesday, the council is expected to set the property tax rate at $1.83 per $100 of assessed valuation, a drop of 5 cents over the rate for fiscal 1996-97. The reason for the decrease is because the city's expected boost in assessed valuation of property lessens the tax burden for individual owners because it is spread over a larger base.

This will be the third year in a row that Glendale has lowered its tax rate.

EXH. TL 5

South Coast
AIR QUALITY MANAGEMENT DISTRICT
21865 E. Copley Drive, Diamond Bar, CA 91765-4182 (909) 396-2000

August 4, 1995

Mr. Charles McDonald
U.S. Department of Agriculture, Forest Service
Angeles National Forest
701 North Santa Anita Avenue
Arcadia, CA 91006

Re: Comments on the Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Proposed Elsmere Solid Waste Management Facility

Dear Mr. McDonald:

The South Coast Air Quality Management District (SCAQMD) is a regional public agency with responsibility for improving air quality in the areas within its jurisdiction, which includes Los Angeles, Orange, and Riverside counties and the western portion of San Bernardino County. In addition to adopting, implementing, and enforcing air pollution control regulations, the SCAQMD reviews California Environmental Quality Act documents prepared by other public agencies to evaluate the adequacy of the air quality analyses. The SCAQMD may provide recommendations to the lead agency for improving the air quality analyses and identifying additional feasible mitigation measures, if necessary.

The SCAQMD has reviewed the air quality section of the Draft EIR/EIS for the Elsmere Solid Waste Management Facility located in the South Coast Air Basin. Because of the size, location and duration of the proposed project, significant adverse air quality impacts for criteria pollutants are expected. Not all of the potential adverse impacts and feasible mitigation measures have been fully addressed in the Draft EIR/EIS. The mitigation measures presented in the Draft EIR/EIS should be required, not merely recommended. An enforceable mechanism for assuring implementation of all feasible mitigation measures should also be included before the project is approved. The attached staff assessment presents a more detailed discussion of the SCAQMD's review of the of the Draft EIR/EIS.

The SCAQMD comments are intended to advise the lead agency in addressing and mitigating the potential adverse air quality impacts of the project. The SCAQMD appreciates the opportunity to review the Draft EIR/EIS for the Elsmere Solid Waste Management Facility and is available to answer any questions you may have, or provide further assistance regarding air quality issues. Questions should be addressed to Terry McCall (909) 396-3107.

Sincerely,

Cindy S. Greenwald
Planning Manager
Office of Planning and Policy

cc: Mr. Richard Frazier, LA Co. Dept. Regional Planning
(CG TM \ELSMERE)

385-1

385

EXH. 9-2

ATTACHMENT

SCAQMD ASSESSMENT OF ELSMERE SOLID WASTE MANAGEMENT FACILITY DRAFT ENVIRONMENTAL IMPACT REPORT

AIR QUALITY RULES AND REGULATIONS (Section 6.1.2)

- Page 6-7. The ambient air quality relied upon data in Table 6.1-2 is not the most current. Ambient data are available through 1994 and should used for all emission calculations (See also reference to Table 6.1-2 on page 6-17).

- Page 6-9. The EIR references the 1991 AQMP. The appropriate document to be used for reference, comparison and a determination of consistency is the latest revision to the SCAQMD AQMP which was adopted in September, 1994.

- Page 6-12. The section on the potential future SCAQMD regulations seems to overlook PM10 measures that are scheduled to be developed in 1996. This section should recognize the Federal requirements for the development of "best available control measures" (BACM) to reduce the amount of fugitive dust and corresponding PM10 emissions from a variety of sources in the district. Under the provisions of the Federal Clean Air Act, PM10 control measures must be developed by the SCAQMD that will be applicable to any land use or activity, including landfills, that have the potential to generate fugitive dust. 385.1

  The SCAQMD fugitive dust regulations will be developed as part of the State Implementation Plan (SIP) for PM10 in the South Coast Air Basin. The SIP must show the BACM PM10 measures will be applied to stationary sources that emit PM10 or PM10 precursors, including NO_x, SO_x and ROG. The federal Clean Air Act requires these measures to be in place and enforceable no later than February 1997. To this end, the SCAQMD has organized a PM10 Task Force with community leaders and industry and academia representatives in the district to assist in coordinating the development of the PM10 SIP with affected facilities. The EIR/EIS should refer to the ongoing development of PM10 measures which will likely have a impact on the proposed project.

AMBIENT AIR QUALITY (Section 6.1.3)

- Page 6-18. The discussion of the state and federal attainment status of criteria pollutants is somewhat misleading. While the district had only one exceedance of the State 1-hour CO standard in 1994, it has not been designated as "in attainment" for the CO in any respect. The district is in attainment with the NAAQS for lead and SO_2. 385.2

CONSTRUCTION EMISSIONS (Section 6.2.1)

- Page 6-26. The EIR/EIS accurately states that construction emissions exceed SCAQMD significance thresholds and are considered a significant impact. Air dispersion modeling is a very effective tool to simulate impacts associated with the transport of pollutants from the project. The broad statement that "dispersion modeling was not considered necessary to assess construction impacts" should be clarified. It is the policy of the SCAQMD to determine the project's significance based on estimates of daily emissions. Dispersion modeling is not used estimate the daily and quarterly emissions. Since the project is found to exceed the SCAQMD's significance threshold for criteria pollutants, subsequent modeling is not required for a significance determination. Due to the determination of significance, all feasible mitigation is required to reduce the construction-related emissions regardless of the results of subsequent modeling. 385.3

OPERATIONAL EMISSIONS (Section 6.2.2)

- Page 6-32. The EIR/EIS states that combustion emissions from flares would be offset by emission reduction credits available from the SCAQMD's priority reserve (SCAQMD Rule 1309.1). It should be noted that this source of offsets may not be available at the time the flares become operational. Amendments to SCAQMD Regulation XIII are scheduled for the SCAQMD Governing Board's consideration in November 1995. The proposed amendments would exclude privately-owned landfills from the essential public services that are eligible for credits from the priority reserve. Privately-owned landfills have obtained a substantial number of emission reduction credits from the SCAQMD priority reserve. The elimination of free credits for sources that operate for profit is expected to increase the availability of credits to other public-owned landfills. The EIR/EIS should be revised to discuss options available to the project proponent to obtain external offsets in the event credits are not available from the SCAQMD priority reserve. 385.4

- Pages 6-34 to 6-39. The analysis of energy impacts in Section 17.0 - Energy is based on the 1991 Draft Final AQMP. More current baseline information on the energy demands in the district can be found in the SCAQMD EIR for the 1994 AQMP (August 1994). The annual energy consumption to operate service buildings and maintenance yards for the proposed project is estimated at 75×10^6 kilowatt hours per year (page 17-3). The analyses of operational emissions in Section 6.2.2 does not appear to address criteria pollutants emissions expected to result from any additional electrical generation that may be necessary to support the project. 385.5

- Page 6-38. The SCAQMD CEQA Handbook identifies emission thresholds for determining the significant impacts of a project's primary effects (Section 6.2). The SCAQMD recommends that a primary threshold of 550 pounds per day of carbon monoxide (CO) be used to determine significance. The SCAQMD also recommends the use of modeling to determine if there are secondary effects. For example, direct CO emissions from a project may fall below the primary threshold of 550 pounds per day, but traffic impacts associated with the project could cause an exceedance of the state ambient CO standards. In such a situation, even though the emission threshold of 550 pounds per day is not expected to be exceeded directly, the project as a whole 385.6

would be considered to have a significant impact due to the potential violation of the ambient air quality standard.

The Draft EIR/EIS concludes that there is a potential for 7,017 pounds per day of CO emissions. That number far exceeds the SCAQMD's significance threshold. The modeling results show that additional CO emissions would not cause an exceedance of the CO standards. That impact is incorrectly described as "adverse, but not significant". The modeling results do not negate the fact the estimated emissions far surpass the threshold of 550 pounds per day. The SCAQMD considers the proposed project to have a significant CO impact despite the modeling results not showing an exceedance of the ambient standard. The EIR/EIS should be revised to acknowledge that potential significant impact, and all feasible mitigation to reduce the CO emissions should be included in the EIR/EIS. 385.6 (cont.)

- Page 6-42. The potential daily NO_x emissions are estimated at 2,635 pounds per day. The EIR/EIS concluded from modeling results that the NO_x emissions would not exceed either the 1-hour or the annual NO_2 standards, and therefore, would not be a significant air quality impact. The SCAQMD considers NO_x emissions over 55 pounds per day a significant impact, regardless of the results of subsequent modeling performed to determine potential violations of ambient standards. The EIR/EIS should be revised to state that the projected NO_x emissions are significant. All mitigation measures to reduce the potential NO_x increase must be included.

The U.S. Forest Service and the County of Los Angeles have primary permitting and approval authority over the proposed project as a whole. The project nevertheless will require SCAQMD permits for the gas collection and control equipment. As such, the equipment must comply with all applicable SCAQMD rules and regulations. Rule 1303 requires the SCAQMD to deny permits to construct if the modeling data indicate that the new facility will exceed allowable concentration limits specified for each nonattainment pollutant. The projected concentration change of 88 ug/m^3 NO_x for a one-hour averaging period exceeds the 20 ug/m^3 allowable concentration threshold in SCAQMD Rule 1303 (Rule 1303 Appendix A, Table A-2). The project proponent should be aware of the possibility that SCAQMD permits could, therefore, be denied even if all other state and local permits for the facility are approved. The EIR/EIS should discuss how the proponents intend to reduce the NO_x emissions such that the concentration change does not exceed the 20 ug/m^3 limit of SCAQMD Rule 1303 385.7

- Page 6-44. The potential daily SO_2 emissions are estimated at 520 pounds per day which exceeds the SCAQMD significance threshold of 150 pounds per day. The EIR concluded that the SO_x emissions would be an adverse impact, but not a significant impact. The SCAQMD considers any SO_x emissions over 150 pounds per day to be significant, regardless of the results from subsequent modeling. The EIR/EIS should be revised to acknowledge the significance of the SO_2 emissions, and feasible mitigation should be described to reduce the expected SO_x emissions. 385.8

- Page 6-46. The discussion of potential odor impacts states the project "does not have the potential to create odors over 10 dilution to a threshold that could impact sensitive receptors". There does not appear to be data supporting this conclusion. Table 21 in Appendix D provides the data 385.9

385-4

showing the ground level concentration of odorous compounds, but there is no mention of the methodology used or specific analyses in the discussion of potential odor impacts. Such a discussion should be included and the conclusion substantiated. 385.9 (cont.)

- Page 6-47. The EIR/EIS states ROC emissions from the project would be offset by other emission reductions (e.g. landfill closures) in the Basin, and significant increases in ozone would not be expected in the Class I area. This conclusion is not substantiated with supporting data. It would be helpful to include a synopsis of the methodologies used to reach this conclusion and references to the appropriate supporting data in the Appendices. 385.10

- Page 6-50. The six percent exceedance of the visibility criterion for terrain within the wilderness should be considered significant. It is inappropriate to identify a significance criterion and then claim that an exceedance of that criterion is not significant. The project impacts on visibility, therefore should be considered significant and all feasible mitigation measures presented to reduce visibility impacts. 385.11

- Page 6-51. The conclusions presented in the Effects on Forest Resources (non-Class I) do not indicate which analytical methods were used to estimate the potential impacts of nitrogen and sulfur emission deposition on the aquatic systems. Also, supporting data is not presented in the discussion or referenced in the appendices. The EIR/EIS should be revised to identify the project as significant for nitrogen deposition, and all feasible mitigation included to reduce the levels of total nitrogen to aquatic and terrestrial resources. 385.12

- Toxic Air Contaminants. There is no analysis or discussion of the potential impacts of toxic air contaminants (TAC) in the air quality section. To make the air quality section complete, the discussion of potential TAC impacts that is presented Section 7.0 - Public Health, should be at least referenced in the air quality section. 385.13

ODOR IMPACTS (Section 6.2.4)

- Page 6-52. It not clear from the discussion how a "combination of computer modeling and empirical data" were used to determine there would be no significant odor impacts. A more specific description of the analytical methods and discussion of supporting data is needed to substantiate the conclusion that odor impacts are adverse but not significant. This discussion should also be included on page 6-46 (Secondary Indicators of Significance). 385.9 (cont.)

- Page 6-53. The odor control measures do not address the necessary maintenance of the gas collection system for maximum odor control. A repair and maintenance plan should be included as a part of the monitoring program to reduce odorous emissions. 385.14

385-5

ALTERNATIVES (Section 6.3)

- Page 6-65. The discussion of the significant residual air quality impacts states PM10 ambient air quality standards will be exceeded in the immediate vicinity of the project during operation and the project will contribute to existing violations of the ozone ambient air quality standards during operations. Section 6.3 - Alternatives does not indicate that the project's criteria pollutant emissions for NO_x, ROG, PM10, SO_2, and CO are significant for both the construction phase and during the operation of the facility. 385.15

PROPOSED PROJECT IMPACTS/MITIGATION (Section 7.2)

- Page 7-15 and App. E.3. The SCAQMD does not use the LAEEM model to estimate toxic emissions from landfills and was, therefore, unable to verify the estimated emissions of toxic pollutants from the project. The SCAQMD recommends that a more detailed discussion of the methodology and assumptions be provided to allow verification of the results. The SCAQMD would be happy to assist the lead agency in preparing an analysis of the potential toxic air pollutants using the SCAQMD model. 385.16

CUMULATIVE AIR QUALITY IMPACTS (Section 19.2.3)

- Page 19-7. The cumulative air quality impacts section states "the area of concern for cumulative air quality impacts is the South Coast Air Basin." The project-specific and cumulative impacts that result from the proposed project will have an adverse air quality impact in the SEDAB as well as the Basin. The location of the project lies within an interbasin transport corridor that connects the Basin with the high desert in the SEDAB. The Soledad Canyon north of the project site connects the San Fernando and Antelope Valleys. Ozone transport into the pass was first suspected because of ozone damage to the needles of the ponderosa pine in the mountains from the northern and eastern limits of the Basin. The southern portion of the High Desert is influenced primarily by air flow moving north through Soledad Canyon from the project location and areas to the south and southwest in the Basin. Also, the EIR/EIS refers to the 1992 AQMP, the appropriate document is the 1994 AQMP. 385.17

385-6

EXH. 23

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone (818) 458-5180

HARRY W. STONE, Director

ADDRESS ALL CORRESPONDENCE TO
P O BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

May 18, 1995

IN REPLY PLEASE REFER TO FILE P-4

Forest Supervisor
U.S. Department of Agriculture
Forest Service
Attention Elsmere EIS
Angeles National Forest
701 North Santa Anita Avenue
Arcadia, CA 91006

Dear Forest Supervisor:

RESPONSE TO A DRAFT ENVIRONMENTAL IMPACT REPORT/ ENVIRONMENTAL IMPACT STATEMENT (DEIR/EIS) PROPOSED ELSMERE SOLID WASTE MANAGEMENT FACILITY LOS ANGELES COUNTY PROJECT NO. 88573

Please disregard our May 4, 1995 comments on the DEIR/EIS. They were inadvertently assembled and sent without Administration review and contained Engineering Geology, Geotechnical Engineering and Transporation Planning issues raised by staff internally during review of earlier drafts of the document. These issues are either not valid, have been addressed, or have been determined to be outside our area of regulatory responsibility.

We thank you for the opportunity to provide the following comments on the DEIR/EIS for the proposed Elsmere Solid Waste Management Facility. We are continuing our review and will forward additional comments as appropriate.

Grading

Slope Stability of the proposed grading for the access road off the freeway should be addressed. 161.1

Traffic Circulation

The DEIR/EIS Transportation Element is based on 1989 traffic volumes obtained from the State of California Department of Transportation (Caltrans). Under the current County Traffic/Access Guidelines, traffic count data should not be over one and half years old. We recommend either taking new counts on all roads and intersection analyzed in the report or validate 1989 counts by conducting several new counts in the area. 161.2

161-1

In addition, we recommend the traffic report be revised to include the following items as they impact public roads in the unincorporated areas (specifically San Fernando Road at the northbound SR 14 ramps):

- The traffic study assumes all project traffic will be from the freeway, with 80 percent from the south and 20 percent from the north. We believe a portion of the northerly traffic will utilize San Fernando Road (SR 126). The trip distribution should be revised to incorporate this traffic.
- Schematic drawing showing a.m. and p.m. peak-hour turning volumes for the key intersections/interchanges addressed in the study for the existing and the future build out of the area in the Year 2010.
- An analysis of all intersections subsequent to the construction of the landfill and related facilities, including the SR 14/Los Pinetos Road interchange.
- The Critical Movement Analysis procedure used in the study to determine intersection Level of Service (LOS) should be based on the following:

  1. For dual left-turn lanes, calculations should indicate a 55 percent/45 percent split of turning volumes.
  2. Intersection Volume to Capacity (VC) should be calculated by dividing the Sum of Critical Volumes by 1,600 and adding a ten percent yellow clearance cycle. Midrange LOS D (V/C=0.85) is the point beyond which mitigation is required. If an intersection is determined to have an "existing plus ambient" VC ratio greater than 0.85 for the project completion year, then mitigation should be proposed so that the LOS is not worsened by the addition of project traffic.

- LOS analysis of key intersections/roadways should be prepared for the following scenarios:
  - Existing
  - Existing plus ambient
  - Existing plus ambient plus project
  - Existing plus ambient plus project plus related project

161.2 (cont.)

161-2

If you have any questions regarding the environmental reviewing process of this Department, please contact Mr. Vik Bapna at the previous page address or at (818) 458-4363.

Very truly yours,

HARRY W. STONE
Director of Public Works

DONALD L. WOLFE
Deputy Director

MA:dbr
elmere

161-4

EXH. 94

BIO-THERMIC
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Notes for C.I.W.M.B. on ADC - 8/25/93

At the Sacramento meeting on 8/18/93, I touched briefly on many important issues related to the approval of green organic materials for ADC. Most of them have now been formally addressed by the California Organics Recycling Council and Californians Against Waste.

Today, I would like to present only two items which relate specifically to the qualification of green organics for ADC.

Number 1 - Green Organics Composting
Number 2 - Moisture Infiltration and/or Permeability Standards

In the past all organic material at the landfill was commingled with inert material. This minimized leachate production and gas generation. In the pilot study, the separation, size reduction and structuring of green organic material into a homogeneous substrate has created a very efficient aerobic composting cell. These cells will be watered weekly for fire prevention (more often in the Sierra or in the dry season). This promotes the process of "active" composting as defined in Title 14 - Chapter 3.1 - Section 17853. The temperature of these cells far exceeds 127.4 degrees F. as specified in the regulation. They are in active, controlled decomposition. Actually, the temperatures may exceed 160 degrees F. in some areas and place the material in a condition for spontaneous combustion. I wonder why no fires have been reported? This could be why a permit change was requested to reduced the overall depth of the cells from 18" to 12".

The cells by every definition in the code are composting sites. If staff is aware of these conditions, the regulations for composting pad permeability should be enforced. Staff considers the leachate on outside composting operations to be environmentally unsafe. Therefore, we must assume that the leachate from these composting cells is equally dangerous.

Are ALL regulations to be selectively and conveniently enforced as a matter of expediency ?

When this unstable, moist, actively composting mass of organic material is sealed with an overlay of additional material, an "anaerobic" condition is created which quickly forms acids and gas. Green organics hold moisture much longer than inert materials and, subsequently, this will prolong and magnify the process.

I do not believe this is competent, conservative landfill management.

This material is a volatile organic mass. Not Soil. Not earthen material. Not stabilized. Not inert. It is an active composting cell. It is not suitable for ADC !

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October 2, 1993

Traci Perry
Office of Local Assistance
California Integrated Waste Management Board
8800 Cal Center Drive
Sacramento CA 95826

Re: Opposition to Proposed ADC Regulations

Dear Ms. Perry:

In reply to your letter of September 17, 1993, obviously, the cities of the Greater Los Angeles area have found a loophole to evade AB939. This may be politically expedient but it is not the intent of the law. If this program for ADC is implemented it will seriously damage the economic development of the composting, mulching, soil amendment and biofuel infrastructure. All of the landfills in the state are waiting in line to bury organics as ADC.

The ratio of organics to inerts in landfills has normally been 1 to 1. The removal of inerts (metals,aluminum,plastic,etc.) due to recycling has increased the organic fraction of landfills. The replacement of inert daily cover with green organic cells will now change the ratio to the organic side at 1.5 to 1 or more making landfills more volatile. The production of landfill gas (58% methane + 42% CO_2) will increase substantially. The addition of water (for fire prevention) also accelerates this "anaerobic" process. The result is a more efficient methane generator and added profit for the landfill operations. (It has been reported that 17 landfills in the state have methane collector systems.)

The higher permeability of the landfill will allow increased migration of landfill gas. The slope faces covered with porous green materials are actually chimneys to the surface.

The collection systems now in place can capture 50% of the gas production. The balance escapes to the atmosphere. These are poisonous, greenhouse and ozone depleting gasses. Many landfills cannot grow vegetation in post closure due the seeping methane gas. Flash explosions are not unusual.

Studies show that a 12,000 ton a day landfill, with the most modern equipment, collects approximately 12 million cubic feet of gas per day. The balance (50%) escapes into the atmosphere. This is equal to 40 acres 6.9 feet deep. The school gym next to the Sheldon-Arleta was closed until the methane intrusion could be controlled. The use of green organics for ADC will increase the volume of methane and other volatile gasses dramatically.

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The increased porosity of the landfill will allow oxygen to be drawn inward from the surface during gas recovery operations. This promotes internal landfill fires. Operating Industries Landfill #19AA-0836 in Monterey Park burned for 12 years.

The California laws are quite clear on this point and the board is directed by code as follows:

PRC code #40051 - Calls for implementation to be "environmentally safe".
PRC code #40052 - States the boards purpose is "to protect air and water quality, to improve the regulation of existing solid waste landfills".
PRC code #43030 - Calls for "control of the subsurface migration of landfill gas" and "make recommendations, as needed, to improve the program".
PRC code #45300 - States "due to the migration of methane gas" "take corrective action as necessary to" "protect human health and the environment".

The approval of green organics for ADC violates the PRC codes as cited above. The use of green organics for ADC is also in direct conflict with the intent of AB939.

If you are going to violate the PRC codes, at least don't do it so flagrantly. An interim policy (which we believe is, nevertheless, a violation of the PRC codes) should provide an incentive for the development of permanent recycling operations. To this end, we would suggest that no more than 50% of the green waste as shown in the SRRE be permitted as diversion allowance and tipping fees should be no less than 80% of the "full burden" cost per ton. It could say that no more than 25% of the normal ADC may be replaced by green waste (this will help to maintain the integrity of the landfill). In addition, such an interim policy could say that the depth of daily cover should not exceed that amount required for suitable performance. Finally, the policy could say that the balance of the green material should be banned from landfill as is done in more than ten other states.

We would urge the board to continue the development of a suitable permeability and flammability standard for ADC. Many organic materials (MSW) will make an excellent ADC after a composting operation stabilizes and reduces them to a "soil like" product. They will be inert and in most cases superior to the native soils now being used. (Note: Most of the so called "native soil" now being used has little or no value in agriculture. The green material being buried will rebuild depleted soils.)

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As noted above there is a correct method for the use of organic material (MSW) as daily cover. The use of unstabilized green materials is not the correct procedure nor in the best interest of public safety. The proposed policy creates a permanent public liability in post closure management for many decades.

In sum, the use the use of green organics for ADC will:
- *increase the organic fraction of landfills
- *increase the production of landfill gas
- *increase the migration of landfill gas
- *accelerate the anaerobic process
- *promote landfill fires
- *harm markets for organics recycling
- *diminish the incentive for cities to reduce the amount of materials that end up in landfill

Thank you for the opportunity to comment on this issue.

Sincerely,

Bill Newland
Bio-Thermic Resource Recovery

cc: Westley Cheshire, Vice Chairman, CIWMB
Paul Reilly, Member, CIWMB
Jesse R. Huff, Member, CIWMB
Rick Best, Policy Associate, CAW
Barton Blum, Policy Co-chair, CORC
Assemblymember Byron Sher

Consulting - Training - Equipment - Transformation - Marketing

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December 12, 1994

Chairman and Members of the Board
California Integrated Waste Management Board
8800 Cal Center Drive
Sacramento, California 95826

SUBJECT: *WHY 23 STATES HAVE BANNED GREEN WASTE FROM LANDFILL!*

Global warming studies by NASA have identified the composition of greenhouse gas. It is 55% CO_2 and 15% CH_4 (methane). Landfill gas (LFG) is 43% CO_2 and 55% CH_4 (MSW Management - December 1994). Landfills rank 6th in the creation of these greenhouse gases. The removal of unstable, compostable organics from landfills and the control of ozone depleting and greenhouse gases is a major environmental priority.

A landfill with currently available equipment can recover 50% of the CH_4 production. Given a 12,000 ton a day facility, the average recovery is 12 million cubic feet. The use of volatile organic material as alternate daily cover (ADC), collected into working cells with water added, can increase this volume 2 to 6 times. One landfill of this class using green waste as daily cover collects 32 million cubic feet per day (Waste Age - Sept. 1993). This system then allows 32 million cubic feet of CH_4 and 59 million cubic feet of CO_2 to be released into the atmosphere daily. Enough to cover 2000 acres 1 foot deep every day. 760,000 acres every year. From one landfill.

Operations of this type are in violation of the Federal Clean Air Act (sections 111(b) and 111(d)), the New Source Performance Standards, Global Climate Protection Act of 1987, Framework Convention on Climate Change (Earth Summit 1992), Presidential Climate Change Action Plan (October 1993) and a federal directive to the EPA "...to formulate a tough *rule to reduce methane emission from landfills* under section 111 of the Clean Air Act. This rule, which will be completed this year, will increase the amount of organic compounds that must be recovered by landfills..." (Climate Change Action Plan - October 1993).

As we have previously sited in our correspondence (on record) with the CIWMB, specific PRC codes and Subtitle D, 40 CFR Part 258 are being totally ignored regarding permeability, LFG migration, fire control and other requirements for ADC which affect the qualification of organic materials. The use of green waste and other compostable organic material for daily cover is in violation of these codes and caters to those who are evading the mandates of AB939.

Professional landfill operators can document fires, explosions and surface collapses at every landfill site in California (over 100 in the L.A. basin). We suggest that an unbiased survey be taken of these hazards before any organic material is authorized for daily cover.

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The general public has accepted the importance of recycling. They are participating with collection programs and by paying increased collection/landfill fees to support it. The cost of qualified ADC and composting was calculated by the franchised operators when the fees were increased (a continuing scenario). Now they want to eliminate that plan and keep the increased fees. This appears to be nothing more than political double dipping.

The garbage companies and haulers must keep up gross incomes in the face of reduced volume. Their answer has been to lobby, stall and obstruct the composting regulations for almost four years. They believe that the communities and CIWMB will allow them to keep the increased fees and continue to landfill organic materials.

The municipal solid waste stream is 50% to 60% organic materials (clean green, biosolids, food processing residue, paper, biogenics, race track bedding, etc.). If they are to be used as ADC or final cover, the proper method is to compost them into a stabile product (as well run landfills are doing) before application. We can not change their name to ADC and continue to bury them in the landfill.

This is not recycling to the highest and best use.

The improper use of unstable organic material for ADC has been well documented by our papers over the last 18 months. The board allowed one sanitation district to claim 7% of their total stream as ADC and diversion allowance on a temporary basis while the composting infrastructure was developed and while the CIWMB staff established a standard on permeability for ADC. After 12 months, this has not happened and all landfills now want organics for daily cover.

The greater Los Angeles area composting infrastructure has stagnated and it may never be developed as long as the L.A. Sanitation District takes in green material for $9.00 a ton and buries it as daily cover.

The CIWMB, with all of the PRC Code directives and more than sufficient data from the pilot projects, has not given us a composting regulation or a permeability specification for ADC as promised. How can the composting industry develop with out guidelines?

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The unsuitability of volatile, virgin organic cells for daily cover is easily understood by everyone.

Green material is particularly unsuitable:

1. It requires additional water to combat fire hazard. This helps increase methane production 2 to 6 times. In the greater Los Angeles area, the landfills with collection systems (which are only 50% efficient) recover 102 million cubic feet a day of CH_4 (Waste Age - September 1993). This means that over 100 million cubic feet per day are released into the atmosphere.
2. Landfill gas is 43% CO_2. Leading climatologists and NASA have identified CO_2 as the major contributor (55%) to greenhouse gas. The CO_2 release from only the landfills with collectors in the greater Los Angeles area can be estimated at 200 million cubic feet daily under landfill practices of 1993. This equals 725,000 automobiles operating for 1 hour at 40 mph. Green waste used as ADC "increases" CO_2 production 2 to 6 times.
3. With the increased anaerobic production of CH_4 (methane) and CO_2, organic acid production is increased equally. These acid leachates penetrate current clay liners in about 30 minutes. When not trapped by the collection system, they continue on to pollute the ground water or they remain to increase LFG production.

All of these problems will continue at public expense for decades after landfill closures.

Every composting facility requires some form of bulking agent. This could be sawdust, rice hulls, straw, cotton gin waste, etc.. However, the only material with statewide distribution is clean green fines. They should not be landfilled.

The footer on the November 1994 newsletter from the CIWMB states, "The six member Integrated Waste Management Board is responsible for protecting the public's health and safety and the environment" and "while ensuring environmentally safe land disposal capacity."

The Composting Council "supports the removal from landfill and composting of all organics, which cannot be put to a higher and better use, to replenish the depleted and eroded agricultural soils of America."

We agree. Thank you for your time.

Bill

Bill Newland

EXH. 95

CAMPO SOLID WASTE MANAGEMENT PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT

DES 92-6

February 1992

Lead Agency: U.S. Department of the Interior
Bureau of Indian Affairs
Sacramento Area Office

Cooperating Agencies: Campo Band of Mission Indians
Campo Environmental Protection Agency

Prepared by: Science Applications International Corporation
Environmental Programs Division
121 Gray Avenue, Suite 101
Santa Barbara, CA 93101

For Information Contact: Donald Knapp
Bureau of Indian Affairs
Sacramento Area Office
2800 Cottage Way
Sacramento, CA 95825
(916) 978-4703

Abstract:

The proposed action consists of BIA approval of a lease between the Campo Band of Mission Indians and Muht-Hei, Inc., a tribally chartered, wholly owned corporation of the Campo Band. The lease would permit the use of reservation land for the construction and operation of an integrated solid waste management project. The technical services of Mid-American Waste Systems, Inc., and Campo Projects Corporation would be used pursuant to subleases and other agreements. The project would involve the shipment of wastes from off the reservation for disposal or recycling at the Campo solid waste management facilities. Several alternatives, including the no-action alternative, were analyzed in the Draft EIS.

Last Date for Receipt of Public and Agency Comments: May 8, 1992

For landfill gas collection systems (i.e., systems of collection wells and pipes), the SCAQMD found that the overall effectiveness in reducing emissions varied between 72 and 100 percent, with most data points falling in the 81 to 88 percent effectiveness range. According to EMCON Associates, "The gas generated in a landfill escapes by migration through the base, sides and top. A landfill design that restricts, or precludes, migration from these perimeter areas enhances gas management and recovery efficiency" (EMCON 1990). The proposed landfill cap system includes a 40 mil very low density polyethylene (VLDPE) liner. The bottom and sides of the landfill would be lined with two high density polyethylene (HDPE) liners. This system would serve to prevent or strongly inhibit off-site landfill gas escape, due to lateral landfill gas migration or migration through the landfill face or cover.

The project must comply with CEPA air quality management regulations. CEPA has adopted regulations that are based on and are consistent with San Diego County Air Pollution Control District (APCD) regulations, including APCD Rule 59 - Control of Waste Disposal Site Emissions. Rule 59, Paragraph (d)(1)(ii)(A), specifies that the concentration of organic compounds cannot exceed 500 ppm (as methane) at any point measured immediately above the landfill. This requirement applies to closed and covered cells as well as to open cells. The liner system should easily allow compliance with this standard for closed cells. Installation of a gas collection system during the working life of the open cell should also allow compliance for the open cell. Existing landfills in San Diego County meet Rule 59 by installing collection systems while the cell is being filled rather than afterward.

When combined with proper contouring and installation of the gas collection system piping, the liner is expected to result in a gas collection effectiveness of 95 to 99+ percent. A collection effectiveness of 95 percent has been assumed for this analysis. The presence of micro-biologic organisms in the cover soil could cause emissions of fugitive ROG to be further reduced.

The 95 percent of landfill gas that is captured would be flared with most of the organics destroyed in the process. The U.S. EPA has proposed New Source Performance Standards (NSPS) for municipal solid waste landfills (EPA 1991). These standards would require at least 98 percent destruction efficiency for organic compounds. The document states that "The EPA concluded that properly designed and operated flares, both open and enclosed, can achieve this efficiency (i.e., 98 percent) with landfill gas." Flares were also determined to be the most cost effective method of destroying organics. For this analysis, a 98 percent destruction efficiency is assumed for organics, including carcinogens.

4.3.2 Landfill Gas Emissions Impact Analysis

4.3.2.1 Proposed Project

Landfill gas emissions from the proposed project would result from flaring of captured gases and escaping fugitive gases. These emissions would include both criteria pollutants and toxic air contaminants. Impacts of criteria and toxic pollutants are discussed individually below. The impact analysis is based on project buildout, with the landfill filled to capacity. Emissions to the air would be generated by each landfill cell, with the same emission profile repeating over time as each cell is filled and closed in sequence, as described in subsection 4.3.1.3.

Criteria Pollutants

Criteria pollutants include nitrogen oxides (NO_x) in the form of nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter (PM_{10}), and ROG. Small amounts of sulfur dioxide (SO_2) may also be generated but these amounts would be negligible and are not discussed further. All of these pollutants occur during flaring. In addition, ROG emissions are contained in the uncaptured fugitive emissions.

Los Angeles Times
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Friday, May 3, 1996

Metro; PART-B; Orange County Focus Desk

Community News Focus

VILLA PARK; Old Waste to End Up in Yards

BILL BILLITER

In an unusual turn of events, city residents last week welcomed the return of some of their garbage.

The waste once was tons of lawn clippings, leaves and garden trimmings from Villa Park. It was recycled into commercial compost, and processor Scotts Co. has given away 25 tons of it for local gardeners--as much as 60 gallons a household.

The city's commercial trash collector, Villa Park Disposal, coordinated the compost giveaway. The company is a division of the Anaheim-based Taormina Industries.

"We did this as a way of saying 'thank you' to residents for their strong support of recycling and also as a way of closing the loop--bringing it back . . . so it could be used again," said Lori Rolleri, director of corporate communications for Taormina Industries.

Rolleri said Villa Park residents divide their trash among three containers: one for general garbage, one for material recyclables such as aluminum cans and glass, and one solely for green waste. The green waste is converted by Scotts into commercial compost.

If the city did not have the recycling program, tons of green waste would be dumped into county landfills, Rolleri said. "It would not only reduce the size of landfills quicker, but it also would be producing methane gas, which adds to the global warming."

Villa Park is now among the top cities in the United States in trash recycling, Rolleri said. "Sixty percent of the city's residential waste is now recycled," she said. "Villa Park has done exceptionally well."

EXH. 76

12/27/96 Ariz. Daily Star 3B

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Friday, December 27, 1996

METRO/REGION

Recycling Christmas trees urged by city and county

Monica Mendoza

After the holidays end and the presents have been unwrapped, that gorgeous Christmas tree is nothing more than dead wood.

So why not make it mulch?

A Christmas tree recycling program, "Treecycling '97," encourages residents to make mulch of cut Christmas trees and replant live Christmas trees.

The program sets up drop-off sites at all three local Home Depot stores and provides curbside pick-up for cut trees.

Officials estimate that 17 percent of the waste in the landfill is "green waste" - trees and plants - and could be recycled, said Erin Kimrey, Tucson waste reduction planner.

The Christmas tree recycling program is the first step in a full green waste recycling program, she said. Green waste in the landfill, when decomposed, can produce the dangerous methane gas. The city eventually wants to keep all green waste out of landfills.

"We are very anxious to find out how many Christmas trees we can divert from the landfill," Kimrey said.

Residents can take their cut trees to the Home Depot stores - 1155 W. Irvington Road, 7102 E. Broadway and 4755 N. Oracle Road - from 8 a.m. to noon Jan. 4 and Jan. 11. In exchange, residents will given a goody bag with information about composting, recycling, and other local environmental programs. All the collected trees will be chipped and made into mulch by Desert Organic Products, a division of Arizona Tree and Landscape Service; Desert Compost, a division of Groundskeeper; and Pima County Solid Waste Department.

Tucson Parks and Recreation Department will accept live Christmas tree donations and plant them in various city parks.

Residents may take live trees to the city's Parks and Recreation Department's administration building, 900 S. Randolph Way, between 8 a.m. and 3 p.m. Monday through Friday.

Last year, the city took in about 20 trees and replanted them, said Glenn Hicks, who runs the city nursery.

Trees that are too small to be immediately planted outside will be kept in the nursery.

"Eventually most of them get planted," Hicks said.

The city's Solid Waste Management Department will collect cut trees left on curbs during January and early February. Those trees also will be chipped into small pieces for use as mulch to re-vegetate city landfills.

Pima County also is accepting cut trees during their regular operating hours at the Ina Road Landfill, 530 W. Ina Road, and Catalina Transfer Station, 14425 N. Oracle Road.

For information about how to assist with the Christmas tree recycling effort as a volunteer, call 791-3171.

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Surveying household hazardous waste generation and collection: trends in Arizona.

Ann Marie A. Wolf Lori E. Kettler J. Fred Leahy Anna H. Spitz

Introduction

Many common household products used in the kitchen, bathroom, garage and basement have the potential to cause serious health and environmental problems during their use or after their disposal. Consumers use a host of specialized, powerful cleaners, paint and paint-related material, pesticides and a wide variety of automotive products. When the consumer disposes of these materials, they become wastes. These potentially hazardous chemicals are readily available in most retail and wholesale establishments. Most are purchased over the counter by any person, in any age group, at a variety of locations such as grocery stores, hardware stores and automotive centers. HHW are exempt by definition from federal and most state hazardous waste regulations; accordingly, they are not subject to the stringent regulations that industry must follow, even though many of the products have similar chemical ingredients. Little information is available on the direct effect of these materials on the environment. Until recently, studies have focused on regulated waste and not the effect of HHW in municipal solid waste (MSW).

The Garbage Project at the University of Arizona in Tucson, Department of Anthropology, has collected the most comprehensive consumer usage data by conducting detailed residential-refuse characteristic studies in the Tucson community. The primary thrust of the HHW characterization studies has been to count the number of hazardous items (containers). They concluded that the approximately 120,000 households in Tucson generate approximately 11 million hazardous items annually (1). In 1989 the Garbage Project collected curbside waste in four urban communities (Tucson, Phoenix, New Orleans and Marin County, CA). The HHW weight fraction was between 0.42 and 0.61 percent of the refuse weight. The study's final conclusions were: 1) although HHW is relatively small in proportion to the total MSW analyzed, significant quantities are discarded each year; 2) great diversity in HHW types exists; however, certain wastes represent a major proportion of the total by weight; 3) differences among communities in types and quantities of HHW are quite distinctive; and 4) landfilled residential waste may contain higher concentrations of hazardous materials than commercial wastes (1).

In response to growing concerns about HHW, collection programs were implemented in the early 1980s. From 1980 to 1994, the number of HHW collection events per year in the United States grew from two to almost 1,700. Thirty states have established permanent HHW programs. Unfortunately, most of these programs collect from only two to six percent of the general population and have an extremely high per-participant cost (2,3,4,5). Use of HHM has not significantly declined even though products such as SAFETY Stripper[TM] and batteries without heavy metals have entered the market. Homes storing HHM and unsafe disposal of HHW are problems still facing communities.

Health and Environmental Problems

When household products are used, misused or improperly stored or disposed of, residents are most likely to be exposed to dangers and long-term exposure. Materials that are used infrequently are often stored in closets, basements or garages for long periods of time. Materials such as paint thinner solvents and fertilizers may react with their containers over years causing the containers to deteriorate, thus increasing potential danger to homeowners. Over 90 percent of poisonings in the United States occur in the home. In 1994, 45,311 exposures to bleaches containing hypochlorite were reported to poison control centers in the United States (with 8,657 of those treated in a health care facility) and 3,850 exposures to ammonia cleaners were reported (with 642 treated in a health care facility) (6). Nationwide in 1993, 140,000 exposures to pesticides were reported, 93 percent of which involved home use. About 25 percent of these reported pesticide exposures involved poisoning symptoms, and over half the exposures involved children under age six (7). Household products continue to be the major source of poisoning among children (6).

HHW alone or in combination with other substances can pose hazards to refuse collectors and workers at landfills and incinerators. HHW causes injuries to approximately three percent of waste collectors through explosions, acid or caustic splashes and burns from flammable substances (8). For example, a refuse worker in California lost his sight when HHW spilled on his face. A firm in Lemon Grove, California reported incidents in which swimming pool chemicals splashed on personnel during the compaction of residential refuse. Personnel from Tempe, Arizona reported an average of five fires in the city's residential packers each year, primarily from chemicals.

Leachate is produced as water percolates through solid waste, leaching soluble components and degradation products from refuse. Researchers from Texas A&M University found that leachates from MSW landfills that do not accept industrial waste contain many of the same compounds found in industrial waste. The presence of these compounds was attributed to the presence of HHW or illegally dumped regulated waste (9). Studies show that even rural landfills that

have had no type of industrial source, have organic chemicals in the leachate (2). A U.S. Environmental Protection Agency study found hazardous organic constituents in the leachate of all 53 landfills analyzed (10). An estimated cancer risk calculation resulted in evidence that MSW landfill leachates are as acutely and chronically toxic as co-disposal and hazardous waste landfill leachates (11). In fact, the leachates from two of the MSW landfills that opened since the regulations prohibiting codisposal of hazardous waste went into effect have cancer risks greater than the Love Canal landfill leachate.

The use of landfill liners, both synthetic and compacted clay, and leachate collection systems decreases the risk of groundwater contamination by landfill leachate. However, leachate collection systems may not be pumped out frequently enough, and even plastic liners leak (an average of 13 holes per acre). These limitations cause groundwater to be contaminated with landfill leachate. Recent data indicate that volatile organic compounds commonly found in landfill leachate can rapidly migrate through synthetic liners, even at dilute concentrations. Organics also can diffuse through compacted clay liners (11). Landfilling HHW may not be the best long-term solution.

Many of these wastes are disposed of in an indiscriminate manner that may ultimately degrade surface water, groundwater and air quality (12). A Seattle study on the sources of hazardous chemicals to the municipal sewage treatment plant showed that for a number of contaminants, the non-industrial sources were much higher percentage contributors than any of the industries (2). Residential sources contributed seven to 11 percent of the heavy metals, and 55 to 64 percent of the extractable organics ending up at publicly owned treatment works. Another study found no difference in metal or organic concentration in wastewater for cities with low and high industrial use (8). One third of all U.S. housing uses septic tanks. Organic cleaners, solvents and paint thinners do not bind to soil particles. Instead they go right through these systems and into the groundwater (2). A California Air Resources Board study determined that the overall composition of landfill gases from hazardous and non-hazardous sites appear to be similar. The study stated that non-hazardous landfills may contain concentrations of toxic gases equal to or exceeding those of hazardous landfills (10).

Lack of Knowledge

Large United States businesses have made great strides in instituting pollution prevention and waste minimization programs to employ chemicals in safer and more cost effective ways. On the other hand, general consumers often do not know they are using, storing and discarding hazardous products. Many individuals do not think that the use or disposal of household products poses a threat to their health and environmental quality. A Colorado survey

reported that 20 percent of the respondents were unable to identify a single toxic product in their home (13). While the majority correctly assessed the damage potential for pesticides, dishwasher soap and paints, most failed to accurately assess the potential for environmental damage if drain cleaner, motor oil or antifreeze are improperly disposed. A New Mexico survey had similar results: only 28 percent surveyed could name one hazardous product, and 12 percent could not name any (14). Homeowners remain unaware of the dangers of the products in their homes, and the notion that "one can of oil on the ground can't hurt" is pervasive.

Methods

Maricopa County, Arizona

The study was conducted among households in Maricopa County, population of 2,209,567 and area of 9,204 square miles. The county includes the cities of Phoenix (pop. 1,012,230), Mesa (pop. 296,645), Glendale (pop. 156,165), Scottsdale (pop. 137,022) Tempe (pop. 150,615), Peoria (pop. 65,500) and Chandler (pop. 100,173) (15). A random digit dialing system was used to obtain a sample of Maricopa County residents aged 18 years or older. Specifically, a review of current telephone directories revealed that 237 telephone prefixes served the geographical boundaries of Maricopa County. A random four-digit number was joined to each prefix. A percentage of surveys were completed based upon the population in each telephone prefix area. The sample size (244 completed interviews) was determined by demographic consideration, the amount of data needed to test the computerized survey instrument and the results from previous awareness surveys conducted by Pima County for a representative sample of the population. A larger sample size would be required in order to complete thorough statistical inference calculations for all the disposal data.

Residents of Maricopa County were surveyed by telephone using a computerized or hard-copy survey instrument. The survey questions asked about the following: products purchased, disposal practices, knowledge of HHW and HHW programs, awareness of health and environmental problems and preferences for disposal and funding options. The survey results were entered into a computer database and modeling program, which calculated the statistics. The program also estimated the amount and types of hazardous waste being improperly disposed of and the potential exposure from the improperly disposed material. Calculations included the following:

* all demographic statistics

* percentage of participants purchasing specific hazardous materials

* amounts of hazardous materials stored and/or disposed of and disposal methods

* percentage of participants aware of HHW and related health and environmental effects

* percentage of participants who use and/or are aware of collection programs

* potential participation in collection programs

* opinions about collection and funding options

* significant differences between responses

Pima County, Arizona

The City of Tucson/Pima County Household Hazardous Waste Program is the only permanent collection facility in Arizona. Along with the permanent facility, satellite collection events are held at least once a month throughout the county; the municipal landfills have battery, oil and paint collection sites. The program has become the model for other programs in Arizona. The program has a participation rate of five percent and a cost per participant of $43 for fiscal year 19951996. The study was conducted among users of the program at the permanent facility and/or a satellite event. Approximately 12,000 face-to-face interviews were completed when the participants brought their waste to the program. The questions asked the length of time the material had been stored, how often they used the program and how they had heard about the program. Selected demographic data were collected. Eight hundred participants also were asked what they would do with the waste if no program were available.

TABLE 2

Participants purchasing specific categories of household hazardous materials

Material	Participants Purchasing (%)
Automotive Products	64
Paint Products	44
Pesticides and Fertilizers	41
Household Cleaners	72
Miscellaneous	76
Batteries	62

Results-Maricopa County

Demographics

Selected demographic data reported by the study participants and the corresponding 1990 U.S. Census Bureau figures for Maricopa County are given in Table 1. The demographic data for study participants were similar to the data for all residents of Maricopa County except males, who were underrepresented. In many two-person households surveyed, the female answered the telephone and subsequently was surveyed.

Material Usage and Disposal Options

Ninety-six percent of the residents surveyed had purchased hazardous materials in the last year (95-96). The percentage of residents that purchased specific categories of hazardous materials is listed in Table 2. "Batteries" was a subgroup of miscellaneous items. Most residents used up significant portions of their paint products (62%), pesticides and fertilizers (89%) and cleaners (90%), but used up only 46 percent of their automotive products and only eight percent of their miscellaneous items (batteries, hobby chemicals, and pool chemicals for example). Residents were asked what they did with the waste or products that they no longer used. As shown in Table 3, all categories of waste were put in the garbage, including 86 percent of the miscellaneous items and 57 percent of the cleaners. An additional 26 percent of the cleaners were taken to the landfill. Over 66 percent of the waste automotive products were recycled or taken to a collection program; however, five percent (all antifreeze) were disposed of on the ground. Significant quantities of automotive products (18%), paint and paint products (55%), and pesticides and fertilizers (39%) were stored.

Residents were asked to estimate the amount and frequency of material disposed of, as shown in Table 4. Over 20 gallons of paint were improperly disposed of with half of the material poured onto the ground. Over five gallons of antifreeze were poured onto the ground; over four gallons of cleaners poured down the sink. Over seven gallons of paint and 1,989 household batteries were put in the garbage.

Health and Enviromental Perception

To determine awareness of HHW and the potential health and environmental problems, residents were asked if they had heard the term "household hazardous waste" prior to the survey and if they thought HHW caused health and environmental problems. Over 68 percent of the participants had heard the term HHW and believed that the products caused health and environmental problems. However, 31 and 24 percent of those surveyed did not believe or did not know that HHW could cause health or environmental problems respectively. A statistically significant lower percentage of males than females thought the products caused health problems. The

results by male and female are shown in Table 5. No significant difference in response was found between income and education levels as has been reported by Schultz et.al. (16).

Preferences for Disposal and Funding Options

Maricopa County has no unified approach to HHW collection, however, several communities do provide annual events. In 1995, Phoenix had approximately 2,000 participants, while Tempe had approximately 600 for one-day events. Twenty percent of the survey participants knew of the collection events in Maricopa County, and 53 percent of those used the events. When surveyed on their preference for HHW collection, 54 percent of the residents preferred a permanent collection facility, while 25 and 6 percent preferred a collection day or curbside pickup respectively. The preference for a permanent collection facility is in agreement with other surveys (17,18).

Of those that chose a permanent facility, 57 percent were willing to drive up to five miles to use the facility, 22 percent up to 10 miles and 12 percent up to fifteen. When asked how a safe disposal option should be funded, 23 percent of the residents chose a tax on products when sold; however, over 30 percent of the participants didn't know or gave no response to this question as shown in Table 6. Only 26 percent stated they would use the facility over three times a year and 32 percent stated twice per year. Of those that chose a collection day, 20 percent stated they would use a collection day over three times a year and 29 percent stated only once per year.

Results-Pima County

Sixty-seven percent of the participants were repeat users of the collection program with over 50 percent using the facility more than three times per year. When asked what they would do with the waste if no program were available, 36 percent of the participants responded that they would throw it in the garbage. The majority of new participants had stored their waste for over a year, while the majority of repeat participants had stored their waste for less than three months. Over 75 percent of the participants had heard about the program through word-of-mouth rather than advertisements or announcements.

The percent by weight of waste categories collected by the facility for fiscal year 19951996 are shown in Figure 2. It collected 422,953 pounds of HHW, of which over 50 percent consisted of automotive products (41 percent was used motor oil) and 26 percent of paint and paint-related material.

Discussion

Even with the majority of the residents in Maricopa County properly disposing of their HHW, significant quantities are being

disposed of improperly. Both surveys, Figure 1 and Table 3, show similar trends with storing and throwing in the garbage being the most common responses. With a collection program participation rate of only five percent, Pima County landfills are also receiving significant quantities of HHW. Even small quantities of improperly disposed material per person result in significant loading of HHW to the municipal facilities and the environment. As demonstrated by both surveys, many of the methods chosen for "disposal" when a program is not available are potentially dangerous to human health and the environment.

Program Design and Operation

The preference of Maricopa County residents for a permanent facility and a drive of less than five miles requires several permanent facilities for a county the size of Maricopa. Permanent facilities have advantages over satellite collection events but may not be feasible initially. Pima County has conducted satellite collection events for ten years, but has the long-term goal of establishing permanent facilities throughout the county. These permanent collection sites would be supplemented by roving neighborhood cleanups and collection programs at the landfills. In addition, sites would be open every weekend, providing residents with more flexibility, and collection activities would be spread throughout the month. Currently, high output of staff and volunteer labor is required the first weekend of every month.

TABLE 5

Perceptions and use of program by participants

Question	Female %	Male %
Aware of pollution problems	77	74
Aware of health problems	74	62
Aware of HHW	82	62
Aware of collection programs	24	15
Use of collection programs	13	8

TABLE 6

Funding options chosen by participants

Funding Option	Percent (%)
Small charge on each item when disposed	16
Small increase in garbage collection or landfill fees	12

Tax on products when sold	26
Would not be willing to pay	12
Other	7
Don't know	16
No response	12

Actual usage rates for Pima County are significantly different from those predicted by the Maricopa County survey. With 67 percent repeat users, residents are developing the habit of taking their HHW to the collection center as it is produced. Once established, participants may use a facility more frequently than projected.

Waste streams from Pima County can be compared to the projected waste streams from the Maricopa County survey. Automotive products and paint and paint-related material were the waste streams (besides batteries) that were least frequently used up by the participants. Maricopa County can expect to receive automotive products and paint and paint-related material as the two main waste streams. If Maricopa County collects only automotive products and paint and paint-related material, it can collect over 80 percent by weight of the waste. Focusing on limited waste streams may be an efficient way to begin the program. These waste streams are easy to collect and handle and can be recycled, reused or sent for fuels blending. The Maricopa survey predicted that large numbers of household batteries would be collected. Pima County collected 4,292 pounds of batteries last fiscal year, which represents approximately 214,600 AA batteries, only approximately 1% of the total waste collected by weight. Inferring from the Maricopa survey, these collected batteries are less than what 24,000 to 30,000 people throw out per year, about three percent of the population of Pima County.

Educational Program Implications-Pima County

Traditional public education programs, which focus solely on collection of waste, have the potential to greatly increase the amount of HHW collected at the facility and also the money spent on disposal. The goal of the current educational program is to decrease usage of HHM and production of HHW in the community. Based on the survey demographic data (zip codes), two satellite collection sites were closed and one new site opened. Public awareness programs were increased in areas with low participation rates. However, reliance solely on traditional advertising is being replaced by school curricula and outreach programs, bilingual materials and cooperative neighborhood and retail take-back programs. Even though the facility has the capacity to handle large quantities of material, the program is shifting from a collection to prevention emphasis. The shift in emphasis addresses public

health concerns during the use of HHM as well as HHW collection.

Conclusions

The survey represents the first step in long-term HHW planning for Maricopa County. The results indicate that the majority of residents in Maricopa County use up or properly dispose of the hazardous materials that they purchase. However, even with the majority properly disposing of their waste, significant quantities of HHW are being improperly disposed of. Of concern is the fact that 29 percent of those surveyed did not believe or did not know that HHW can cause health problems, and 23 percent did not believe that HHW can cause environmental problems. Of further concern is that the Pima County program, a ten-year old program with a public awareness campaign, has a participation rate of only five percent. Many residents remain unaware of the potential problems associated with using HHM and disposing of HHW. Motivation for using the existing programs remains low.

Even though the surveyed participants preferred a permanent collection facility, this may not be feasible initially for Maricopa County. The county may need to follow the Pima County model with satellite collection events and battery, oil and paint collection sites at municipal facilities in addition to a permanent site that could be later expanded as needed. Results indicated that the participants were open to an additional tax or fee to fund the program. The Pima County program is funded by existing revenues and sale of recyclables. All suggestions of additional fees or taxes have been opposed by its users.

Collection programs must be supplemented by strong educational programs. These educational programs must demonstrate how HHW can affect both human health and the environment, and must emphasize decreased usage of HHM and production of HHW. Educational programs that only emphasize collection have the potential to physically and financially overwhelm programs with collected waste and focus on only one part of the problem, the end product. Removing HHW from the municipal waste stream was the initial motivation for most programs; however, programs must now expand to address usage, safety and prevention as well.

Acknowledgement

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Wednesday, July 2, 1997

NATIONAL

Grizzly bear proposal will go public today Federal plan to restore Ursus horribilis in Idaho

Ken Miller
Staff

calls for bringing them to Selway-Bitterroot area

The U.S. Fish and Wildlife Service will release its plan today to restore grizzly bears to rugged central Idaho, backing a compromise to put the bears' future in the hands of a citizen management team for what could be a century-long recovery effort.

The proposed grizzly recovery plan calls for the shipment of three to five bears a year into the Selway-Bitterroot for five years, building an "experimental, non-essential" population that could take 100 years to reach a recovery level of 200 to 300 animals.

Alternatives not recommended for approval but still on the table include returning bears with full endangered-species protections, not allowing grizzlies in the area, and letting grizzlies try to colonize on their own.

The bears are to be delivered into the Selway-Bitterroot, but the core recovery area is expected to include the adjacent Frank Church-River of No Return Wilderness. A larger "experimental population area" - 15 million acres bordered by U.S. 93 on the east and U.S. 95 on the west, Interstate 90 on the north and Banks and Salmon on the south - would allow for more management than normally accorded endangered species.

The bears would be managed by a 15-member Citizen Management Committee. The panel, serving six-year terms, would be appointed by the Interior secretary. The Idaho governor would recommend seven members for the panel, Montana's governor would name five, and the Interior secretary, Nez Perce Tribe and the Agriculture secretary each would submit one name.

Hearings on the plan will be conducted Aug. 27 in Salmon and in Hamilton, Mont.; Aug. 28 in Lewiston and Missoula; and Aug. 29 in Boise and Helena.

Getting involved

For the first time, the U.S. Fish and Wildlife Service will make the massive grizzly bear draft environmental impact statement available to the public on a special Internet World Wide Web site: http://www. r6.fws. gov/end spp/grizzly

North Valley Coalition

October 30, 1997

Please Reply To:
17219 Orozco St.
Granada Hills, California 91344

Con Howe
Director of Planning
Department of City Planning
221 N. Figueroa Street
Los Angeles, California 90012

Re: Sunshine Canyon Landfill Expansion
Request for Extension of Comment Period

Dear Mr. Howe:

I have been provided with a copy of your letter to Council Member Hal Bernson on October 8, 1997. Your letter acknowledges that the Sunshine Canyon Landfill DEIR is "difficult to review," and that the City is entitled to designate a comment period of greater than 90 days in "unusual situations," yet you agreed to extend the comment period for only 30 days instead of the 90 days requested by Council Member Bernson.

The only justification offered in your letter for refusing this requested accommodation is that many of the issues requested in the City DEIR "were also addressed in a previously released EIR for the County Los Angeles which has been reviewed by the public." Unfortunately, your letter fails to recognize that public's primary opportunity to review the County EIR occurred almost ten years ago. Since that time, many members of the public who submitted comments on the County DEIR have died or moved away, and during the same period of time new residents have moved into the area to be affected by the landfill expansion; these new residents have not had a reasonable opportunity to become familiar with the issues presented in the County EIR, which is in itself a complex document consisting of several thick volumes which are if anything even more difficult to understand that the City DEIR. You should also be aware of the fact that BFI has refused to provide copies of the City DEIR to community organizations and interested individuals who have requested it, and has instead cynically sent the EIR to community organizations in areas far away from the landfill, thus making it even more difficult for members of the public to respond effectively. Finally, BFI's prolonged delay in releasing the City EIR means that it is in no position to object to the relatively brief extension sought by Council Member Bernson.

Planning experts recognize that the siting of a municipal landfill raises "extraordinarily difficult" public policy issues

12841 JIMENO STREET GRANADA HILLS CA 91344 (818) 360-7635

(see, for example, page 788-89 of the Spring 1994 edition of the Fordham Urban Law Journal. This is particularly true in view of the fact that, as noted in the Azusa Land Reclamation case, the California legislature has declared that landfills constitute a "threat to the environment" (52 Cal.App.4th at 1207). In other words, the issues raised in the Sunshine Canyon Landfill Expansion EIR represent the type of "unusual situation" that justifies the extension sought by Council Member Bernson, over and above the fact that the EIR is "difficult to review" (as your letter acknowledges). Under these circumstances, it is vitally important that the public have a meaningful opportunity to submit comments on the landfill expansion--an opportunity that will be denied if the public is not given sufficient time to analyze and respond to the highly technical assertions made in the City DEIR. Accordingly, we request that you reconsider your decision and extend the comment period for the full 90 days as Council Member Bernson has requested.

Sincerely,

Mary Edwards

Mary Edwards

cc: Councilmember Hal Bernson
Los Angeles Times
Los Angeles Daily News

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14747 San Fernando Road
Sylmar, California 91342

RE: Sunshine Canyon Landfill Draft Subsequent Environmental Impact Report
SEIR No. 91-0377 ZC/GPA - Notice of Termination

Dear Mr. Aidukas,

This letter is to inform you that the above referenced EIR file is terminated and effective after the date of this notice. A previous termination warning letter, dated August 1, 1995, to the environmental consultant, Ultrasystems Environmental Incorporated (Ultrasystems), stated that if the revisions made by the Environmental Review Section (ERS) of the Planning Department were not incorporated into the above-referenced draft environmental document, the EIR file would be terminated. After careful review of the re-submitted document by the Planning Department, it was determined that the data base failed to incorporate the requested corrections, and therefore, remained inadequate with regards to CEQA compliance..

It should be noted subsequent to the Scoping Session held on April 13, 1995, ERS staff has engaged in continuous communication with Ultrasystems providing guidance and specific written instruction. A meeting was held on July 18, 1995 with Ultrasystems to discuss the concerns ERS staff had regarding the data base submitted on June 19, 1995. The overall concern ERS staff had was that the document created a false sense of urgency which avoided a careful analysis of alternatives to the Sunshine Canyon Landfill. In that, the data base was inclined to advocate for the proposed project by stating that all other alternatives had greater impacts than the proposed landfill. Further, ERS staff instructed that these other alternatives were to be objectively and seriously considered, and analyzed. The results of these analyses need to be

PUBLIC COUNTER & CONSTRUCTION SERVICES CENTER
CITY HALL - 200 N. SPRING STREET, RM. 460S - (213) 485-7826
VAN NUYS - 6251 VAN NUYS BLVD., 1ST FLOOR, VAN NUYS 91401 - (818) 756-8596

AN EQUAL EMPLOYMENT OPPORTUNITY – AFFIRMATIVE ACTION EMPLOYER

DRAFT

quantitatively substantiated. Less damaging alternatives to the environment, as well as to the local residents, need to be developed. All these instructions were ignored and not reflected in the September 29, 1995 data base submitted by Ultrasystems.

Annotated portions of the data base were returned to Ultrasystems, with correspondence, dated July 19, 1995 following the meeting of July 18, 1995. The correspondence re-emphasized in detail the concerns of the ERS staff. A project suspension warning letter, dated and effective August 1, 1995, warned of project termination if ERS staff requests were not met by October 1, 1995.

Further correspondence to Ultrasystems, dated August 16 and September 12, 1995, from ERS staff again emphasized in detail the necessary corrections and provided further clarification of alternatives. ERS staff held a meeting on September 8, 1995 specifically regarding 1) No Project alternative, and 2) regional environmental impacts. It should be noted that Chris Funk, the applicant's legal representative, at the above-mentioned September 8, 1995 meeting with ERS staff, made a specific request that regional environmental impacts in relation to the proposed project be discussed in the data base.

ERS staff was in anticipation of receiving a data base incorporating the requested corrections. However, the re-submitted data base #1, received on September 29, 1995, failed to incorporate the necessary revisions. Staff's comments and corrections are attached to this letter for the subject data base #1 submitted on September 29, 1995.

As part of the Planning Department's EIR file termination process, the applicant would have to pay the applicable new fees for further review of Sunshine Canyon Landfill EIR data base. Per Ordinance No. 1905A9 of the Municipal Code, said data base will also be subject to full cost recovery surcharge. In addition, a scoping session would be required.

Should you have any questions regarding this matter please feel free to contact me at (213) 580-5555.

Sincerely,
CON HOWE
Director of Planning

ALTA SHIGETA
Senior City Planner
Environmental Review Section

DRAFT

James Aidukas
December 20, 1995

cc: Robert Janovici
Horace Trammel
Chris Funk
Betsy Lindsay

Here are my notes
H. Lewis

December 12, 1995

James T. Aidukas
Browning-Ferris Industries
14747 San Fernando Road
Sylmar, California 91342

RE: Sunshine Canyon Landfill Draft Subsequent Environmental Impact Report
SEIR No. 91-0377 ZC/GPA - Notice of Termination

Dear Mr. Aidukas,

This letter is to inform you that the above referenced EIR file ~~will be~~ is terminated ~~30 days after~~ and effective the date of this notice. A termination warning letter, dated August 1, 1995, to the environmental consultant, Ultrasystems Environmental Incorporated (Ultrasystems), stated that if the ~~requested~~ revisions made by the Environmental Review Section (ERS) of the Planning Department were not incorporated into the above-referenced draft environmental document, the EIR file would be terminated. After careful review of the re-submitted document by the Planning Department, ~~the City Attorney's Office, the Environmental Affairs Department and the Bureau of Sanitation~~, it was determined that the data base failed to incorporate the requested corrections, and therefore, remained inadequate with regards to CEQA compliance.

Subsequent to the Scoping Session held on April 13, 1995, ERS staff has engaged in continuous communication with Ultrasystems providing guidance and specific written instruction. A meeting was held on July 18, 1995 with Ultrasystems to discuss the concerns ERS staff had regarding the data base submitted on June 19, 1995. The overall concern ERS staff had was that the document created a false sense of urgency which avoided a careful analysis of alternatives to the Sunshine Canyon Landfill. Other alternatives were ~~requested~~ to be objectively and seriously considered, and analyzed. The results of these analyses need to be quantitatively substantiated. Less damaging alternatives to the environment, as well as to the local residents, need to be developed. All these instructions were ignored and not reflected in the September 29, 1995 data base submitted by Ultrasystems.

In that, the data base was inclined to advocate for the proposed project by stating that all other alternatives had greater impacts that the proposed landfill. Further, ERS staff instructed that these

Mr. James T. Aidukas
December 12, 1995

Annotated portions of the data base were returned to Ultrasystems, with correspondence, dated July 19, 1995 following the meeting of July 18, 1995. The correspondence re-emphasized in detail the concerns of the ERS staff. A project suspension letter, dated and effective August 1, 1995, warned of project termination if ERS staff requests were not met by October 1, 1995.

Further, correspondence to Ultrasystems, dated August 16 and September 12, 1995, from ERS staff again emphasized in detail the necessary corrections and provided further clarification of alternatives. ERS staff held a meeting on September 8, 1995 specifically regarding 1) No Project alternatives, and 2) regional environmental impacts. It should be noted that this meeting was requested by the applicant's legal representative, at the above-mentioned September 8, 1995 meeting with ERS staff, made a specific request that regional environmental impacts in relation to the proposed project be discussed in the data base.

ERS staff was in anticipation of receiving a data base incorporating the requested corrections. However, the re-submitted data base #1, received on September 29, 1995, failed to incorporate the necessary revisions. Staff's comments and corrections are attached to this letter for the subject data base #1 submitted on September 29, 1995.

Should you have any questions regarding this matter please feel free to contact me at (213) 485-5585.

Sincerely,
CON HOWE
Director of Planning

~~HELENE Y~~ Alta Shigeta
Senior City Planner
Environmental Review Section

cc: Robert Janovici
Horace Traniel
Chris Fumie
Percy Lindsay

warning

As part of the Planning Department's EIR file termination process, the applicant would have to pay the applicable

the Sunshine Canyon Landfill EIR database.
Per Ordinance No. 1905.4 of the Municipal Code, said database will also be subject to a full cost recovery surcharge.

ZONE PLANS AND POLICIES

RECEIVED
CITY OF LOS ANGELES
DEC 05 1997
ENVIRONMENTAL
UNIT

For many of us who attended hearings and provided comments to the Granada Hills-Knollwood District plan, the current proposal to remove hundreds of acres of land designated as "open space" and to redesignate it as "heavy industrial" seems to be in direct conflict with the goals and policies that we helped draft as a guide for the development of our community. 1274

One of the adopted objectives of the plan was "to encourage open space for recreation uses and to promote the preservation of views, natural character and topography of mountainous parts of the district for the enjoyment of both local residents and persons throughout the Los Angeles region." 1275

This resolve is repeated again as a stated objective "To encourage open space for recreation uses, and to promote the preservation of views, natural character and topography of mountainous parts of the District..."

In the Policy Statements we find the "conservation of open space" as a stated goal. 1276

We feel that the proposed landfill, that will remove hundreds of acres of open space from the Community Plan, is in direct conflict with the goals and policies of that plan, and a betrayal of the efforts of the community that prepared it. 1277

BUFFER ZONE

The Granada Hills-Knollwood Plan calls for the "separation of incompatible uses and more particularly residential from industrial." 1278

A covenant agreement, executed 17 February 1958 under Civil Code section 1468, precludes the owner from using or permitting the buffer zone to be used "for or in connection with said cut and fill dumping operations or for any noxious or dangerous trade or business." 1279

This would preclude the uses that are allowed in the M-3 zone. The applicant is now requesting a change of zone. 1280

Why is the applicant allowed to use this area for a condensate treatment facility? The covenant on this land states: "... their successors and assigns will not use, nor permit the use of any of the following described portions of said lot 8" (similar wording for a portion of lot 9) "of tract 10422 for or in connection with a cut and fill garbage or rubbish disposal operation or in connection with any noxious or dangerous trade or business." 1281

Surely this is an operation in "connection" with the disposal operation. 1282

The SEIR refers to: *"a 100-acre permanent open space buffer from the nearest residential area to the south."* Mr. Funk also makes reference the open space buffer zone that separates the dump from the homes in his testimony. 1283

In reality, the buffer zone itself is nothing more than an oil and gas production area with many active wells and storage tanks. Tanker trucks service this area on a regular basis. At times, enormous drilling rigs have been erected that light up the night sky for weeks while new oil exploration is in progress. 1284 In addition, this area illegally contains the condensate treatment plant that treats the toxic gas condensate before discharge into the sewer. 1285 This area also has an unsightly communications tower. 1286

The buffer zone was once described by Mr. Wise, BFI's site manager, as: *"a green belt buffer zone to isolate the landfill .... .covered with natural vegetation and will never be developed."* This was an obvious misrepresentation. The Buffer zone is, for the most part, a vertical slope; the rest has been leased with no thought to the environment or the residential character of the neighborhood. 1287

We are bitter that greed, alone, has dictated the destruction of this area and that BFI is allowed to refer to it as a *mitigation*. 1288 We need to have BFI purchase the property between Sesnon and the buffer zone, to buffer us from the current activities in the buffer zone. Will this be done? 1289

Under no circumstances should the buffer zone be allowed an M-3 designation, which would allow the most undesirable uses of this area adjacent to a residential community. 1290

Z.A. #15544

Miller

AGREEMENT

(Civil Code Section 1468)

THIS AGREEMENT made and entered into this 17th day of February, 1958, by and between SUNSHINE CANYON, INC., a California corporation, and NORTH VALLEY LAND DEVELOPMENT CORPORATION, a California corporation (hereinafter referred to as "First Parties"), and JOHN O'MELVENY and CORINNE E. O'MELVENY (hereinafter referred to as "Second Parties"), and SAINT VINCENT de PAUL SOCIETY OF LOS ANGELES, CALIFORNIA, a charitable religious corporation (hereinafter referred to as "Third Party"),

W I T N E S S E T H that:

WHEREAS, Sunshine Canyon, Inc. is the owner and North Valley Land Development Corporation is the lessee of that certain real property in the City of Los Angeles, County of Los Angeles, State of California, described as follows:

> Lot 9 of Tract 10422, as shown in Book 157 at pages 38 to 44 of Maps, Official Records of the County of Los Angeles, State of California,

and;

WHEREAS, Second Parties are the owners in joint tenancy of that certain real property in the City of Los Angeles, County of Los Angeles, State of California, described as follows:

> Lot 8 of Tract 10422, as shown in Book 157 at pages 38 to 44 of Maps, Official Records of the County of Los Angeles, State of California,

and,

RECEIVED
CITY OF LOS ANGELES
FEB 27 1958
ZONING ADMINISTRATOR

WHEREAS, Third Party is the owner of those portions of the Southeast quarter of Section 25, and of the Northeast quarter of Section 36, in Township 3 North, Range 16 West, in the Rancho Ex-Mission de San Fernando, in the City of Los Angeles, County of Los Angeles, State of California, described as follows:

> Beginning at a 2 inch pipe in the west line of the northeast quarter of said Section 36, distant South 96.32 feet from the NW corner of said NE-1/4; thence North 2° 28' East, 60 feet; thence North 5° 30' East, 60 feet; thence North 10° 50' East, 60 feet; thence North 29° 38' East, 60 feet; thence North 38° 19' 30" East, 59 feet; thence North 41° 05' 50" East, 631.36 feet; thence South 41° 57' 10" East, 122.55 feet; thence South 72° 25' 40" East, 53.25 feet; thence North 77° 33' 20" East, 271.24 feet; thence North 62° 44' 50" East, 141.76 feet; thence North 81° 11' 20" East, 149.02 feet; thence South 85° 57' 30" East, 108.02 feet; thence North 78° 24' 45" East, 57.78 feet; thence North 62° 47' East, 186.63 feet; thence North 27° 43' 45" West, 590.20 feet; thence North 41° 48' 30" West, 552.63 feet; thence North 12° 33' 45" East, 943.09 feet to a point in the north line of said southeast quarter of Section 25, distant east 1064 feet from the northwest corner of said southeast quarter; thence, along said north line, being also the south line of lot 9, of Tract No. 10422, as per map recorded in book 157 pages 38 et seq. of Maps, in the office of the county recorder of said county, west 1064 feet to said northwest corner; thence, along the west lines of the southeast quarter of Section 25, and the northeast quarter of Section 36, being also the easterly boundary of lot 8, of said Tract No. 10422, South 2736.23 feet to the point of beginning,

and;

WHEREAS, First Parties have made application to the City of Los Angeles, State of California, for a zone variance which if granted will permit the use of a portion of said Lot 9 for a cut-and-fill garbage and rubbish disposal dump; and

WHEREAS, such use of said Lot 9 will not be injurious to the property of Second Parties or of Third Party

hereinabove described provided that no such use is made of the portion of said Lot 9 described as follows:

> That Portion of Lot 9, Tract No. 10422, in the City of and County of Los Angeles, State of California, as per map recorded in Book 157, pages 38 to 44 of Maps, Records of said County, described as follows:
>
> Beginning at the most Southeasterly corner of said Lot, said point being the most Southerly and Easterly boundary of said lot, Thence along the Southerly boundary thereof; North 89 degrees 35 minutes and 02 seconds West 2,639.70 feet to an angle point therein, Thence along the Southwesterly boundary of said Lot North 26 degrees, 05 minutes and 30 seconds West 1,436.76 feet, Thence North 72 degrees 58 minutes and 40 seconds East, 991.19 feet, Thence South 81 degrees 06 minutes and 42 seconds East 1,443.51 feet, Thence North 2 degrees, 16 minutes and 06 seconds West 782.35 feet, Thence North 67 degrees 46 minutes and 40 seconds East 1,012.24 feet to the Easterly corner of said lot, Thence South 0 degrees 24 minutes and 57 seconds West 2,541.19 along the Easterly boundary of said Lot to a point of beginning.

and;

WHEREAS, First Parties have assured Second and Third Parties that they do not intend to and will not use or permit the use of said portion of Lot 9 hereinabove described for or in connection with said cut-and-fill dumping operations, or for any noxious or dangerous trade or business; and

WHEREAS, Second Parties have assured First and Third Parties that they will not use or permit the use for a cut-and-fill dumping operation or for any noxious or dangerous trade or business of that portion of said Lot 8 described as follows:

> Beginning at the most northerly corner of said lot; thence along the boundary line of said lot 8, South 61° 35' 40" East, 862.09 feet; thence East 600.00 feet; thence South 65° 02' 57" East, 1167.75 feet; thence South 11° 40' East, 320.00 feet; thence North 78° 17' 09" East 546.15 feet; thence South 86° 00' East, 345.00 feet; thence South 26° 05' 30" East 1436.76 feet; thence South 0° 25' West 672.15 feet; thence leaving the easterly boundary of said lot 8, North 26° 05' 30" West 1885.36 feet; thence North 86° 00' West 130.71 feet; thence South 78° 17' 09"

West 805.00 feet; thence North 11° 40' West 469.42 feet; thence North 65° 02' 57" West 950.55 feet; thence West 609.56 feet; thence North 61° 35' 40" West 1043.17 feet to the northwesterly line of said lot 8; thence North 47° 43' 16" East along said northwesterly line to the point of beginning.

and;

WHEREAS, the use of any or all of that portion of Lot 9 hereinabove described or of any or all of that portion of Lot 8 hereinabove described for a cut-and-fill disposal operation would be injurious to First, Second and Third Parties and to their lands hereinabove described,

NOW, THEREFORE, in consideration of the foregoing and of the covenants hereinafter set forth, it is agreed as follows:

1. First Parties agree for themselves and their successors and assigns, and for the express benefit of Second and Third Parties and their successors and assigns and for the express benefit of the lands of Second and Third Parties hereinabove described, that First Parties will not, and their successors and assigns will not, use nor permit the use of any of the following described portion of said Lot 9 of Tract 10422 for or in connection with a cut-and-fill garbage or rubbish disposal operation or for or in connection with any noxious or dangerous trade or business:

That Portion of Lot 9, Tract No. 10422, in the City of and County of Los Angeles, State of California, as per map recorded in Book 157, pages 38 to 44 of Maps, Records of said County, described as follows:

Beginning at the most Southeasterly corner of said Lot, said point being the most Southerly and Easterly boundary of said lot, Thence along the Southerly boundary thereof; North 89 degrees

35 minutes and 02 seconds West 2,639.70 feet to an angle point therein, thence along the Southwesterly boundary of said Lot North 26 degrees, 05 minutes and 30 seconds West 1,436.76 feet, Thence North 72 degrees 58 minutes and 40 seconds East, 991.19 feet, Thence South 81 degrees 06 minutes and 42 seconds East 1,443.51 feet, Thence North 2 degrees, 16 minutes and 06 seconds West 782.35 feet, Thence North 67 degrees 46 minutes and 40 seconds East 1,012.24 feet to the Easterly corner of said lot, Thence South 0 degrees 24 minutes and 57 seconds West 2,541.19 along the Easterly boundary of said Lot to a point of beginning,

provided, however, the use of said premises for or in connection with the drilling for or production of oil or gas or other hydrocarbon substances shall not be deemed to be a use for a noxious or dangerous trade or business.

2. Second Parties agree for themselves and their successors and assigns, and for the express benefit of First and Third Parties and their successors and assigns and for the express benefit of the lands of First and Third Parties hereinabove described, that Second Parties will not, and their successors and assigns will not, use nor permit the use of any of the following described portion of said Lot 8 of Tract 10422 for or in connection with a cut-and-fill garbage or rubbish disposal operation or for or in connection with any noxious or dangerous trade or business:

Beginning at the most northerly corner of said lot; thence along the boundary line of said lot 8, South 61° 35' 40" East, 862.09 feet; thence East 600.00 feet; thence South 65° 02' 57" East, 1167.75 feet; thence South 11° 40' East, 320.00 feet; thence North 78° 17' 09" East 546.15 feet; thence South 86° 00' East, 345.00 feet; thence South 26° 05' 30" East 1436.76 feet; thence South 0° 25' West 672.15 feet; thence leaving the easterly boundary of said lot 8, North 26° 05' 30" West 1805.36 feet; thence North 86° 00' West 130.71 feet; thence South 78° 17' 09" West 805.00 feet;

thence North 11° 40' West 469.42 feet; thence North 65° 02' 57" West 950.55 feet; thence West 609.56 feet; thence North 61° 35' 40" West 1043.17 feet to the northwesterly line of said lot 8; thence North 47° 43' 16" East along said northwesterly line to the point of beginning;

provided, however, the use of said premises for or in connection with the drilling for or production of oil or gas or other hydrocarbon substances shall not be deemed to be a use for a noxious or dangerous trade or business.

3. The provisions hereof shall be binding upon and inure to the benefit of each of the parties hereto and their respective successors and assigns, and the covenants of First Parties herein are expressly declared to be for the benefit of the lands of Second and Third Parties, and the covenants of Second Parties herein are expressly declared to be for the benefit of the lands of First and Third Parties.

IN WITNESS WHEREOF, Second Parties have executed this agreement, and First and Third Parties have caused this agreement to be executed on the day and year first above written.

SUNSHINE CANYON, INC.

By Philip John Shustik

Its President

By Marshall M Robins

Its Secretary

(CORPORATE SEAL)

NORTH VALLEY LAND DEVELOPMENT CORPORATION

By Marshall M Robins

Its President

By Hy Sinsheimer

Its Secretary

(CORPORATE SEAL)

SECOND PARTIES

John O'Melveny

Corinne E. O'Melveny

SECOND PARTIES

SAINT VINCENT de PAUL SOCIETY OF LOS ANGELES, CALIFORNIA

By

Its President

By

Its Secretary

(CORPORATE SEAL)

THIRD PARTY

The Dumps Zoning History

* The dump started as an illegal operation in the mid fifties when the objection of neighbors forced the operators to legalize their facility. The North Valley Land Corporation made application for a CUP in 1957. Certain actions by the proponents in the notification process were irregular and "fraudulent" according to John O'Melveny, founder of O'Melveny and Meyers and himself owner of a large ranch. (please see attached letter). 1291

* The City Planning Commission on June 5,1957 DISAPPROVED the application for a CUP stating, in part, that "The proposed M3 zone would actually constitute a license to utilize the property for numerous obnoxious uses because of the unrestricted nature of the zone classification." (see attached findings). 1292

* In the Commission report, the Air Pollution Control District stated prophetically: "We believe that the location of an area of M3 zoning in this vicinity would have highly adverse effects upon large portions of the San Fernando Valley from the standpoint of air pollution, and hence, is not desirable." 1293

* The matter was appealed to Council and the report of the Planning Commission upheld. 1294

* The Planning Commission suggested the applicant seek a zone variance, rather than a zone change. This was done and in 1958, under ZA case 14544, the variance was granted over the objection of neighbors living directly across from the project for a period of ten years. 1295

* Condition 20 of that variance reads: "That, at the expiration of this grant the premises shall be left in a neat and orderly manner with no uncovered materials or waste products on the premises, and shall be maintained in a park like appearance. Further, that upon completion of the landfill reclamation project, the property involved be made available to the City or County Department of Recreation and Parks for possible recreational purposes, if found desirable for such purposes, or if the property is used, it be devoted to permitted agricultural uses or some private recreational use if approved." 1296

* In 1961 the owners returned to request a modification of the zone variance to include accepting wrapped garbage collected by the City and not allowed under the conditions of the existing variance. This condition was granted, however the report that accompanies the variance request (ZA case 15925) notes: "Inspection of the records and property discloses that numerous conditions involving the methods of operations have not been complied with." 1297

* In 1966 the operator applied for and was granted variance. From the testimony of the Zoning Administrator on May 17, 1966 at the appeals hearing (page 32 BZA case 1672) we learn that the early application for an expanded site was due to the fact that the operators had exceeded their permitted elevations. 1298

* Pages of testimony related to the hardships experienced by the residents living directly across from the landfill exist in this record. 1299

* In testimony at the ZA hearing on October 29.1965 the proponent testified that "when the fill has been completed a golf course or recreational area is proposed on portions of the filled area" 1300

* One of the conditions of this variance (17804 #14 issued April 18, 1966) reads: ".... Further upon completion of the project the applicant or owners shall advise the City and County Recreation and Parks Department that the property is available for recreational purposes." 1301

* Although the aggrieved residents living across the street from the site vigorously protested, the dump was issued a 25 year variance. The City ignored their complaints of odors, dust and litter and promised them a valuable recreational area in 25 years. This residential community was gradually replaced by mixed industry and salvage operations. 1302

* In 1978 BFI bought out the smaller dump and began taking far more trash than the amount indicated in their operating permit (3000cyd) and violated the operating hours, set forth on the permit. BFI exceeded their elevations and went beyond their boundaries into the Significant Ecological Area, In so doing, they removed an oak woodlands, again without a permit. BFI encroached into the primary watercourse with trash and compromised federally protected wetlands. 1303 1304

* In 1988, because of these violations and in response to the many complaints from residents living near the landfill, Councilman Bernson filed a revocation action. 1305

At the hearing scores of aggrieved residents told about their experience with blowing dust trash in their trees and parks and foul odors that clung in their entries. 1306 The Zoning Administrator ruled in a decision, dated September 1, 1988, that the landfill had violated its permit in the following ways: 1307

* The landfill was causing conditions that were MATERIALLY DETRIMENTAL to the surrounding community. 1308

* The landfill had exceeded its proscribed elevations. 1309

* The landfill had placed its haul road and trash beyond the variance line.

* The landfill had come too close to the water course and Bradley Ave.

* The landfill was operating too close to the ridgeline.

* Through the ZA's ruling and in the appeal process new conditions were added to the permit, in an attempt to cure the violations and BFI was ordered to request a curative variance (the only one ever given by the City) to encompass the land that they had illegally used. In addition, BFI was ordered to move operations to a canyon further from the residential area nearer the I-5 freeway. The violations were upheld through appeals to City Council and BFI significantly reduced the amount of trash taken in the two year period that proceeded the dumps closure with the expiration of their variance in 1991.

* Many of the mitigations ordered by the zoning administrator were not complied with, so that, when the variance expired, BFI could walk away from them. Some of these important conditions were:

* The health study, ordered by John Parker in the Revocation Findings, Sept 1, 1988.

* Restoration of the water course, ordered under ZA case 17804 (PAD) Nov. 2, 1988, Condition 2 c.

* Replacing oaks in the north canyon, ordered under BZA case #4336 & 4337.

* Hiring an inspector to oversee closure, BZA case 4484, Dec. 19, 1991, Condition #2.

* Providing an accurate survey, ZA89-1129.

* Offering the land to the Dept.of Parks and Recreation, ZA case 17804.

LAW OFFICES OF
O'MELVENY & MYERS
433 SOUTH SPRING STREET
LOS ANGELES
13

HOLLYWOOD OFFICE
6920 SUNSET BOULEVARD
LOS ANGELES
28

CABLE ADDRESS "OMMYS"

June
17th
1957

IN REPLY REFER TO

Councilman Ernest E. Debs
Room 132-a City Hall
Los Angeles, California

Dear Mr. Debs:

I am writing to you concerning my ranch in the San Fernando area, which is in the City of Los Angeles. The description of the ranch is as follows:

> "Parcel 1. Lots 7 and 8 of Tract No. 10422, in the City of Los Angeles, County of Los Angeles, State of California, as per map recorded in Book 157 Page 38 et seq. of Maps, in the office of the County Recorder of said County, together with the right and easement to use for road purposes the existing road across the Northerly 600 feet of the Easterly 1300 feet of Lot 5 of said Tract No. 10422."

There is also additional property in the bottomlands of around 50 or 60 acres, which may be described by metes and bounds, but it is generally property fronting on Balboa Avenue, at 13101 Balboa Avenue.

I have owned this ranch for over 19 years. I have spent every weekend on it that I possibly could, and my family enjoy it thoroughly, including my children and grandchildren. It is very dear to our hearts. I have spent a great deal of money on it, and it has become a very important part of our lives. It has a tremendous potential value as residential property, and the sub-dividers are now putting in housing projects, a country club, etc., within 3/4 of a mile of our front gate.

The ranch is comprised of around 1,000 acres, if measured as a flat property, but it is, of course, quite hilly, and there is probably twice as much grazing land on it. We raise cattle and grapefruit on it at the present time, but its real value is as possible residential property in the future. For instance, 72 acres immediately

adjoining me, of hilly, rolling country, could have been purchased by me 15 years ago for $12,000. It was sold by Mr. Welsh for $45,000 eventually, was purchased some years ago for $125,000 and is now on the market for $350,000. This gives you some idea of what property values are in that portion of the City. The entire ranch lies within the City limits of Los Angeles.

Directly adjoining me is Bob Hope's property, directly adjoining him is about 15 acres belonging to James Cagney, and on the east side of the property the Roman Catholic Church owns about 100 acres which is being used as a camp for underprivileged boys. It formerly was owned by Gene Autry, and it has beautiful buildings, a swimming pool, baseball field, etc.

Immediately across Balboa from us, and adjoining the Church property, is property owned by the Vangle brothers, which is largely devoted now to raising citrus. A large piece of property, probably 600 or 700 acres, which adjoins the Vangle property, the Catholic Church property and my own land, was purchased some time ago by a Mr. Visco, who operates under the name of Bentz Disposal, and has made application for a zone change under the name of North Valley Land Development Corporation. This man is in the rubbish collecting business and is attempting to zone the property so he can dump rubbish on it. There have apparently been two hearings before the City Planning Commission, and his last hearing was denied last week by the Planning Commission on the theory that the property surrounding it was potential residential property in the future, which is true, in my opinion. Neither the Vangle brothers nor the Catholic Church, nor myself, or anybody that I know in our neighborhood ever received any notice of these hearings. The law, of course, is that he has to notify everyone who owns land within 300 feet of his boundary line. My people, on investigating the matter, have apparently found that what he has done is to cut off a segment of his property on all sides 300 feet back, and conveyed it to people over which he has complete control, so that the only people who are notified of these hearings are his own stooges. I am having this entire matter checked by the Title Insurance and Trust Company, so as to obtain their names. I assume that he will now appeal from the decision of the Planning Commission to the City Council, but of course none of us have any way of knowing whether such an appeal is taken unless we get a notice, and presumably we will have no notice.

#3 - Councilman Ernest E. Debs - 6-17-57

I wish to get this letter on file with you people and a copy of it on file with the City Planning Commission for whatever protection it will give me. I am going to organize a group of property holders out there, including all the people I have mentioned above, and a great many others, to fight this thing for all that we can put into it.

From what we have discovered, this man is apparently doing this in an entirely fraudulent way for the purpose of preventing any of us from knowing that he is attempting to zone the property for the purpose of dumping rubbish on it.

I understand that you are going to have a meeting on Wednesday of this week, and I hasten to send this letter to you, and I will get any and all other information that is necessary which you desire. If this man seeks to appeal from the order of the City Planning Commission, I would certainly appreciate it if I could have notice of this appeal and an opportunity to appear before you or the City Council, whichever is necessary, to explain our position.

Sincerely yours,

John O'Melveny

John O'Melveny

JOM:MB

Copies to Councilman Harold A. Henry
Councilman L. E. Timberlake
City Planning Commission

CITY OF LOS ANGELES
CALIFORNIA

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MAYOR

DEPARTMENT OF
CITY PLANNING
561 CITY HALL
LOS ANGELES 12
MICHIGAN 5211

JOHN E. ROBERTS
DIRECTOR

June 13, 1957

North Valley Land Development Corp. City Plan Case No. 8246
c/o Reuben Rosensweig, Attorney
Suite 1203 Bankers Building
629 South Hill Street
Los Angeles 14, California

Attention: Hy Ginsberg

Gentlemen:

The City Planning Commission, on June 6, 1957, disapproved your request for a change of zone from Zone A1 to Zone M3 on an L-shaped parcel of land having a frontage of approximately 175 feet and an over-all depth of 2000 feet lying on the southwesterly side of San Fernando Road 1665 feet southerly of Ferncliff Court in the Sylmar District.

Although the applicant was legally represented at the time of public hearing, no attempt was made to make any strong and conclusive showing to support the change of zone as requested. While the records support the applicant's statement that this property lies within an oil drilling district, the wells are not visible from the property in question, and indications are that wells within this district are on extremely low production and might be abandoned at any time in the near future.

The Commission was of the opinion that there are no factors which could justify approval of the establishment of the proposed M3 district based upon considerations of public necessity, good zoning practice, or in the interests of public welfare or convenience. The proposed M3 Zone would actually constitute a license to utilize the property for numerous obnoxious uses because of the unrestricted nature of the zone classification. The area in question appears to have been designed without consideration of topographic conditions.

Staff recommendation to the Commission in this matter should not be construed as approval or disapproval of a land reclamation project on the property in question since such a request should be filed with the Zoning Administrator's Office as a variance to the present zoning regulations if such a use is so desired.

The zoning regulations provide that any person whose property is included in a proposed change of zone may appeal to the City Council from the disapproval by the Commission of the requested change. The appeal must be filed in duplicate with the City Clerk, Room 195, City Hall, within twenty days from the date of mailing this notice. It must set forth specifically wherein the Commission's findings and decision were in error, and that public necessity, convenience, general welfare or good zoning practice justify the requested zone change.

Very truly yours,

John E. Roberts
Director of Planning

By
Charles V. Cadwallader
City Planner

CVC:at

CITY OF LOS ANGELES
CALIFORNIA

OFFICE OF
CITY CLERK
ROOM 193, CITY HALL
LOS ANGELES 12
MICHIGAN 5211

NORRIS POULSON
MAYOR

...INQUIRIES
...TO THIS MATTER,
...O FILE NO.

79905

December 23, 1957

City Planning Commission

North Valley Land Development Company
c/o Jerome Weber
Suite 1203 Bankers Building
629 South Hill Street
Los Angeles 14, California

Greetings:

At the meeting of the Council held December 23, 1957, the following report of the Planning Committee was adopted:

"The City Planning Commission transmits report relative to appeal of the, North Valley Land Development Company from disapproval of request for a change of zone from A1 to M3 on 41.9 acres of land on the southwesterly side of San Fernando Road, 1665 feet southerly of Ferncliff Court. CPC 8246

The Commission disapproved this request for the reasons more fully set forth in their attached report dated July 9, 1957, and because it felt that a land reclamation project on the property in question should more properly be filed with the Zoning Administrator's Office as a variance.

On August 7, 1957, your Committee conducted a public hearing on this case at which time all interested persons present were given an opportunity to express their views, and after discussion, the matter was taken under advisement.

We are aware of a recent State Law relative to the approval of public dump sites; however, since it is proposed to operate a private dump on this property, we feel that the Zone Variance method should be utilized in order that the necessary regulatory conditions may be applied.

Your Committee is now advised that the applicant proposes to file a zone variance application with the Zoning Administrator requesting permission to use the subject property for a land reclamation project. Accordingly, we concur in the action of the Planning Commission and RECOMMEND that said appeal be denied without prejudice, and thereafter the matter be filed."

Respectfully yours,

City Clerk

RECEIVED
CITY OF LOS ANGELES
DEC 26 1957
CITY PLANNING

fw

INTRODUCTION

The community's efforts to properly respond to this confusing SEIR have been frustrated by incomplete and misleading information. 1323

In the first place, the quantity of waste that would be permitted to enter the landfill daily is never accurately discussed. 1324 The lack of this information makes it impossible to accurately access the important traffic impacts, and air quality impacts. 1325 The proponent currently has a State-issued Solid Waste Facilities Permit (see attached) to accept 9000tpd. This permit gives a top daily limit of 6,600 of buried waste and the additional is made up of exempt waste. Whatever this waste is comprised of, the fact remains that 9000tpd can currently enter without any additional permits. If then, the proponent is requesting a permit from the City to receive an additional 5,500tpd, the possible total could be 14,500tpd. This is a huge difference from the 11,000tpd mentioned so often in the SEIR. 1326 We realize that weekly averages are somewhat lower, due to lack of commercial inflow on Saturday, but the real possibility exists that weekday inflow could regularly reach 14,500tpd. 1327

Secondly, we find that the changes that are seemingly occurring between the County EIR and the City SEIR are never made clear. 1328 Since the information in all volumes is included by reference, you would expect it to agree on specifics. 1329 In one place it states that oak trees will be monitored for three years; in another place it says five. 1330 In one place it says graded slopes will be 1.5 to 1, or 2 to 1; in another it says 3 to 1. 1331 In one place in these documents we are told that final cover will be 15 feet deep, and in another we are told it will be three feet deep. 1332 In several places are told the working face will be kept to a small 3 to 5 acres in area, and then we are told that it will reach 10 acres in another section of the SEIR.

These are just a few of the discrepancies. The proponents need to list the changes they propose for the City landfill. 1333 The public cannot possibly know what they are proposing without this information.

Thirdly the information is hopelessly outdated. We attempted to contact one of the two Doctors, who were quoted as having said that a health survey was unneeded. We found that he had apparently commented five years ago, and had left the County employ several years ago. 1334 The other doctor who was quoted said he knew nothing about the project and could only comment on the difficulties involved in doing cancer studies. 1335 Neither of these doctors

5. The facility shall not accept more than 9,000 tons of solid waste (Exempt Waste [See Finding 1.F. for the definition of Exempt Waste] plus Refuse. This figure, for the purposes of this permit, will be referred to as the Gross Tonnage Limit.) on any operating day until such time as the operator has constructed traffic improvements pursuant to Condition No. 13 of the CUP and has submitted, to the LEA, a document from the City of Los Angeles, as an addendum to the RDSI, which states:

   a. The daily Gross Tonnage which the facility may accept with the traffic improvements;
   OR
   b. The daily maximum number of vehicles which, with the traffic improvements, may enter the facility.

   If this document contains only references to the maximum number of vehicles, the LEA, using industry standards, shall translate this figure to daily tonnage.

   The resultant tonnage, derived from either a. or b. above, will be the Gross Tonnage Limit but in no case shall exceed 17,500 tons/day. (Refer to Page 30 of the MMIS, Attachment 1)

6. The final elevation of the filled area, including final cover (and surcharge) shall not exceed 1885 feet above mean sea level.

7. The operator shall install (prior to landfilling operations) and operate Three (3) Scales in order to weigh all waste received at the facility.

8. One of the Three (3) Scales shall be used only to weigh:

   a. exempt waste as it enters the facility;
   b. waste leaving the facility which will be recycled/diverted or put to further use;
   c. waste which initially was classified as exempt upon entering the facility but later determined to be refuse.

9. The operator shall maintain a strict accounting of the amounts and types of exempt waste which enters the County site and recyclable or reusable waste which leaves the County site or is reused on site.

could have been aware five years ago of many studies that now show the grave impact pm10's and diesel-generated particulates have on human health. Inclusion of this sort of dated material has no substance. Since health issues were identified as an important issue to the community, this section needs to be completely redone, analyzing the effects of these emissions on health. Traffic, housing, demographics and many other areas are similarly outdated. 1336 1337

THE CITY'S RESPONSIBILITY

Even though it is obvious that BFI's hired consultant prepared this document, the City must share some of the responsibility for this disorganized and inaccurate SEIR. 1338
We implore the City to independently run the modeling programs to check their accuracy. The community does not have the capability to verify the results and assumptions. 1339
Instead of meeting with BFI's hire consultants, and being smoozed into accepting their biased interpretations, it is incumbent upon the City to independently review this SEIR and give it the highest level of scrutiny. A project this large and complex deserves nothing less. 1340

1.6.5

If BFI was offered extension after extension in the preparation of this SEIR, why was the public's request for an additional 180 days for response refused? The public is at a considerable disadvantage. They are presented with two huge disorganized volumes, and referred to over a dozen more volumes, and forced to review them at libraries after work, or on Saturdays. 1341 1342

5.9.5

We are concerned about the possible use of ADCM's. We believe that they will not be sufficient to control surface gas omissions. This section states: "Well-compacted soil is still regarded as the superior daily cover material because of its ability to retard odors and reduce vector intrusion." 1343 1344

In view of this, will soil then be the cover material used on this project?

2.15.1
END USE OF SITE

It was always the intention of those who granted the original variance to have the land used for recreational purposes when the dump closed its doors. Since BFI seems to now feel that this is too dangerous, and the project will not to be complete for thirty years, the public will again wait. The thirty years began in 1991 and by 2021 nature will have reclaimed it and our grandchildren will again have open space. But we must have BFI's assurance that this will happen. The County states in its Findings that: "The Project site will ultimately provide additional permanent open space for the County when the landfill has reached final capacity and the facilities closure plan is completed. The completed landfill surface will be revegetated with substantial trees and vegetation as described in the FEIR Response to Comments Volume A Topical response 15) The site will be maintained by the permittee until the time that its final use is determined by State and County, however it is expected that ultimately it will be made available to the public at no additional cost to the agency designated to receive the land." 1345 1346

Do we have BFI's assurance that they will turn the City site over to the City at no additional cost?

Why is the land that is to be dedicated in upper Bee canyon not shown or mentioned? This purchase is required under the County C.U.P. 1347 1348

ALTERNATIVES

Although a viable alternative with a projected capacity of 70 million tons exists in the County, the SEIR does not include a full discussion of a County-only alternative. 1349

The conclusions drawn from both the no-project and reduced volume alternatives do not recognize that either choice would, in all likelihood, lead to a 70 million expansion in the County. The County findings clearly allow BFI to make that application. In this case all the arguments about the negative aspects of transporting waste or loosing County bucks are moot. I'm intrigued by the argument that if the project was approved in a reduced form, dust and "litter generation would occur at these other facilities." This creative little jewel is at least good for a laugh in the midst of this depressing cross between *Mine Kampf* and *The Prince*. 1350 1351

The only substantive issue in a County expansion would be the loss of biota. This would amount to 799 additional oaks (1363, minus the 564 saved in the City) When we inquired of Mr.Richard Fraser, then with the County Regional Planning Dept. at the time of the County zone changes, as to the reason the whole 70+ acres were being removed from the SEA designation, rather than just the footprint, Mr.Fraser said that the whole area would be severely impacted by the landfill operations, particularly since the main stream that fed the canyon was being graded to bedrock. 1352 1353

Where is the analysis of the map presented in 1991 (attached)? This map was represented to be the City expansion proposal and made part of the County EIR. We can only believe that it was not submitted, in the belief that, since the City would probably cut back the configuration, it represents what the proponent sees as a fall-back position. 1354

The County requested that BFI seek a minimum expansion of 20 million capacity. Why is BFI seeking so much more? 1355

Page 1-14 & 5.9 Alternative Waste Management Technologies & Strategies. 1356

Anything that would reduce the amount of trash going into landfills must be given careful evaluation. We believe you have dismissed these options too lightly The City has issued an RFP for new and innovative technology projects. 1357

Why were no inert landfills included in the study? Couldn't directing all inert loads to these facilities reduce the need for class III landfills? 1358

WORKING FACE

One of the mitigations offered and repeated, again and again, in these volumes was that the working face was to remain small, 3 to 5 acres. Now this document is talking about an eventual 10 acre working face. This flies in the face of what the community was promised. The smaller working face with the rest receiving either temporary or final revegetation was, and is, an essential part of the mitigation program. 1359

SLOPE GRADIENT

In the County's Finding of Facts we read:
"The final maximum refuse slope gradient at the site will be no steeper than 3 horizontal to 1 vertical for the landfill extension" 1360

Why is a lesser standard, i.e. 1.5 to 1, or 2 to 1 being applied to the City Project?

Figure 2.4.2

Why isn't the land that is currently being acquired in upper Bee canyon shown or discussed? The County directed as follows: "The applicant is further required to arrange for the acquisition as public open space of approximately 450 additional acres along the southwest boundary of the landfill within upper Bee Canyon." What is the status of this acquisition? 1361 1362

I.6.2
Public Scoping Meeting

The public has never had the opportunity to address the SEIR. The scoping meeting was held over five years before the release of this document. It was held on the night of the LA riots, when people were being cautioned to stay at home. Only a few ventured out, disregarding the advice broadcast on their radios and TV. This was not a full hearing of the issues. 1363

I.6.3
Post Scoping Meeting

We would assume that City staff met regularly with the consultant and the proponent. What makes this meeting so different? Who on the city staff independently reviewed this document? 1364 1365

MAPS AND GRAPHICS

Elevations on some maps are, for the most part, unreadable. Please correct. 1366

Photographs showing the projected height of landfill in relationship to the existing contours were omitted from this document. The elevations and design have changed since the original DEIR was prepared and those older view sheds are no longer accurate. 1367 1368

No map seems to exist that shows the approved County elevations and how they will connect with the proposed new county acreage and then to the City. The maps attached to the County approvals and the Phase II Stability Report in the appendix are too small to read. We understand the originals have been revised to promote stability. Please provide an updated map. 1369 1370

RECYCLING

The City has embarked on an ambitious program of recycling that is not only meant to satisfy the goals of AB939, but to save precious resources. Siting more landfills that are cheap and close in provides a strong economic incentive for the City to abandon its commitment to recycling to provide short-time savings at the expense of long term solutions. If the City, or other cities, attempt to claim the green waste that is used for daily cover as "recycled" in order to meet the goals of AB939 the recycling effort will be further undermined. Will the City attempt to do this? 1371 1372

Various places in the document give different descriptions of the on-site recycling program. It is, at times, referred to as a composting program (see appendix). The County volumes describe an ambitious program for corrugated materials, wood processing etc. Exactly what will be processed at the facility proposed for the berm? 1373 1374 1375

Why was the facility relocated from the site originally proposed near the I-5 freeway? This type of facility can have significant impacts. Please prepare a separate environmental document for this facility describing, in detail, the process and equipment to be used and dealing with the effects of noise, odor, air pollution etc. upon the residents adjacent to the facility. How close will the nearest residents be to the facility? What do the studies of green waste used as daily cover show in terms of outgassing and other potential problems. 1376 1377 1378 1379

page 4-338

The traffic studies referred to are far to old to be accurate. Will you provide recent ones? The January 1995 counts were not accurate, since San Fernando Road and Foothill were still impacted by the overpass repair taking place following the earthquake the previous year and commuters were choosing alternate routes. The January 1995 mini-study is still more than two years old. 1380 1381 1382

Page 4-372

Please describe exactly which roadways will be "widened," which "reconfigured," and where additional lanes be will provided? Hasn't some of the restriping already been done, as a mitigation for the County project? We need to know exactly which additional mitigations will be done. 1383 1384 1385

If the addition of traffic from the landfill raises the intersection levels to LOS F, why doesn't the City consider that significant? 1386

How many 60 foot transfer trucks could be accommodated on a freeway offramp? If most of the transfer trucks arrive from the south, won't this cause the offramp at Roxford to back up ? 1387 1388

You seem to be using a factor of .64 to figure trucks which you note as being "passenger cars times two." In that case, using a worse case scenario, the 14,500 tpd would generate 9280 truck trips, or 4640 passenger trips. This number is clearly over the level of significance. 1389

Since the SEIR for this project was published less than a year after the opening of the County landfill, it is necessary to evaluate all the traffic impacts of both County and City, or be guilty of seeking incremental approvals in violation of the requirements of CEQA. 1390

page 4-379

You have provided conflicting information about the incidence of accidents in the vicinity of the landfill. On this page you indicate "no unusual safety problems" from your search of records (1982 through 1987). This is in direct conflict with the report to the Regional Planning Commission given by the County Dept.of Public works and contained in Vol.A of the Response to Comments which states: "in addition, the traffic studies indicate a higher than average accident rate at intersections of city streets with current volumes which are 5,000 to 6,000tpd" (1989) In view of this discrepancy, please provide accident figures for the appropriate intersections and the landfill entrance. 1391 1392

Neighbors who use San Fernando Rd. report that the driveway entrance to the landfill is dangerous and has been the scene of several accidents. We don't know if any were serious enough to be reported, but we feel that intersection should have a signal, even if no further expansion is granted. 1393

Have you considered designating the right turns from San Fernando Rd. and Foothill on to Balboa as carpool-only turns at peek hours in the AM, and left turns as carpool-only turns at peek hours in the PM ? This would effectively reduce the dangerous traffic on San Fernando Rd. and encourage carpooling. 1394

BIOTA Section 4.4

We were not able to find the field survey referred to in section 1.4.4 conducted by Dole and Fisher, 1978, covering 1.560 acres. In which referenced volume can we find a copy of that survey? Will you incorporate it into your appendix? 1395 1396

Page 4-187 says that a field survey determined that there was 4.20 acres of wetlands and 5 acres of riparian habitat in the city. Why do you appear to be planning mitigation based on a 2.95 loss? (page4-189) 1397

page 4-188 Impacts Resulting from Closure

According to the staff of the Environmental Affairs Department that is overseeing BFI's closure of the existing City landfill and the staff of the State Integrated Waste Management Board nothing in their requirements, or in engineering practice, necessitates constructing surface water "improvement channels". When we ask the Environmental Affairs staff why this was being done, they said "because BFI wants to." Does the 2.95 acres referred to in the next paragraph include the 1.25 acres that may be removed at closure? 1398 1399

Will the proponent guarantee that the wetlands mitigation will be carried out in the vicinity of the project? 1400

page 4-198

Why is the City requiring only a 3 year monitoring program for the oaks, instead of the 5 year program demanded by the County? 1401

Will the period over which the trees are monitored begin when the tree has reached the required 1 inch in diameter when measured 1 foot above the ground? This is not clear. 1402

Page 4-194 Cumulative Impacts

Will the "phased restoration" be implemented as described by Mr. Osterling in his Revegetation Plan contained in volume A ? 1403

Were any heritage oaks identified in the surveys? The chart in the index shows diameters up to 52 inches. How many of these large oaks were found and how will their loss be mitigated. 1404 1405

The first sentence in paragraph under City Mitigation Measures on page 4-194 that starts "A total of 100---" doesn't make sense. Please clarify. We cannot comment on this reduction until that sentence explained. 1406

Topical Response #14 incorporated by reference on page 4-139 of this DEIR states that the rare big cone fir will be replaced at a five to one ratio and monitored for five years after reaching a diameter of one inch. We feel that this is an acceptable mitigation. 1407

What performance guarantee is being placed on the important mitigation for the Biota? 1408

What field verification of the mitigation program will take place? When will this happen, in relationship to the annual report. Will a forester from a public agency be on hand to verify the accuracy of the field study, as required by the County permit? 1409 1410 1411

The County maps, showing the Significant Ecological areas, show SEA 20 extending into the city. Why is that area not shown on the map presented? Figure 4.4-1 shows this area as greatly disturbed. Since this land was outside of the variance line, as shown on all city maps, please explain why the oak woodlands shown on the vegetation map outside of the variance line was removed? The map prepared by Ultrasystems and labeled number 3, that is a part of the original EIR, shows many communities of oak woodlands in the City and outside of the variance line that now seem to have disappeared. Please explain? Was the City ever compensated for the loss of these oaks under the City Oak tree ordinance? In BZA case 4336 & 4337 Exhibit #B-1 condition #5 which approved the curative variance reads: 1412 1413 1414

> " Oak trees. No oak tree shall be removed from within the area of the variance, except in the northern fill area. Oak trees within that area shall be counted prior to displacement and replaced at a ratio of two trees for every one removed in strict compliance with the oak tree regulations of Section 17.05-R of the Los Angeles Municipal Code." 1415

Why was this never done?

RISKS

4.9.1

Sections of referenced materials should be reprinted and circulated with the current documents. Parts of the EIR were circulated eight years ago and the original volumes are not available at all listed libraries and certainly all referenced material should have been provided to the decision makers. 1416 1417

Will BFI fund half of additional hazardous waste roundups in the City, as it has been required to do in the County? Will it be, at least, in the same ratio, i.e. 6 for each 17,000,000 tons of permitted capacity. 1418

What percentage of HHW generated is being properly disposed of at these roundups? 1419

Based on the City figures of.7% of their waste stream being hazardous, and subtracting what is now being properly disposed of at roundups, how much hazardous waste will eventually be put into the landfill at capacity, using a worst case scenario. 1420

The EIR states that a waste-load inspection will be conducted for every 1000 tons received.
The current County permit requires that 6 waste-load checks be conducted daily, REGARDLESS of the amount of inflow. Why is the City requiring a lesser standard? 1421

A City inspector should be present at, and conduct, all waste-load checks, since very little of the HHW is being found at the current inspections or at the working face. 1422

For example, BFI reported in February of this year an inflow of 58,961+ tons or 117,992,000 pounds, but they recovered through examination of the working face only approximately 115 pounds of prohibited waste. Using City figures 0.7 percent of their waste, or 825,000 pounds, could be expected to be hazardous. 1423

The SEIR refers to "sensors for detecting volatile organic compounds". These sensors are not being used at the scale house and, in fact, have never been used. When we inquired why this was not done, we were told by Mr. Hanson of the County Health Dept. that "it (the detector)" would go off in every load." Why then, if BFI is conducting the required 144 load checks monthly, and monitoring the working face, are they finding only 23 items (as occurred in February) and similarly small numbers in other months? 1424

Has anyone, over the years since BFI first started operating the site in 1978, been fined, or punished in any way for bringing in prohibited waste? When and how? 1425

The SEIR states a "Full time inspectors shall be employed on site for the inspection of waste materials." Will those inspectors will be employed by the City, and the City reimbursed by BFI for his (her) salary, as is the case with the County inspector at the County site? 1426

It is imperative that any inspector not have direct ties with BFI, but be a City employee. 1427

If it takes one full-time inspector to monitor the disposition of Trash in the County trash will at least one full-time inspector more be employed, so that the dump will ultimately have at least two full-time inspectors on site? 1428

The SEIR states on page 4-299 that .."all waste materials brought to the site would be unloaded at an active working face area, compacted with at least 9 inches of clean soil by the end of the working day." This is a departure from County practice and seems to conflict with other portions of this document. 1429

Can we rely on this use of dirt as cover? 1430

The current system of requiring tarping at the present landfill is not working. Many of the smaller trucks that use neighborhood streets and drop litter arrive at the dump without cover of any kind. The landfill workers may issue a "warning," but there is no practical way of keeping track of repeat offenders and thus far no fines have been imposed. We, therefore, recommend that a five dollar additional charge be imposed, similar to that imposed at Puente Hills, on all trucks arriving uncovered and that the revenue from that charge be donated to the beautification of the community in the immediate vicinity of the landfill. 1431 1432

The landfill is now operating in the lower elevations of the canyon and taking far less trash than the daily limit, nevertheless neighbors have complained about trash from the dump in O'Melveny Park. An observation of the on-sight inspector for the current operation reads: "I did observe plastic bags and papers blowing approximately 100 feet but confined within the perimeter of the canyon" How will this be controlled when the dump is operating only 50 feet below the ridgeline, as they propose. 1433 1434

How have the conditions that resulted in two safety violations being issued by OSHA, concerning the death of a worker, been corrected? 1435

Would the citizens advisory committee be funded to conduct health surveys? 1436

Why does this document refer to the incinerators as flares? The community was corrected on this point by the engineers at AQMD. Is this a euphemism intended to make incinerators seem more benign, and mislead the public? 1437 1438

You say that "as an example of how the system operated during the Northridge earthquake on January 17, 1994, the system" (gas collection) "successfully shut down, effectively reducing the risk of upset." Isn't it a bit like saying: "On the morning of the earthquake I was successfully propelled from my bed, thus effectively reducing the risk of dying in bed?" Didn't the incinerators shut down, do to the lack of electrical power, just like everything else in the neighborhood? Has the system had any other shutdowns due to lack of electrical power on other days of high usage? If so, please document. Will you purchase a generator to provide back-up power in emergencies? 1439 1440 1441 1442

The Dept of Water Resources worries (letter to Rodney Nelson, July 1997) that shear strengths, based on an analyses of the OII landfill were not correct because they believe it is probable that the OII landfill had a"higher component of soil in the waste" than other landfills. 1443

Since BFI is not now using soil as daily cover in the County portion, how will that impact shear strength analysis if this practice continues in the City? Did the stability analysis for the City consider this as a factor. 1444 1445

Do you intend to continue to use ADC's? Other parts of this document indicate you will be using soil. If you use an ADC, will you request a change in the CUP to reflect this important operational change. 1446

APPENDIX

The Appendix volume is not paginated and is a hodge podge of relevant and irrelevant information. For example, the spring and stream information should be accompanied by a map showings where the samples were taken. Without this they are meaningless. The obviously less important items like the photo copies of the speakers' cards should not have been interspersed with comments from responding agencies. The reader gets the feeling that the preparer is trying to create an SEIR of such size and so confusing and conflicting in content that the reader will be intimidated. 1447 1448 1449

Many of the resource documents in Appendix are over 5 years old. Will these be updated? 1450

Traffic from the Appendix

The traffic analysis is yet another glaring example of incremental approval being sought by the proponent. By splitting the project into stages the analysis of the impacts of the entire project remain unknown. In less than a year after opening, BFI is back with another proposal to expand. The original document attempted to consider the larger project but when these projections exceeded a level of significance (see Response to Comment Volume A pg.592) traffic calculations were reduced to include only the County portion. Now the County impacts are being excluded. This is clearly an attempt to minimize the impacts of the entire project as required by CEQA. 1451 1452 1453 1454

The County Dept. of Public Works said in their report to the County Regional Planning in 1989: "The traffic studies set forth in the EIR, combined with the lack of a dedicated freeway access, suggest that negative impacts of traffic volumes associated with more than 6000 -10,000 tpd may not be mitigated by the traffic mitigation measures" BFI now has a permit that limits its daily tonnage inflow to 9000 tpd (see SWFP at page 11) and is requesting another 5,500 tpd. This amount clearly is significantly over the tonnage that the County believed would cause negative impacts. 1455 1456

In that same report, the County also stated that: "The traffic studies indicate a higher than average accident rate at intersections of city streets with current volumes which are 5000 to 6000tpd." Since BFI has implemented its traffic improvements and the landfill is currently operating at well under its permitted inflow, please provide the 1997 accident reports identifying the same comparisons used by the County to reach their conclusions. 1457

The Linscott, Law & Greenspan report on traffic does not factor in the exempt waste that is not counted toward tonnage requirements but must be considered in any traffic analysis. They conclude that the 6,600 TPD maximum County plus the 5,500TPD maximum City would result in a 12,100TPD limit. This however is erroneous, since the State issued SWFP for the County allows a gross tonnage of 9000 TPD, including exempt waste. This means that the real impacts should be calculated on the basis of 14,500 TPD. 1458

The LADOT should be required to follow its own guidelines on providing recent traffic data (ie data should not be over two years old). In the Linscott study they say they were allowed to use 1992 and 1993 data and refer to it as 1995 data (page 8). How can this company justify this misleading and unscientific presentation? They go on to say that they base this on the belief that the January 1995 data showed lower volumes at two intersections. Interestingly these areas were still undergoing construction modifications from the 1994 earthquake and data taken at that time could in no way reflect the current impacts. Even the Jan 1995 data exceeded the two year proscription by eight months and it fails to include the traffic generated since the landfill in the county opened in August of 96. Certainly new counts must be made. 1459 1460 1461 1462 1463

We have trouble seeing why the trip generation rates based on the "daily counts taken at the landfill entrance" (page 15) are not more accurate than the speculative estimates provided by BFI. BFI is required to keep daily records of the weight of all trucks entering the landfill. The projections should be based on the actual data. The SEIR states that transfer trucks (or even transfer stations) were not used in 1985-1985"(page 15). We believe this to be erroneous since transfer trucks from Santa Monica arrived daily at the landfill during the eighties. It is incumbent for BFI to consistently use figures that reflect fact. BFI records the weight of every vehicle entering the landfill on a daily basis. Please require them to make at least the last few months of these records a part of this record so that the weight-to-volume ratios can be verified. 1464 1465 1466 1467

The traffic Impact Report in Volume II at"i" states ; "The proposed City Landfill would have a net airspace volume of approximately 31 tons..." This figure does not agree with the proposal. Why? 1468

The landfill has now been operating for over one year, although this has been at a smaller than permitted volume. Has there been any increase in traffic accidents in the vicinity of the analyzed intersections in that period and did any involve garbage trucks? 1469

Will all trucks, not servicing the neighborhood, that are over the current weight restriction be precluded from using Balboa Blvd? 1470

Appendix Liner Section

This section describes several different liners. Which one will be used on the new site? Will uniform construction be used throughout on side slopes, as well as underneath the waste pile. How will the chosen liner accommodate the differential subsidence, if the liner is placed on existing trash? During the '94 earthquake did any other landfill in the affected area have a liner placed over waste? If so, how did it perform? 1471 1472 1473 1474

Please explain diagrams #6,#7 and #8. It appears that the liner will be placed on intermediate cover. Since the landfill is closed, won't the final cover be in place? If not, why not? What is the permeability of the buffer soil? What is the sub-base made of? Will this be used on all side slopes? 1475 1476

In #8 you show a vegetation layer of 1 foot. Your revegetation plan prepared by Mr. Osterling calls for 15 feet of final cover. Which is accurate? Will you be using the revegetation described in the program included in the Appendix and in the topical response in Vol.A of the Response to Comments? 1478 1479

Appendix C7

Why did you not give as much statistical analysis and consideration to the population of Sylmar as you did to Granada Hills-Knollwood in your analysis of minority and socio-economic impacts? The address of the dump is Sylmar and, according to your own data, identical in proximity to the dump. Will you combine these statistics to give a more realistic picture of the affected communities. It is inaccurate to use 2 miles as a distance for either of these communities; the trash will be much closer than the entrance. Your maps show ancillary facilities within 600 yards of homes. The demographics have changed dramatically since the last census in 1990. The declining home prices have caused many changes. Will you do a more recent study to provide an accurate basis for your conclusions? 1480 1481 1482 1483 1484 1485

Because of problems with dust violations, the AQMD required BFI to install an anemometer to record wind speed on the old landfill. Will you please include these site-specific records from the last years of the City operation and those from the current operation. The anemometer readings in the appendix are not usable because no location is indicated. The readings from the city berm must be included. 1486 1487 1488

Biota Appendix B2 section 5 page 5-1

Mitigation measures are recommended for each of the following where "significant impacts are identified": Arroyo willow series, southern willow scrub, coast live oak woodland, Venturan coastal sage scrub, slender mariposa lily and the San Diego horned lizard. With the exception of the coast live oak, we cannot find the mitigation proposals for the other communities. Where can we find them? 1489

Will the suggested mitigations for the mariposa lily be carried out as recommended by the consultant on page 5-2? It is said that impacts on this species will remain significant if transplantation fails. What measures are being used to insure that failure does not occur? 1490 1491

Appendix A6

The Conservancy biologist seems to believe that pumping ground water, needed for landfill operations, will pose a strong possibility of altering important ecological resources related to existing soil and substrate moisture regimes. The Conservancy states that "if a lack of significant adverse impacts cannot be conclusively demonstrated then the ultimate burden of such proof should be considered as a project requirement prior to any subsequent level of government approval." Where in this document is this issue discussed, and what proof is offered? 1492

Litter

The problem of litter is still with us, even after the dump has been closed since 1991. After the heavy rains of the last two winters, hikers in O'Melveny Park have observed a great deal plastic debris washed down from the dump into the side canyons. Again hikers in the far reaches of the canyons report wind blown trash from the current opperation in the County. 1493

The upper reaches of the steep cliffs and dense sections of underbrush in this wilderness park have been virtually impossible to clean, once fouled by litter. Fortunately, most of the paper has degraded over time, but the plastic, washed down into the canyons, remains a problem. In 1987, an inspection by the Dept of Sanitation showed: 1494

> "On several occasions the ridges and hillsides, contiguous to the landfill in O'Melveny Park, have been searched for windblown litter, in an effort to determine the extent of this problem. Although litter crews of 3 or 4 people have been observed successfully policing the park entrance, the grassy picnic areas, and the immediate trail and stream areas, there is a great deal of windblown paper and plastic bags, littering the hillsides and ridges. It has been determined that the sole source of this litter is Sunshine Canyon Landfill." 1495

For years, the community was forced to pluck plastic bags out of their trees and pick up papers from remote areas of the County. The wind blown trash contained income tax returns and business records from a firm in Santa Monica; we knew how much a man in Beverly hills paid for his dental crowns; we gathered up medical records and read about the very private medical problems of unsuspecting strangers. Trash burst out of the dump and went high in the sky, plastic bags and long streams of computer paper were carried aloft. 1496

Of rubbish blowing from the dump, the City Zoning Administrator, John Parker, said: "This is a definite problem involving a VIOLATION of condition 13" 1497

The community fears the return of this nuisance. 1498

Dust

This was, and will be, a problem with ominous health implications. Fugitive dust pollution, according to the A.Q.M.D., is responsible for 60,000 deaths nationally and 1,600 in the southland. When the dump was operating full tilt, and in the southern canyon, we breathed the dust - we ate the dust. Fire Department records will show you how many times they responded to calls in the area, only to find out that there was no fire, All of the intense smoke reported was not a forest fire, only dust from the dump! We have had guests take their children home, from fear for their health. We watched sadly, as old friends and neighbors moved to escape. We listened to our children cough and wheeze. How can you *possibly* consider inflicting this community with these problems again? 1499 1500

The proponent continues to ignore the fact that the existing landfill and the expansion are in a wind tunnel and that as the landfill rises the "sheltered" places will no longer exist. 1501

Violations

The Zoning Administrator put conditions on the dump, as did the AQMD. BFI protested at every juncture. At first BFI refused to accept AQMD's mitigations. On July 7,1988 the AQMD District Council testified: 1502

> "As I said earlier the District attempted to negotiate some additional variance conditions which would help to alleviate any future dust problems. In light of the fact that the petitioner" (BFI) "has told us at our prior meeting this morning that, I believe, they intend to not adopt any variance conditions dealing with dust. We have no choice but to oppose the granting of this variance...." 1503

BFI, rather than loose their variance, capitulated and reluctantly adopted AQMD's conditions. This was an action forced upon them and only reluctantly accepted.

Excerpts from the AQMD hearings show how duplicitous BFI was, in representing their project before the AQMD Hearing Board. As John Parker said, 1504

> "THE ADMINISTRATOR CONCLUDES THAT THERE WERE VIOLATIONS OF THE EXTANT GRANT, PROBABLY INADVERTENT INITIALLY, BUT EXACERBATED BY LACK OF CANDOR AND AGGRESSIVE ATTEMPTS TO CURE ON THE PART OF THE OPERATOR."

The AQMD did not cite the dump, when they concluded that they were "doing what was required and the winds were over 25 miles an hour."

The Enforcement Manager of the Air Toxics Control Branch of the AQMD testified as follows at the AQMD Hearing on July 7,1988:

> "Since the beginning of the year through the end of June we have investigated 83 dust complaints from the surrounding neighborhood and in many of those cases District inspectors were able to confirm that there was dust in the neighborhood and that they could see that it was from the landfill property. However we did not issue a 403 violation because it was our feeling, it was District Staff feeling, that the landfill was taking every precaution to prevent fugitive dust emissions. Those were very high wind conditions.....And so no notices of Violation resulted although there was a dust problem from the landfill in the residential neighborhood."

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As a result of this hearing, the AQMD attached more conditions in the hope of lessening the problem. There was now at least a greater effort made to control dust although the problems continued.

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We believe that this law, that protected the dump from receiving citations, explains why there were so few issued, in view of the enormous problem.

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As you can see, strong winds are not an aberration, but normal in the area. How can we believe that these same conditions, that did not protect us before, will protect us in the future? When the Zoning Administrator said that the landfill was in the wrong place, it was to these conditions, for which there are no mitigations, that he referred.

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Appendix C 5-2

Odors

Here again, this document would lead you to believe that the community was imagining odors. Since, according to the AQMD inspectors, the human nose is the most sensitive instrument for detecting odor, we were at last not put at a disadvantage, by someone claiming to have more sophisticated instrumentation! There was a long period of time in the eighties, when BFI was taking lots of garbage, that the dump emitted really foul odors. Things got better when the new incinerator was installed. We have always challenged the statement that the odors came from the gas fields, or seeps in O'Melveny Park, as this document states. We believe they came from the dump. If the odors come from the oil well and gas injection storage areas that BFI owns and leases isn't BFI still responsible for the nuisance created? We are worried that if the dump expands, we will face a return of odor in the form of outgassing, since not all gas can be collected. This gas contains several cancer causing hydrocarbons and teratogens.

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Appendix C 5-4

Aesthetics

Although the area of the berm above the oil production area has been landscaped, the slopes of the City landfill remain an eyesore, even though it's been over six years since the landfill closed its gates. The existing slopes have insufficient cover and have not been properly closed as required by law. The City and the AQMD tried to get BFI to revegetate on numerous occasions. After 33 years in operation this is how successful the revegetation plan has been (show photo) From the I-5 the 210 freeway and the residential community of Sylmar the dump is an ugly blot on the landscape. Even the new County portion is without the intermediate cover required in the CUP. What extra measures, soil amendments, consultants etc. will be used to insure success? Will BFI post a bond in an amount sufficient to hire another company to revegetate, if they continue to be unsuccessful in their attempts to revegetate? Page C 5-5 Of the 1,367 coast live oaks planted in the buffer zone, how many have survived? I believe this to be an inaccurate number, since most of the trees in the buffer appear to be eucalyptus.

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CONDITIONS

For dates of conditions, see "The Dump's Zoning History"

1520 BFI operated acres and acres beyond its boundaries and, in the process, destroyed a wetland and scores of protected 1521 oaks *without a permit*. They illegally destroyed that 1522 portion of SEA 20 that extended into the City. When applying for the expansion they placed a misleading map in the EIR, on which the City SEA had been completely erased. The original map from the 1966 variance shows the destroyed wetlands *clearly beyond the variance line*. The only confusion that ever existed sprang from BFI's refusal 1523 to conduct a proper survey, in an attempt to cover their misdeeds. Instead of admitting, simply, that they goofed, the landfill boundaries started to *mysteriously* expand.

The City surveyors drew a map that showed the landfill to 1524 be *out of compliance*. The NVC always accepted the City's work, but a complete survey was needed because the city survey had only involved three fourths of the dump. BFI was ordered by the Zoning Appeals Board to pay for a 1525 survey, done by a surveyor that was mutually acceptable to BFI and the Councilman's office. BFI appealed this condition, claiming that it was "too expensive". They have *violated* yet another condition of the Variance by putting off doing this survey.

By exceeding their elevations, *another violation* for which 1526 BFI was convicted, BFI exacerbated the dust conditions and created an unnatural appearing ridge line.

BFI *violated* their permit by ignoring a condition that 1527 prohibited them from coming within 50 feet of the ridge-line.

BFI *violated* a condition of their permit, by not restoring 1528 the wetlands, in cooperation with the Dept of Fish & Game, as ordered.

BFI *violated* a condition of their permit, by not replacing 1529 the oaks removed in the north canyon, two to one, as ordered.

BFI has now refused to comply with City Zoning conditions 1530 that were ordered to correct past violations. BFI claims that the City no longer has jurisdiction. This was the 1531 issue at the last City hearing. Is it any wonder that the Chairman of the Zoning Appeals Board said of BFI at that hearing; "The disingenuousness on the part of the proprietary sector has made fools of us and made the people distrustful of the process."

BFI's violations of their permit were appealed and sustained through all levels of zoning review and finally 1532 to the full City Council. These are *proven violations* and their record must be considered before assuming that they will comply with conditions of any permit the City is considering.

It is appalling that the City is even being approached for 1533 this expansion considering the proponent's dismal past record. The community is afraid that it will soon again 1534 have to go through hearings when BFI has again violated their permit.

In 1989 the Zoning Administrator found:

> "Pursuant to section 12.27-B,5 of the Municipal code, the Administrator finds that certain conditions of the variance have not been 1535 complied with, and pursuant to Condition 13 of extant Case No.17804, that certain activities on the property have proven to be materially detrimental to the occupants of surrounding property"

The hours of testimony from the community, plus the photos 1536 of blowing dust and trash convinced the Zoning Administrator, and those at various levels of appeal, that the landfill was causing conditions that were detrimental to the community. The Administrator found permit violations 1537 in boundaries, elevations, ridgelines, and degradation of the water course. Similar conditions will exist in any 1538 future permit. Why will BFI now comply when they have cavalierly ignored their permit conditions in the past?

The City joined the lawsuit against BFI's expansion into 1539 the County. Why would the City now consider allowing BFI to return?

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QUESTIONS ON THE EIR SECTION ON ANIMAL LIFE

p.4-139

1.The reference is to "numerous biological assessments and reports". How many does "numerous" exactly refer to? 1540

2. Did the consulting firms ask for any support information from environmentally-conscious groups such as The Sierra Club, groups that have an active interest in protecting the current ecosystem? 1541

3. Regarding data from the previous FEIR that has been "previously addressed", how do we know that those previous determinations are still relevant and not out-of-date? Ecosystems are constantly changing. 1542

4. As ecosytems are constantly changing, why does the EIR use information from 1989, over eight years ago? These assessments and reports should be made in 1997 so they are totally current- this area has changed considerably over the last eight years with, among other things, large urban development and a major earthquake. 1543

5. Who approved the biological consultants that were used in this report? Was it BFI? If so, then their reports are invalid as they represent an interested party. Who paid their fees? 1544

p.4-140

1. As ecosystems change, what is the relevance of reports from 1978 and 1985-86? Surely these are out-of-date? 1545

2. Shouldn't any relevant studies be performed today before a proper determination can be made of environmental impact on the animal life? 1546

p.4-141

1.How can a field reconnaissance survey be valid that did no examination between October and June, totally avoiding the impact of Winter on the area? This is in reference to the study by P&D Services . 1547

p.4-149

1.On p.2-84, there is reference to prevention of ponding of surface water to prevent insect breeding and the attracting of vectors.On p.4-149, there is reference to freshwater marsh habitats occuring onsite and , as the EIR says, 1548

> "Amphibians require moisture for at least aportion of their life cycle, requiring standing or flowing or flowing water for reproduction."

So if ponds are prevented, won't this result in the destruction of amphibian pond life? Won't this upset the natural ecological balance in this area?

2. If ponds are allowed to develop, doesn't this raise the likelihood of insect proliferation and , therefore, the transmission of waste out of the dump area? 1549

3. If "terrestial amphibians avoid dessication by burrowing underground", what is to prevent them eating/burrowing into the waste and then carrying waste residue out of the dump area? Surely they will also effect the removal of waste from the dump area in their faeces? Surely this spreads the impact of the dump far beyond its established limits? Is there any realistic way to prevent this while still maintaining the balance of the ecosystem? 1550

p.4-150

1. What is to prevent birds carrying off waste , including dead carcasses and rotting food, and depositing it over the protected recreational area of O'Melveny park where children play or over the housing areas? I often find dead mice in my pool, dropped by passing birds. 1551

2.What is to prevent birds carrying waste over a wide area in their excrement? 1552

3.The EIR says "The existing inactive landfill" contains "minimal habitat suitable for supporting a diverse number of bird species." What does "minimal" mean and who made this determination? Was it someone paid by BFI? "Minimal" still allows that there will be some impact, so what is this impact exactly? 1553

p.4-151

1. The EIR states that several raptor species have been observed foraging onsite. What will be done to prevent this? 1554

2. Why is there no reference to the prescence of coyotes and mountain lions in this area? Won't they be attracted to the waste area, bringing them closer to the housing areas? Won't they carry waste beyond the dump limits? 1555

3. Has there been a current 1997 survey to determine whether any of the wildlife are protected or endangered species? I see no evidence of this, but surely this should take place and that the EIR should not rely on old, possibly out-of-date studies? 1556

p.4-153

1.The EIR accepts that site conditions are attractive to the California Condor, an endangered species. The EIR then says that the likelihood of its prescence here is low. But surely "low" accepts that there is a possibility? What does "low" exactly mean? Who made this determination? 1557

2. Regarding the condor, the EIR states that the Condor has never been observed onsite by consulting biologists. But how long were their studies? Have they made a study recently ? I see no evidence of this and we must remember there are only 13 individuals in the current condor population. 1558

3. The EIR admits that the decline in the population of the Coastal california Gnatcatcher is attributed to the loss of coastal sage scrub habitat through development. The gnatcatcher is federally listed as threatened. Surely the dump would constitute such "development" that would threaten this species? 1559

4. The last survey on the gnatcatcher was 1995. Surely one should be done for 1997? 1560

5. Regarding table 4.4-4, the analysis of local wildlife, why is there no mention of coyotes or mountain lions , both which are frequently observed in these areas? 1561

p.4-165

1. A Golden Eagle, protected by the Federal Bald Eagle Act, was observed onsite during a previous study. Why was no extra effort made to determine whether it was nesting in this area? Surely a 1997 survey should be made to determine whether it has nested in this area? 1562

2. Thes same questions apply with respect to the White -Tailed Kite, another fully protected species? 1563

3. Why is the EIR quoting information obtained during a telephone conversation? Surely this should have been documented and validated? (re. Rick Farris conversation) 1564

p.4-146

1. If the mountain lion is a "passage Species" and "there is no evidence that wildlife use Sunshine Canyon for local or regional movement" into local mountains, then why do we frequently see lions and coyotes in this area ? Surely this information is wrong? 1565

p.4-172

1.The EIR admits that there will be a loss of animal life within the project site, upsetting the balance of the ecosystem. Will this not have a resulting effect on the ecosystem on a much larger scale causing permanent damage to the wild life population? 1566

2. By displacing the more mobile wildlife species, will animals such as coyotes and mountain lions not be forced down into housing areas? 1567

3. The EIR admits that there will be adverse indirect effects on wildlife such as the threat from increased vehicular traffic and the introduction of noise, litter, dust and other human debris into the habitat areas. Who has determined that these impacts are not significant? How did they come to this conclusion? When was this study made? What models were used in coming to this determination? 1568

p.4-174

1.What mitigation will be effected if raptor nests are removed?..These are protected under the CA Fish and Game Code. Is there a model for the success of any mitigation plans? 1569

2. When was the most recent study to see if California gnatcatchers occupy the site? 1570

3. Whose opinion is it that the impact on many species is considered "adverse, but not significant"? Is this based on a factual model or just a random opinion? 1571

p.4-178

1. It is stated that there will be no impact on any wildlife corridor, but does this take into account the attraction of food waste for predators in the area? There is no mention of this. 1572

It seems that we should make a strong effort to contact local ornithologists and Nature societies. If we 1573

could find evidence of nesting by the California Condor or the Coastal california gnatcatcher or the Golden Eagle, then it could be very, very helpful to us!!!!!!

Hope this is what you want!!

Julian Stone

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Comments on Sunshine Canyon Landfill Draft SEIR

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Senior Research Scientist in Atmospheric Chemistry
Jet Propulsion Laboratory*

Section 4.2.9 Health Risk Analysis. The entire health risk analysis as summarized in section 4.2.9 and detailed in appendix B6 is of very poor quality. It contains numerous unjustified assumptions, uses unscientific sampling methods and contains at least one serious arithmetic error which gives a value for the cancer risk which is too low by a factor of 10. This section should be completely revised using better emissions data, a much more sophisticated source-receptor model, and the results should be checked independently by SCAQMD staff. 1574

Given the poor quality of this section of the SEIR and the lack of independent detailed model verification by SCAQMD, the comment period for analysis of this section is believed to be too short. The comment period provided for future versions of the SEIR should be long enough to allow for detailed analysis of the work that has been performed by BFI. 1575

Detailed comments on this section are given below:

Comments refer to Appendix B6.

p. 2: The SCREEN2 model is not appropriate for the complex terrain in the Sunshine Canyon area. The assumption was made that the SCREEN2 results would provide a worst-case analysis which would provide an initial screening. There is no justification or reference to relevant literature upon which to base the conclusion that that SCREEN2 provides a worst-case estimate. 1576

In addition, the arithmetic error in the cancer risk calculation discussed below puts the overall cancer risk within a factor of 5 of significance which is well within the uncertainty of SCREEN2. A more sophisticated model must be used to model the complex terrain and micrometeorology encountered in the project area. 1577

The model calculations are based on flare emissions data from only one day, i.e. August 3, 1995. The use of only one day's sampling data on which to base the health risk analysis for the entire project is ludicrous and highly unscientific. It is well known that the emission rates of toxic contaminants in landfill gas is highly variable and depends on factors such as temperature, moisture, age of the fill, fill composition and a number of other factors. The sampling should have been based on a much larger number of samples (at least two per month) taken over a time period of a year or more to simulate the effect of varying soil moisture and temperature on the trace gas emission rate. The samples should be collected and analyzed by an independent testing laboratory which is not employed by BFI. These results need to be presented along with a credible statistical analysis which makes it clear what the worst-case emissions rates will be. 1578

In addition to variability in the composition of landfill gas, the test results are subject to additional uncertainties associated with sample handling and analysis procedures. There is no discussion in the SEIR of the details of the sampling procedures, i.e. type of flasks, preparation of the flasks, the chain of custody of the samples and the analytical techniques employed. 1579

*The comments expressed here are those of the author and do not reflect the opinions of the Jet Propulsion Laboratory, California Institute of Technology or NASA. This work was prepared by the author in his capacity as a resident of Granada Hills

p. 3: The meaning of the "less than" symbols for the benzyl chloride and chlorobenzene emission rates should be clarified. Does this mean that these TACs are below the detection limit? If so, the detection limits for all the TACs should be clearly stated so that the quality of the measurement techniques can be assessed. 1580

The health risk analysis does not take into consideration the emissions from the landfill which are not captured by the landfill gas system. It is well known that landfill gas recovery systems do not capture all of the landfill gas due to cracks and diffusion through the soil. These emissions are called "uncontrolled emissions" because they bypass the flare and are therefore released into the atmosphere untreated. Estimates of recovery efficiencies in the literature vary from 10-50%. If the flare combustion efficiency is 99%, then in the best case (assuming 50% recovery) then the emission rate of toxic air contaminants from the entire project will be a factor of fifty larger than the emissions rates from the flare exhaust, yet these emissions are completely ignored in the health risk analysis. Models such as BEEST-X contain area source algorithms that can estimate the increase in exposure due to these uncontrolled emissions. This is another reason why the SCREEN2 model is inappropriate for use in this project. 1581

Some of the values in Table 1 (TAC emission rates) are difficult to understand. It is assumed that the "less than" sign means that the emission rates are below the analytical detection limit. If so, why for example are the upper limits for the inlet and outlet rates for carbon tetrachloride different? If they are both below the detection limit, the values should be the same, i.e. the rate corresponding to the detection limit of the measurement. 1582

Also, how is it possible for the inlet rate for chloroform to be below the detection limit but the outlet rate to be measurable? 1583

Why are the combustion efficiencies for trichloroethylene and vinyl chloride so different from one another given that these compounds are chemically quite similar? 1584

These obvious questions detract from the credibility of the values presented in Table 1 and provide additional justification for a far more extensive sampling data base than the single set of samples provided here. 1585

p. 6: In order to estimate exposures the analysis uses a plume model called the "hybrid configuration". No justification is given for the derivation of this "hybrid configuration". It appears to be an arbitrary hand-drawn curve which lies between the "flat terrain" and "zero plume rise" models shown in Figure 1. Since the hybrid configuration curve is arbitrary, the point labelled "maximum" corresponding to the "worst-case" concentration is also arbitrary and could a factor of 10 or more larger. 1586

The use of what amounts to a completely downwind concentration profile curve shows clearly that the model employed in this analysis is far too simplistic and calls for a much more sophisticated analysis which takes into account the actual terrain and wind conditions. 1587

Table 3: There is a serious arithmetic mistake in Table 3. The formula used to calculate the downwind concentrations given in Table 3 is: 1588

Concentration ($\mu g/m^3$)=EMFAC($\mu g/s$)*(normalized plume concentration)/(normalization factor)

where EMFAC = emission rate of toxic compound from the flare stack
normalized plume concentration = .02138 $\mu g/m^3$
normalization factor = 0.001 g/s = 1000 $\mu g/s$

For benzene, for example the value derived using this formula is 1.13×10^{-4} $\mu g/m^3$ but the value in Table 3 is given as 113.4×10^{-6} $\mu g/m^3$ which is a factor of 10 smaller than the correct value. This mistake is made for every entry in Table 3. The correct value for the risk total is 1.82×10^{-7} which is a factor of 10 larger than the value in the table. While this is still below the significance level of 1×10^{-6}, it is lies sufficiently close to the significance level to trigger a much more detailed analysis. For the contractor to make an arithmetic mistake of this magnitude shows that this work has not been reviewed carefully by the contractor or the SCAQMD. 1589

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General questions regarding the Proposed Sunshine Canyon Landfill. Please respond with specificity to the following concerns: 1590

1. How will the air pollution created by the proposed Landfill impact the health of local residents?

2. Why have no epidemiological studies been done in this area? 1591

3. What will the impact of air and noise pollution have on property values in the area? How will local home owners be compensated? 1592

4. What effect will the airborne contaminates caused by the project have on the LA Water Treatment Plant off Balboa? What is the methodology used to determine impact and all supporting data? 1593

5. Why is the EIR accepted as an objective document when the preparers were hired and obviously influenced by BFI and its commercial interests? 1594

6. Why is a Landfill that will have significant negative impact on the health and well being of local residents and school children even being considered? 1595

7. Exactly who stands to profit by this landfill at the expense of Granada Hills and Sylmar residents? 1596

8. Why isn't the waste being trucked to a non-populated area far from homes and schools? 1597

Specific Comments on EIR Noise Section

1. According to Noise Ordinance No. 144,331 of the City of Los Angeles General Plan Noise Element, (as sited on page 4-206), all residential zone noise should remain within the following parameters: 50 decibels during the day (7 AM to 10 PM) and 40 decibels during the night (10 PM to 7 AM). 1598

   If the zoning for the Sunshine Canyon Landfill area is changed to heavy industrial, (as is proposed), 75 decibels will be allowed, twenty-four hours a day. Please respond to the above comment.

2. My observations are not in agreement with the statement on page 4-207, 3rd paragraph from the bottom..that "the intervening north ridge line within Sunshine Canyon and the extended distance between the project site and these receptors serve as an effective buffer and shield these units from any potential noise impacts originating from landfill operations.

   - What is the source of this assumption? 1599
   - Where is the supporting data?
   - If the assumption cannot be supported, it should be revised and impacts reassessed.

3. Has BFI officially agreed to 1 - 5 in second paragraph from bottom on page 4-205? Who will enforce and monitor this? 1600

Comments On Traffic Section

Refer to section 4.13 transportation.circulation. Page 4-346, passenger car equivalents under Traffic Generation Criteria.

The EIR states that one transfer truck has approx the same impact on normal traffic operations as three passenger cars and one curb side collection trash truck is equivalent to two passenger cars.

- My observations are not in agreement with these assumptions
- Please substantiate assumptions with concrete data or remove from EIR 1601
- Provide supporting data that shows that the assumptions apply to each of the analyzed intersections
- Comment on the fact that the impact of a truck varies depending on road and traffic conditions. EXAMPLE: Multiple trucks at an intersection or section of road can create much greater impact than an equal number of trucks evenly spaced out in traffic.
- If the assumptions cannot be fully supported by data they should be revised and the impact should be recalculated

Refer to page 4-372, table 4.13-9 (Project mitigation measures). The second paragraph. 1602

The EIR states that no specific mitigation is assured regarding the San Fernando Road at Balboa intersection. Mitigation is a required part of a project proposal, so why is this omission being overlooked or accepted?

- If there is no guarantee that the mitigation will be provided, this section should be removed. 1603

Refer to section 4.13.1 Traffic top of page 4-334

Traffic studies can't be more than two years old. This a 2 ½ year old study. Also, at the time of the May 22, 1995 study, San Fernando Road was blocked.. Normal traffic had not resumed due to earth quake damage. 1604

- Please respond to the above objection.

General Comments Regarding Traffic:

BFI is now applying for an inflow of 14,250 tpd, resulting in 4531 truck trip ends. Even if this amount is reduced by the 937 average trips at the former dump, we are left with 3594 trip ends, clearly over the Districts level of significance. This figure does not even 1605

include the employee vehicles or the additional trucks that would be used to haul away recycled material. Furthermore the SWFP allows inflow to reach 17,500 tpd without further District review. These actions point to incremental approvals, in violation of C.E.Q.A

Please respond to the above comment

Please state exactly how many transfer trucks will be used per day. (Not <u>are</u> being used, but WILL be used, if the proposed landfill is in full operation) 1606

BARBARA A. FINE CONSULTANTS

1614 Benedict Canyon Drive Beverly Hills, California 90210-2003 (310)550-0932
FAX (310)550-8682

* *Community Responses to:*
  - *Environmental Documentation*
  - *Urban and Hillside Planning*
* *Solid Waste Management and Recycling*

December 5, 1997

Hadar Plafkin, City Planner
Environmental Review Section
Office of Zoning Administrator
Department of City Planning
221 North Figueroa Street, Suite 1500
Los Angeles, California 90012-2601

RE: SUNSHINE CANYON LANDFILL EXPANSION
DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT
STATE CLEARINGHOUSE NO. 92041053
CITY OF LOS ANGELES SEIR NO. 91-0377-ZC/GPA

Dear Mr. Plafkin:

Landfill Alternatives Save Environmental Resources (LASER), which I represent, is an environmental organization based in Newhall but active throughout Los Angeles County. Together with other community groups, LASER has coordinated its review of the Draft Subsequent Environmental Report for the proposed expansion of Sunshine Canyon Landfill back into the City with the office staff of 12th District Councilmember Hal Bernson. LASER is especially indebted to Greig Smith, Chief Deputy for the Councilmember, and to David Oeffling, intern with the Council office, for their help, patience and research.

Because other community members and the 12th District Council office are also commenting on various aspects of the DSEIR, this response focuses on the proposed expansion and its impacts upon the solid waste management policies of the City of Los Angeles. Under separate cover, LASER is also commenting further on landfill alternatives and water quality. Therefore, LASER wishes to incorporate all community statements and those of the Council office into its response. In addition, these comments will include aspects of the landfill expansion which particularly impact the Granada Hills community or adjacent land uses.

I. PROJECT DESCRIPTION

A. CURRENT OPERATION WITHIN LOS ANGELES COUNTY, VIA CITY ACCESS

Sunshine Canyon Landfill is a Class III landfill accepting non-hazardous solid waste which is wholly owned and operated by Browning-Ferris Industries of California, Inc., 14747 San Fernando Road, Sylmar, California 91342. It straddles the Los Angeles City-County line, but its current operations are wholly within the County and have a permitted capacity of 16.9 million tons. Its Operating Permit was issued by the County Department of Health Services Solid Waste Management Program on November 17, 1994 and expires November 17, 1999. Its wasteshed is Countywide, but out-of-County waste has previously been taken. 1607

An amended Conditional Use and Oak Tree Permit approved by the County Board of Supervisors on November 30, 1993 will terminate whenever the County fill design level of 1885 feet mean sea level has been reached. Daily and weekly tonnage limits, however, vary according to the following complex schedule: 1608

1. A 6,600 daily net tonnage limit and a weekly net tonnage limit of 36,000 tons are in effect until the County Board of Supervisors approves a revised CUP.
2. This revised CUP is to allow 8,800 daily net tons and a weekly net tonnage limit of 48,000 tons. 1609
3. A "cap" of 9,000 tons per day of solid waste (defined as exempt waste, or asphalt, concrete, soil, rock, wood chips and green wastes, which are not to be disposed of at the working face of the landfill, but are to be otherwise used at the site or transported off for reuse; plus refuse to be landfilled) to be referred to as the Gross Tonnage Limit until such time as the City of Los Angeles has certified that various traffic improvements have been made on San Fernando Road, such as widening and/or restriping and installation of traffic signals at the landfill entrance; restriping turn lanes at the intersection of Balboa Boulevard; and installing various traffic control signs and markers. 1610
4. After the above traffic improvements have been made, the daily Gross Tonnage Limit would be allowed to reach a maximum of 17,500 tons of solid waste. 1611

With such a complex schedule for implementing daily tonnages, the question must be asked about what the present daily/weekly limit is. Further, if the improvements listed in Item 3 above are made as part of the City CUP, does that automatically allow the operator to apply to the County for permission to take in 17,500 tons per day of solid waste? 1612 1613

B. PROPOSED CITY/COUNTY EXPANSION (THE PROJECT)

A previously operating landfill within the City portion stopped accepting waste when its Operating Permit expired in September, 1991. Negotiations with the Local Enforcement Agency over a Final Cover began before then, however, and only now appear to be finalizing. This "Cover" will also serve as a partial liner for the proposed expansion within the City. 1614

BFI is proposing to come back into some 194 acres of its City land to construct a 5,000 ton per day landfill with a final elevation of 2,000 feet mean Sea Level. This is to connect with a 42-acre vacant parcel in the County which abuts the City/County line. Development of this parcel would allow another 6,000 tons per day in the County, for a total of 11,999 tons per day. 1615

The County's Conditional Use and Oak Tree Permit has predicated the use of the 42-acre parcel, in Condition 10 b. on the requirement that the City allow 1616

further development of its land. This was done in order to allow a set-aside of vacant land in the western portion of the County land for preservation of trees. If the City does not allow development to at least 20 million tons capacity, then, according to Condition 10 d., the City is to be excluded from utilizing any portion of the landfill within the County. This exclusion is to be in effect until such time as the City approves a permit. 1617

The proposed enlarged landfill would allow a daily intake of about 11,000 tons per day of waste, for a total capacity of 90 million tons. The combined landfill configuration would occupy about 451 acres in both the City and County. 1618

While BFI must receive separate approvals from the City and County, it is also seeking permission to combine landfill operations, using one working face, about 18 to 24 months after obtaining permits from the City. 1619

BFI estimates that the landfill should be operational for about 26 years, and that total grading would involve about 10,044,500 cubic yards of earth material, all of which would be utilized on site. At first, earth for daily cover would be stockpiled within the northern portion of the existing landfill, but would later be relocated as necessary. The existing access road is to be relocated to the north and east of the present winding road. Generally, it would run along the rim of the proposed eastern landfill border and stop just before entering County land. 1620

The closed portion of the existing landfill would be used to house a wood and green waste recycling facility, a public drop-off area, a tree nursery and a gas flare station. Currently, a 100,000-gallon water tank and a flare station serving the old landfill are located to its immediate south. Two additional water tanks, each with a capacity of 265,000 gallons, are proposed, for a total capacity of 630,000 gallons of on-site storage. An educational center is proposed near the present landfill entry area. 1621

Generally, the southern portion of the applicant's land within the City is bordered by O'Melveny Park and a residential area of Granada Hills. There is a 100-acre "buffer zone," in the southeastern portion of the property adjacent to some of the residences; it has a restrictive covenant limiting the use of the land to non-industrial uses, with the exception of oil drilling. A portion of the Cascades Oil Field is located there and is leased out by the applicant. 1622

II. SIMULTANEOUS PROCESSING OF EIR CERTIFICATION AND ZONE CHANGE REQUEST

Along with certification of the Subsequent Environmental Impact Report, the applicant is seeking a General Plan amendment from the current "Agricultural" land use shown in the Granada Hills-Knollwood Community Plan to a "Heavy Industrial" use. This would result in a Zone Change from A1-1-0 to M3-1-0. All previous approvals within the City were for a variance for a nonconforming use within the A1 Zone. 1623

The Planning Commission is empowered to certify environmental documentation and approve or disapprove zone change requests and General Plan Amendments simultaneously. However, the zone change request and General Plan Amendment are to be tracked separately from the SEIR; at one point they even were on a different timetable. However, the Department acceded to a request by the Council office to have both the zoning and environmental document comments due on December 5, for which LASER is appreciative. 1624

Unfortunately, the general public does not understand the nature of this "bifurcated" process, even though the recent "key group" community meeting held by the applicant supposedly attempted to explain it. Because the printed material and the presentations largely dealt with environmental issues, confusion still abounds. 1625

Therefore, LASER requests that whenever zoning matters appear in community comments to the Draft Subsequent EIR, the response from the developer's consultant, Ultrasystems Environmental, Inc., state that because the matter addresses the proposed Zone Change request, the concern is being forwarded to the Hearing Examiners to be considered in their recommendations to the Commission. In addition, the City is reminded that Section 15204 (e) of the California Environmental Quality Act states that:

> "This section shall not be used to restrict the ability of reviewers to comment on broader isssues and on the general adequacy of a document or to reject comments not focused as recommended [by CEQA]..." 1626

For the future, the dual-track process needs to be clarified and response times synchronized at the time environmental documents are distributed. The letter stating the time comments must be received by the Planning Department should state the section of the Department to which all zoning issues are to be sent.

III. COMMENTS ON THE DSEIR SHOULD BE REPRODUCED IN THEIR ENTIRETY

CEQA, Section 15132, does allow discretion in how comments and recommendations received on the draft document are to be handled, by stating they can appear in the Final EIR "either verbatim or in summary." However, it is possible when summarizing comments in order to respond to them to lose the meaning of an individual comment. Therefore, LASER requests that all comments be reproduced by Xerox in their entirety and that the consultant indicate responses by numbers which appear immediately following each letter. 1627

IV. BACKGROUND OF THE PRESENT PROPOSAL

Landfills at this time are necessarily an important part of any solid waste management program. Nonetheless, it should be remembered that they have severe, inherent environmental problems which at best can only be mitigated in part. 1628

The greatest environmental danger from landfills comes from the amount of air pollution they produce. Recent studies by the National Aeronautics and Space Administration identified the composition of "greenhouse gas" in part to be 55 percent carbon dioxide and 15 percent methane. Methane usually comprises more than half the components of landfill gas and carbon dioxide almost as much. It is not surprising, therefore, that landfills rank sixth in the creation of greenhouse gases (*MSW Management*, December, 1994). 1629

A. FULL EXTENT OF SUNSHINE CANYON LANDFILL PROPOSAL

The proposal for Sunshine Canyon Landfill expansion, for 5,000 tons per day in the City portion, cannot be separated from what the County is allowing and in fact encouraging by its 1993 Conditional Use Permit and the Solid Waste Facilities Permit of 1995. The County portion of the landfill has a maximum 1,885 foot mean sea level elevation, but ultimately will allow 17,500 tons per day of rubbish and other material, including green waste, to enter. 1630

If the City grants in full the tonnage Browning-Ferris Industries is requesting, then Sunshine Canyon Landfill would be permitted to accept 22,500 tons per day. 1631

Further, because the proposed City expansion proposes to extend to a 2,000 foot mean sea level elevation, there is little doubt that the proponent would soon be requesting the County to allow a similar rise in elevation within its jurisdiction. 1632

Thus it should be realized that Sunshine Canyon Landfill would allow more daily tonnage than the projects now being planned for remote desert areas. These landfills would accept no more than 20,000 tons per day, although they each would have enough total capacity to last between 50 and 100 years. 1633

Make no mistake: Browning-Ferris Industries and Los Angeles County intend for Sunshine Canyon to be a large, regional landfill. And, lest we forget, all material to be dumped or used on site can only enter through a City access road, off San Fernando Road, which is also within the City limits. 1634

B. ARRANGEMENTS COVERED BY SETTLEMENT AGREEMENTS

The existing landfill area within the City was closed in 1991 when its permits expired. Browning-Ferris Industries next applied to the County for landfilling within the County; its plan was similar to what is now being proposed for the County-City landfill. Access was to be through the City. Litigation by both the City and a Granada Hills community group to prevent use of the City access followed. The City action resulted in two tri-party settlements. 1635

1. AGREEMENT I. Signed in 1994, the first agreement provided for Browning-Ferris Industries to compensate Los Angeles for the problems associated with having a landfill at its borders. BFI agreed to contribute a sum totalling $4,500,000 into the General Fund and into a Trust Fund for community improvements, starting 90 days after disposal operations began in the County. (These 1636

operations began in July, 1996.) Payments would be completed into the Trust Fund in 1999.

In addition, BFI agreed to pay $1,100,000 for a "City environmental program," which would also begin with the onset of County landfill operations. These monies would be paid into the City's Environmental Affairs Fund; for the first five years payments would be $55,000 per year, followed by a ten-year period of payments in the amount of $82,500 per year. The environmental fund would be for the creation and expansion of riparian and wetland habitat, and oak and other native plant restoration activities, as well as recycling activities and public information. 1637

In this regard, it should be noted that the County landfill, located in upper Sunshine Canyon, destroyed about 8,500 oak trees and many other varieties as well. For this reason, BFI also agreed to donate 500 oak trees for replanting by the City, provided that the City foot the cost for planting and in turn agreed to a careful monitoring program. 1638

In return, the City agreed "to expeditiously process BFI's application" for a Zone Variance for an access road through the applicant's land within the City to the County. BFI also agreed to careful [illegible]s on its landfill liner in the County, and to request the County to remove the restriction against the City using the County landfill. 1639

2. AGREEMENT II. Signed on December 8, 1995, this agreement provided for ministerial processing of permits for the access road after the Zoning Administrator granted the Zone Variance allowing a non-conforming use within the A1 Zone. BFI was also granted the consideration of "Parcel B for future alignment of the access roadway. 1640

BFI additionally agreed not to accept any out-of-County waste for 90 months (7 1/2 years) following the opening of the County portion of the landfill, provided that the City agreed to dispose "not less" than an average of 1,250 tons per day of municipal solid waste. This would allow the City to pay a special low rate of $16.00 per ton plus tax tipping fee during the same period, which could increase annually only as much as the Consumer Price Index, but not more than three percent per year. If the City wishes to dump more waste, in excess of 2,500 tons per day, it would pay the lowest tipping fee BFI charges to its larger contract clients. This is the price that will also prevail if the City wishes to continue using the landfill after 90 months. 1641

This Agreement also modified the payment schedule for BFI's contribution to the City's environmental fund. The present agreement is for an initial payment of $550,000 within three months of County landfill operations beginning, plus $27,500 per year for the first five years. For the next 10 years, the payments will be $41,250 per year. It should be noted that some of this funding and oak trees have recently been used for a restoration project within the Arroyo Seco. 1642

It should be noted that other than agreeing to consider the relocation of the present access road to County land, the City has no legal obligation to approve the present proposal for a 5,000 ton per day expansion of the BFI landfill within the City portion of the proponent's land. 1643

V. WHY THE NECESSITY FOR A 22,500 TON PER DAY LANDFILL ABOVE GRANADA HILLS

Condition 10 (b) of the County's Permit, stating that BFI cannot use the 42 acres of land between the existing landfill unless the City also allows landfilling once again on the BFI land within its jurisdiction, is supposed to have been imposed in order to save the trees within East Canyon, which would become a protected area. However, the County itself removed the status of its own Significant Ecological Area No. 20 from much of these lands in order to permit the existing landfill. 1644

Therefore, it may be concluded that other matters are fueling the desire to create a major regional landfill capable of receiving 22,500 tons of waste and "exempt" materials per day on land that is adjacent to O'Melveny Park in the City and close by single-family residences. 1645

A. LOS ANGELES COUNTY COUNTYWIDE SITING ELEMENT

The Draft Subsequent Environmental Impact Report does include information on the Los Angeles County *Countywide Siting Element*, taking information from the January, 1996 Preliminary Draft. This document, while presenting data on landfill capacities, states that it is County policy to have excess daily disposal capacity equivalent to the largest daily tonnage permitted within the County. To date, this is the Puente Hills Landfill, which is permitted through 2004 for a daily limit of 13,200 tons. No municipally collected refuse from the City is accepted at this landfill, although some may inadvertently come from transfer stations. The *Siting Element* shows that in 1995, an average of 10,341 tpd were being deposited at Puente Hills (Table 3-1). 1646

The County also defines a "garbage crisis" as existing when there is "...a comparison of the projected date of daily permitted disposal capacity shortfall with the date additional daily capacity can be permitted." (*Siting Element*, page 4-18.) By County definition, we will be in a "garbage crisis" by 1999 (Table 4-5). However, because a number of landfills have closed since the date of the draft document, it is safe to say that the County now considers itself in a garbage crisis. 1647

Within the City's sphere of landfills, Lopez Canyon Landfill, the last City owned and operated landfill, closed in July, 1996--just as the County portion of Sunshine Canyon Lnadfill was opening. Mission-Rustic-Sullivan Landfill and Towsley have been removed from consideration. Land for the Elsmere Canyon landfill is now also owned by BFI and its future as a landfill is in doubt. Only Chiquita Canyon Landfill in Newhall is open and has recently been permit- 1648

ted for twice its 1995 daily tonnage, going from about 5,000 tpd to 10,000 tpd. In the Northwest County area, only Sunshine and Chiquita are operational.

B. NORTHWESTERN COUNTY PROJECTED GROWTH: FATAL FLAW OF THE SDEIR

While the Draft SEIR does discuss the *Countywide Siting Element*, it remains totally silent on a critical issue: approved and proposed new development in Santa Clarita and the Newhall Ranch and Land Company. No figures for growth are mentioned, nor is the increase in the area's waste stream caused by this growth. Consequently, the traffic analysis contained in the SDEIR does not disclose this projected increase, much of it to be in place well before the end of the 26-year lifespan of the proposed City-County landfill in Sunshine Canyon. 1649 1650

David Oeffling, intern for Councilmember Hal Bernson, was requested to research this information. His information determined that about 40,000 additional dwelling units have been approved by the City of Santa Clarita within the past several years, some of them not far from Elsmere Canyon. The proposed development of the Newhall Ranch land is to include about 24,000 dwelling units. This means that between them the Chiquita and Sunshine Canyon Landfills, as the only two landfills in the Northwestern County area, will need to accomodate about 64,000 additional dwelling units plus the commercial development they will require. Industrial development is also occurring in this area. 1651 1652

In what may be described as the fatal flaw of the Subsequent Draft EIR, the failure to disclose or analyze the impacts of this additional development means that there are inadequacies in discussing many of the environmental impacts as they pertain to the expansion of the Sunshine Canyon Landfill. 1653

1. WASTE STREAM ANALYSIS REQUESTED. The proponent is requested to provide an analysis of the existing waste stream for the City of Santa Clarita. Within the unincorporated County area, the communities of Val Verde, Castaic Junction, Stevenson Ranch, Del Valle, and the Newhall Ranch need to be analyzed as well. All approved growth and proposed development needs to be listed and discussed in terms of its waste stream. 1654 1655

2. TRAFFIC ANALYSIS OF THE I-5 FREEWAY. The traffic study by Linscott, Law and Greenspan analyzes only intersections which, with one or two exceptions, includes only the City of Los Angeles. However, the Golden State Freeway contains most of the traffic from these areas southbound to and from the City. Its present Level of Service during peak periods and the impact from the projected development need to be analyzed and included in the SEIR. The California Department of Transportation (CalTrans) should be able to provide these figures. Also, the present and future traffic along The Old Road between the Stevenson Ranch and the Sierra Highway should be analyzed, because together these two roads are the only routes through the San Fernando Pass. Not until these figures are provided for future ambient conditions can there be a true analsyis of the landfill traffic. 1656 1657 1658 1659

3. EMERGENCY FIRE RESPONSE FROM COUNTY AREAS. The SEIR should take into account the projected growth from the North County area as it discusses the adequacy of fire and emergency medical response times from relief facilities in Santa Clarita. The SDEIR, pages 4-391 and 4-392 refer to Los Angeles County Fire Station No. 124 on Pico Canyon Road in Valencia, which is able to provide backup fire and paramedic relief. This is about 6 miles from Sunshine Canyon Landfill. According to the SDEIR, response time is about 4 to 5 minutes. 1660 1661

County Fire Station 73 on North San Fernando Road in Newhall, about 6.25 miles from the landfill, has a response time of about 11 minutes. Fire Station 76 on Henry Mayo Drive in Valencia has easy access to the divided expressway State Route 126, which is close to the I-5. In addition to fire fighting capability, it maintains a 5-person hazardous materials squad. It is about 11 miles from the landfill, and its present response time is about 10 minutes, according to the SDEIR, page 4-392. 1662 1663

However, a glance at *The Thomas Guide* for Los Angeles County, shows that in addition to serving Santa Clarita, all these stations are also needed for the nearby Six Flags Magic Mountain recreation facility. Are additional fire and paramedic stations needed to serve the expected growth in the area? Will they be able to continue serving the landfill with the same response times? 1664

It is clear from the above discussion that it is the projected growth for the immediate area of the County that is fueling the need for a large, regional landfill. The *Countywide Siting Element* contains a largely theoretical analysis of County-wide landfill capacities, as well as County-wide projections of the solid waste stream. The reality, however, is that most of the growth within the County is occurring in the Northwestern County area—precisely the area to be serviced by Chiquita and Sunshine Canyon Landfills. Failure to consider this aspect of future needs means the Draft SEIR is grossly inadequate. 1665

VI. BACKGROUND: STATUS OF CITY'S SOLID WASTE PROGRAMS

A. SOLID WASTE STREAM ANALYSIS

1. 1990 BASE YEAR FIGURES. According to the 1994 City of Los Angeles *Solid Waste Management Policy Plan*, in 1990, the City's total waste stream was officially estimated to have been about 4,782,761 tons. Known as the "Base Year Figure," this is the amount from which all else must be calculated for the purpose of the State's Integrated Waste Management Act of 1989, referred to as "AB 939." By 1995, about 25 percent of this figure was to have been diverted from landfills, and by the year 2000 fully 50 percent is to be diverted. Failure to achieve these diversion rates can result in fines by the California Integrated Waste Management Board of up to $10,000 per day. (To date, no fines 1666

have been levied by the State Board.) AB 939 is the State's basic recycling law, enacted by the Legislature in response to a perceived national and State shortage of landfill space.

It has since been recognized that the "landfill crisis" was one of cost rather than a true lack of space, especially in the East, where landfill tipping fees in excess of $100 per ton were thought to be conceivable. It is as well a crisis of "permitted" landfill space, because landfills are universally acknowledged to be a "Locally Undesireable Land Use" and thereby difficult to site. Here in Southern California, tipping fees now range from just over $20 per ton to more than $30. 1667

The Solid Waste Management Policy Plan breaks down the Base Year Figure further: Of the 4,782,761 tons comprising the total City-generated waste stream, about 3,798,662 tons of solid waste were disposed in permitted landfills, corresponding to approximately 12,000 tons per day. Of this amount, about 40.1 percent was collected by the Bureau of Sanitation, and comprised both the residential curbside collection from 720,000 single-family houses and small apartments under five units, as well as material from City departments. 1668

About 984,099 tons were diverted from landfills, discounting "inerts" such as asphalt, biosolids (sewage sludge), and scrap metals. This amounted to about 20.1 percent of the waste stream being diverted. The relatively small, privately collected industrial sector led the way in recycling; 59.3 percent of its waste stream was diverted. The privately-collected commercial sector recycled about 20.7 percent. About 130 haulers were involved in private collection. The City-collected waste recycled but 9.9 percent because the curbside recycling program was still in its pilot stage at this time, with but 19,000 tons being diverted. 1669

2. 1995 WASTE STREAM FIGURES. According to the Draft *Annual Update*, at present being approved by the City, the largest change in reporting diversion rates in 1995 was that the responsibility shifted from cities to counties. Counties are allowed to report data based on landfill disposal figures. 1670

The City of Los Angeles, however, elected to continue its previous calculations because it believed the knowledge gained from the results would allow its excellent tracking record of targeted materials and industries to remain focused and subject to rigorous monitoring. The County has objected to this, but as of this date the CIWMB is accepting the City's calculations. In actuality, the County's disposal figures differed by only 0.3 percent, according to the Draft *Annual Report*, page 1-5. 1671

The City's calculations showed that some 3,365,000 tons of the total 5,854,372 generated tons were disposed of at landfills in 1995, down about 11 percent from 1990 (page 1-4). Thus, even though the total generated waste stream was up by 18 percent from 1990, the City showed a reduction in diversion. 1672

The most prevalent materials disposed in landfills Citywide were food and paper goods of all kinds, especially kraft and "remainder" paper. Unlike 1990, yard trimmings were greatly diminished in quantity, because these were an early "targeted" material by the City's Integrated Solid Waste Management Office. 1673

Private haulers, in 1995 numbering close to 150, disposed of 54 percent of the City's waste stream, about the same as in 1990. Their disposal quantities decreased from 2.08 million tons in 1990 to 1.81 million tons in 1995, a decrease of 13 percent, according to the *Annual Report*, page 1-5. Self-hauled waste to landfills was estimated by gate surveys at landfills to comprise about 10 percent of the total disposed tonnage (page 1-7). 1674

Various City agencies controlled only 39.5 percent of the total disposed waste, lower than the 44.6 percent tallied in 1990. The decrease is believed to be due to extensive recycling efforts. 1675

3. EFFORTS SINCE 1995. The City is making extensive efforts, as a result of the numbers found in the 1995 *Annual Report*, to target City government-generated waste and through ordinances to have various departments purchase recycled materials. Extremely little yard waste is delivered to landfills from the City's separate automated yard waste collection, except from contaminated containers or other special situations. This is because the City has adopted a policy of re-use for all such waste. In February of this year, the BOS reported that 98 percent of all yard trimmings were being recycled, mostly as part of an out-of-town composting program. The materials are first dropped off at wood chipping facilities and then transported to the facilities. Some is being done at a Valley composting facility. 1676 1677

Food waste composting programs are being instituted in the Downtown Produce Mart, according to the ISWMO. A two-year Citywide automated "blue bin" recycling program has recently begun in the West San Fernando Valley, replacing the complex "yellow bin" semi-automated program. It is hoped this single-stream recycling program will make it easier to recycle all clean paper and other materials, which under the old program had resulted in low rates of recycling of about 7 percent, according to the Bureau of Sanitation. Even the West Valley and the Westside, the two highest recycling areas of the City, had recycling rates of about 11 to 14 percent in 1996. 1678

Nonetheless, the City has concluded that it has achieved an AB 939 diversion rate of 44.5 percent in 1995. All earthquake debris has been excluded from this figure. However, the City's debris removal program recycling rates were so successful that the State has used it as a model for similar disaster planning. The City collected over 1 million tons of earthquake debris; it disposed of 330,890 tons and recycled 785,727 tons under special contracts. Unfortunately, according to the *Annual Report*, the construction industry did not continue its recycling practices when allowed to revert back to free market conditions. More effort is needed in this area. 1679

B. LANDFILL DISPOSAL STATUS

Since the publication of the *Countywide Siting Element* and the completion of calculations for the City's AB 939 waste generation figures for the *Annual Report* for 1995, conditions for disposal of Los Angeles's solid waste have changed dramatically. Lopez Canyon Landfill, the last City owned and operated landfill, closed in July, 1996 as the County portion of Sunshine Canyon Landfill was beginning its operations. 1680

While the amount of material being taken to landfills is generally less than it was a few years ago, the City now has contracts with two privately owned landfills: Bradley West, owned and operated by Waste Management, is under contract to the City through 2001. The City has contracted through 1999 with BFI to accept about 1,250 tons per day, as per the tri-party Agreements. According to the Bureau of Sanitation, about 1,000 tons per day are going to Sunshine. The West Valley and West Los Angeles west of the 405 Freeway are sending their trash to Calabasas Landfill, because it is within its stipulated wasteshed. The old BKK landfill closed in September, 1997, and waste going to this landfill, from about 3,500 to 4,250 tons per month, is now being divided between the other three. 1681

As of June, Sunshine was receiving about 24,657 tons per month direct haul. Some material from the BLT transfer station in Downtown Los Angeles was also transported to Sunshine, but most went to Bradley West. In June, that landfill received about 9,130 tons direct haul. BLT received 33,165 tons. Calabasas received about 2,400 tons to 3,700 tons per month direct haul. 1682

Through June, 1997, according to BOS reports, the City disposed a total of 437,911 tons at landfills. That roughly corresponds to an annual rate of 875,822 tons. It should be noted that at present, because of contractual arrangements, Bradley West is receiving most of the transfer trailers, while Sunshine is receiving most of the direct hauled material. 1683

C. PROGRAMS FOR THE FUTURE

In addition to the AB 939 goal of achieving a 50 percent reduction of the 1990 waste stream diversions, which the City in 1995 was well on the way towards achieving, the City's *Solid Waste Management Policy Plan* sets a further goal: a 70 percent reduction by the year 2020. To achieve this, in light of the fact that by that time the total amount of solid waste generated within the City will most likely be higher than it is now, will take considerable effort. The 18 percent rise in the total waste stream evidenced in 1995 is just an example which will keep repeating. 1684

Having available a close, inexpensive landfill will, of course deflect the City from this goal. The City's massive investment in its residential recycling program will be lost if too much capacity is made available. Yet, there is a 1685

place for landfilling in the City's future. Not all materials can be re-used, and the City's natural population increase and rise in business activity assures higher generation rates. Future programs must, therefore, focus on Citywide source reduction as well as landfill diversion. Until then, the Bureau of Sanitation is looking at three programs:

1. SHORT-TERM: THREE TO FIVE YEARS. Within the next six months, the Bureau will be sending out Requests for Proposals for an unlimited timeframe in order to develop a new landfill disposal program. The RFP will be sent to government entities and private waste haulers alike. Only landfills that are permitted and operating will be considered as final disposal sites. 1686

2. MEDIUM-TERM: FIVE YEARS . The Bureau is currently seeking to upgrade its District Yards at a cost of $19 million. More importantly, the BOS is seeking to purchase two sites, the existing BLT Transfer Station in Downtown Los Angeles, at a cost of $261 million, and a new site adjacent to Bradley West in the East Valley for $231 million. Both would become City-owned transfer stations and/or partial Materials Recovery Facilities. The savings over the present use of privately owned facilities is claimed to be $208 million. The plus side is that the City would then be able to exercise more control over disposal and recycling; the down side of this is that it is almost a one-half *billion* dollar program. 1687

3. LONG-TERM: FIVE YEAR PLUS. Two programs are planned. The first is to award an RFP for alternative disposal programs. As a result of the closure of Lopez Canyon Landfill in 1996, the City believes it needs to seek out innovative technologies to landfilling. However, the reality is setting in as it now seeks to award the RFP. The technologies are not fully tested for large-scale municipal solid waste, or they involve the use of yard trimmings, which are not now sent to landfills. Then too, their size is about 100 tpd, which would be equivalent to the amount now sent to a small landfill. 1688

4. LONG-TERM: Another RFP for landfill disposal, this time perhaps to include rail long-haul to desert areas of the State. The problems are the reliability of the railroad and the cost of transportation added to the tipping fee and possible County host fee. 1689

VII. THE SDEIR IN LIGHT OF THE CITY'S PLANS

Two areas of the SDEIR are of particular concern to LASER in light of the City's plans and the previous discussions of this response. The first is the traffic study and the second is the totally unrealistic discussion of alternatives. 1690

A. SDEIR TRAFFIC STUDY

1. Outdated Traffic Studies. Because this document has been held in abeyance, 1691

traffic projections for future construction within the City and for the impact the landfill expansion proposal would have on them appear to be outdated. 1995 is the year given for "Existing Conditions" and 1998 for Conditions at the time the project comes on line. The problem with this timeframe is that it is now almost 1998 and the project is nowhere near ready to come on line. Table 4.13.3 and 4.13.7 are specifically referenced. LASER requests that these tables be updated to 1998.

Considering that this is a landfill to be operational for 26 years, these are totally inadequate. A minimum spread of five years would be more in keeping with the landfill development. It takes a long time to move over 10 million cubic yards of earth, even if it is on site. At what date would the City portion plus the 42 acres in the County become operational if construction begins in 1999—a likely scenario, if over-optimistic. The date operation begins is the date that traffic projections should be considering, not a date that is upon us as the response period of the Draft document ends. 1692

2. Ambient Growth Rate. Linscott, Law and Greenspan reports in both volumes refer to a one percent ambient growth rate within the City for their projections. The full report in the Appendices mentions an additional equation in conjunction with the one percent rate. Yet, according to Allyn Rifkin of the Los Angeles Department of Transportation, the Department has for years used 2 percent as its ambient annual growth rate. 1693

Linscott, Law and Greenspan used this 2 percent rate for its traffic study of the proposed Constellation Place office tower in Century City (DEIR Appendix, page 49 of the traffic study.) This was in October, 1996. The traffic study for the Draft EIR for the Elsmere Solid Waste Management Facility, prepared in January, 1995 by Dames and Moore, states plainly that, using CalTrans calculations, a 3.7 ambient growth rate was used in its study (Volume I, page 13-8). 1694

In addition, the City is reminded that the County Department of Public Works is at the very least a Responsible Agency under CEQA. It must be forthcoming with the additional information requested earlier in this response on future growth and development within the Northwestern County area. 1695

B. PROJECT ALTERNATIVES

It is most unfortunate that the discussion of project alternatives, with the exception of the "No Project" and the "Reduced Volume" alternative—although this is problematic—has almost nothing to do with the reality of proposed City programs. The City is intending to issue an RFP not for a specific landfill, but most likely for a private hauler to take the trash to whatever existing landfill or landfills have space to accomodate the City. By overlying on the County's theoretical discussion of landfills in its *Siting Element*, an inaccurate picture is presented. It should be remembered that the City will be requiring the the landfill or landfills be fully permitted and operational. The hauler will bear the responsibility of determining which landfill to use. 1696

A check with Southern California landfills is a better way to determine what is presently available as an alternative. In the first place, no rail long haul landfill in California is fully permitted and operational at this time. The Mesquite landfill project, operated by U.S.A. Waste, is perhaps the closest to coming on line, but it will not qualify for discussion in any RFP the City sends out within the next few months. La Paz Landfill in Arizona is owned and operated by the applicant. It would only be an alternative if Sunshine Canyon is not available to the City. However, considering the legal issues binding the City to Sunshine, this is unlikely to occur for the foreseeable future. 1697

El Sobrante Landfill in Riverside County, owned and operated by U.S.A. Waste, has yet to receive permission to expand, although the County expects a decision by June, 1998. If this occurs, then U.S.A. Waste will determine the terms of disposal, which must include a host fee. Only U.S.A. vehicles will be allowed to enter the landfill with out-of-County trash. 1698

Chiquita Canyon Landfill has recently been allowed to expand from about 5,000 tpd to 10,000 tpd. It too is owned and operated by U.S.A. Waste at this time. This landfill has conveniently been "overlooked" in the discussion of alternatives; however, if U.S.A. Waste does respond to the City's RFP, this is the likely short-term landfill it will propose. 1699

Orange County has two landfills which also may be considered. Olinda is the closest, especially to the BLT transfer station. However, there is currently a problem with access through Brea, according to the County. It is served by various private haulers. The Frank M. Bowerman landfill in Bee Canyon near the El Toro Airbase is also available under the same terms. Tipping fees are in the low twenty-dollar per ton range. Neither of these are mentioned as alternatives, although they are likely candidates for an RFP response. 1700

Alternate technologies and strategies are not at this time true alternatives to Sunshine as proposed. The use of Alternate Daily Cover materials is not an "alternative" to a landfill. The City is proud of its present policy of not sending any Yard Trimmings to landfills, not for disposal, and not for "exposed disposal" as ADC. The use of foam or old, chipped tires for ADC has not been proven to be environmentally sound, even though allowed by the CIWMB. LASER opposes the use of ADC, with the possible use of tarps in conjunction with frequent cover soil applications. The City and the County disagree once again on this policy. With the present rate of diversion in Los Angeles, it does not need this excuse to artifically inflate its figures. 1701

Blind Canyon and Elsmere may still appear in the *Countywide Siting Element*, but they are remote possibilities at this time. 1702

VIII. ADDITIONAL CONCERNS

The question of whether to allow the project as proposed has been answered. The close proximity of the landfill to sensitive areas such as a park and 1703

single-family residential areas must be taken into account. The Granada Hills community has borne the brunt of this landfill for many years. The answers for the City portion are clear; it is not the responsibility of the City to accept the severe negative impacts of landfill dust on frequent windy days, nor of greenhouse gases, nor of high traffic counts, nor of decreased property values that come from having to disclose the landfill's existence, in order to accomodate the high rate of North County growth and its impacts on solid waste generation. That responsibility lies squarely with the County. If landfill space cannot be found then either growth must be controlled or alternatives must be found which are environmentally sound. LASER believes landfills and people simply do not mix.

The needs of the City with regard to landfill space are seen with the present rate of disposal. Permitting a 5,000 tpd landfill when then City has little need for such disposal would be harmful to the interests of the City. It would discourage competition, which is vital if a monopoly on waste disposal is to be avoided. Alternatives to landfills can never develop unless the economics of the marketplace will allow them. Keeping the tipping fees low to entice the City discourages their development, and discourages recycling and source reduction as well. 1704

As has been shown earlier in this response, this is not merely a request for a 5,000 tpd facility—or of even an 11,000 tpd facility, as BFI would have us believe. Rather, approving the project as proposed is in reality allowing a facility of up to 22,500 tpd. If the applicant has made, or is about to make, the required traffic improvements along San Fernando Road, this can become a reality. Therefore, BFI is requested to clarify where it stands on the status of these traffic improvements. 1705 1706

Landfill Alternatives Save Environmental Resources (LASER) appreciates this opportunity to respond.

Respectfully submitted,

Barbara A. Fine

Barbara A. Fine

cc: Lynne A. Plambeck, President, LASER
The Honorable Hal Bernson, Councilmember, 12th District

December 4, 1997

Attn: Hadar Plafkin, City Planner
Los Angeles City Planning Department
Environmental Review Section
221 North Figueroa Street, 15th Floor
Los Angeles, CA 90012-2601

Dear Mr. Plafkin,

Comments regarding Sunshine Canyon Landfill
Draft SEIR 91-0377-ZC/GPA

I am a resident adjacent to the proposed extension into the City of Los Angeles of the Sunshine Canyon Landfill Project. I am writing to comment on the SEIR and oppose the project. 1707

Browning Ferris Industries owns property within Los Angeles County called the East Canyon Dedication Area that is already zoned for the expansion of landfill activities and I feel that it is unnecessary to change the Open Space zoning to allow the proposed landfill to come within 2500 feet of our homes. I bought my property in June 1990 based on the knowledge that the landfill would soon be closing and moving further west into the county area. I feel that it is unfair to expect the residents to accept the Open Space zoning to be changed just so BFI can make more money. 1708

By the Granada Hills-Knollwood Community Plan this property is zoned Open Space which is to "be preserved and conserved from encroachment by inconsistent uses" refer to page 4-230. I can't think of a more inconsistent use than heavy industrial which is being requested. This area was declared Open Space in an agreement with the City of Los Angeles when they operated from 1966 to 1991. On page 4-249 of their SEIR they admit they are creating land use conflicts with the residential use in the area. 1709

We all can understand the need for landfill sites, BFI has planned to continue landfill operations into the County area. They own additional property which is not being proposed to be used in this 25 year plan. One of the reasons they say they do not want to expand into the 215 acre East Canyon Dedication Area is that it would require removal of 1383 oaks trees, yet in their attachment they would be removing 865 oak trees which they claim they already have a permit for. How did they get a permit to remove oak tress in Open Space ? 1710 1711

We live in an area that is extremely windy. I am very concerned that they are proposing to alter the elevation of the Open Space area from the current 1450 feet to 2000 feet elevation. This would make the 192 acres in the City almost the same elevation as the ridge line. I feel this will greatly alter the wind patterns that come from the north. Now the ridge acts as a wall to block the wind, with them filling this area up it will direct all of the wind over the ridge. On page 4-47 of their SEIR they greatly miss discussing the heavy wind speeds in our area. They generalize with a discussion of the wind throughout the City. They claim the wind only blows from 11 am to 5 pm and admit that the measurement of 45 mph for one hour does not include high Santa Ana conditions ! 1712 1713

So what is the maximum wind speeds they have seen ? They claim to measure it and also admit that several times a year they have to shut down due to heavy winds. Why did they arbitrarily use 45 mph ? How is their operations contributing to the dust in our area ? 1714 1715

On the EIR Summary Sheet and page 1-7 they admit that there are unavoidable adverse impacts due to the dust in the area. There will also be exposure to odors from the landfill and "noise levels adversely impacting adjacent residential areas". Yet they claim this will not affect our property value. 1716 1717 1718

On page 6 of the addendum they state "since the landfill is situated away from major population centers on the City, there are limited environmental impacts upon Los Angeles residents". We are residents of Los Angeles adjacent to this project and they admit we will be adversely affected. Maybe we are a small percentage when you look at the total population of Los Angeles. What if the "limited environmental impacts" are severe to the immediate area. It appears that the adjacent residents are being considered insignificant. 1719 1720

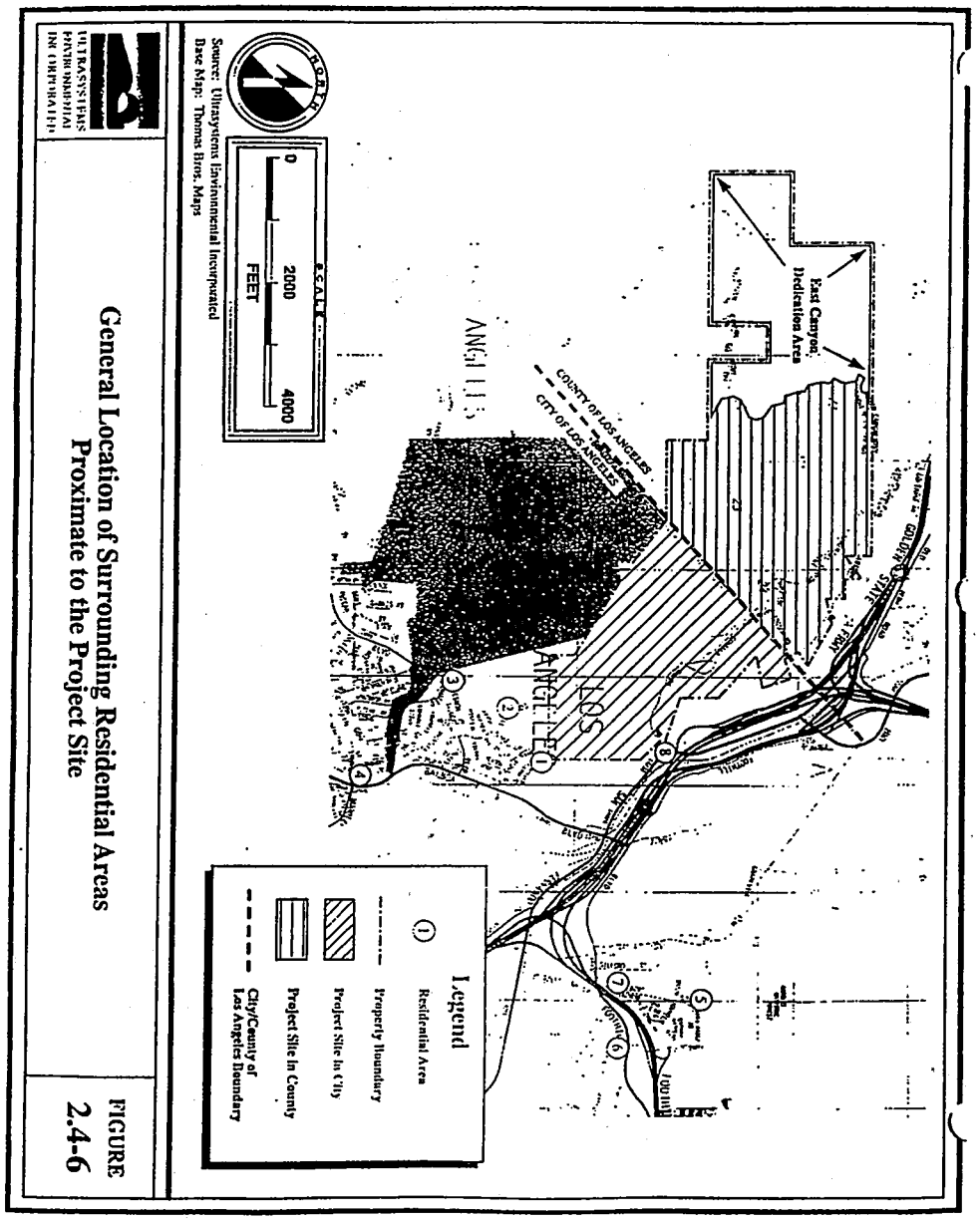
On the same page 6 they state that since this has been a landfill for over 30 years it is ideally suited to continue. Well in 1966 they promised to close in 1991 which allowed for residential expansion adjacent to their property. When is it enough ? 1721

My concern is who verifies the data in the SEIR ? What is the maximum wind speeds they have recorded ? They have conflicting statements regarding the affects on nearby residents. We will be greatly affected and they are trying to gloss it over to get approval. I am recommending that they get approval to expand only in the County area, which is further away from our homes. 1722 ↓ 1724

Sincerely,

Charlotte Rodrigues

Charlotte Rodrigues
13301 Constable Avenue
Granada Hills, CA 91344
(818) 831-9353



General Location of Surrounding Residential Areas
Proximate to the Project Site

FIGURE 2.4-6

Mountains to the north, the Chatsworth-Porter Ranch District to the west, and the Golden State (I-5) and San Diego (I-405) Freeways to the east.[139]

Thirty-five community plans comprise the Land Use Element of the City General Plan. The Granada Hills-Knollwood Community Plan (community plan) is one of those plans. It guides future development of the CPA and promotes an arrangement of land use, circulation, and public services intended to contribute to the economic, social, and physical well-being of community residents. A comprehensive amendment to the plan was approved by the City in July 1996. Subsequent amendments to the Los Angeles Municipal Code (LAMC), as a result of plan revisions, were incorporated as Ordinance No. 171,182. Current plan amendments are designed to protect single-family neighborhoods and provide updated planning policies and practices, protect hillside areas, and ensure adequate transportation and circulation in the CPA. Prior plan updates occurred in November 1974 and August 1987. Those revisions were a result of A.B. 283, which is the General Plan Zoning Consistency Program.[140]

Figure 4.7-2 depicts existing land use designations on the project site and on surrounding areas. The project site in the City is designated "Open Space." The following standards and criteria apply to that designation for privately owned land:

> The Open Space designation for privately owned land is to protect and preserve natural resources and natural features of the environment, such as wildlife refuge and preservation areas; to encourage the management of private lands in a manner which protects the environmental characteristics; and to conserve large parcels which are essentially unimproved. The A1-1 Zone is the intended corresponding zone for privately owned property.[141]

The Granada Hills-Knollwood Community Plan also indicates that

> Open Space areas be preserved and conserved from encroachment by inconsistent uses. Natural waterways should be preserved and maintained as natural open space whenever possible. A buffer zone should support native vegetation and be at least 100 feet from the top of the channel bank. Trails should be designated to be outside this buffer zone as much as possible. Access within these areas should prohibit off-road vehicles and motor bikes by fencing.[142]

The plan's land use map includes the following footnote regarding the project site:

> Under Case No. ZA-17804 (Zone Variance) approved April 18, 1966, the site was granted a variance to permit the continued operation of the dump facilities based upon certain terms

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[139]/ *Granada Hills-Knollwood Community Plan*, City of Los Angeles, Department of Planning, p. 1. Adopted by the City Council on July 10, 1996.

[140]/ Ibid., p. 6. and Planning and Land Use Management Committee Report to the City Council. Approved on July 10, 1996.

[141]/ *Granada Hills-Knollwood Community Plan*, op. cit., p. 15.

[142]/ Ibid., p. 16.

ATTACHMENT

II.F. The information utilized was obtained from the Oak Tree Report prepared for the Sunshine Canyon Landfill Extension FEIR, located in the City and County of Los Angeles.

Approximately 865 existing Coastal Live Oaks would be removed from the proposed project site. The trunk diameters would consist of the following estimated averages, in percentage form:

less than 12"	37%
12" - 18"	48%
18" - 24"	11%
24" - 36"	3%
greater than 36"	>1%

The removal of the 865 Coastal Live Oaks was based upon the oak tree sampling prepared for the FEIR County Oak Tree Report.

II.G. The number of trees being removed from the project site would be counted at a later date and subsequently located and plotted on a Plot Plan Map. Actual numbers plotted would be based upon a 100% inventory. In addition, appropriate mitigation measures would be developed based upon actual tree removal.

During project implementation, all trees would be counted during the year that they are removed; furthermore, oak tree removal would follow the requirements of the Oak Tree Ordinance No. 153,478 of the City. In addition, the project proponent is proposing to replace oak trees on a 2:1 ratio and implement both an oak tree monitoring and management program.

Table 1.6-1
ESAC'S DETERMINATION REQUIREMENTS

Environmental Topical Issue(s)	Potential Area(s) of Impact/Concern
Earth (Grading, Drainage, and Geologic Hazards)	• The proposed project is located within the boundaries of a hillside study area with possible impacts occurring due to grading and alteration of onsite drainage. • The proposed project is proximal to potentially active fault zones and may be subject to unstable earth conditions and other seismic-related hazards.
Air (Air Quality-Stationary Sources)	• Project development may result in deterioration of ambient air quality due to short-term emissions generated during construction. • Future project residents may be exposed to dust and odors generated by landfilling and related activities proximal to the site.
Plant Life	• The proposed project would result in the removal of existing vegetation on the site.
Animal Life	• The proposed project may result in the conversion and/or disturbance of existing animal habitat onsite and proximal to the site. • The proposed project may result in the disruption of access corridors between habitat areas.
Noise (Stationary Sources)	• Project development may significantly affect noise levels, adversely impacting adjacent residential areas.
Land Use (District Plan)	• The proposed project would result in alteration of existing land use.
Light/Glare (Artificial)	• Project development may result in increased ambient reflectivity and glare from the project site, adversely impacting locations proximal to the site.
Risk of Upset	• Project development may result in the release of hazardous substances in the event of an accident or upset conditions due to the volume of solid waste that may be accepted.
Transportation/ Circulation Driveway/Access	• Project-generated vehicular traffic may contribute to cumulative impacts on local circulation. • The project is also located within a traffic impact area defined by the LADOT.
Public Services	• The proposed project may result in a need for additional fire protection and emergency services.
Energy Conservation	• The proposed project would result in increased consumption of nonrenewable energy resources and should consider potential energy impacts.
Water Conservation	• The proposed project would result in an increase of water use on the project site.
Service System (Storm Drainage)	• The proposed project may have a cumulative impact on the existing service system.
Aesthetics	• The proposed project development may substantially alter the surrounding land use.
Equestrian Issues	• The proposed project is located in a community characterized by equestrian-related activities and may impact use of and views from existing equestrian trails.
Cultural Resources (Archaeological)	• Development of the project site may result in disturbance to prior unrecorded sites potentially containing significant artifacts resources.

Source: Ultrasystems Environmental Incorporated

APPENDIX C7

Comments Received after December 5, 1997

Letter 3.9-1

STATE OF CALIFORNIA—BUSINESS AND TRANSPORTATION AGENCY — PETE WILSON, Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 7, 120 SO. SPRING ST.
LOS ANGELES, CA 90012-3606

RECEIVED
JAN 2 1 1998
ULTRASYSTEMS ENVIRONMENTAL

RECEIVED
CITY OF LOS ANGELES
JAN 13 1998
ENVIRONMENTAL UNIT

January 9, 1998

HADAR PLAFKIN
City of Los Angeles
Department of City Planning
221 North Figueroa Street
Los Angeles, CA 90012-2601

Re: IGR/CEQA #971209/NP
SEIR
Sunshine Canyon City Landfill
Extension Project (SEIR 97-0377-ZC/GPA)
City of Los Angeles
Vic. LA-005-44.43

Dear Mr. Plafkin:

Caltrans acknowledges receipt of a copy of the memorandum sent to you by Mr. Robert Takasaki, DOT Senior Transportation Planner referencing the above-named project.

The proposed project consists of the development and operation of a Class III nonhazardous solid waste landfill facility and an on-site green waste/wood waste recycling area on a 205-acre site. The project is contiguous with the previously approved Sunshine Canyon County Landfill Extension project located in the unincorporated County area of Sunshine Canyon and utilizing a common access driveway on San Fernando Road south of the I-5 southbound off-ramp and south of Sierra Highway. 1725

Route 5 in the subject area carries a high volume of truck traffic (13.5 per cent compared to average 5 per cent on interstate routes for California, based on the 1994 Annual Average Daily Truck Traffic count). Therefore, any development plans such as this needs to take into consideration the increased volume of large trucks entering and exiting the freeway.

We have the following recommendations:

1) Truck turning radii should be determined based on Interstate Truck Turning Templates for the following locations:

   - N/B Route 5 off-ramp (diamond) onto Roxford Street (westbound)
   - The dual left-turn lanes from westbound Roxford Street going onto S/B Route 5 on-ramp 1726

2) Investigation needs to be conducted to increase curb returns (if needed) at the following locations:

   - Right-turn lane on S/B Route 5 off-ramp at Roxford Street going onto Sepulveda Blvd.
   - Lane coming from Sepulveda Blvd. (eastbound) onto S/B Route 5 on-ramp
   - Right-turn lane on S/B Route 5 off-ramp (cloverleaf) going onto Roxford Street (westbound)

Thank you for the opportunity to have commented on the project. If you have any questions, please call the undersigned at (213) 897-4429 and refer to our IGR/CEQA #971209/NP.

Sincerely,

STEPHEN J. BUSWELL
Program Manager
IGR/CEQA

cc: Chris Belsky - State Clearinghouse
Robert Takasaki - LA DOT

STATE OF CALIFORNIA—BUSINESS AND TRANSPORTATION AGENCY PETE WILSON, Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 7, 120 SO. SPRING ST.
LOS ANGELES, CA 90012-3606

March 23, 1998

RECEIVED
MAR 26 1998
ULTRASYSTEMS ENVIRONMENTAL

HADAR PLAFKIN
City of Los Angeles
Department of City Planning
221 North Figueroa Street
Los Angeles, CA 90012-2601

Re: IGR/CEQA #980230/NP
Revised Mitigation Concept Plan
For the Roxford Street (I-5 SB on-off ramps
And Encinitas Avenue)
Sunshine Canyon Landfill Project
City of Los Angeles
Vic. LA-005-44.43

Dear Mr. Plafkin:

We have received and reviewed the Revised Mitigation Concept Plan for the Roxford Street (I-5 SB on-off ramps and Encinitas Avenue) sent by Betty Lindsay of Ultra Systems Environmental Incorporated.

Our review of the concept plan indicates:

1) Turning will be difficult to negotiate without climbing the curb on the north side of Roxford. 1727
2) Trucks using the northerly left-turn pocket may successfully negotiate the left turn as long as no one is also turning from the southerly left-turn pocket. Trucks using the southerly pocket cannot negotiate the left-turn without climbing the S/E curb return at the S/B on-ramp.
3) The right-turn from S/B off-ramp to Sepulveda Boulevard is too "tight" for trucks to negotiate.
4) The increase of the curb return radius will work (barely).
5) (Isn't this a diamond-shaped ramp, rather than cloverleaf?) The left-turn can be negotiated as long as vehicles aren't waiting at the southerly left-turn pocket (W/B Roxford to S/B I-5 on-ramp).

Thank you for the opportunity to have commented on the project. If you have any questions, please feel free to contact the undersigned at (213) 897-4429 and refer to our **IGR/CEQA #980230/NP.**

Sincerely,

Original Signed By

STEPHEN J. BUSWELL
Program Manager
IGR/CEQA

Cc: Betsy Lindsay
Ultra Systems Environmental Incorporated

Chris Belsky
State Clearinghouse

REVISED AND UPDATED INFORMATION

APPENDIX D1

LADOT Comments (February 26, 1998), Revised Mitigation Concept Plan and Summary of Freeway Segment Analysis

FORM GEN. 160A (Rev. 1/82)

CITY OF LOS ANGELES

INTER-DEPARTMENTAL CORRESPONDENCE

San Fernando Rd
& Sunshine Canyon
Landfill Access Rd

Date: February 26, 1998

RECEIVED

MAR 0 6 1998

ULTRASYSTEMS
ENVIRONMENTAL

To: Hadar Plafkin, City Planner
Department of City Planning

Robert T. Takasaki

From: Robert T. Takasaki, Senior Transportation Engineer
Department of Transportation

Subject: **REVISED DEPARTMENT OF TRANSPORTATION COMMENTS ON JULY 1997 SUBSEQUENT ENVIRONMENTAL IMPACT REPORT FOR PROPOSED SUNSHINE CANYON CITY LANDFILL EXTENSION PROJECT (SEIR 97-0377-ZC/GPA)**

Reference is made to our November 25, 1997 memo to your Department in which the Department of Transportation (DOT) submitted comments on the July 1997 Subsequent Environmental Impact Report (SEIR) for the Sunshine Canyon City Landfill Extension Project. Upon further consideration and based on a recent meeting between DOT, Department of City Planning and representatives for the Sunshine Canyon Landfill Extension Project and Browning-Ferris Industries (BFI), DOT would like to change our previous comments regarding the improvement plans for the intersection of San Fernando Road and the project driveway. Previously our Department recommended that a new traffic signal and the Ultimate Improvement Plan (dual northbound left turn lanes)be required as the mitigation measure for this location. BFI is now processing a B-Permit to install a new traffic signal at this location to improve the safety of trucks currently using the project driveway to access the County landfill portion of the site.

DOT now recommends that either of the two Interim Improvement Plans (single northbound left turn lane on San Fernando Road at the project driveway depicted in the Conceptual Mitigation Plans contained in Appendix F) may be installed initially at this location. However, if found warranted by DOT within 5 years after the City portion of the landfill begins operations, the developer shall install the Ultimate Improvement Plan (dual northbound left turn lanes) at this location. The developer shall guarantee by a surety bond or other suitable financial instrument acceptable to the Bureau of Engineering, all costs associated with the design and installation of the Ultimate Improvement Plan (dual northbound left turn lanes including the widening of the San Fernando Road and project driveway).

The developer shall also commence processing a B-Permit with the Bureau of Engineering for the Ultimate Improvement Plan within 60 days after the City portion of the landfill begins operation to insure that the Ultimate Improvement Plan can be installed immediately after DOT determines that such improvements are needed. Prior to setting the bond amount the Bureau of Engineering shall require that the developer's engineer or contractor contact DOT's B-Permit Coordinator, telephone (213) 580-5336, to arrange a pre-design meeting to finalize the proposed design needed for the project.

If any questions should arise, please contact John Sam of my staff at (213) 580-5206.

JSS6\wpwin\sunshin1.wpd

c: Council District No. 12
West Valley District, DOT
Design Division, DOT
Citywide Planning Coordination Section, Counter "J", DOT
Valley District, Bureau of Engineering
Betsy Lindsay, Utrasystems Environmental Incorporated
Linscott, Law & Greenspan, Engineers

LINSCOTT LAW & GREENSPAN ENGINEERS

AM PEAK HOUR
CMP FREEWAY SEGMENT (MAINLINE) ANALYSIS
Sunshine Canyon Landfill, Los Angeles

CMP Station	Freeway Route	Post Mile	Location	Direction	Capacity	1995 Existing Conditions Demand	D/C	LOS	1998 Background Conditions Demand	D/C	LOS	1998 Background plus Project Demand	D/C	LOS	Project Impact
1006	5	29.97	at Burbank Boulevard	Northbound	8,000	6,372	0.80	D	6,777	0.85	D	6,784	0.85	D	0.00
				Southbound	8,000	8,104	1.01	F(0)	8,602	1.08	F(0)	8,607	1.08	F(0)	0.00
1007	5	36.9	at Osborne Street	Northbound	12,000	12,124	1.01	F(0)	12,921	1.08	F(0)	12,942	1.08	F(0)	0.00
				Southbound	10,000	12,600	1.26	F(1)	13,391	1.34	F(1)	13,407	1.34	F(1)	0.00
1008	5	R46.55	n/o Route 14	Northbound	10,000	3,099	0.31	A	3,374	0.34	A	3,385	0.34	A	0.00
				Southbound	10,000	8,871	0.89	D	9,578	0.96	E	9,592	0.96	E	0.00
1070	405	44.27	n/o Roscoe Boulevard	Northbound	10,000	4,541	0.45	B	4,860	0.49	B	4,874	0.49	B	0.00
				Southbound	8,000	10,080	1.26	F(1)	10,708	1.34	F(1)	10,719	1.34	F(1)	0.00

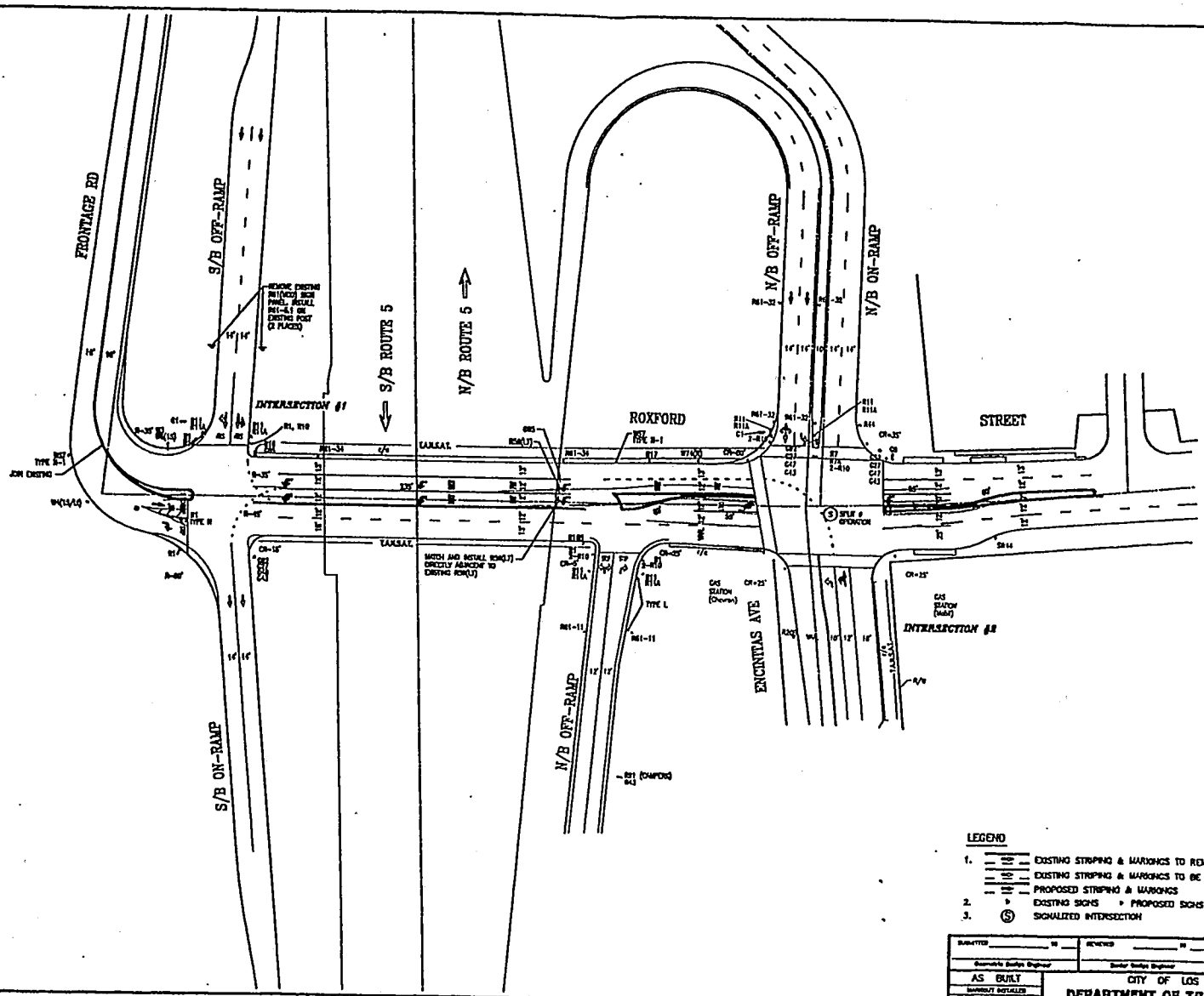
1998 PM Peak Hour Background Traffic Calculation		CMP Station 1006 NB	CMP Station 1006 SB	CMP Station 1007 NB	CMP Station 1007 SB	CMP Station 1008 NB	CMP Station 1008 SB	CMP Station 1070 NB	CMP Station 1070 SB
1995 Existing PM Peak Hour Traffic		6,372	8,104	12,124	12,600	3,099	8,871	4,541	10,080
Growth Factor (2%/year for three years)	1.06	6,754	8,590	12,851	13,356	3,285	9,403	4,813	10,685
Horizon Year Trip Increase (1995 to 1998)		382	486	727	756	186	532	272	605
Cumulative Traffic		23	12	69	35	89	175	46	24
Project Generated Traffic Volumes		7	5	21	16	11	14	14	11

LINSCOTT LAW & GREENSPAN ENGINEERS

PM PEAK HOUR
CMP FREEWAY SEGMENT (MAINLINE) ANALYSIS
Sunshine Canyon Landfill, Los Angeles

CMP Station	Freeway Route	Post Mile	Location	Direction	Capacity	1995 Existing Conditions Demand	D/C	LOS	1998 Background Conditions Demand	D/C	LOS	1998 Background plus Project Demand	D/C	LOS	Project Impact
1006	5	29.97	at Burbank Boulevard	Northbound	8,000	7,172	0.90	D	7,622	0.95	E	7,628	0.95	E	0.00
				Southbound	8,000	6,498	0.81	D	6,916	0.86	D	6,924	0.87	D	0.01
1007	5	36.9	at Osborne Street	Northbound	12,000	7,677	0.64	C	8,199	0.68	C	8,217	0.68	C	0.00
				Southbound	10,000	10,037	1.00	E	10,723	1.07	F(0)	10,747	1.07	F(0)	0.00
1008	5	R46.55	n/o Route 14	Northbound	10,000	8,845	0.88	D	9,482	0.95	E	9,494	0.95	E	0.00
				Southbound	10,000	4,561	0.46	B	4,993	0.50	B	5,009	0.50	B	0.00
1070	405	44.27	n/o Roscoe Boulevard	Northbound	10,000	14,600	1.46	F(3)	15,516	1.55	F(3)	15,528	1.55	F(3)	0.00
				Southbound	8,000	3,433	0.43	B	3,695	0.46	B	3,711	0.46	B	0.00

1998 PM Peak Hour Background Traffic Calculation		CMP Station 1006		CMP Station 1007		CMP Station 1008		CMP Station 1070	
		NB	SB	NB	SB	NB	SB	NB	SB
1995 Existing PM Peak Hour Traffic		7,172	6,498	7,677	10,037	8,845	4,561	14,600	3,433
Growth Factor (2%/year for three years)	1.06	7,602	6,888	8,138	10,639	9,376	4,835	15,476	3,639
Horizon Year Trip Increase (1995 to 1998)		430	390	461	602	531	274	876	206
Cumulative Traffic		20	28	61	84	106	158	40	56
Project Generated Traffic Volumes		6	8	18	24	12	16	12	16



LINSCOTT, LAW, & GREENSPAN, ENGINEERS
TRANSPORTATION PLANNERS — TRAFFIC ENGINEERING — PARKING

AS BUILT

CITY OF LOS ANGELES
DEPARTMENT OF TRANSPORTATION
ROBERT R. YATES, GENERAL MANAGER

MITIGATION CONCEPT PLAN:
SUNSHINE CANYON LANDFILL PROJECT
ROXFORD STREET
I-5 ON/OFF RAMPS TO ENCINITAS AVE
INTERSECTIONS #1 & #2

CITY OF LOS ANGELES
CITY ENGINEER
ROBERT S. HORII

SCALES	SHEET	INDEX NUMBER
HORZ. 1"=		
VERT. 1"=		

THOMAS | DISTRICT | PROJECT NO. 00000 | DRAWING NO. A-00000 | 1 / 4

APPENDIX D2

Revisions to Draft SEIR, Section 4.2, Air Quality

4.2 AIR QUALITY

FEIR DOCUMENTATION

The following list references specific volumes, sections, and page numbers of the certified FEIR and its incorporated technical documentation that provide background information and technical analyses relevant to the topical issue of air quality. Development of the proposed project, including the additional ±42 acres located in County jurisdiction, has been previously addressed within the context of ~~this~~ the certified County FEIR and approved for development pursuant to County Landfill CUP conditions. Any new potential air quality impacts associated with this area (i.e., ~~the proposed project and the~~ relocation of ancillary facilities and environmental protection and control systems onto City lands) ~~will be~~ have been addressed in ~~the Draft SEIR~~ this Final SEIR.

- *FEIR Sunshine Canyon Landfill Extension*, Volume I, Section 3.2.6, Air Quality and Section 3.2.7, Odor/Landfill Gas, pp. 154-191, April 1989.

- *FEIR Sunshine Canyon Landfill Extension Appendices*, Volumes IIA and IIB, Appendix I, Cumulative Air Emission Calculations; Appendix P, CALINE 4 Air Quality Modeling Results; and Appendix X, Wind Rose Diagrams, April 1989.

- *FEIR Sunshine Canyon Landfill Extension, Responses to Comments*, Volumes A and B, Topical Response 17, Fugitive Dust Mitigation Measures, pp. 42-44; Topical Response 18, Landfill Gas Generation, Collection System and Commercial Recovery, pp. 44-45; Topical Response 19, Landfill Gas Flaring Emissions Control, pp. 45-47; and Topical Response 20, Existing Sources of Odor in Sunshine Canyon Area, p. 47; and Responses No. 7, pp. 80-81; No. 64, pp. 117-118, No. 66, p. 119; No. 67, pp. 119-120; No. 116, p. 150; No. 117, pp. 150-151; No. 132, pp. 157-158, No. 290, pp. 240-241; No. 684, pp. 371-372; No. 686, pp. 373-374; No. 689, pp. 375-376; No. 691, pp. 377-378; No. 692, pp. 378-379; No. 735, p. 405; No. 826, pp. 461-462; No. 833, p. 465; No. 840, pp. 467-468; No. 842, pp. 468-469; No. 910, pp. 507-508; No. 995, pp. 589-591; No. 998, pp. 592-601; No. 999, pp. 601-605 and No. 1103, p. 678; Appendix 4, Sunshine Canyon Soil Treatment and Transport Abatement Plan, July 13, 1990.

- *FEIR Sunshine Canyon Landfill Extension, Comments Received and Responses for the Los Angeles County Board of Supervisors*, Section 3.7, Air Quality/Landfill Gas, pp. 43-49 and Section 4.0 (No. 3), Letter from SCAQMD, February 1991.

- *FEIR Sunshine Canyon Landfill Extension, Mitigation Monitoring Summary*, pp. 24-30, November 1993.

ENVIRONMENTAL SETTING

4.2.1 Existing Conditions

The proposed project is located in the City and County of Los Angeles within the South Coast Air Basin (SCAB). The SCAB is a 6,600-square-mile area that encompasses Los Angeles County, Orange County, the nondesert portions of Riverside County, and the western portion of San Bernardino County. The SCAB is comprised of a coastal plain with connecting broad valleys and low hills bounded by the Pacific Ocean to the southwest, the San Gabriel Mountains to the north, the Santa Ana Mountains to the south, and the San

Bernardino and San Jacinto Mountains to the east. The region lies in the semipermanent, high-pressure climatic condition of the eastern Pacific zone. The entire SCAB is under the jurisdiction of the South Coast Air Quality Management District (SCAQMD).

4.2.2 California's SCAB Regional Climatic Characteristics

Meteorological conditions are important to air quality because atmospheric parameters, including wind speed and direction, temperature, temperature inversions, and topography, significantly influence air contaminant dispersion and ground-level concentrations.

Climate. The distinctive climate of the SCAB is determined by terrain and geographical location. The SCAB has a Mediterranean climate characterized by mild winters when most rainfall occurs, and warm, dry summers. The most important climatic and meteorological characteristics influencing air quality in the project area are the persistent temperature inversions, predominance of onshore winds in Los Angeles County, mountain ridge and valley topography, and prevalent sunlight.

The mountains that frame the SCAB range in elevation from approximately 6,000 to 11,500 feet above mean sea level (MSL). The topography of the SCAB is a major contributing factor to the observed air quality and air pollution levels. During the daytime, prevailing coastal winds blow inland, and air masses subsequently become blocked by the surrounding mountain ranges. As a result, the restricted airflow makes the SCAB highly susceptible to air pollutant accumulation. With very light average wind speed, the air basin has a limited capability to disperse air contaminants horizontally.

Temperature. With the exception of mountain locations, the annual average temperature (averaging 62°F) within the SCAB varies little throughout the 6,600-square-mile air basin; however, with a less pronounced oceanic influence, the eastern portion shows greater variability in annual minimum and maximum temperatures. The City of San Bernardino, for example, has an annual average temperature range from 37 to 97°F, while the City of Santa Monica has an annual range between 47 to 75°F, and Burbank, ranges from 42 to 87°F. All portions of the SCAB have had recorded temperatures well above 100°F in recent years. January is usually noted as the coldest month, and July and August are usually the hottest months throughout the year.

Temperatures at the project site can be inferred from data published by the SCAQMD (January 1980). An SCAQMD monitoring station is located at 24875 San Fernando Road in Newhall and may be generally considered to be representative of the project area. Temperatures at this monitoring station range between 42 and 93°F, and recorded minimum and maximum temperatures of 23 and 113°F, respectively, have been measured.

Precipitation. Practically all of the annual rainfall in the SCAB occurs between the months of November and April. Summer rainfall normally is restricted to widely scattered thundershowers near the coast and slightly heavier shower activity in the air basin's easterly area and over the mountains. Annual average rainfall varies from 9 inches in Riverside to 14 inches in downtown Los Angeles, but higher amounts are measured at local foothill locations (e.g., Pacoima area has an average rainfall of 19.04 inches).[1] Monthly and yearly rainfall totals are extremely variable. Rainy days vary from 5 to 10 percent in the SCAB with the frequency of such days being higher near the coast.

1/ South Coast Air Quality Management District (SCAQMD). 1980.

Humidity. Although the SCAB has a semiarid climate, the air near the ground surface is surprisingly moist because of the presence of a shallow marine layer. Except for infrequent periods when dry, continental air is brought into the air basin by offshore winds, this shallow marine layer is an important modifier of the Basin's climate. Periods with heavy fog are frequent, and low stratus clouds (sometimes referred to as "high fog") are a characteristic climate feature. Humidity is typically at a minimum during the winter months and peaks in the months of September and October. Annual average relative humidity is about 70 percent at the coast and approximately 57 percent in the eastern part of the SCAB. The Van Nuys area has an average humidity of about 63 percent.[2]

Wind. With very light average wind speeds, the SCAB's atmosphere has a limited capability to disperse air contaminants horizontally. For example, wind speeds in downtown Los Angeles average about 5.7 miles per hour with little seasonal variation. Summer wind speeds average slightly higher than winter wind speeds. Inland areas record slightly lower wind speeds than downtown Los Angeles, while coastal wind speeds average about 2 ~~miles per hour (~~mph~~)~~ higher than downtown Los Angeles. The dominant daily wind pattern is a daytime sea breeze and a nighttime land breeze. This regime is broken only by occasional winter storms and infrequent strong northeasterly Santa Ana flows from the mountains and deserts north of the SCAB. The dominant wind patterns in the SCAB are shown on **Figure 4.2.1**.

On most spring and early summer days, the daily air pollutants produced within the SCAB are moved out of the air basin through mountain passes or are lifted upward by the warm, vertical currents produced by the heating of mountain slopes. In those seasons, pollutants within the SCAB are dispersed and transported (often to a distance of 60 miles or more) by ocean air currents during the afternoon. From late summer through the winter months, this flushing is less pronounced because of lighter wind speeds and the earlier appearance of offshore winds. This trend is observed on **Figure 4.2-2** where it is noted that the wind blows from a southerly direction about half the time with an average speed of less than 6 mph. With extremely stagnant windflow in the Basin, offshore drainage winds begin in the late afternoon near the mountains. During the winter months, the project area also experiences a frequent flow from the north and northwest through the Newhall Pass into the western San Fernando Valley. These winds predominate between 11:00 AM and 5:00 PM. The speeds (16.5 mph average) reflect the influence of Santa Ana winds, which are strongest during those hours of the day and blow in a similar direction.

Onsite measurement has shown the overall average wind speed to be 9.9 mph with a maximum 1-hour measurement of 45 mph. It should be noted that the overall average wind speed and maximum 1-hour wind speed do not preclude the presence of very low or high wind speeds, especially during Santa Ana conditions. These Santa Ana conditions, which are prevalent in Southern California from the fall through spring, with an average 5 to 10 occurrences per year, can create strong southern-flowing winds.

Cloudiness. The presence of clouds is a contributing factor to air quality, considering the necessary role of sunshine in the process of producing photochemical smog. Because of persistent low inversions and cool coastal ocean water, morning fog and low stratus clouds are common in coastal areas, with decreasing concentrations inland. On average, there are 187 clear days (i.e., 0 to 30 percent of the sky obscured by clouds), 102 partly cloudy days (i.e., 40 to 70 percent cloud cover), and 76 cloudy days (i.e., 80 percent to full cloud cover). Cloudiness is slightly less in the eastern portions of the air basin and about 25 percent greater along the coast.

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[2]/ Ibid.

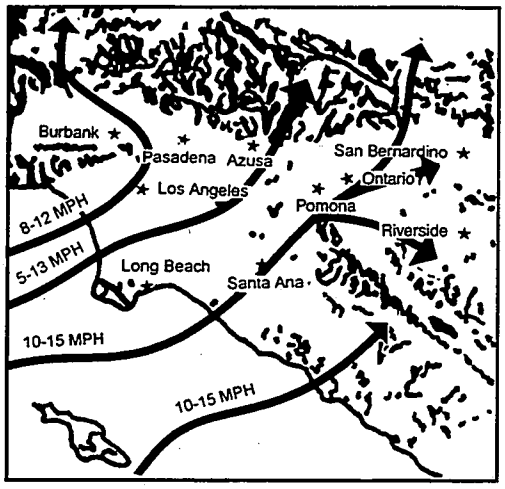
Inversions. The vertical dispersion of air pollutants in the SCAB is hampered by the presence of a persistent temperature inversion in the layers of the atmosphere near the surface of the earth. Because of expansional cooling, temperatures usually decrease with altitude. A reversal of this atmosphere condition, where temperature increases with altitude, is termed an inversion. Inversions can exist at the surface or at any height above the ground. The height of the base of the inversion at any given time is known as the "mixing height."

The mixing height can change under conditions when the top of the inversion does not change. Usually, inversions are lower before sunrise than during the daylight hours. Mixing heights normally increase as the day progresses (the sun warms the ground, which in turn warms the surface air layer). As this heating continues, the temperature of the surface layer approaches the potential temperature of the base of the inversion. When these temperatures become equal, the inversion layer begins to erode at its lower edge. If enough warming takes place, the inversion layer becomes weaker and finally "breaks." The surface air layers can then mix upward without limit. This phenomenon is frequently observed in the middle to late afternoon on hot summer days when the smog appears to clear up suddenly. Winter inversions frequently break up by midmorning, thereby preventing contaminant buildup during these periods.

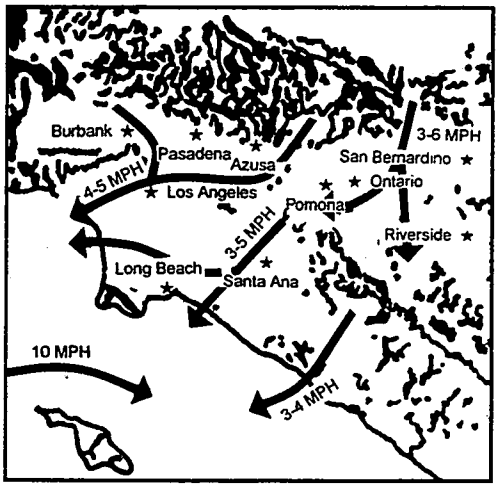
The net input of pollutants in the atmosphere from both mobile and stationary emission sources varies little by season. Pollutants enter the surface air layers and can mix with less contaminated air from anywhere below the inversion base. The contaminants in the surface layer tend to diffuse and form a relatively uniform mixture (in some cases higher concentrations exist immediately below the inversion base) all the way up to the mixing height. These contaminants cannot, however, rise through the inversion. As a result, these air pollutants become more and more concentrated unless the inversion layer lifts or is broken or unless surface winds are strong enough to disperse the pollutants horizontally. The combination of low wind speeds and low inversions produces the greatest concentration of pollutants. On days of no inversion or when winds average over 15 mph, there is little likelihood of any significant smog effects.

In the summer, the longer daylight hours and the brighter sunshine combine to cause a reaction between hydrocarbons (HC) and oxides of nitrogen, thereby forming photochemical smog. (Note: for purposes of this analysis, HC, reactive organic gases [ROG], and volatile organic compounds [VOC] are used synonymously.) In the winter, the greatest pollution problems are carbon monoxide (CO) and oxides of nitrogen because of extremely low inversions and air stagnation during the late night and morning hours. CO is not as great a problem in summer because inversions are not as low and intense in the surface boundary layer (within 100 feet of the ground) and because horizontal ventilation is better in summer than during the winter. The higher summer inversions, however, are typically stronger and last until much later in the day.

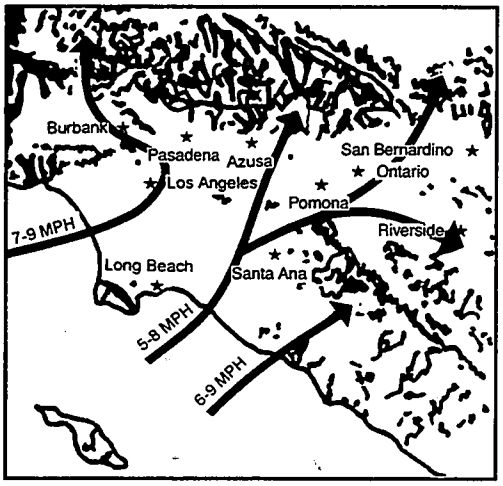
Along the Southern California coast, surface air temperatures are relatively cool. The resultant shallow layer of cool air at the surface, coupled with warm, dry subsiding air from aloft produces early morning inversions on about 87 percent of the days. The SCAB-wide average occurrence of inversions at the ground surface is 11 days per month. The averages vary from 2 days in June to 22 days in December and January. Higher inversions, but less than 2,500 feet above sea level, occur 22 days each month on an average of 25 days in June and July to 4 days in December and January. Restricted maximum mixing heights of 3,500 feet above MSL or less average 191 days each year.



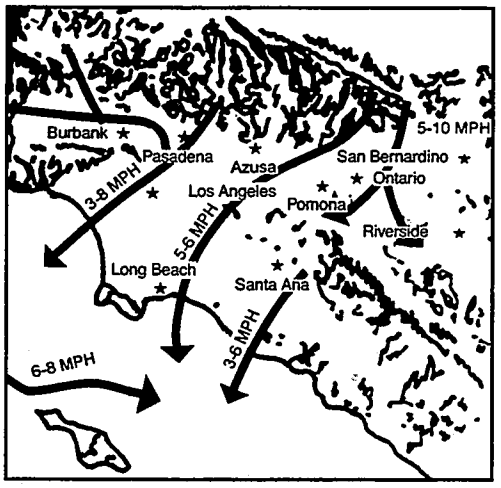
Typical Summer Daytime Ocean Winds
(Noon to 7:00 PM)



Typical Summer Night Drainage Winds
(Midnight to 5:00 AM)



Typical Winter Daytime Ocean Winds
(Noon to 5:00 PM)



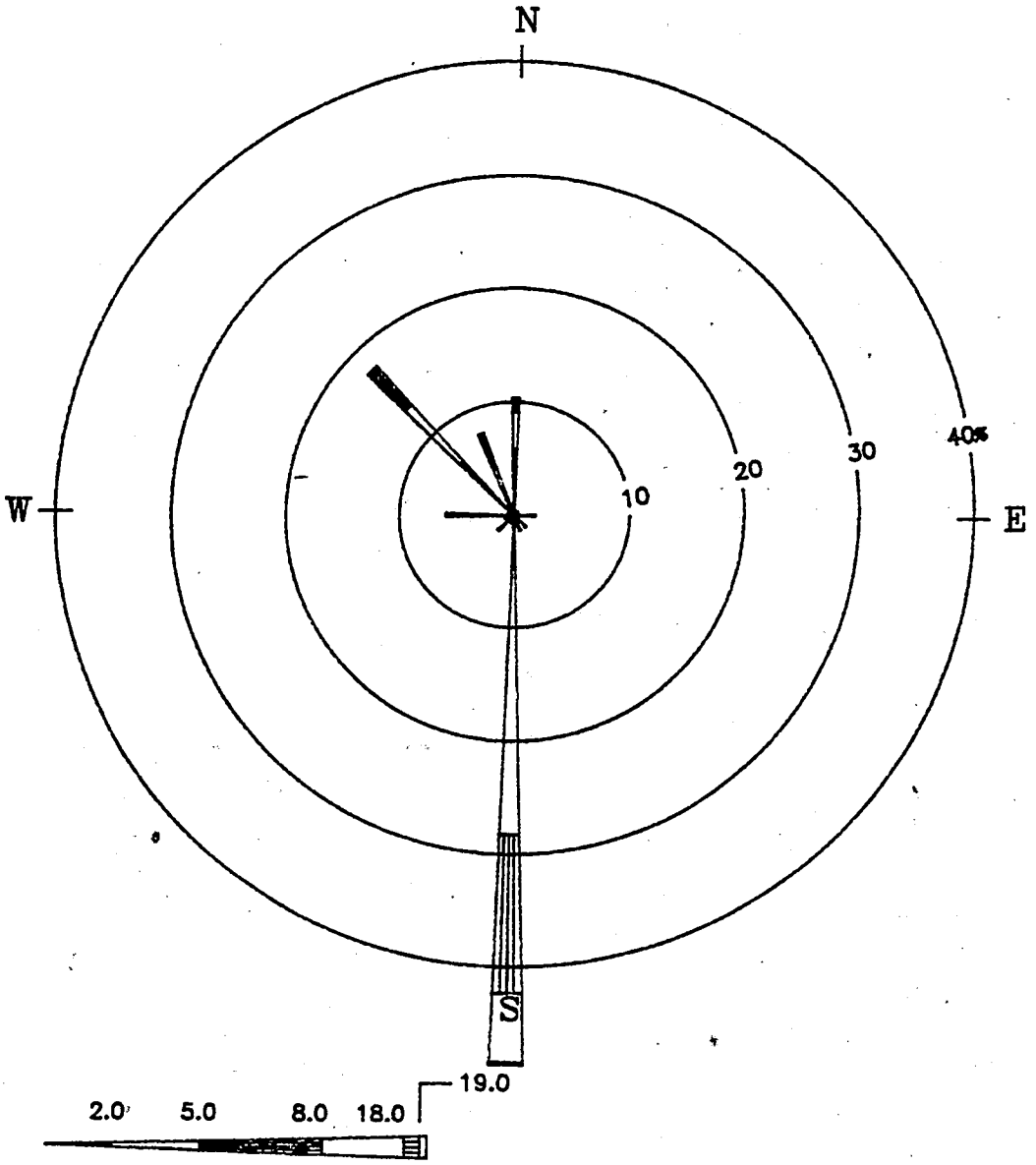
Typical Winter Night Drainage Winds
(Midnight to 7:00 AM)

Source: Ultrasystems Environmental Incorporated

ULTRASYSTEMS ENVIRONMENTAL INCORPORATED

Dominant Wind Patterns in the SCAB

FIGURE 4.2-1



WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 10.3 PERCENT OF THE TIME.

Source: RES Environmental, Inc.

ULTRASYSTEMS ENVIRONMENTAL INCORPORATED

Windrose for the Sunshine Canyon Landfill

FIGURE 4.2-2

The potential for high concentrations varies seasonally for many contaminants. During late spring, summer, and early fall, light winds, low mixing heights, and brilliant sunshine combine to produce conditions favorable for the maximum production of photochemical oxidants, mainly ozone (O_3). During the spring and summer, when fairly deep marine layers are frequently found in the SCAB, sulfate concentrations are at their peak. When strong inversions are formed on winter nights and couple with near-calm winds, CO from automobile exhausts becomes highly concentrated. The highest yearly values for CO are generally measured during November, December, January, and February.

4.2.3 Criteria Air Pollutants

The quality of the ambient air is affected by pollutants emitted into the air from stationary and mobile sources. Stationary sources can be divided into two major subcategories: point sources and area sources. Point sources consist of one or more emission sources at a facility with an identified location and are usually associated with manufacturing and industrial processing plants. Area sources are widely distributed and produce many small emissions.

Mobile sources refer to emissions from motor vehicles, including tailpipe and evaporative emissions, and are classified as either on-road or off-road. On-road sources are a combination of emissions from automobiles, trucks, and indirect sources. Indirect sources are sources that by themselves may not emit air contaminants; however, they indirectly cause the generation of air pollutants by attracting vehicle trips or consuming energy. Examples of indirect sources include an office complex or commercial center that generates commuter trips and consumes energy resources through the use of electricity for lighting and space heating. Indirect sources also include actions proposed by local governments, such as redevelopment districts and private projects involving the development of either large buildings or tracts. In addition, indirect sources include those emissions created by the distance vehicles travel. Off-road sources include aircraft, ships, trains, and self-propelled construction equipment.

The air pollutants emitted into the ambient air by stationary and mobile sources are regulated by federal and State law. These regulated air pollutants are known as "criteria air pollutants" and are categorized as primary and secondary pollutants. Primary criteria air pollutants are those that are emitted directly from sources. CO; ROG; nitrogen oxide (NO_x); sulfur dioxide (SO_2); and most fine particulate matter (PM_{10}), ~~including~~ that are found in lead (Pb) and fugitive dust; are primary criteria air pollutants. Secondary criteria air pollutants are those pollutants formed by chemical and photochemical reactions in the atmosphere. O_3 and nitrogen dioxide (NO_2) are the principal secondary pollutants.

Presented below is a description of each of these primary and secondary criteria air pollutants.

Carbon Monoxide. CO is a colorless, odorless, toxic gas produced by incomplete combustion of carbon substances (e.g., gasoline or diesel fuel). The primary adverse health effect associated with CO is the interference of normal oxygen transfer to the blood, which may result in tissue oxygen deprivation.

Reactive Organic Gases. ROGs are compounds comprised primarily of atoms of hydrogen and carbon. Internal combustion associated with motor vehicle usage is the major source of HC. Adverse effects on human health are not caused directly by ROG but rather by reactions of ROG to form secondary pollutants.

Nitrogen Oxides. NO_x serve as integral participants in the process of photochemical smog production. The two major forms of NO_x are nitric oxide (NO) and NO_2. NO is a colorless, odorless gas formed from atmospheric nitrogen and oxygen when combustion takes place under high temperature and/or high pressure.

NO_2 is a reddish-brown irritating gas formed by the combination of NO and oxygen. NO_x acts as an acute respiratory irritant and increases susceptibility to respiratory pathogens.

Sulfur Dioxide. SO_2 is a colorless, pungent, irritating gas formed by the combustion of sulfurous fossil fuels. Fuel combustion is the primary source of SO_2. At sufficiently high concentrations, SO_2 may irritate the upper respiratory tract. At lower concentrations and when combined with particulates, SO_2 may do greater harm by injuring lung tissue.

Particulates. Particulates consist of finely divided solids or liquids such as soot, dust, aerosols, fumes, and mists. About 90 percent by weight of all emitted particles are greater than 10 microns (i.e., 10 one-millionths of a meter or 0.0004 inch) in diameter; however, about 90 percent of the total number of particulates are smaller than 5 microns. Particulate discharge into the atmosphere results primarily from industrial, agricultural, construction, and transportation activities. Particulates may adversely affect the human respiratory system, especially in those people who are naturally sensitive or susceptible to breathing problems.

Fugitive Dust. Fugitive dust poses primarily two public health and safety concerns. The first concern is that of respiratory problems attributable to the suspended particulates in the air. The second concern is that of motor vehicle accidents caused by reduced visibility during severe wind conditions. Fugitive dust may also cause significant property damage during strong windstorms by acting as an abrasive material agent (much like sandblasting activities).

Ozone. O_3 is one of a number of substances called photochemical oxidants that are formed when reactive organic compounds (ROC)[3] and NO_x (both byproducts of the internal combustion engine) react with sunlight. O_3 is present in relatively high concentrations in the SCAB, and the damaging effects of photochemical smog are generally related to the concentrations of O_3. O_3 may pose a health threat to those who already suffer from respiratory diseases. However, O_3 also affects healthy people. In the past, those effects were thought to be limited to more difficult breathing during work and exercise. However, research now indicates that children in the SCAB experience a 10- to 15-percent loss in lung function. The SCAB has peak O_3 levels two and a half times higher than the federal health standard and three times higher than the more stringent State standard.

Nitrogen Dioxide. NO_2 is a byproduct of fuel combustion. The principal form of NO_2 produced by combustion is NO, but NO reacts quickly to form NO_2, creating the mixture of NO and NO_2 commonly called NO_x. NO_2 acts as an acute irritant and, in equal concentrations, is more injurious than NO. At atmospheric concentrations, however, NO_2 is only potentially irritating. There is some indication of a relationship between NO_2 and chronic pulmonary fibrosis. Some increase in bronchitis in children (2 and 3 years old) has also been observed at concentrations below 0.3 part per million (ppm). NO_2 absorbs blue light; the result is a brownish-red cast to the atmosphere and reduced visibility. NO_2 also contributes to the formation of PM_{10} (particulates having an aerodynamic diameter of 10 microns or 0.0004 inch or less in diameter).

3/ In SCAQMD documents, the inclusive term "reactive organic compounds" generally describes and is gradually replacing the separate terms reactive organic gases (ROG), volatile organic compounds (VOCs), and hydrocarbons (HC), except in cases where such separation provides additional clarification and definition. For purposes of this analysis, these terms are used synonymously.

4.2.4 Ambient Air Quality Standards and Annual Statistics

The federal Clean Air Act (CAA) established the National Ambient Air Quality Standards (NAAQS) and the California Air Resources Board (CARB) established the California Ambient Air Quality Standards (CAAQS) to reflect the maximum levels of the respective air pollutants permissible to avoid adverse health and welfare effects. NAAQS have been established for six ambient air pollutants (i.e., SO_2, Pb, CO, NO_2, O_3, and PM_{10}). In contrast, California has established CAAQS for other pollutants, imposed more stringent standards, and established different exposure periods than those presented ~~those~~ in the NAAQS. The federal and State standards are presented in **Table 4.2-1**.

Existing Air Quality

The CARB monitors air pollutants at more than 200 locations throughout the State and publishes these data on a regular basis. Existing levels of ambient air quality and historical trends and projections in the project area are best represented by measurements made by the SCAQMD at its Santa Clarita air monitoring station located at 24875 San Fernando Road in Newhall, which is the nearest monitoring station to the project site and, like the project site, is also located within the Newhall Pass. Monitored air pollutants include O_3, CO, NO_2, SO_2, and PM_{10}. These measurements have shown that photochemical smog levels (mainly O_3) are high in summer, dust levels may exceed particulate standards throughout the year, and primary vehicular pollutant levels (e.g., CO and NO_2) are very low in the area. **Table 4.2-2** summarizes the last ~~5~~ 7 years of published data for the Santa Clarita station.

The federal O_3 standard is exceeded approximately ~~65~~ 50 days per year and is the pollutant of most concern in the SCAB. Although there are no exceedances of the NO_2 standards, NO_x is a precursor to O_3 formation. O_3 is the result of a chemical reaction between ROG and NO_x emissions in bright sunlight. HC and NO_x are emitted by both mobile and stationary sources, with the greater portion emanating from mobile sources in the SCAB. Pollutants emitted from the upwind areas react during their transport downwind to produce the O_3 concentrations measured at the Santa Clarita monitoring station. As a result, all upwind areas within the SCAB and portions of the Southeast Desert Air Basin contribute to the O_3 production. These concentrations increase during the summer, with daily concentrations increasing from the late morning through the afternoon.

With regard to particulate matter, monitoring for this criteria pollutant only began in 1989; therefore, it is difficult to determine the existence of a regional trend. The State standard for PM_{10} was exceeded at the Santa Clarita station during ~~69~~ 87 of the ~~289~~ 403 monitoring events (~~24~~ 22 percent) in the last ~~5~~ 7 years. The federal standard has not been exceeded since monitoring began at this station.

Suspended particulate matter is a mixture of natural and manmade materials including soil particles, biological materials, sulfates, nitrates, organic compounds, and Pb. High dust levels result from strong winds acting on loose arid soils. This is evidenced by the fact that airborne particulate exceedances are strongly correlated with the frequency of desert windstorms. Much of this dust burden is in the form of large, heavy particles that settle out of the air in proximity to their origin.

These larger particles are filtered out by the respiratory system and pose more of a nuisance than a health threat. Smaller particles (PM_{10}) are created by the combustion of fossil fuels but are also given off from tire wear and brake dust, as well as windblown dust.

Table 4.2-1
STATE AND FEDERAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards[1]		Federal Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[4,7]
Ozone (O_3)	1 Hour	0.09 ppm (180 $\mu g/m^3$)	Ultraviolet Photometry	0.12 ppm (235 $\mu g/m^3$)	Same as Primary Std.	Ethylene Chemiluminescence
Carbon Monoxide (CO)	8 Hour	9.1 ppm (10 mg/m^3)	Nondispersive Infrared Spectroscopy (NDIR)	9.5 ppm (10 mg/m^3)	Same as Primary Std.	Nondispersive Infrared Spectroscopy (NDIR)
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
Nitrogen Dioxide (NO_2)	Annual Average	—	Gas Phase Chemiluminescence	0.0534 ppm (100 $\mu g/m^3$)	Same as Primary Std.	Gas Phase Chemiluminescence
	1 Hour	0.25 ppm (470 $\mu g/m^3$)		—		
Sulfur Dioxide (SO_2)	Annual Average	—	Ultraviolet Fluorescence	0.03 ppm (80 $\mu g/m^3$)	—	Pararosaniline
	24 Hour	0.05 ppm[8] (131 $\mu g/m^3$)		0.14 ppm (365 $\mu g/m^3$)	—	
Suspended Particulate Matter (PM_{10})	Annual Geometric Mean	30 $\mu g/m^3$	Size Selective Inlet High-Volume Sampler and Gravimetric Analysis	—	—	—
	24 Hour	50 $\mu g/m^3$		150 $\mu g/m^3$	Same as Primary Std.	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	—	—	50 $\mu g/m^3$		
Sulfates	24 Hour	25 $\mu g/m^3$	Turbidimetric Barium Sulfate	—	—	—
Lead	30-Day Average	1.5 $\mu g/m^3$	Atomic Absorption	—	—	Atomic Absorption
	Calendar Quarter	—		1.5 $\mu g/m^3$	Same as Primary Std.	
Visibility Reducing Particles	1 Observation	Insufficient amount to reduce the prevailing visibility[9] to less than 10 miles when the relative humidity is less than 70 percent.		—	—	—

Source: California Air Resources Board

Table 4.2-1(Cont.)
STATE AND FEDERAL AMBIENT AIR QUALITY STANDARDS

Notes:

1. California standards for O_3, CO, SO_2 (1-hour), NO_2, and PM_{10} suspended particulate matter are values that are not to be exceeded. The sulfates, lead, and visibility reducing particle standards are not to be equaled or exceeded.
2. National standards, other than O_3 and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The O_3 standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.
3. The concentration is expressed first in units in which it was promulgated. Equivalent units given in parentheses are based on a reference temperature of 25°C and a reference concentration of 760 millimeters (mm) of mercury (1,013.2 millibar); ppm in this table refers to parts per million by volume, or micromoles of pollutant per mole of gas.
4. Any equivalent procedure that can be shown to the satisfaction of the CARB to give equivalent results at or near the level of the air quality standard may be used.
5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the USEPA.
6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the implementation plan is approved by the USEPA.
7. Reference method as described by the USEPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the USEPA.
8. At locations where the state standards for O_3 and/or suspended particulate matter are violated. National standards apply elsewhere.
9. Prevailing visibility is defined as the greatest visibility attained or surpassed around at least half of the horizon circle but not necessarily in continuous sectors.

* Table prepared in accordance with CARB Fact Sheet 38 (revised 7/88).

All other pollutants, particularly those related to vehicular source emissions such as CO and NO_2, have not exceeded their allowable levels since monitoring began in 1989.

Although major sources of air pollution exist within the Santa Clarita Valley, the data in **Table 4.2-2** suggest that air quality problems in the study area are mainly due to the transport of pollutants into the area from upwind sources. Because the area is subject to frequent violations of both the State and federal air quality standards for O_3 and State standards for PM_{10}, the project area is very sensitive to additional O_3 precursor and particulate pollutant (PM_{10}) emissions.

4.2.5 Air Quality Management Plan

The SCAQMD and the Southern California Association of Governments (SCAG) are the agencies responsible for preparing the Air Quality Management Plan (AQMP) for the SCAB. Since 1979 a number of AQMPs have been prepared. The most recent adopted comprehensive plan, at the time that this air quality assessment was completed, is the 1994 Air Quality Management Plan (1994 AQMP), which includes a variety of strategies and control measures. Recently, the 1997 AQMP was adopted by the SCAQMD and has been approved by the CARB. This plan has not yet received final approval from the United States Environmental Protection Agency (USEPA) as part of the State Implementation Plan revision. The 1994 AQMP was based on the 1991

Table 4.2-2 (Revised)
AIR QUALITY MONITORING SUMMARY
FOR SANTA CLARITA MONITORING STATION
(Number of Days Standards Were Exceeded and Maximum Levels During Such Violations[1])

State and Federal Pollutant/Standard	1990	1991	1992	1993	1994	1995	1996
Ozone (O_3)							
State 1-hour > 0.09	115	118	127	92	118	72	68
Federal 1-hour > 0.12 ppm	62	65	71	44	66	26	19
Max. 1-hour conc. (ppm)	0.15	0.24	0.22	0.22	0.26	0.17	0.15
Carbon Monoxide (CO)							
State 8-hour > 9.1 ppm	0	0	0	0	0	0	0
State 1-hour > 20 ppm	0	0	0	0	0	0	0
Federal 8-hour ≥ 9.5 ppm	0	0	0	0	0	0	0
Federal 1-hour > 35 ppm	0	0	0	0	0	0	0
Max. 1-hour conc. (ppm)	11	9	8	8	9	7	7
Max. 8-hour conc. (ppm)	4.6	5.1	3.7	3.9	3.9	4.1	3.9
Nitrogen Dioxide (NO_2)							
State 1-hour > 0.25 (ppm)	0	0	0	0	0	0	NM[1]
Max. 1-hour conc. (ppm)	0.15	0.17	0.11	0.13	0.12	0.16	NM
Sulfur Dioxide (SO_2)							
State 1-hour > 0.25 (ppm)	0[2]	NM[3]	NM	NM	NM	NM	NM
State 24-hour ≥ 0.05 (ppm)	0[2]	NM	NM	NM	NM	NM	NM
Federal 24-hour > 0.14 (ppm)	0[2]	NM	NM	NM	NM	NM	NM
Max. 1-hour conc. (ppm)	0.01[2]	NM	NM	NM	NM	NM	NM
Max. 24-hour conc. (ppm)	0.004[2]	NM	NM	NM	NM	NM	NM
Inhalable Particulates (PM_{10})[4]							
State 24-hour > 50 $\mu g/m^3$	15/57	25/59	8/60	8/55	13/58	13/61	5/53[4]
Federal 24-hour > 150 ($\mu g/m^3$)	0/57	0/59	0/60	0/55	0/58	0/61	0/59
Max. 24-hour conc. ($\mu g/m^3$)	93	81	84	75	66	97	91

Source: Air Quality Data, SCAQMD 1991, 1992, 1993, 1994, ~~and~~ 1995, 1996 and 1997.

Notes:

1. With the exception of inhalable particulates (PM_{10}), all values are based on 365 days per year.
2. Less than 12 full months of data and may not be representative.
3. NM - Not Monitored, monitoring discontinued.
4. Violations per number of samples.

AQMP and was designed to comply with State and federal requirements, reduce the high level of pollutant emissions in the SCAB, and ensure clean air for the region through the control measures detailed below. To accomplish its task, the 1991 AQMP relied on a multilevel partnership of governmental agencies at the federal, State, regional, and local level. These agencies (i.e., U.S. Environmental Protection Agency [USEPA], CARB, local governments, SCAG, SCAQMD) are the cornerstones that implement the 1994 AQMP and previous AQMP programs.

The control measures in the 1991 AQMP are categorized into three tiers: (1) Tier I includes measures that propose currently available technological applications and management practices that can be adopted within the next 5 years, (2) Tier II measures are based on significant advancement of today's technological applications within the next 10 to 15 years, and (3) Tier III requires the development of new technologies that are currently in the research stage and that will be implemented within the next 20 years. In addition, the 1991 AQMP provides an attainment planning framework that sets specific dates by which the SCAB will achieve the federal and State air quality standards as shown in **Table 4.2-3** below.

Table 4.2-3
PROJECTED ATTAINMENT DATES FOR FEDERAL AND STATE AIR QUALITY STANDARDS FOR THE SOUTH COAST AIR BASIN

Air Pollutant	State	Federal
Nitrogen dioxide (NO_2)	December 31, 1999	December 31, 1994
Carbon monoxide (CO)	2000 - 2010	December 31, 1999
Ozone (O_3)	Beyond 2010	December 31, 2009
Particulate matter (PM_{10})	Beyond 2010	December 31, 2005

Source: 1991 AQMP, SCAQMD

The 1991 AQMP was revised in 1994 (1994 AQMP) to satisfy the planning requirements of both the 1990 amendments of the CAA and the California Clean Air Act (CCAA). These requirements are briefly discussed below.

- **Federal Clean Air Act Requirements.** The CAA requires plans to provide for the implementation of all reasonably available control measures "as expeditiously as practicable," including the adoption of reasonably available control technology for reducing emissions from existing sources. Emission control innovations in the form of market-based approaches are explicitly encouraged by the CAA. The SCAQMD is the first local agency in the country to adopt a market-based approach for controlling stationary source emissions of oxides of nitrogen and sulfur and, in accordance with the pending revisions, is proposing additional market-based control measures. Other federal requirements addressed in the revision include mechanisms to track plan implementation and milestone compliance for O_3 and CO.

  In addition, the 1990 amendments to the CAA require the SCAQMD to develop the following demonstrations or plans addressed in the 1994 AQMP: (1) an O_3 attainment demonstration, (2) a post-1996 rate-of-progress demonstration, and (3) a PM_{10} State Implementation Plan (SIP) (required in 1996) that incorporates best available control measures for fugitive sources.

- **California Clean Air Act Requirements.** In addition to federal requirements, the 1994 AQMP meets CCAA requirements. According to the CCAA, air pollution control districts must design their air quality attainment plans to achieve a reduction in basin-wide emissions of 5 percent or more per year (or 15 percent or more in a 3-year period) for all nonattainment pollutants and their precursors. For emission reduction accounting purposes, the CARB has established a 7-year initial reporting period (1988 to 1994) with reporting intervals every 3 years thereafter. As a result, the 1994 AQMP

must seek to achieve a 35-percent reduction for the initial period and a 15-percent reduction for every subsequent interval.

The CCAA also requires that the 1994 AQMP control measures reduce overall population exposure to criteria pollutants, with a 40-percent reduction due by the end of 1997 and a 50-percent reduction by the year 2000. This provision is applicable to O_3, CO, and NO_2 in the SCAB. The CCAA further requires the SCAQMD's Governing Board to determine that the 1994 AQMP is a cost-effective strategy that will achieve attainment of the State standards by the earliest practicable date. In addition, the 1994 AQMP must include an assessment of the cost-effectiveness of available and proposed measures and a list of the measures ranked from the least cost-effective to the most cost-effective. In addition to cost-effectiveness, other factors must be considered, including technological feasibility, emissions reduction potential, rates of reduction, public acceptability and enforceability.

THRESHOLDS FOR DETERMINING SIGNIFICANCE

The *SCAQMD CEQA Air Quality Handbook* identifies a landfill expansion that produces an exceedance of recommended emission thresholds or other secondary significance criteria as a project of potential environmental significance for air quality.[4] The basis for listing landfills as "potentially significant" relates to the generation of potentially significant quantities of mobile source emissions associated with the project's operation. Other "secondary indicators" include the potential for a landfill project to subject sensitive receptors to objectionable odors.

Presented in the *SCAQMD CEQA Air Quality Handbook* are both a methodology for the quantification of project-related air quality impacts and recommended standards to evaluate the significance of those emissions. Based on that document, the following information is presented:

> While § 15064, subd.(b) of the State CEQA Guidelines states that an ironclad definition of a significant effect is not possible because the significance of an activity may vary with the setting, the SCAQMD believes that the setting as referred to in CEQA can be defined in this case. Under State (California) law (Health and Safety Code § 40402), the SCAB is defined as a distinct geographic area with a critical air pollution problem for which ambient air quality standards have been promulgated to protect public health. As such, the District believes that significance thresholds can be established based on scientific and factual data that is contained in the federal and State Clean Air Acts. Therefore, the District recommends that these thresholds be used by lead agencies in making a determination of significance. However, *the final determination of whether or not a project is significant is within the purview of the lead agency* pursuant to § 15064, subd.(b) of the State CEQA Guidelines [emphasis added].

In Chapter 6 of the *SCAQMD CEQA Air Quality Handbook,* the SCAQMD has established two types of air pollution thresholds (i.e., emission thresholds and additional indicators) to assist local governmental agencies in determining whether the projected emissions from operational phase of a project will be significant. As stated in the *SCAQMD CEQA Air Quality Handbook*, "if the lead agency finds that the operational phase of

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[4] *SCAQMD CEQA Air Quality Handbook*, South Coast Air Quality Management District (SCAQMD), Table 6-2. April 1993.

a project has the potential to exceed either of the air pollution thresholds, the project should be considered significant." Both types of threshold factors are discussed below.

Separate threshold standards have been recommended for assessing construction impacts that are averaged over a 3-month period and include only actual working days.

Emission Significance Thresholds (Primary Effects)

Specific criteria air pollutants have been identified by the SCAQMD as pollutants of special regional concern. Based on this categorization, **Table 4.2-4** lists the following significance thresholds for emissions from these pollutants.

Table 4.2-4
EMISSION SIGNIFICANCE THRESHOLDS

Pollutant	Construction Criteria (lb/day)	Construction Criteria (tons/qtr)	Operational Criteria (lb/day)
CO	550	24.75	550
NO_x	100	2.5	55
ROG	75	2.5	55
SO_x	150	6.75	150
PM_{10}	150	6.75	150

Source: *SCAQMD CEQA Air Quality Handbook*, Chapter 6.

Note: The *SCAQMD CEQA Air Quality Handbook* does not list daily construction criteria for SO_x. This value is extrapolated from the quarterly criterion.

Projects in the SCAB with daily operation-related emissions that exceed any of the above emission thresholds may be considered significant. Additionally, a project may be significant if vehicle CO emissions cause an exceedance of either the State 1- or 8-hour CO standard.

As indicated in the *SCAQMD CEQA Air Quality Handbook*, "the District considers a project to be mitigated to a level of insignificance if its impact is mitigated below the thresholds defined in Chapter 6 of the *SCAQMD CEQA Air Quality Handbook*."

Additional Indicators (Secondary Effects)

The SCAQMD recommends that "additional indicators" be used as screening criteria with respect to air quality. Relevant additional factors identified in the *SCAQMD CEQA Air Quality Handbook* include the following significance criteria: (1) interference with the attainment of the federal or State ambient air quality standards by either violating or contributing to an existing or projected air quality violation; (2) generation of vehicle trips that cause a CO "hot spot"; (3) creation of or subject receptors to an objectionable odor that requires a 10:1 dilution with fresh air before being no longer detectable; (4) introduction of hazardous materials onsite that could result in an accidental release of air toxic emissions or acutely hazardous

materials posing a threat to public health and safety; (5) emissions of an air toxic contaminant regulated by SCAQMD rules or included on a federal or State air toxic list; (6) the burning of hazardous, medical, or municipal waste as in waste-to-energy facilities; and/or (7) emissions of carcinogenic or toxic air contaminants that individually or cumulatively exceed the maximum individual cancer risk of 10 in 1 million.[5]

ENVIRONMENTAL IMPACT

4.2.6 Proposed Project Overview

The project's air pollutant emissions are comprised of two basic source categories: construction-related or short-term impacts and operational or long-term impacts. Project construction would include initial site excavation and grading activities, including clearing and grubbing of all surficial vegetation, leveling unpaved areas, and site excavation for the landfill base liner system and the installation of the environmental protection and control systems. Construction-related air pollutant emissions are associated with the site preparation and construction phasing of the proposed project and include fugitive dust emissions and exhaust emissions from construction equipment, material delivery trucks, and workers' vehicles.

Long-term air pollutant emissions are generally associated with operational activities that would occur over the site life of the landfill and closure and post-closure maintenance activities that would take place once the landfill ceases landfilling operations. Stationary source emissions are typically generated by the combustion of LFG, daily grading and cover operations, and the offsite generation of electrical energy for onsite use. Mobile source emissions consist of motor vehicle exhaust generated by project traffic. The installation of the liner system and access road realignment, will be performed in sequences as landfill development occurs. Thus, these improvements are considered operational components of the proposed project. Also during the operational phase, portable structures now located at the County Landfill will be relocated onto the City portion of Sunshine Canyon. Construction-related emissions associated with the project, as well as any associated impacts, are addressed below. Long-term (operational) air quality impacts are addressed within the Section 4.2.8, Air Quality Operational Phase (Long-Term).

4.2.7 Site Preparation/Construction ~~Sequencing~~ Phase (Short-Term)

Construction Exhaust Emissions

Diesel-powered, earthmoving vehicles or other heavy equipment would be utilized during the grading and construction sequencing of the proposed City/County Landfill. Information regarding the numbers and types of construction equipment that would be utilized was provided by the project proponent. As a reasonable worst-case scenario, grading operations are expected to occur during a 10-hour workday. Equipment emissions were calculated in accordance with methodology presented in the *SCAQMD CEQA Air Quality Handbook* and are shown in **Table 4.2-5**.

Offsite emissions will be produced by the 70 construction workers who will commute to the site daily. According to the *SCAQMD CEQA Air Quality Handbook*, these work-based trips are projected at 10 miles in each direction. Based on an average speed of 30 mph, two cold starts, and two hot soaks per worker,

5/ Ibid., pp. 6-2 and 6-3.

Table 4.2-5 (Revised)
CONSTRUCTION EXHAUST EMISSIONS FOR INITIAL SITE PREPARATION[1]

Equipment Type (number)	CO (lb/day)	NO_x (lb/day)	ROG (lb/day)	SO_x (lb/day)	PM_{10} (lb/day)
Dozer (4)	~~24.3~~ 26.9	~~51.0~~ 111.2	~~4.9~~ 19.8	~~4.9~~ 13.2	~~1.2~~ 2.3
Excavator (1)	~~9.7~~ 8.6	~~21.1~~ 35.6	~~0.9~~ 2.1	~~1.8~~ 4.2	~~1.3~~ 0.2
Small Compactor ~~(4)~~(2)[2]	~~16.0~~ 8.3	~~45.6~~ 34.4	~~4.86~~ 3.0	~~4.8~~ 2.9	~~2.4~~ 0.2
Scraper ~~(10)~~ (13)[2]	~~193.7~~ 262.2	~~334.5~~ 1082.9	~~17.6~~ 35.1	~~35.2~~ 59.8	~~26.4~~ 3.4
Loader (2)	~~15.9~~ 7.5	~~16.7~~ 31.1	~~3.2~~ 2.3	~~1.6~~ 1.8	~~1.2~~ 1.2
Rock Truck ~~(10)~~ (2)[2]	~~180.0~~ 13.3	~~417.0~~ 54.9	~~19.0~~ 3.8	~~45.0~~ 9.0	~~26.0~~ 1.1
Water Truck[3] [3](2)	~~13.1~~ 6.3	~~1.7~~ 2.9	~~1.3~~ 0.8	~~0.1~~ NV[34]	~~1.6~~ 0.1
Materials Delivery[345]	~~10.3~~ 6.1	~~3.7~~ 7.6	~~1.0~~ 1.2	~~0.2~~ NV[4]	~~0.4~~ 0.7
Worker Commutes[456]	~~41.7~~ 27.7	2.5	~~2.8~~ 2.1	~~0.3~~ NV[5]	~~0.3~~ 0.1
Total	~~**504.7**~~ **367.0**	~~**893.8**~~ **1363.1**	~~**55.5**~~ **70.2**	~~**93.9**~~ **90.9**	~~**60.8**~~ **9.3**
SCAQMD Threshold[567]	550	100	75	150	150
Exceeds Threshold	No	Yes	No	No	No

Source: Browning-Ferris Industries of California, Inc., Ultrasystems Environmental Incorporated

Notes:

1. Heavy equipment emissions are calculated according to methodologies presented in Table 4.2-7 ~~Based based on Tables A9-8-A, A9-8-B, A9-8-C, and A9-8-D of the *SCAQMD CEQA Air Quality Handbook.*~~
2. Horsepower ratings for the small compactors and rock trucks are 190 and 398, respectively. The criteria emissions are calculated similarly to operational phase compactors and dirt trucks, respectively. Scrapers are duel engine equipment with horsepower ratings of 200 and 550. PM_{10} emissions are based on equipment manufacturer specifications. ROG and SO_x emissions are calculated using *SCAQMD CEQA Air Quality Handbook*, Table A9-8-A. NO_x and CO are calculated using *Exhaust Emission Factors for Non-Road Engine Modeling – Compression Ignition.*
3. ~~2~~ Based on ~~1995~~1997 emission factors for two medium heavy trucks each driving 5 mph for 10 hours per ~~day with one cold start and one hot soak per truck.~~
4. ~~3~~ Based on ~~1995~~ 1997 emission factors for eight trucks each commuting 40 miles round trip at an average speed of 30 mph ~~with one cold and one hot start and two hot soaks per truck~~.
5. NV = No value is calculated by the EMFAC7G model but value would be inconsequential.
6. ~~4~~ Based on ~~1995~~ 1997 emission factors for 70 workers each commuting 20 miles round trip at an average speed of 30 mph with two cold starts and two hot soaks per vehicle.

~~57.~~ Daily threshold for construction. Note that with the exception of NO_x, all emissions will remain below the SCAQMD quarterly thresholds.

emissions for these vehicles were calculated from the ~~EMFAC7EP~~ 1998 EMFAC7G computer model runs ~~included in the *SCAQMD CEQA Air Quality Handbook*~~. Truck trips will be necessary to deliver construction-related materials. It was assumed that eight trucks will make one round trip of 40 miles. Based on an average speed of 30 mph, ~~one cold and one hot start, and two hot soaks per truck,~~ emissions for these vehicles were calculated from ~~the EMFAC7EP model run included in the *SCAQMD CEQA Air Quality Handbook*~~EMFAC7G.

Equipment use assumes usage during 10-hours per day, with no downtime, and is not averaged over the week to include nonworking days. Actual emissions would be lower if averaging were taken into consideration. Similarly, material deliveries would not be a daily occurrence and worker commutes are based on a separate vehicle for each worker with no ridesharing. This analysis then presents a reasonable worst-case estimate. Actual emissions, both daily and quarterly, are projected to be less than the presented values that are considered "conservative." Projected equipment emissions are included in **Table 4.2-5**.

Based on the projected emissions presented herein, a significant air quality impact is predicted for NO_x. All other gaseous emissions are projected to occur at levels below their respective criteria threshold. No other significant impacts for construction-related exhaust emissions are projected with implementation of the proposed project.

Fugitive Dust Emissions

Fugitive dust is defined as the discharge of particulate matter into the atmosphere from a nonpoint source. Fugitive dust is generated either by a mechanical disturbance to soil (i.e., associated with human activities such as grading operations or agricultural tilling) or by wind-related entrainment of dust particles. Site preparation, clearing, surface grading, excavation, and the use of heavy equipment and trucks on unpaved surfaces have the potential to generate significant quantities of dust during initial site preparation activities. The actual quantity of fugitive dust emissions generated during the construction phase will be governed by the type and amount of work being done, the soil type and moisture, and the prevailing wind conditions.

AP-42: Compilation of Air Pollutant Emission Factors (USEPA,19985) (AP-42) provides emission data for stationary, area, and mobile sources of air pollutants. The document also provides specific methodology for calculating fugitive dust emissions from soil movement. (Many of the emission factors included in the *SCAQMD CEQA Air Quality Handbook* are taken from AP-42.) In accordance with AP-42, when no mitigation measures are implemented, site grading for construction produces approximately 110 pounds of total suspended particulate matter (TSP) per day, per acre graded.[6] This value is based on a medium level of activity, a silt content of about 30 percent, and a semiarid climate. Test data used to derive the specified value are not sufficient to derive the specific dependence of dust emissions on correction parameters and for the purposes of this analysis, none have been applied.

AP-42 estimates the PM_{10} portion of TSP (the portion with an aerodynamic diameter of 10 microns or 0.0004 inch or less) to comprise roughly 45 percent of this TSP or approximately 50 pounds per acre per day. ~~However, local testing by Transit Mixed Concrete at their proposed site located along Soledad Canyon Road~~

[6] *AP-42: Compilation of Air Pollutant Emission Factors*, U.S. Environmental Protection Agency. ~~1985~~1995.

~~(approximately 10 miles north of the project site) has shown that the PM_{10} portion of the TSP comprised only 28.6 percent of all TSP (as opposed to the 45 percent predicted by AP-42). Even this value of 28.6 percent is considered conservative because these samples were obtained from the soil fines (i.e., material that is too small for use in the sand and gravel industry) and would be expected to have even higher PM_{10} levels than the surrounding soil. Based on this information and barring the use of any mitigation, each acre disturbed would be expected to produce about 31.5 pounds of PM_{10} on a daily basis (28.6 percent of 110 pounds/day).~~

Construction work at the proposed landfill footprint would disturb a relatively small area (estimated not to exceed 40 acres at any given time). In accordance with information provided by the project proponent, actual excavation operations would be further restricted to an even smaller area not expected to exceed about 10 acres per day of the 40 acre footprint. ~~By applying the above-referenced factor to the project surface area to be affected, a TSP emissions estimate of 1,100 pounds per day is calculated prior to mitigation. Of this total TSP,~~ and PM_{10} emissions are estimated at ~~315~~ 500 pounds per day prior to mitigation.

~~The USEPA has estimated that the regular watering of a site under construction may reduce fugitive dust emissions by as much as 50 percent;[7] therefore, with watering measures (per SCAQMD Rule 403) project-induced fugitive dust emissions are estimated to be approximately 550 pounds per day for total TSP. With regular watering, the PM_{10} portion of TSP emission is estimated to constitute approximately 158 pounds per day.~~

Erosion of the excavation area will also produce fugitive dust. AP-42 estimates that erosion of exposed areas creates approximately 0.38 ton per acre per year (2 pounds per acre per day) of TSP. (It should be noted that AP-42 does not denote a wind speed used in the derivation of erosion values and actual values could differ from those presented in this analysis.) The PM_{10} portion (i.e., ~~28.6~~ 45 percent of the TSP) is estimated at ~~0.3~~ 0.9 pound per acre per day. As noted above, total disturbed area is estimated at 40 acres at any one time and the daily TSP is calculated at 83 pounds per day, ~~and~~ while the PM_{10} emission is estimated at ~~24~~ 37 pounds per day. ~~Twice daily site watering will reduce this value by an estimated 50 percent.~~

Table 4.2-6 lists the PM_{10} emission sources for initial site construction. The projected PM_{10} emissions from fugitive dust, when added to the projected PM_{10} emissions attributable to vehicle exhausts produce approximately ~~231~~ 546.3 pounds of PM_{10} emissions per day. This value is in excess of the 150-pound-per-day significance criterion recommended by the SCAQMD and a significant impact is projected.

Storage and Dispensation of Fuel

The storage and transfer of diesel fuel for construction equipment are not expected to add substantially to the air pollution emissions. *AP-42: Compilation of Air Pollutant Emission Factors*[8] lists transfer operations for diesel loading from tank trucks as 0.03 pound per 1,000 gallons transferred. Due to the low Reid vapor pressure of diesel, evaporative losses from both onsite and offsite diesel storage are even lower; however, the transfer of this fuel into storage tanks will produce an additional 0.014 pound of ROG per 1,000 gallons.

7/ Ibid.

8/ Ibid.

Based on the *SCAQMD CEQA Air Quality Handbook*[9] and the equipment listing in **Table 4.2-5**, diesel fuel consumption for heavy equipment operating 10 hours per day is ~~calculated~~ estimated at approximately 2,800 gallons per day (gpd). Fuel consumption for the eight material delivery trucks based on 320 miles per day at 5.9miles per gallon (mpg),[10] projects an additional 54 gallons. Based on these values, fuel loss is calculated at 0.1 pound per day and is therefore considered inconsequential.

Table 4.2-6 (Revised)
UNMITIGATED PM_{10} EMISSIONS FOR INITIAL SITE PREPARATION

Source	PM_{10} (lb/day)[1]	~~PM_{10} (lb/day)[2]~~
Site grading	~~315~~ 500	~~158~~
Site erosion	~~24~~ 37	~~12~~
~~Vehicle~~ Exhaust emissions	~~60.8~~ 9.3	~~60.8~~
Total	~~399.8~~ 546.3	~~230.8~~

Source: Ultrasystems Environmental Incorporated

~~**Notes:**~~
~~1. No site watering.~~
~~2. Assumes twice Daily site watering as required by SCAQMD Rule 403.~~

Gasoline will also be necessary for fueling worker vehicles. Based on 70 workers each traveling 20 miles per day, 1,400 miles would be traveled on a daily basis. Vapor loss at gasoline stations is presented in AP-42 at 1.8 pounds per 1,000 gallons transferred, including spillage. Moreover, the storage of this fuel in underground tanks at service stations will produce 1.0 pound of ROG for every 1,000 gallons dispensed, and filling these underground tanks will contribute an additional 0.3 pounds per 1,000 gallons. Therefore, every 1,000 gallons of gasoline transferred result in the production of 3.1 pound of ROG. These emission estimates can be expected to be reduced in future years as low-emission gasolines are refined and better methods of vapor recovery are installed at service stations.

Based on an average anticipated fuel consumption of ~~23.5~~ 24.3 mpg (from the ~~1995 EMFAC7EP~~ 1997 BURDEN7G model run) and 1,400 miles traveled on a daily basis, ~~60~~ 57.6 gallons would be dispensed on a daily basis. Vapor loss is then calculated at less than 0.2 pound per day. When combined with the predicted ~~55.5~~ 70.2 pounds per day from exhaust emissions, ROGs from fuel transfer will not exceed the recommended 75-pound-per-day significance threshold.

9/ *SCAQMD CEQA Air Quality Handbook*, op. cit., Tables A9-8-C and A9-8-D.

10/ Ibid., Table A9-5-O.

Summary

Project construction is projected to produce NO_x (~~893.8~~ 1,363.4 lbs/day) and PM_{10} (~~230.8~~ 546.3 lbs/day). These values are in excess of those levels deemed by the SCAQMD as significant. All other emissions are estimated to remain below both daily and quarterly threshold levels.

4.2.8 Air Quality Operational Phase (Long-Term)

After the site is prepared to receive wastes, most air emissions will be produced by hauling refuse to the landfill, erosion of exposed landfill areas, and operating heavy equipment during daily landfilling operations. Emissions, to a lesser extent, will be associated with employee-generated commute trips. Additionally, onsite emissions will be produced by flaring gases produced as a byproduct of refuse decomposition. Minor quantities of emissions would also be produced ~~by the use of electricity for space and water heating and the offsite production of electricity for use onsite.~~ associated with the offsite production of electricity for use onsite. These emissions are, however, minor in comparison to equipment and vehicle emissions and will not add to or change the results of the air quality analysis.

At full operation, the proposed project (combined landfill within both jurisdictions) will receive an anticipated average solid waste intake of approximately 11,000 tons per day (tpd) and a maximum of 12,100. The estimated number of trucks necessary to deliver this intake amount is based on the traffic study submitted by the traffic consultant and is included as Appendix B1 (Traffic Impact Study Report - Sunshine Canyon Landfill, Browning-Ferris Industries, Inc.) within this SEIR. Based on the traffic impact analysis, as many as 220 transfer trucks, 640 curbside collection trucks, and 250 local delivery trucks will transport refuse to the project site on a daily basis. Additionally, up to 87 employees are anticipated to commute to the project site.

Onsite Equipment

During operation, vehicles will be utilized to transport refuse to the landfill. Waste material is deposited within prepared working face areas, compacted, and then covered daily with cover material. A completely covered compacted solid waste unit (or cell) is adjoined to other cells in similar height, making a lift. ~~When landfill capacity of a working area is exhausted, a new area is excavated and lined with an impermeable membrane, and additional cells are formed.~~ Heavy equipment would be used ~~to~~ for ~~excavate~~ cell preparation ~~and prepare new landfill working areas~~, to provide cover material, and to compact refuse on a daily basis. The equipment listings and hours of operation are based on existing requirements at the County Landfill and experience gained when the existing inactive City Landfill was operational. Emissions were calculated using *Exhaust Emission Factors for Non-Road Engine Modeling – Compression - Ignition (EPA Report No. NR-009, February 13, 1998)* or manufacturer specifications where available. Load factors taken from *SCAQMD CEQA Air Quality Handbook* (Table A9-8-D) or manufacturers specifications, where available, were also used in emissions calculations. ~~As previously noted, to present a reasonable worst-case scenario, all equipment is projected to operate 10 hours per day.~~ The equipment utilized and the projected emissions are presented in **Table 4.2-7**.

Table 4.2-7
HEAVY EQUIPMENT EMISSIONS FOR SITE OPERATIONS[1]

Equipment Type (number)	CO[1] (lb/day)	NO_x[1] (lb/day)	ROG[2] (lb/day)	SO_x[2] (lb/day)	PM_{10}[3] (lb/day)
Bulldozer (10)	60.8	127.4	12.2	12.2	3.0
Grader (2)	19.8	37.8	5.4	3.6	1.8
Compactor (4)	16.0	45.6	4.6	4.6	2.4
Scraper (6)	116.2	200.8	10.6	21.2	15.8
Water Truck[4] (4)	26.3	3.3	2.5	0.3	3.2
Total	233.7	414.9	35.3	41.9	26.2

Source: Browning-Ferris Industries of California, Inc., Ultrasystems Environmental Incorporated

Notes:

1. Based on Tables A9-8-B, A9-8-C, and A9-8-D of the *SCAQMD CEQA Air Quality Handbook* for 10 hours per day
2. Based on 1995emission factors for three heavy trucks each driving 5 mph for 10 hours per day with one cold start and one hot soak per truck.

Table 4.2-7
UNCONTROLLED PM_{10} EMISSIONS FROM OPERATIONAL HEAVY EQUIPMENT EXHAUST

Emission Source: Operational Heavy Equipment Exhaust 1/1

Introduction: Heavy equipment operation produces PM_{10} from exhaust. Equipment is used to landfill waste at the active working face, provide cover at the active working face, prepare landfill areas for receiving waste, and maintain other landfill areas.

Parameters:

Reference 1 Equipment Manufacturer
Reference 2 SCAQMD CEQA Air Quality Handbook
Reference 3 Exhaust Emission Factors For Non-Road Engine Modeling--Compression-Ignition
Reference 4 1998 EMFAC7G model
Conversion factor (I) 454 grams/pound

Equipment	Horsepower Rating (hp)	No. of Equip.	hrs/day	Load Factor[1]	Criteria Emission Factors[2]														
					PM_{10}	Units	Ref.	ROG	Units	Ref.	SOx	Units	Ref.	NO_x	Units	Ref.	CO	Units	Ref.
Bulldozer	280	5	10	0.59	45	g/hr	1	0.003	lb/hp-hr	2	0.002	lb/hp-hr	2	7.64	g/hp-hr	3	1.85	g/hp-hr	3
Grader	150	1	10	0.575	20	g/hr	1	0.039	lb/hr	2	0.086	lb/hr	2	7.64	g/hp-hr	3	1.85	g/hp-hr	3
Compactor	569	6	10	0.54[3]	0.14	g/hp-hr	1	0.15	lb/hr	2	0.143	lb/hr	2	7.64	g/hp-hr	3	1.85	g/hp-hr	3
Dirt Truck	398	7	8	0.41	0.16	g/hp-hr	1	0.19	lb/hr	2	0.45	lb/hr	2	7.64	g/hp-hr	3	1.85	g/hp-hr	3
Excavator	365	2	10	0.58	0.05	g/hp-hr	1	0.001	lb/hp-hr	2	0.002	lb/hp-hr	2	7.64	g/hp-hr	3	1.85	g/hp-hr	3
Water Pull	536	2	10	0.41	0.4	g/hp-hr	1	0.19	lb/hr	2	0.45	lb/hr	2	7.64	g/hp-hr	3	1.85	g/hp-hr	3
Water Truck	Based on 1998 EMFAC7G emission factors for 3 medium heavy trucks each driving 5 mph for 10 hours per day. (Reference 4)																		

Notes:
1. Load factors are taken from SCAQMD CEQA Air Quality Handbook Table A9-8-D.
2. For each piece of equipment, the most specific and recent criteria emission factors are applied.
3. Equipment manufacturer provided load factor.

Emissions Estimate:

Emissions Estimates:

For units of g/hr:

Criteria Emission Factor x No. of Equip. x hrs/day x I x Load Factor = lb/day

For units of g/hp-hr:

Criteria Emission Factor x No. of Equip. x hrs/day x hp x I x Load Factor = lb/day

For units of lb/hr:

Criteria Emission Factor x No. of Equip. x hrs/day = lb/day

For units of lb/hr:

Criteria Emission Factor x No. of Equip. x hrs/day x hp x Load Factor = lb/day

Equipment	Criteria Emissions (pounds/day)				
	PM_{10}	ROG	SOx	NOx	CO
Bulldozer	2.9	24.8	16.5	139.0	33.7
Grader	0.3	0.4	0.9	14.5	3.5
Compactor	5.7	9.0	8.6	309.9	75.0
Dirt Truck	3.2	10.6	25.2	153.8	37.2
Excavator	0.5	4.2	8.5	71.3	17.3
Water Pull	3.9	3.8	9.0	74.0	17.9
Water Truck	0.2	1.1	NV*	4.2	9.4
TOTAL	***16.6***	***54.0***	***68.6***	***766.7***	***194.0***

* No value is calculated by the EMFAC7G model. Value would be inconsequential.

Source: Browning-Ferris Industries

Mobile Emissions

Employee Commuting

As many as 87 employees (at landfill buildout) would be employed during the long-term operational phase of the proposed project. Based on the home-to-work projections included in the *SCAQMD CEQA Air Quality Handbook* (Table A9-5-D for Los Angeles County), each round trip is projected at a 20-mile distance, for a total of 1,740 miles per day. Emissions for these trips were calculated in accordance with the ~~methodology presented in the *SCAQMD CEQA Air Quality Handbook* (Table A9-5-J-4)~~emission factors projected by the 1998 EMFAC7G model using emission factors projected for the 1998 vehicle fleet and are included in **Table 4.2-8**.

Table 4.2-8 (Revised)
OPERATIONAL GASEOUS EMISSIONS

Emission Source	CO (lb/day)	NO_x (lb/day)	ROG (lb/day)	SO_x (lb/day)	PM_{10} (lb/day)
Heavy Equipment[1]	~~233.7~~ 194.0	~~414.9~~ 766.7	~~35.3~~ 54.0	~~41.9~~ 68.6	~~26.2~~ 16.6
Employee Commutes[2]	~~46.0~~ 35.6	~~3.0~~ 3.3	~~3.2~~ 2.8	~~0.2~~ NV[3]	~~0.5~~ 0.1
Waste Transfer Trucks[34]	~~254.0~~ 174.3	~~128.6~~ 275.0	~~25.8~~ 33.2	~~8.4~~ NV	~~13.4~~ 23.3
Curbside Collection Trucks[45]	~~977.6~~ 677.9	~~259.4~~ 587.1	~~106.2~~ 110.2	~~15.8~~ NV	~~25.2~~ 43.9
Local Deliveries[56]	~~106.4~~ 102.0	~~8.4~~ 13.0	~~8.0~~ 7.7	~~0.6~~ NV	~~1.2~~ 0.2
Combustion of Landfill Gas[67]	~~1,440.0~~ 520.0	~~289.4~~ 870	~~30.4~~ 125.0	~~68.4~~ 535.0	~~36.0~~ 205
Storage and Dispensation of Fuel	NE[78]	NE	~~1.3~~ 1.2	NE	NE
Total	**~~3,057.7~~ 1,703.8**	**~~1,103.7~~ 15.1**	**~~210.2~~ 334.1**	**~~135.3~~ 603.6**	**~~102.5~~ 289.1**
SCAQMD Threshold[89]	550	100	75	150	150
Exceeds Threshold	Yes	Yes	Yes	~~No~~ Yes	~~No~~ Yes

Source: Browning-Ferris Industries of California, Inc., Ultrasystems Environmental Incorporated

Notes:

1. From **Table 4.2-7** above.
2. Includes 87 employees traveling a total of 1,740 miles at an average speed of 30 mph with two cold starts and two hot soaks per vehicle.

~~3.~~ NV - No value is calculated by the EMFAC7G model but value would be inconsequential

~~34.~~ Includes 220 trucks traveling a total of 11,880 miles at 40 mph ~~with one cold and one hot start and two hot soaks per truck~~.

~~45.~~ Includes 640 trucks traveling a total of 19,200 miles at 25 mph and 3,200 miles at 5 mph ~~with one cold and one hot start and two hot soaks per truck~~.

~~56.~~ Includes 250 light-duty trucks traveling a total of 5,000 miles at 25 mph with one cold and one hot start and two hot soaks per vehicle.

~~67.~~ ~~Based on twice the maximum permitted emissions.~~ Combustion emissions have been revised and are based on permitted emissions for 5 flares, including the existing flares at the City and County landfills, which are already in operation. In 1997, the emission limits for two permitted flares were revised to reflect changes in gas composition for those flares. The emission limits in the original permits were based on the best estimate of gas composition available at the time the permits were issued. Since gas composition changes over time, SCAQMD practice is to periodically revise permitted emission limits to reflect actual conditions.

~~78.~~ NE - No emissions of this type are associated with this operation.

~~89.~~ Daily threshold for operations.

Collection and Transport Trucks

Generally, three types of trucks would be utilized to transport refuse to the project site: transfer trucks that bring in materials from transfer stations, curbside collection trucks that obtain wastes from the local collection routes, and pickup and small stakebed trucks that are primarily used by private contractors to bring in refuse (such as gardening and landscaping green wastes). Each type of vehicle is described below.

Transfer Trucks: Generally, wastes transported in transfer trucks would comprise about ~~46~~ 42 percent of the refuse brought to the project site. These trucks would be received from the BLT Enterprise Central Los Angeles, Santa Monica, Beverly Hills, Culver City, and Falcon (Wilmington) transfer stations. An average round trip is estimated at 54 miles. Based on the traffic study (refer to Appendix B1 of this Draft SEIR), approximately 220 transfer trucks will produce 440 trip ends (TEs). (Note: Travel is based on TEs, so all starts and their attendant emissions are properly accounted.) Based on a one-way travel distance of 27 miles for each TE, approximately 11,880 transfer truck miles will be generated. Because the majority of travel distance for these trucks would be along existing freeway corridors, an average speed of 40 mph is used in accordance with the *SCAQMD CEQA Air Quality Handbook* (Table A9-5-F). Emissions are calculated in accordance with ~~the *SCAQMD CEQA Air Quality Handbook* (Table A9-5-K-4)~~ emission factors projected by the 1998 EMFAC7G model and included in **Table 4.2-8**.

Curbside Collection Trucks: The proposed project would also have collection vehicles transporting refuse to the project site. It is anticipated that curbside collection vehicles from the communities of Granada Hills, Chatsworth, West San Fernando, Encino, and numerous west Los Angeles cities (e.g., Santa Monica, Culver City, Beverly Hills, and Inglewood) would transport refuse to the site. These vehicles would comprise about ~~52~~ 56 percent of the waste brought to the project site, and as many as 640 trucks would generate about 1,280 daily TEs.

During curbside collection, these trucks are projected to average about 5 mph and travel approximately 5 miles before reaching load capacity. The trucks would transport refuse to the landfill using an average speed of 25 mph. (Note: The reduced average speed for collection trucks, as opposed to transfer trucks, is due to their project proximity and reduced freeway use.) Representative average speeds for all vehicles in Los Angeles County are presented in the *SCAQMD CEQA Air Quality Handbook* (Table A9-5-F).

Because the geographic locations of curbside collection will vary, an average distance of about 15 miles to the landfill (30 miles round trip) is assumed in this analysis. This value is based on approximately half of the transfer truck distance. Based on this assumption and the above, each collection truck will travel 30 miles at 25 mph and 5 miles at 5 mph. The resulting emissions have been calculated in accordance with ~~the methodology presented in the *SCAQMD CEQA Air Quality Handbook* (Table A9-5-K-4)~~ emission factors projected by the 1998 EMFAC7G model.

Local Deliveries: Local deliveries include the use of small pickups (0.75- to 1.5-ton load capacity) and stakebed trucks. Generally, these vehicles would collect and transport landscaping material, green wastes, and wood wastes. These deliveries comprise less than 2 percent of the total vehicle trips to the project site and, as a result, would represent a very small percentage of the total volume of solid waste transported to the project site on a daily basis. An estimated 250 local delivery vehicles will also produce 500 daily TEs. An average round trip distance of 20 miles, assuming an average speed of 25 mph, is used in the emissions calculation. Emissions have been calculated in accordance with ~~the methodology presented in the *SCAQMD CEQA Air Quality Handbook* (Table A9-5-J-4)~~ emission factors projected by the 1998 EMFAC7G model.

Other Emissions

Various other emission sources are also associated with operation of the landfill facility. Electricity is used for water heating and is anticipated to be used to operate various types of onsite equipment and lighting and will ~~produce~~ result in offsite emissions at the local power generating station. In accordance with *SCAQMD CEQA Air Quality Handbook* each megawatt of electricity consumed produces only 1.64 pounds of all pollutants combined. Therefore these emissions, would be minimal and are not considered significant due to existing and projected ~~sufficient~~ capacity, which is sufficient and available. Based on the conservative method utilized in the derivation of heavy equipment and vehicle emissions, these electrical emission sources will not produce a change in the outcome of this impact analysis.

Other emission sources include the development and use of the flaring stations and the storage and transfer of nonrenewable fuel for project-related vehicles, ~~that~~ which will result in VOC emissions from the evaporation of fuel during its storage and transfer. These potential sources are discussed below.

Combustion of Landfill Gas Emissions

Rule 1150.1 of the SCAQMD requires the collection of gas generated by landfills and the destruction of the gas collected from the landfill site. In order to comply with this rule, collected LFG would be burned in high-efficiency flares, each with a total volume disposal capacity of approximately 6 million standard cubic feet per day (scf/day) or 4,167 standard cubic feet per minute (scf/min). While the *FEIR Sunshine Canyon Landfill Extension* proposed a total of eight flaring stations within Sunshine Canyon, revisions in LFG generation calculations as well as experience gained in the generation rates associated with the existing inactive City Landfill have shown that only two additional flare stations will be required for the proposed City/County Landfill project~~, in addition to the two landfill gas flares already permitted for the County Landfill~~ for a total of five flares. An existing flare station is located in the southwest perimeter area of ~~Sunshine Canyon~~ in the existing inactive City Landfill and two additional flares are proposed in the City's jurisdiction. (Refer to **Figure 2.5-1** of the Draft SEIR.) Currently, and within the County, two flares are permitted but only one flare station has been constructed. This flare ~~will become~~ is now operational. The existing flare station in the City is now operating at approximately 50 percent of its permitted capacity and would be utilized for the proposed project until sufficient LFG is generated to warrant development of an additional flare station(s) in the City portion of Sunshine Canyon.

A typical LFG flaring station encompasses approximately ½ acre of land and is well secured with perimeter fencing ~~and locked for safety purposes~~. The flare itself includes several components that consist of a condensate knockout drum, a condensate pump, three blowers, particulate filter, two flame arresters, one flare, an LFG flow meter, and an LFG emergency shutoff valve. The proposed LFG station would be designed similar to the constructed County Landfill flare station, which includes a flare stack approximately 50 feet high and ~~13~~ 12.5 feet in diameter.

The proposed flare stations located in the City would be considered sources of new emissions, subject to SCAQMD's Permit to Construct and Permit to Operate rules and regulations. Compliance with these permits would require performance testing of the landfill gas flaring system prior to 60 days of achieving normal operation and annually in accordance with SCAQMD testing procedures. Performance tests are conducted at the maximum flow rates available and do not exceed the flow rate allowed by the Permit to Construct. Tests of the inlet landfill gas flare and the flare exhaust are conducted for methane, total non-methane organics, non-methane organics (i.e., speciated and quantified), oxides of nitrogen, carbon monoxide, total

particulate, hydrogen sulfide, total sulfur compounds, hydrogen chloride, carbon dioxide, oxygen, nitrogen, moisture content, BTU content, and flow rate.

Generally, emissions for gas combustion are calculated in accordance with emission factors utilized by the SCAQMD for natural gas flares and the amount of emissions expected from flaring activities at the facility. The flare emissions would be controlled to meet the SCAQMD's best available control technology (BACT).

As stated previously, two new flare stations are currently proposed in the City jurisdiction, in addition to two permitted flare stations (one of which is constructed and in operation) located within the County jurisdiction, and ~~existing~~ the currently operating flare station within the City. A total of five flare stations would be located within Sunshine Canyon. ~~Permitted for combustion~~ The maximum emissions allowed for the three permitted flares are presented in **Table 4.2-9**. One of the existing flares was recently repermitted with new emissions/ limitations, while the other two permitted flares (one of which is currently operational) are permitted at older limitations. It is projected that all five flares will be subject to the revised limitations of the re-permitted unit and all these revised emissions factors have been used for all five flares in the included analysis.

Table 4.2-9 (Revised)
PERMITTED MAXIMUM DAILY EMISSIONS FROM EXISTING FLARING ACTIVITIES[1]

Pollutant	Permitted Emissions from Landfill Gas Flaring (lb/day)
CO	~~720.0~~ 1,544
NO_x	~~144.7~~ 462.0
NMHC[2]	~~15.2~~ 55.0
SO_x	~~32.4~~ 169.0
PM_{10}	~~18.0~~ 77.0

Source: Ultrasystems Environmental Incorporated
Notes:
1. Based on SCAQMD permits for three existing flares
2. Nonmethane hydrocarbons (NMHC). These emissions are also considered as ROG.

~~Note that the existing flare station (within the City) is currently operating at about 50 percent of its 105 million British thermal units per hour capacity; existing emissions are reduced accordingly. For CEQA purposes, the volume of emissions associated with the permitted activities has been doubled to include both existing emissions, and the proposed City/County Landfill Project at buildout or 11,000 tpd of accepted waste.~~

Fuel Storage and Dispensation

Volatile organic emissions are associated with the storage and transfer of fuel to project-generated vehicles. The 220 transfer trucks and 640 refuse collection trucks are anticipated to travel approximately 34,280 miles per day. Based on an average fuel consumption of 5.9 mpg predicted ~~in the *SCAQMD CEQA Air Quality Handbook* (Table A9-5-O)~~ by the BURDEN7G model, an estimated 5,810 gallons of fuel may be used daily. All of these vehicles are ~~all~~ assumed to use diesel fuel.

Diesel fuel will also be utilized by onsite equipment and machinery. When the existing inactive landfill was operational during peak capacity (i.e., 6,000 tpd), onsite equipment and machinery utilized approximately 450 ~~gpd~~ gallons per day (gpd) of diesel fuel. For the proposed project, this value was doubled and daily diesel consumption for heavy equipment is estimated at 900 ~~gallons per day~~ gpd.

Based on the consumption quantity of 900 gpd utilized for onsite operations, plus fuel usage for vehicles transporting refuse to the landfill site, the total diesel consumption is projected to be approximately 6,700 gpd for the proposed project. Based on AP-42 requirements, approximately 0.03 pound of vapor (ROG) is released per every 1,000 gallons transferred from storage into vehicles. Storage of this fuel source would contribute an additional 0.014 pound per 1,000 gallons. Based on these estimates, approximately 0.3 pound of vapor emissions is anticipated to occur at the project site on a daily basis.

Gasoline will be utilized by landfill employees who would be commuting to the site and service vehicles and light-duty vehicles that would transport wastes to the site. As discussed above, employees are anticipated to generate approximately 1,740 commuter miles per day. Onsite service vehicle use is assumed to be minimal and is therefore conservatively projected to generate 100 miles per day. Light-duty trucks are projected to travel approximately 5,000 miles per day. In accordance with the ~~*SCAQMD CEQA Air Quality Handbook* (Table A9-5-O)~~ BURDEN7G model, fuel economy for employee commute vehicles is projected to be ~~25~~25.2 mpg; therefore, the daily fuel consumption for all employees is estimated to be approximately ~~70~~69 gpd. The fuel economy for both onsite service vehicles and light-duty trucks is projected to be ~~20~~22.4 mpg; therefore, these vehicles will consume approximately ~~255~~228gpd. Based on a value of 3.1 pounds of VOC per 1,000 gallons consumed, vapor loss due to gasoline storage and distribution is calculated at ~~1.00~~.9 pound per day.

Fugitive Dust

Fugitive dust is produced by daily site operations, including landfilling operations, the ~~excavation~~ preparation of ~~new~~ landfilling areas, procurement of cover material, wind action on material that has been stockpiled during the initial construction and on disturbed areas, and truck travel on both the paved access roadway and the unpaved haul route surface to the active working face. Following initial site preparation, normal operations and disturbed areas would be confined to approximately ~~40~~20 acres. Heavy equipment would be utilized ~~to~~ for landfill ~~excavate~~ cell development ~~and prepare new landfill cells~~, as needed, procurement of cover materials, and refuse compaction ~~refuse~~ on a daily basis. Of the ~~40~~20-acre area, up to 10 acres would be used for active landfilling operations, including the active working face and truck turnaround area. ~~It is anticipated that an additional 10 acres would be used for the procurement of cover materials. The entire 40 acres would be subject to erosion and potential fugitive dust emissions.~~

Active Working Face Area and Truck Turnaround. It is anticipated that an active ~~working face~~ area of up to 10 acres would be disturbed at any one time. The actual area for landfilling is expected ~~at~~ to be approximately ~~25,000 sq. ft. or about 0.6~~ 1.0 acre ~~per day~~. This area would receive the solid wastes and be

compacted and covered with soil material on a daily basis. The remaining area is the waste-bearing truck turnaround. The turnaround area consists of densely compacted soil similar to an unpaved road. ~~Based on a value of 31.5 pounds of PM_{10} emissions per acre per day, approximately pounds of PM_{10} emissions would be produced during daily cover and compaction operations. Dust would also be generated during the disposal and movement of refuse at the working face area. Unloading refuse would not create substantial quantities of dust emissions.~~ Fugitive PM_{10} emission sources at the active working face area and truck turnaround consist of heavy vehicle operations, unloading of solid waste, dumping of daily cover, wind erosion of the active working face, and truck travel in the turnaround area. Fugitive PM_{10} emissions from heavy equipment operations are calculated according to the *SCAQMD CEQA Air Quality Handbook* (Table A9-9-F) and are provided in **Table 4.2-10**. Fugitive PM_{10} emissions calculations from material handling activities are estimated according to *SCAQMD CEQA Air Quality Handbook* (Tables A9-9 and A9-9-G) and are shown in **Table 4.2-11**. Fugitive PM_{10} emissions from wind erosion of exposed surfaces are calculated according to AP-42 (Table 11.9-4) and are shown in **Table 4.2-12**. Fugitive PM_{10} emissions calculations from truck travel on the truck turnaround area are estimated according to *AP-42* (Chapter 13.2.2) and are shown in **Table 4.2-13**.

Landfill Area ~~Excavation~~ Preparation. When additional landfill areas are ~~excavated~~ prepared, an area of up to 10 acres would be disturbed. Ongoing ~~excavation~~ preparation activities are necessary to keep pace with the projected landfilling operations. ~~As discussed above, the area of active landfilling is anticipated to encompass approximately 0.6 acre per day.~~ Fugitive PM_{10} emission sources during landfill preparation include heavy equipment operations and wind erosion of the area.

~~The area for landfilling operations includes both a deck area for vehicle maneuvering and a trench area estimated at a depth of approximately 20 feet. Access to the trench area will be sloped. If excavation would require that landfill be ramped at a 2:1 (horizontal to vertical) slope, the area for excavation is estimated at roughly twice the working face area or about 1.2 acres per day. Based on a value of 31.5 pounds of PM_{10} emissions per acre per day, about 38 pounds of PM_{10} would be generated from landfill excavation.~~

Cover Procurement. ~~Cover procurement would occur in an area of up to 10 acres. Assuming that 1 foot of cover material is required for the daily cover at the working face and that the material is procured to a depth of 2 feet, one-quarter acre would be excavated on a daily basis. It is estimated that fugitive dust emissions from the procurement of cover material would be approximately pounds per day.~~ Daily cover is applied over compacted waste on the active working face. The amount of cover required on a daily basis was calculated assuming that 1 cubic yard of cover is needed for every 10 tons of waste dumped. Cover material consists of clay at 1.2 tons per cubic yard. Therefore, approximately 1,450 tons of cover material is procured daily from one of two anticipated stockpile areas. Fugitive PM_{10} emission sources during cover procurement include heavy equipment operations, wind erosion of cover stockpile areas, and excavation of the cover stockpile. Fugitive PM_{10} emissions calculations from stockpile erosion according to *SCAQMD CEQA Air Quality Handbook* (Tables A9-9-E) are shown in **Table 4.2-12**.

Surface Erosion. As mentioned above, ~~daily operations would typically be restricted to small areas of land (approximately 10 acres although as much as 40 acres could be excavated at any one time). Based on a value of 0.3 pound of PM_{10} per acre per day and 40 acres, approximately 12 pounds of PM_{10} would be generated as a result of potential surface erosion.~~ surface erosion occurs at the active working face and during landfill preparation. Calculation of fugitive PM_{10} emissions from surface erosion is provided in **Table 4.2-12**.

Table 4.2-10
FUGITIVE UNCONTROLLED PM_{10} EMISSIONS FROM HEAVY EQUIPMENT OPERATIONS

Emission Source: Heavy Equipment Operations 1/1

Introduction: Heavy equipment operations produce fugitive PM_{10} dust during bulldozing, grading, and compacting activities. Equipment is used to landfill waste at the active working face, provide cover at the active working face, prepare landfill areas for receiving waste, and maintenance in other landfill areas.

Parameters:

Silt Content (G) 6 % AP-42 Table 13.2.4-1; Municipal Solid Waste Landfills, clay

Moisture Content (H) 12 % cover material Facility Data
12 % landfill excavation Facility Data
27 % solid waste Facility Data

Ratio of PM_{10} to TSP 0.45 AP-42

Ratio of kg/hr to lb/hr (I) 2.2046

Hours of Operation (J) 10 hrs/day for each piece of equipment staggered over the 14-hour day

Emissions Estimate:

Emissions Estimate:

$0.45 \times G^{1.5} / H^{1.4} \times I \times J \times$ Ratio of PM_{10} to TSP = lb/day CEQA Table A9-9-F

Emissions Source	Amount	Units	No. of Equip.	Location	Equipment Hours/Day	Uncontrolled PM_{10} Emission Factor	Units	Uncontrolled PM_{10} Emissions (lb/day)
Bulldozer	10	hrs/day	1	Active Face	10	0.14	lb/equip. hr	1.44
			1	Cover Proc./Landfill Ex.	10	0.45	lb/equip. hr	4.50
			3	Other Landfill Areas	30	0.45	lb/equip. hr	13.49
Grader	10	hrs/day	1	Active Face	10	0.16	lb/equip. hr	1.59
Compactor	10	hrs/day	6	Active Face	60	0.16	lb/equip. hr	9.55
TOTAL						***Uncontrolled PM_{10} Emissions - pounds/day***		***30.60***

Source: Browning-Ferris Industries

Conclusion: The uncontrolled PM_{10} emissions that could result from heavy vehicle operations are 30.6 pounds/day.

Table 4.2-11
FUGITIVE UNCONTROLLED PM_{10} EMISSIONS MATERIAL HANDLING ACTIVITIES

Emission Source: Material Handling Activities 1/1

Introduction: Material handling consists of dumping of solid waste, dumping of daily cover, and excavation of the cover stockpile.

Parameters:

Mean Wind Speed (G) 9.9 mph Site specific meterological data

Moisture Content (H) 12 % cover material Facility Data
27 % solid waste Facility Data

Amount of material handled (I) 1,452 tpd daily cover (10% by volume of the tonnage of waste)
12,100 tpd solid waste

Ratio of PM_{10} to TSP 0.45 AP-42

Emissions Estimate:

Active Face Area Emissions Estimate:

$0.00112 \times (G/5)^{1.3} / (H/2)^{1.4} \times I$ = lb/day CEQA Table A9-9-G

Stockpile Area Dirt Digging Emissions Estimate:

2.21E-02 x I x Ratio of PM_{10} to TSP = lb/day CEQA Table A9-9; Truck Filling

Emissions Source	Amount	Units	Location	Uncontrolled PM_{10} Emission Factor	Units	Uncontrolled PM_{10} Emissions (lb/day)
Stockpile Dirt Digging	1,452	tpd	Stockpile Area	2.21E-02	lb/ton-day	32.02
Dumping of Solid Waste	12,100	tpd	Active Face	7.12E-05	lb/ton-day	0.86
Dumping of Daily Cover	1,452	tpd	Active Face	2.22E-04	lb/ton-day	0.32
TOTAL				*Uncontrolled PM_{10} Emissions - pounds/day*		*33.2*

Source: Browning-Ferris Industries

Conclusion: The uncontrolled PM_{10} emissions that could result from material handling are 33.2 pounds/day.

Table 4.2-12
FUGITIVE UNCONTROLLED PM_{10} EMISSIONS FROM WIND EROSION

Emission Source: Wind Erosion 1/1

Introduction:

Parameters:

Silt Content (G)	6	%	AP-42 Table 13.2.4-1, Municipal Solid Waste Landfills, clay
Time when unobstructed wind speed exceeds 12 mph at mean pile height (I)	100	%	conservative assumption
Number of Days with at least 0.01 inches of precipitation/year (H)	34	days	CEQA Table A9-9-E-2
Ratio of PM_{10} to TSP	0.45		AP-42
Exposed Acres (A)	30	acres	Stockpile Areas
	10	acres	Landfill Area Preparation
	1	acre	Active Working Face

Emissions Estimate:

Stockpile Erosion Emissions estimate:

1.7 x G / 100 / 15 x (365 - H) / 235 x I / 15 x Ratio of PM_{10} to TSP = lb/day CEQA Table A9-9-E

Surface Erosion Emissions estimate:

0.38 x 2000 / 365 x A x Ratio of PM_{10} to TSP = lb/day AP-42 Table 11.9-4

Emissions Source	Amount	Units	Hours/Day	Uncontrolled PM_{10} Emission Rate	Units	Uncontrolled PM_{10} Emissions (lb/day)
Active Working Face	1	acres/day	24	0.94	lb/acre-day	0.94
Daily Cover Stockpile	30	acres/day	24	0.29	lb/acre-day	8.62
Landfill Area Preparation	10	acres/day	24	0.94	lb/acre-day	9.37
TOTAL				***Uncontrolled PM_{10} Emissions - pounds/day***		***18.90***

Source: Browning-Ferris Industries

Conclusion: The uncontrolled PM_{10} emissions that could result from wind erosion are 18.9 pounds/day.

Table 4.2-13
FUGITIVE UNCONTROLLED PM_{10} EMISSIONS FROM UNPAVED ROADS

Emission Source: Unpaved Roads 1/1

Introduction: Unpaved roads at the landfill include the crushed stone covered access road, the stockpile road, and the truck turnaround area. Crushed stone may consist of purchased rock, recycled asphalt, recycled cement, and/or recycled rock.

Parameters:

Particle Size Multiplier (k)	0.36	AP-42 Chapter 13.2.2; PM_{10}
Silt Content (s)	4 %	CEQA Table A9-9-D-1; gravel
	6.4 %	AP-42 Table 13.2.2-1
Number of Days with at least 0.01 inches of precipitation/year (p)	34 days	CEQA Table A9-9-E-2
Mean Vehicle Speed (S)	10 mph	Access Road and Stockpile Road
	3 mph	Truck Turnaround
Mean Vehicle Weight (W)	24.5 tons	Transfer Truck
	16.3 tons	Curbside Collection Truck
	2.5 tons	Light Duty Truck
	44 tons	Dirt Truck
Mean Number of Wheels (w)	18 wheels	Transfer Truck
	10 wheels	Curbside Collection Truck
	4 wheels	Light Duty Truck
	6 wheels	Dirt Truck
Vehicle Miles Traveled (VMT)	Varies, see below	

Emissions Estimate:

Emissions Estimate:

$k \times 5.9 \times (s/12) \times (S/30) \times (W/3)^{0.7} \times (w/4)^{0.5} \times (365 - p)/365 \times VMT = lb/day$ AP-42 Chapter 13.2.2

Emissions Source	Amount	Units	No. of Trucks	Round Trip Distance (miles)	VMT per Day	Uncontrolled PM_{10} Emission Factor (lb/VMT)	Uncontrolled PM_{10} Emissions (lb/day)
Transfer Truck	5,060	tpd	220	0.1515	33	1.95	65.1
Curbside Collection Truck	6,820	tpd	640	0.1515	97	1.10	106.2
Light Duty Truck	220	tpd	250	0.1515	38	0.19	7.1
Dirt Truck	1,452	tpd	7	1*	36	2.54	92.3
TOTAL					***Uncontrolled PM_{10} Emissions - pounds/day***		***270.6***

Source: Browning-Ferris Industries

Note:

* A round trip distance of approximately 1 mile was assumed for travel between the stockpile and the active working area.

Conclusion: The uncontrolled PM_{10} emissions that could result from unpaved road travel are 261.4 pounds/day.

Table 4.2-14
FUGITIVE UNCONTROLLED PM_{10} EMISSIONS FROM PAVED ROADS

Emission Source: Paved Roads 1/1

Introduction: The paved road at the landfill consists of the paved portion of the access road.

Parameters:

Particle Size Multiplier (k) 0.016 lb/VMT AP-42 Chapter 13.2.1; PM_{10}

Silt Loading (sL) 1.02 g/m^2 CEQA Table A9-9-C-1; collector road

Mean Vehicle Weight (W) 24.5 tons Transfer Truck
16.3 tons Curbside Collection Truck
2.5 tons Light Duty Truck

Vehicle Miles Traveled (VMT) Varies, see below

Emissions Estimate:

Emissions estimate:
$k \times (sL/2)^{0.65} \times (W/3)^{1.5} \times VMT$ = lb/day ; AP-42 Chapter 13.2.1

Emissions Source	Amount	Units	No. of Trucks	Round Trip Distance (miles)	VMT per Day	Uncontrolled PM_{10} Emission Factor (lb/VMT)	Uncontrolled PM_{10} Emissions (lb/day)
Transfer Truck	5060	tpd	220	2	440	0.24	105.9
Curbside Collection Truck	6,820	tpd	640	2	1280	0.13	167.6
Light Duty Truck	220	tpd	250	2	500	0.01	3.9
TOTAL					***Uncontrolled PM_{10} Emissions - pounds/day***		***277.4***

Source: Browning-Ferris Industries

Note:
* This round trip distance reflects the worst-case daily PM_{10} emissions. For modeling purposes, the highest PM_{10} contributing sources were placed nearest to potential receptors resulting in a round trip distance of 0.216 miles.

Conclusion: The uncontrolled PM_{10} emissions from paved road travel that could result in the worst-case daily total PM_{10} emissions are 277.4 pounds/day.

Stockpile Erosion. During initial site construction, soil material will be stockpiled and stored onsite for subsequent use as daily cover material. Estimates for soil stockpiling indicated that as much as 500,000 cubic yards of soil may be stockpiled at any given time. This material would be utilized and depleted over time~~; it~~ and would not be replenished. ~~Subsequent cover material would be obtained by daily procurement (discussed above), and~~ Therefore, the fugitive dust emissions associated with the stockpile would eventually be alleviated. However, while the soil remains onsite, the stockpile would be subject to erosion and potential fugitive dust emissions. At a height of 10 feet, the two anticipated stockpile areas would together require a land area of approximately 30 acres. Calculation of fugitive PM_{10} emissions from stockpile erosion is provided in **Table 4.2-12**.

~~Included within AP-42 (Table 8.19.1-1) is a listing of PM_{10} emissions for stockpiles at sand and gravel processing plants. Based on this type of listing it is anticipated that approximately 1.7 pounds per acre per day for inactive stockpiles and 6.3 pounds per acre per day for active stockpiles would be generated. It is assumed that 1 acre of stockpile material would be active and that 55.6 pounds of PM_{10} would be generated on a daily basis. By adjusting this value to reflect the reduced onsite PM_{10} content, approximately 35 pounds of PM_{10} emissions would be released.~~

~~Vehicular~~**Truck Travel on Paved Surfaces.** Because dust generally settles on horizontal surfaces, onsite ~~vehicular~~truck travel over paved surfaces would also produce fugitive dust emissions. ~~In accordance with the AP-42, the equation used in this analysis includes the following calculation:~~

~~$E = k(3.5)(sL/0.35)^{0.3}$~~

~~where E = emission factor (in pounds per vehicle mile traveled [VMT])~~
~~k = particle size multiplier (dimensionless)~~
~~sL = road surface silt loading (in ounces per square yard~~

~~For transfer trucks traveling along the access roadway, the calculated emission factor would use the following values:~~

~~k = 0.22 (for PM-10 particulates)~~
~~sL = 3.2 ounces per square yard (extrapolated from 100 grams per square meter in Table A9-9-C-1 of the SCAQMD CEQA Air Quality Handbook for industrial sites in operation)~~

~~Based on these calculations, approximately 1.5 pounds per mile of PM_{10} emissions would be generated by the truck traffic using the paved portion of the access road.~~ The paved portion of the access roadway leads from the landfill site entrance through the scale house area to the active working face areas, and is approximately 1 mile in each direction. There are curbs and gutters the entire length of the paved portion of the access road. ~~Approximately 1,110 trucks (i.e., 220 transfer, 640 collection, and 250 local delivery) would travel nearly 2,200 miles over paved surface areas to the working face and potentially generate 3,330 pounds of PM_{10} emissions per day.~~ Fugitive PM_{10} emissions from truck travel on paved surfaces are estimated according to *AP-42 Chapter 13.2.1* and are shown in **Table 4.2-14**.

Truck Travel on Unpaved Surfaces. Dust is also associated with ~~vehicular~~truck travel over unpaved or hard-packed surfaces ~~such as the haul road~~. Unpaved surfaces at Sunshine Canyon Landfill consist of the crushed stone covered portion of the access road, the truck turnaround area, and the stockpile road used for dirt truck travel between the cover stockpile and the active working face. ~~In accordance with~~ Fugitive PM_{10}

emissions from truck travel on unpaved surfaces are calculated according to *AP-42 Chapter 13.2.2* and are shown in **Table 4.2-13**. ~~, the equation used in this calculation is~~

~~$E = k(5.9)(s/12)(S/30)(W/3)^{0.7}(w/4)^{0.5}(365-p/365)$~~

~~where E = emission factor (in pounds per VMT)~~
~~k = particle size multiplier (dimensionless)~~
~~s = surface material silt content (percent)~~
~~S = mean vehicle speed (mph)~~
~~W = average vehicle weight (tons)~~
~~w = mean number of wheels~~
~~p = number of days of precipitation per year~~

~~For transfer trucks traveling along the unpaved surfaces, the calculated emission factor would use the following values:~~

~~k = 0.36 (for PM-10 particulates)~~
~~s = 4.8 percent (mean value for sand and gravel processing, from AP-42)~~
~~S = 10 mph~~
~~W = 16 tons (average weight of full transfer trucks coming in [19 tons] and empty trucks leaving [13 tons])3~~
~~w = 18 wheels per truck~~
~~p = 40 days (from AP-42 rain areal distribution map)~~

~~Based on this calculation, approximately 1.7 (per mile) of PM_{10} emissions would be generated from the 220 transfer trucks traveling along unpaved surfaces. Emissions for curbside collection trucks are estimated by substituting an average vehicle weight of 10 tons and 10 wheels into the equation, and each of the 640 trucks are projected to generate about 0.9 pound of PM_{10} emissions per mile traveled. Additionally, the vehicle weight of each of the 250 local delivery trucks is assumed to average 2.5 tons. Each vehicle includes four wheels and would produce 0.2 pound of PM_{10} emissions per mile traveled. Based on a roundtrip distance of 800 feet, these trucks are projected to generate approximately 152 pounds of PM_{10} emissions per day. Emissions for each truck type are summarized in **Table 4.2-10**.~~

~~**Table 4.2-10**~~
~~**ESTIMATED EMISSIONS FOR TRUCK TRAVEL OVER UNPAVED SURFACES**~~

~~Type of Truck~~	~~PM_{10} Emissions (lb/mi)~~	~~Total Distance Traveled (miles)[1]~~	~~Total PM_{10} Emissions (lb/day)~~
~~Transfer~~	~~1.7~~	~~33.3~~	~~56.7~~
~~Curbside Collection~~	~~0.9~~	~~97.0~~	~~87.3~~
~~Local Delivery~~	~~0.2~~	~~37.9~~	~~7.6~~
~~Total~~	~~—~~	~~168.2~~	~~151.6~~

~~Source: Ultrasystems Environmental Incorporated~~
~~Note: Based on a round-trip distance of 800 feet.~~

~~**Total Dust Generation.** When the above emission estimates are added (in the absence of mitigation), a total of 3,594 pounds of PM_{10} emissions could be generated by site operations on a daily basis. **Table 4.2-1**~~

Carbon Monoxide Micro-Scale Analysis

Emissions of CO from motor vehicles can cause localized problems in areas where high CO concentrations already exist. The *SCAQMD CEQA Air Quality Handbook* requires additional analysis of CO emissions for the following projects: (1) projects that may subject sensitive receptors to CO concentrations in excess of State and federal standards, (2) projects that may potentially impact the level of service of a roadway, and (3) projects that would have a significant impact on air quality. Typically, CO emissions from a project are modeled, and the predicted concentration is added to the ambient CO concentration level to obtain the total project impact. The 1- and 8-hour CO standards constitute the threshold values above which CO emissions would be considered significant. The locations where the CO thresholds are exceeded are called "hot spots." If CO hot spots are located at sensitive receptor locations, concentrations of CO at the sensitive receptors must be compared against recognized thresholds.

~~**Table 4.2-11**~~
~~**ESTIMATED FUGITIVE DUST PM_{10}**~~
~~**EMISSIONS FOR SITE OPERATIONS**~~

~~Source~~	~~Projected PM_{10} Emissions (lb/day)~~
~~Active Working Face Area~~	~~19~~
~~Landfill Cell Excavation~~	~~38~~
~~Cover Procurement~~	~~8~~
~~Surface Erosion~~	~~12~~
~~Stockpile Erosion~~	~~35~~
~~Travel on Paved Road Surfaces~~	~~3,330~~
~~Travel on Unpaved Surfaces~~	~~152~~
~~Total~~	~~3,594~~

~~Source: Ultrasystems Environmental Incorporated~~

Roadway impacts are estimated using dispersion models that are based on continuous line source emissions. In accordance with SCAQMD recommendations and methodology, dispersion modeling for the project using the CALINE4 computer model was performed. Modeling was utilized to determine the potential for CO hot spots at local intersections with sensitive receptors ~~for future 1997 and 1998 traffic emissions data~~. The analysis was based on existing conditions, plus cumulative project and project-generated traffic. Therefore, a worst-case scenario model run was performed. The analysis considers a composite vehicle mix, including 87.64 percent passenger cars, 11.66 percent trucks, 0.68 percent motorcycles, and 0.02 percent buses.

Although approximately 73 percent of traffic associated with the project is derived from heavy trucks, in this analysis, the trucks associated with the project were converted into passenger car equivalents (PCEs) and essentially "double counted" for curbside collection trucks and "triple counted" for transfer trucks. Conversion factors yield a composite 2.25 PCE per truck. This value is reasonable since, at 20 mph, a truck

would produce approximately 2.5 times the volume of CO as a passenger car. In the composite analysis, 11.66 percent of the project-related vehicles are trucks. The composite vehicle mix was prepared in accordance with the *SCAQMD CEQA Air Quality Handbook* (Table A9-5-P-1) for both running and idle CO emissions.

As a worst-case scenario, the evening peak hour was modeled (based on information presented in the traffic study) because these hours generally produce the greatest traffic volumes. In accordance with the *SCAQMD CEQA Air Quality Handbook* (Table A9-5-F), the average anticipated speed during the PM peak hour for Los Angeles County is projected at 22.0-mph for the year 1998. Because the model used in the *SCAQMD CEQA Air Quality Handbook* predicts emissions in 5-mph increments, an average speed of 20 mph was used to present a reasonable worst-case scenario. Results of this modeling are presented in **Table 4.2-~~12~~5**. In accordance with the model, no exceedance of either the State or federal CO standards are projected, and no significant impacts are predicted as a result of project implementation. Model runs of this analysis are presented in Appendix B8, within ~~this~~ the Draft SEIR.

4.2.9 Health Risk Analysis

~~In addition to the generation of potential criteria pollutants, thermal destruction of the LFG through the proposed flare system(s) has the potential to release carcinogenic or toxic air contaminants (TACs) that may individually or cumulatively exceed the maximum individual cancer risk rate of one in 1 million. To determine the potential for such an impact, a health risk screening assessment was performed by air quality consultants and is included in Appendix B6 of this Draft SEIR.~~

~~Two potential types of impacts were considered in the dispersion calculations and include (1) a screening level health risk assessment for any excess cancer risk from that fraction of TACs not destroyed in the LFG combustion process relative to SCAQMD Rule 1401, and (2) a screening level ambient air quality analysis for criteria air pollutants (those with clean air standards) from the combustion byproducts from the LFG flare system. In accordance with SCAQMD Rule 1303 (New Source Review), the USEPA SCREEN2 dispersion model was utilized to determine the maximum pollutant concentration at downwind receptor locations (offsite impacts). This model generates peak-hour concentrations based on point or area geometry, plume buoyancy, terrain, meteorology, and release rates. For daily and annual averages, conservative (over-predictive) multiplication factors were utilized to convert the predicted peak-hour concentrations to extended exposure periods.~~

~~In accordance with SCAQMD guidelines and several meetings with SCAQMD staff, modeling protocols were specified for the proposed project within the jurisdiction of the City. This analysis was conducted for the nine carcinogenic TACs (i.e., benzene, carbon tetrachloride, chloroform, dichlorobenzene, ethylene dichloride, methylene chloride, perchloroethylene, trichloroethylene, and vinyl chloride) and five noncarcinogenic constituents (i.e., benzyl chloride, chlorobenzene, methyl chloroform, toluene, and xylene) that have the potential to contribute to acute (short-term) or chronic (long-term) health impacts. These substances are listed in **Table 4.2-13** and define potential health impacts. Modeling was performed using in-flare exhaust concentrations derived from a source test of the existing landfill flare station (August 1995). The measured values were augmented to a combustion rate of 4,400 cubic feet per minute, which is the maximum flow rate permitted by the SCAQMD.~~

Table 4.2-~~12~~ 15 (Revised)
CO HOT SPOT ANALYSIS FOR LOCAL RECEPTORS

Intersection	1997 1-Hour Ambient CO Concentration (ppm)[1]	Total 1997 1-Hour CO Concentration (ppm)[2]	Exceeds State Standard[3]	1997 8-Hour Ambient CO Concentration (ppm)[4]	Total 1997 8-Hour CO Concentration (ppm)[5]	Exceeds State Standard[6]
Yarnell Street and I-210 Freeway Ramp (North of Freeway)	8.3	9.5	No	3.7	4.4	No
Yarnell Street at Foothill Blvd.	8.3	10.3	No	3.7	4.9	No
San Fernando Road at Roxford Street	8.3	15.3	No	3.7	7.9	No
Encinitas Avenue at Roxford Street	8.3	17.2	No	3.7	9.0	No
San Fernando Road at Landfill Entrance	8.3	13.4	No	3.7	6.8	No

Source: Linscott, Law & Greenspan, Engineers and Ultrasystems Environmental Incorporated

Notes:
1. Per Table 5-2 of the *SCAQMD CEQA Air Quality Handbook.*
2. Worst-case corner as measured at a distance of 50 feet from the edge of the near lane.
3. Based on a State standard of 20 ppm.
4. Per Table 5-3 of the *SCAQMD CEQA Air Quality Handbook.*
5. Based on a persistence factor of 0.6 for areas in attainment of the CO standard.
6. Based on a State standard of 9.1 ppm.

~~It should be noted that the SCREEN 2 model is not designed for a complex terrain such as Sunshine Canyon. Mountainous terrain and foliage have the potential to impinge on the flare's plume, create local mixing, and limit downwind concentrations. The model is not able to account for these effects. However, the model can be used to present a "worst-case scenario." To utilize this model, the project area was modeled as if it were flat with zero plumes rising from the flare station. This allowed for the greatest prediction of excess health risk. In other words, the model will "over predict" rather than "under predict" excess health risks.~~

~~Findings of the analysis indicated that the cumulative maximum individual cancer risk is 0.0182 in 1 million, as compared to a significant threshold of one in 1 million. The cancer risk to the maximum exposed individual is substantially below any level of concern based on conservative assumptions. With less restrictive input assumptions, the cancer risk would have been even lower.~~

~~Along with the potential carcinogenic, chronic, and acute health risks, LFG emissions have the potential to create pollutant concentrations in excess of SCAQMD Rule 1303 threshold criteria. Results of the SCREEN 2 impact assessment compared to the SCAQMD *de minimis* thresholds in Rule 1303 resulted in all pollutants having less than significant impacts when conservative (i.e., over predictive) assumptions were utilized. Less conservative assumptions would have created an even greater margin of safety between ambient impacts and significant criteria thresholds.~~

~~In addition to individual cancer risk impacts, the TACs listed in **Table 4.2-13** were modeled for potential chronic health risks using the hazard index recommended by the California Air Pollution Control Officers Association (CAPCOA). The chronic health impact predicted in the health risk assessment is 0.0000409, or under conservative impact assumptions, the level is less than 0.001 percent of the significant threshold of a hazard index significance level of 0.5 recommended by CAPCOA. Similarly, acute health risk impacts are predicted at 0.0000292, with a hazard index of 0.5 being a potentially significant impact. Based on the results of the SCREEN 2 dispersion modeling identified in the risk assessment, both chronic and acute health risks (using the CAPCOA hazard index) are clearly considered less than significant. Results of flaring the LFG, both in terms of TACs and criteria air pollutants, will also have a less than significant impact.~~

~~In addition to criteria for chronic and acute health risks, emissions produced by LFG flaring could potentially exceed CAA standards. Criteria pollutants, including CO, NO_2, PM_{10}, and SO_2, were assessed for potential contribution at the maximum exposed individual. These values were compared to the Rule 1303 threshold levels to determine a level of significance. All emissions generated are at less than allowable levels, and no significant impacts are projected as a result of LFG flaring. Results of this analysis are presented in Appendix B7 of this Draft SEIR.~~

A health risk assessment (HRA) was conducted to evaluate the carcinogenic and noncarcinogenic risks associated with toxic air contaminant (TAC) emissions from the Sunshine Canyon Landfill. The risks due to the cumulative emissions from both the "City" and "County" portions of the project were calculated.

The approaches and methodologies used in this risk assessment are from the document entitled, "Air Toxics Hot Spots Program, Revised 1992 - Risk Assessment Guidelines", prepared by the AB 2588 Risk Assessment Committee of the California Air Pollution Control Officers Association (CAPCOA), October 1993. Input assumptions were coordinated with the staff of the South Coast Air Quality Management District (SCAQMD). The CAPCOA procedures for risk assessments from airborne contaminants is the methodology recommended for use by the SCAQMD. All emission estimates used to calculate risk values were from monthly analyses of landfill gas and from periodic emission source tests of the existing flare conducted pursuant to SCAQMD requirements.

Per the requirements of the SCAQMD, the HRA addressed a total of 18 substances on the SCAQMD Rules 1150.1 and/or 1401 lists for the landfill risk evaluation. The substances are listed in **Table 4.2-16**. Of the 18 substances, 10 are considered carcinogenic and were evaluated as part of the cancer risk evaluation. The noncancer health effects evaluation addressed 17 of the 18 substances for chronic impacts, and 7 of the 18 substances for acute impacts.

Table 4.2-~~13~~16 (Revised)
TOXIC AIR CONTAMINANTS INCLUDED IN HEALTH RISK ASSESSMENT

Substance	Health Impact		
		Noncarcinogenic	
	Carcinogenic	Chronic	Acute
Benzene	✔	✔	
Benzyl Chloride		✔	✔
Carbon Tetrachloride	✔	✔	✔
Chlorobenzene		✔	
Ethylene Dibromide	✔	✔	
Chloroform	✔	✔	
Dichlorobenzene	✔	✔	
Vinylidene Chloride		✔	
Ethylene Dichloride	✔	✔	
Ethylidene Dichloride*			
Methyl Chloroform		✔	✔
Methylene Chloride	✔	✔	✔
Perchloroethylene	✔	✔	✔
Toluene		✔	
Trichloroethylene	✔	✔	
Vinyl Chloride	✔	✔	
Xylenes		✔	✔
Hydrogen Sulfide		✔	✔

Source: Giroux and Associates

Note: * Not listed in CAPCOA HRA guidelines as having carcinogenic or noncarcinogenic health risks.

The lifetime carcinogenic risk was estimated for an individual assumed to reside continuously for 70 years at the off-site location of maximum ground-level concentration for the maximum exposed individual (MEI). The chronic and acute health risks were calculated in terms of a "hazard index". This index is calculated by

dividing the predicted maximum short- (acute) and long-term (chronic) pollutant exposures by an established safe exposure level called the Reference Exposure Level (REL; CAPCOA, 1993).

Modeling Methodology

Health risks associated with landfill proximity were assumed to derive from landfill gas (LFG) emissions. These emissions result from that fraction of the LFG not collected by the collection/ disposal system, called "fugitive" emissions, plus the small fraction of TACs emitted by the flares. These emissions were used in a computerized dispersion model (ISCST3, Version 97363) to predict the maximum hourly, daily and annual LFG concentrations at the landfill boundary and at the nearest residences and school locations.

Modeling protocols were coordinated with the SCAQMD staff. Meteorological data from the SCAQMD "Newhall" monitoring station was used as the closest and most representative data resource.

A grid of 90 points along the landfill perimeter and 12 Granada Hills residences plus one school (e.g., Van Gogh Street Elementary School) was used to determine off-site exposure to combined flare and fugitive LFG emissions. The off-site grid is shown in Appendix D3, Revisions to Draft SEIR Appendix B6, Low-Level Health Risk Assessment, **Figure 1**, in this document. The residential receptor with the calculated highest concentration of contaminants was analyzed for health risk potential as a worst-case human exposure location. The maximum exposure was determined to be at the residential receptor designated as #50 in **Figure 1**, which is the residence in the community of Granada Hills that would be the most impacted by landfill emissions.

The composition of the gas flare emissions was determined from monthly analysis data of the "raw" LFG entering the existing flare on the "City" portion of the landfill. The maximum number of flares is five flares burning slightly over 20,000 CFM. Over the 70-year risk assessment time frame, the average annual volume generation for LFG emissions will be approximately 60 percent of the highest year based on peak volumes determined from gas generation predictive models or 12,260 CFM. The input parameters for each of the five (5) flares needed during maximum LFG generations were as follows:

Stack Height	=	15.3 meters
Stack Temperature	=	1180° K
Exit Velocity	=	10 m/sec
Stack Diameter	=	3.8 meters
Max. LFG Rate	=	4167 CFM/flare
70-Year Average LFG Rate	=	2452 CFM/flare

The concentration of TACs in LFG was determined from an average of six monthly LFG composition tests conducted from July-December, 1997 by AtmAA, Inc. Flares were assumed to destroy 98 percent of TACs during combustion. Actual measurements of organic gas destruction efficiencies over the last five years have shown better than a 99 percent destruction efficiency. Use of the 98 percent destruction efficiency assumption over estimates the actual flare impact two-fold compared to actual observed flare behavior.

A total of ten percent of all LFG generated was assumed to escape collection.[11] The fugitive LFG was assumed to be uniformly emitted over approximately 2,000,000 square meters (500+ acres) of landfill surface (both City and County areas). The ISCST3 model was run for a unit emission rate (1 g/sec for each flare, 1 $\mu g/m^2$/sec for fugitive area sources). The exposure for each TAC was calculated based upon the ratio of the estimated emission rate to the reference (unit) rate.

Model Results

Output from the ISCST3 model is attached. The maximum exposed individual (MEI) is the residence in the community of Granada Hills located closest to the landfill, and is labeled as #50 in Appendix D3, Revisions to Draft SEIR, Appendix B6, Low-Level Health Risk Assessment, **Figure 1** in this document. The concentration of TACs within the LFG and the maximum estimated ambient concentrations at the MEI are shown in Appendix D3, **Table 2**. These predicted concentrations were combined with the appropriate exposure parameters and toxicity data to complete the HRA.

Individual Cancer Risk

Excess cancer risk is calculated by assuming the MEI remains outdoors for 24 hours per day for 365 days per year, for 70 years. While a 70 year exposure assumption is the standard assumption for a CAPCOA health risk assessment, the excessively conservative (over-predictive) nature of this assumption needs to be recognized.

Appendix D3, Revisions to Draft SEIR, Appendix B6, Low-Level Health Risk Assessment, **Table 3** in this document combines the predicted chronic exposure for 70 years of LFG emissions (1998 - 2068) to predict the excess individual cancer risk at the #50 receptor. The worst-case MEI exposure is 0.96 in one million. A risk of one in a million is considered less than significant. Risks up to ten in a million are considered acceptable if toxics best available control technology (T-BACT) is used to reduce emissions. Flares are considered T-BACT for landfills. The excess cancer risk is thus below the "de minimus" insignificance threshold, and far below the allowable exposure for a T-BACT equipped source. All other receptors have lower exposures than the MEI.

No amount of excess cancer risk is "acceptable" for the person contracting the disease. However, people accrue far higher risks from common daily activities, in comparison to a less than one in a million risk due to landfill proximity. Appendix D3, **Table 4** shows the mortality risk from accidents and disasters for the average American. Appendix D3, **Table 5** puts the maximum cancer risk in perspective compared to some other risk factors.

Chronic Health Risk

The TACs considered in this assessment are known to potentially affect seven organs/systems in the human body as shown in Appendix D3, Revisions to Draft SEIR, Appendix B6, Low-Level Health Risk Assessment, **Table 6** in this document. Non-cancer effects are calculated through a ratio of the TAC exposure to a published level determined to have no observable health effect (the REL). The sum of all the individual ratios for every identified pollutant emitted by a source is called the health hazard index (HHI). An HHI of 0.5 is considered a potentially significant impact that would require additional analysis. If the HHI is less

[11]/ The SCAQMD recommends using a ten percent escape rate for HRA modeling.

than 0.5 (below 50 percent of the "safe" exposure level), no additional analysis is necessary. Appendix D3, **Table 7** calculates the HHI for any individual target receptor location in the human body. All are well below the significance level of 0.5.

Appendix D3, **Table 8** compares and combines the HHI for all organs/systems. Although HHI's are not strictly additive, the combined threat to all organs/systems of 0.0113 is well below the 0.5 HHI significance threshold. Accordingly, chronic non-cancer health effects from landfill proximity are less than significant.

Acute Health Hazard

The acute health hazard was similarly calculated as the chronic HHI. Appendix D3, Revisions to Draft SEIR, Appendix B6, Low-Level Health Risk Assessment, **Table 9**, in this document shows the acute HHI from the seven compounds with an acute health threat. The acute HHI of 0.1618 is below the 0.5 HHI significance threshold for acute non-cancer health impacts. Therefore, acute health impacts are considered less than significant.

4.2.10 Project Consistency with Applicable Plans

As mentioned previously, a significant impact would be generated if a project is inconsistent with the goals and policies of local and regional air quality plans. As indicated in the *SCAQMD CEQA Air Quality Handbook*, an EIR should discuss the project consistency with the most recent AQMPs. Several of the key underlying assumptions contained within those plans include the following requirements: (1) assumptions such as the number and location of population, housing units, and employment as contained in SCAG's Regional Comprehensive Plan and Guide, Growth Management Chapter and Growth Management Plan (GMP); (2) assumptions concerning the type, size, and location of transportation infrastructure as contained in SCAG's Regional Mobility Element; and (3) consistency with local plans and policies as contained in the City of Los Angeles General Plan, Air Quality Element.

Air Quality Management Plan

CEQA requires that projects are reviewed for consistency with the AQMP. A consistency determination plays an essential role in local agency's review of a project by both linking local planning with the attainment of the AQMP. Additionally, this analysis provides the local agency with ongoing information, thus assuring local decision-makers that they are making real contributions towards regional clean air goals.

New or amended general plan elements, specific plans, and regionally significant projects need to undergo a consistency review because the AQMP's strategy is based on projections from local planning documents. Projects that are consistent with local general plans are considered to be consistent with the regional AQMP. The proposed project will require a General Plan Amendment, and it is of a nature and a size to be considered significant in its air quality emissions; therefore, a consistency determination is considered necessary.

There are two key indicators of consistency with the AQMP: (1) whether the project will result in an increase in the frequency or severity of existing air quality violations or cause or contribute to new violations or delay timely attainment of air quality standards or the interim emissions reductions specified therein; and (2) whether the project will exceed assumptions for growth or regional distribution used in the emissions projections for the year 2010 or increments thereof based on the year of project buildout and phase. The following presents the methodology for a finding of consistency with the AQMP.

Determination of consistency with the AQMP is addressed in SCAG's *Guidelines for Implementation of 1989 AQMP Conformity Procedures*, March 1990. In accordance with that document, a project conforms with the AQMP if the following consistency requirements are met:

- The project improves or has a neutral effect on the jobs/housing balance. As addressed for the Regional Comprehensive Plan and Guide (RCPG) below, the project will incrementally increase jobs in a "job-rich" region within the City; however, the County portion of the project site is located within a "job-poor" region and will positively contribute to job opportunities available within this region.

- The project is required to demonstrate that vehicle trips (VTs) and VMT have been reduced to the extent feasible by implementing transportation demand strategies. The recommended mitigation measures include means to reduce VT and traffic congestion to the extent feasible. ~~The traffic~~ Section 4.13.1, ~~Traffic~~ Transportation and Circulation, Table 4.13-9, lists roadway improvements focused on reducing vehicle congestion and concludes that the level of service on traffic routes will not be degraded below acceptable levels. Adherence to these mitigation measures ensures compliance with this requirement.

- The project's environmental document should provide an analysis to demonstrate the following: (1) that the project will not have a significant negative impact on air quality in the long term (5 years or longer), demonstrated through improvement of the jobs/housing balance and reduction in VMT/VT; (2) that the transportation, land use, and energy conservation control measures are used to the extent possible to mitigate the impact on air quality; and (3) that the impact on air quality be analyzed on a subregional level.

- The impact analysis demonstrates that significant levels of air pollutants will be generated over the long term. However, it must be realized that the exhaust and particulate emissions associated with project implementation would be associated with another landfill project. The AQMP predicts that in the year 2010 the SCAB will experience a 34-percent increase in population with a 47-percent increase in VMT. Even with an increased awareness in the necessity for recycling, this increased population will require additional disposal of refuse.

The most recent version of the AQMP (Draft 1997 Air Quality Management Plan, August 1996) has now been released and is currently undergoing review. Recently, the 1997 AQMP was adopted by the SCAQMD and has been approved by the CARB. This plan has not yet received final approval from the USEPA as part of the State Implementation Plan revision. The 1997 Draft AQMP is based on the 1994 AQMP and carries forward most of the strategies included therein. However, with recent findings by nationally recognized health experts, the new 1997 Draft AQMP puts greater emphasis on PM_{10} particulate matter. In fact, the 1997 Draft AQMP is the first plan required by federal law to demonstrate attainment of the federal PM_{10} ambient air quality standards. The Draft 1997 AQMP also updates the demonstration of attainment of ozone and carbon monoxide. Additionally, because the Basin came into attainment of the federal nitrogen dioxide standard since the prior AQMP was prepared, the 1997 Draft AQMP includes a maintenance schedule to assure continued compliance.

The 1997 Draft AQMP also addresses several State and federal planning requirements and incorporates new scientific data, primarily in the form of updated emissions inventories, ambient measurements, and new air quality models. Expanding on the control strategies included in the 1994 AQMP, the 1997 Draft AQMP

projects sufficient emissions reductions to meet all federal criteria pollutant standards within the time frames allowed under the federal Clean Air Act.

The 1997 Draft AQMP also addresses notable regulatory rules promulgated since the preparation of the 1994 AQMP. These include the implementation of Phase II reformulated fuels in 1996, the replacement of Regulation XV rideshare program with an equivalent emission reduction program, and new incentive programs for generating emission credits. Other highlights of the 1997 Draft AQMP are noted below.

- use of the most current air quality information (1995), including special particulate matter data from the PM_{10} Technical Enhancement Program;
- improved emissions inventories, especially for motor vehicles, fugitive dust, and ammonia sources;
- a similar, but fine tuned overall control strategy with continuing emphasis on flexible, alternative approaches including intercredit trading;
- a determination that certain control measures contained in the 1994 AQMP are infeasible, most notably the future indirect source measures;
- enhanced modeling for particulates;
- separate analyses for the desert portions within the District's jurisdiction: the Coachella Valley within the newly designated Salton Sea Air Basin, and the Antelope Valley within the Mojave Desert Air Basin.
- attainment to the federal Post-1996 Rate-of-Progress Plan and the Federal Attainment Plans for ozone and carbon monoxide;
- a maintenance plan for nitrogen dioxide; and
- an attainment demonstration and State Implementation Plan Revision for PM_{10}.

Regional Comprehensive Plan and Guide

Growth Management Chapter

In addition to demonstrating consistency with the AQMP, regionally significant projects should provide consistency with the Regional Comprehensive Plan and Guide, Growth Management Chapter, which incorporates by reference portions of the GMP. The growth management chapter presents baseline and future socioeconomic data and policies for anticipated growth within the SCAG region up to the year 2015. These projections are used by agencies in developing long-term programs for improving the SCAB and regional mobility strategies. This chapter also provides guidance in addressing growth and land use patterns that would reinvigorate the economy, avoid social and economic inequities, curb geographical dislocation of communities, and maintain the quality of life in the region.

Relevant policies applicable to the proposed project include the following:

- SCAG shall encourage patterns of . . . land use which reduce costs in infrastructure construction and make better use of existing facilities.[12]

- SCAG shall encourage existing or proposed local jurisdictions programs . . . which . . . create opportunities for residents to walk and bike.[13]

Consistency with the Growth Management Chapter is determined by performing an analysis of the project and providing comparisons with the population, housing, and employment forecast presented in this chapter for the year 2010. The AQMP requires that the regional jobs/housing balance (as well as many other variables) be taken into consideration in the prediction of future air quality. If development within the project area has been considered in the Growth Management Chapter, the project will generally be found to be consistent with the AQMP.

SCAG's 1989 GMP presented SCAG's forecasted distributions to the year 2010. This plan incorporated a regional job/housing balance policy. The goal of the job/housing balance policy was to relieve the pressure of population and job growth on the transportation system by achieving more balanced future development. A region is considered balanced if the employment-to-housing ratio is 1.27 in the year 1984 and 1.22 in the year 2010.[14] Ideally, each city within the Southern California area could achieve this ratio and attain the overall jobs/housing balance, thereby reducing the need for extended commuter trips. However, this is not practical since the locations of existing employment centers and housing areas tend to be grouped as a result of local land use planning, as well as budgetary and practical constraints. Furthermore, a balance of jobs to housing does not ensure that the jobs will be filled by local residents. As a result, the overall ratio is examined from both a subregion and subarea basis.

The project site (within the City) is located in the San Fernando Valley subarea and the Los Angeles City subregion. The Los Angeles City subregion comprises the Cities of Los Angeles, Calabasas, Malibu, San Fernando, Hidden Hills, and various unincorporated areas. This subregion includes the geographical subareas of the San Fernando Valley, Santa Monica Mountains, most of the westside area, central downtown area, and Los Angeles Harbor area. The San Fernando Valley subarea, located closest to the project site, is characterized as urban, except for the northern periphery that includes hillside lands, publicly owned open spaces associated with major flood control dams and spreading basins, and equestrian communities. The predominant land use in this subregion is single-family residential.[15]

As indicated within the GMP the San Fernando Valley subarea had a jobs/housing balance ration of 1.28 in 1984 and a projected ratio of 1.26 for the year 2010, thereby classifying this subarea as "jobs rich." As updated by SCAG, the revised jobs/housing balance for the San Fernando Valley subarea was 1.50 in 1987

12/ *Regional Comprehensive Plan and Guide*, Southern California Association of Governments (SCAG), p. 3-23. March 1996.

13/ Ibid., p. 3-24.

14/ *Regional Growth Management Plan*, Southern California Association of Governments (SCAG), p. VI-1. February 1989.

15/ *Final Environmental Impact Report, Regional Transportation Plan and Chapters of the Regional Comprehensive Plan, Volume I: State of the Region Report*, SCAG, pp. 1.21 and 1.22. May 1994.

and is projected to be 1.31 by 2010.[16] The Los Angeles City subregion had a job/housing ratio of 1.35 in 1994 and is projected to have a jobs/housing ratio of 1.43 by 2010. This ratio also indicate a "jobs rich" subregion. As referenced within the RCPG, by 2010 approximately 2,213,000 jobs are projected within this subregion. This is an increase of 248,000 jobs (or 12.62 percent) above the 1990 job level of 1,965,000.[17] Since the project will create additional jobs within the region without providing additional housing, the project will not positively contribute to the attainment of the stated objective. However, because the number of jobs associated with the project is minimal (i.e., 35 jobs of the total 248,000 jobs projected to occur between the years 1984 and 2010), it will not significantly affect the current balance or adversely affect the attainment of the regional goal.

The project site (within the County) is within the Santa Clarita subarea, which has a jobs/housing ratio of 1.18 for the year 2010, making this region "jobs poor." The North Los Angeles subregion (within the County) also is identified as "jobs poor" with a projected 2010 jobs/housing ratio of 1.14.[18] ~~Therefore~~ Implementation of the project would therefore serve to improve the jobs/housing balance in this subarea and subregion by providing additional job opportunities.

The proposed general plan amendment required for the project could result in less residential growth in the Los Angeles City subregion and San Fernando Valley subarea than projected in the RCPG. Based on the site's existing land use and zoning designations (i.e., Open Space, A1-1-O), residential uses could be developed at a density of 0.5 to 1 dwelling unit per acre. However, because the project site includes an inactive landfill and an operating County Landfill, residential use onsite would not be a feasible option at this location.

The development of a landfill within this project site would significantly reduce infrastructure costs since many existing improvements (e.g., utilities, access roads, ancillary facilities, environmental protection and control systems) that currently service the inactive landfill (City) and operational landfill (County) could be used. If project development does not occur, transportation or hauling costs to other landfill facilities located either in-County or out-of-County would increase due to greater travel distances. Additionally, the development of the proposed project would minimize many significant environmental impacts, such as biological resources, development of new infrastructure, air quality emission impacts associated with new site development, or the exportation of wastes to other landfill sites. The dedication of Bee Canyon and East Canyon associated with the previous County Landfill project approval, would provide linkage to regional hiking and equestrian trails as described in Section 4.14.4, Parks and Recreational Resources.

Air Quality Chapter

The air quality chapter sets forth SCAG policy for participating in, responding to, and implementation of regional air quality plans. SCAG prepared the regional AQMP and uses this plan to determine conformity to transportation projects that use federal monies and the State Implementation Plan (SIP). The SIP implements, maintains, and enforces primary and secondary National Ambient Air Quality Standards. These

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[16]/ Ibid., Updated by "Southern California Association of Governments Job Housing Ratios by Subregion". Facsimile. October 18, 1996.

[17]/ *Regional Comprehensive Plan and Guide*, SCAG, pp. 3-6. March 1996.

[18]/ "Southern California Association of Governments 1996 Regional Growth Forecast". Facsimile. October 4, 1996.

federal standards are further described within this section. Project impacts on regional air quality are also analyzed within this section.

Regional Mobility Element

Referencing the *SCAQMD CEQA Air Quality Handbook*, "if the project is a transportation project, it should be compared to the assumptions in the Regional Mobility Plan: Information on Transportation Corridors, 1989, concerning the type, size and location of the project. The comparison is necessary because many of these transportation projects are relied upon in the AQMP (1991 AQMP) to reduce emissions." The Regional Mobility Plan has been updated by the 1994 Regional Mobility Element. Although several traffic-related improvements will mitigate transportation and circulation impacts as a result of the proposed project, the project is not a "transportation project" in the context of the Regional Mobility Element and therefore cannot be directly compared to the plans and policies contained therein.

Congestion Management Program

Conformity with the Los Angeles County Congestion Management Program (CMP) requires that the project be compared with the stated goal of obtaining certain levels of service on established CMP roadways. None of the key intersections within the project area are considered CMP intersections, and the project will not exceed the threshold criteria of 150 trips during the peak hour, which would necessitate a freeway CMP analysis. As a result, no CMP consistency determination is necessary for the project.

Los Angeles Clean Air Program

The Los Angeles Clean Air Program (CAP), adopted in December of 1992 provides implementation strategies for achieving federal, State, regional, and local air quality goals and mandates. The program is based on the goals and policies included in the 1991 AQMP. The CAP is a dynamic program and considers both on-going and historic measures and allows elected officials and City staff examination of both past and current trends in the attainment of clean air.

Included in the CAP are various measures, many of which are directly referenced to the AQMP. These measures, considered as feasible for implementation address airport and harbor operations, energy and conservation, land use strategies, Public Works operations, dust suppression, transportation, and governmental administrative controls. The City currently incorporates goals and policies and implementation strategies contained in the 1997 Draft AQMP.

City of Los Angeles Air Quality Element

The City of Los Angeles Planning Department has adopted an Air Quality Element as an optional element of the City of Los Angeles General Plan. As stated therein, the purpose of the Air Quality Element is to promote the attainment of the NAAQS and CAAQS and support areawide economic growth. The Air Quality Element specifies performance-based standards to meet its objectives.

Presented below are some of the element's primary goals applicable to the proposed project.

Goal 1. Supports consistency with the AQMP and sustenance of Citywide economic growth to obtain good air quality. AQMP consistency was discussed previously. Economic growth in the City will be supported by the provision of additional local landfill capacity. Since waste hauling costs increase with the distance

traveled, the expansion of a local landfill will provide a cost-effective disposal site proximal to the waste generation sources. Development of the proposed project would be consistent with this goal.

Goal 2. Promotes the reduction in single-occupant VTs. Because only 35 employees are associated with proposed landfill operations and 52 employees currently facilitate County landfill operations, the project would not be subject to SCAQMD's Rule 2202 (On-Road Vehicle Emissions Mitigation Options), which requires employers of more than 250 workers at one location to reduce motor vehicles through ridesharing or other programs. ~~However, since projected emissions exceed daily threshold criteria, project-related mitigation measures specify methods to encourage ridesharing and thereby ensure attainment of this goal.~~

Goal 3. Increase the number of work trips via transit and reduce vehicular traffic during peak periods. Mitigation measures aimed at meeting Goal 2 (above) will aid in achieving this goal. The goal of reducing traffic during peak-hour periods will be supported by restricting the operational hours of the landfill site. Moreover, transfer trucks that haul partial loads will be penalized, thereby encouraging full loads and reduced truck movement.

Goal 4. Minimize impacts of land use development on air quality. Review of the project is occurring at the local level. This will ensure that the relationship between land use, transportation, and air quality is in balance with the nature of the project. Air quality impacts will be considered during the City's decision-makers review of the project. The analyses of air quality impacts caused by the proposed project include both a CEQA analysis and a stand-alone health risk assessment. Vehicle trips would be reduced through implementation of the mitigation measures presented and the development of a local, rather that a more distant landfill facility. The air pollutants emitted from the flare station, which is a pollution control device, were shown to induce no potential adverse health effects.

Goal 5. Improve energy efficiency primarily at City facilities. Private developments should encourage waste reduction and recycling as part of this goal. The proposed project would include development of a green waste and wood waste ~~recycling and public drop-off~~ area to support recycling efforts. Another part of this goal is to reduce the use of polluting fuels in stationary sources in favor of electric or low-emitting fuels. LFG will be destroyed through the flaring stations; however, the amount of energy resources expended in this process is not expected to be significant and would be provided by the City Department of Water and Power (DWP). In later stages of landfill development, the gases that would be collected through the LFG collection and disposal system may be combusted to produce electricity.

CUMULATIVE IMPACT

Table 3.2-1 lists the 33 related projects associated with cumulative project development. These projects range from small residential developments that would not be expected to produce significant air quality impacts of themselves (e.g., five single-family lot subdivision on 1.78 acres) to large projects that probably cannot be mitigated to a less than significant level (e.g., 1,895,000 square feet of industrial, 105,000 square feet of commercial, 34 single-family units, and 120 recreational vehicle spaces all on 249.4 acres).

As noted in **Table 4.2-8**, the single greatest source of project-generated emissions is from vehicles transporting refuse to the project site. Vehicle emissions are also the greatest source of air pollutants for the identified cumulative projects. Because the emissions associated with construction and operation of the cumulative projects cannot be determined without a full analysis of each project (including a traffic study), the cumulative analysis for the project's air quality must be generic by nature.

The project area is currently out of attainment for both O_3 and PM_{10} suspended particulate matter pollutants. Construction and operation of cumulative projects will further degrade the local air quality, as well as the air quality within SCAB. Air quality will be temporarily degraded during construction activities that occur separately or simultaneously. However, the greatest cumulative impact on ~~the quality of~~ regional air quality will be the incremental addition of pollutants primarily from increased traffic associated with the development of residential, commercial, and industrial projects and the use of heavy equipment and trucks associated with construction of these projects.

The *SCAQMD CEQA Air Quality Handbook* provides methodology to determine whether a project is cumulatively significant. In accordance with the *SCAQMD CEQA Air Quality Handbook* (pp. 9-12), if a project can reduce emissions by 1 percent per year to the year 2010, it is not considered cumulatively significant. This analysis is performed through a comparison of unmitigated and mitigated emissions and by dividing the projected reduction (in percent) over the period from project operations to the year 2010. This would require that mitigation attain a control efficiency of 14 percent for operations beginning in 1996.

As demonstrated in **Table 4.2-148**, NO_2, ~~SO_2~~, and PM_{10} are projected to exceed this ~~14 percent~~ reduction. However, both CO and ROG primarily associated with vehicular travel as well as, SO_2 associated with the combustion of landfill gas are not expected to achieve this reduction, and the project is considered significant on a cumulative level.

CITY MITIGATION MEASURES

4.2.11 Construction

Site construction will create exhaust pollutants from onsite earth movement and the employment of heavy equipment. A comparison between project emissions and the levels considered by the SCAQMD to be potentially significant illustrates that NO_x emissions are expected to exceed the SCAQMD threshold criterion and mitigation would be necessary. Mitigation for heavy equipment is limited. However, the following mitigation measures will reduce these emissions to the maximum extent reasonably feasible.

Exhaust Emissions

- The project proponent will maintain equipment in tune per manufacturer's specifications.
- The project proponent will use catalytic converters on gasoline-powered equipment.
- The project proponent will retard diesel engine injection timing by 2 degrees.
- High-pressure fuel injectors will be installed.
- Heavy equipment will use reformulated, low-emission diesel fuel.
- The project proponent will substitute electric and gasoline-powered equipment for diesel-powered equipment where feasible.
- Where applicable, equipment will not be left idling for prolonged periods.

- The project proponent will curtail (cease or reduce) construction during periods of high ambient pollutant concentrations (i.e., Stage II smog alerts).

Presented in **Table 4.2-147** are the construction exhaust emissions, the anticipated efficiency of these control measures, and the residual impact. Note that the control efficiency of the proposed mitigation measures is based on best estimates of values presented in the ~~*SCAQMD CEQA Air Quality Handbook*, AP-42, and past conversations with CARB and SCAQMD personnel~~ staff report "Initial Statement of Reasons for Proposed Rulemaking, public hearing to consider the adoption of regulations regarding the California Exhaust Emission Standards and Test Procedures for new 1996 and later heavy-duty off-road diesel cycle engines and equipment engines," released by the CARB on January 9, 1992. As depicted in this table, even with the implementation of the mitigation measures, NO_x emissions are projected to remain significant.

Fugitive Dust

Dust from construction activities, including physical site disturbance, material deliveries, employee commuting, and potential wind erosion during high wind episodes, may create a visual and soiling nuisance beyond the property line. Because dust impacts are expected to be significant during the construction phase, standard mitigation measures (by project design) will be implemented to control fugitive dust emissions during construction as required by SCAQMD Rules 402 (Nuisance) and 403 (Fugitive Dust).

The following mitigation measures will reduce fugitive dust emissions during construction activities at the landfill facility:

- Daily watering of active construction areas, active soil stockpiles, and all traveled unpaved roads shall be performed to minimize dust lofting from construction disturbances. Construction areas will also receive a soil stabilization (sealant) product if they are to be left unattended for periods in excess of 5 days.

- Wind speed shall be continually monitored using onsite anemometers. Excavation within construction areas shall be halted when the 15-minute average wind speed exceeds 15 mph or when the instantaneous wind speed exceeds 25 mph.

- Graded areas shall be watered as necessary to reduce dust emissions.

- Disturbed areas shall be revegetated with an interim ground cover as specified in the proposed revegetation plan. Excavation will proceed in a manner to reduce the amount of graded areas at any given time.

- Public streets (i.e., San Fernando Road) shall be swept at the conclusion of construction work.

As depicted in **Table 4.2-147**, even with the implementation of the mitigation measures, PM_{10} emissions, due mainly to dust generation, are projected to remain significant.

Table 4.2-147 (Revised)
CONSTRUCTION EMISSIONS, CONTROL MEASURE REDUCTION EFFICIENCY, AND RESIDUAL EMISSIONS[1]

Emissions Source	Heavy Equipment Operation[2]	Worker Vehicles and Materials Deliveries	Fugitive PM_{10} Dust[3]	Fuel Storage and Transfer	Total
CO	~~452.7~~ 333.2	~~52.0~~ 33.8	NA	NA	~~504.7~~ 367.0
Mitigation Control Efficiency (percent)	40.0	0.0	NA	NA	
Residual	~~271.6~~ 202.5	~~52.0~~ 33.8	**NA**	**NA**	~~323.6~~ 236.3
NO_x (as NO_2)	~~887.6~~ 1,354.4	~~6.2~~ 10.1	NA	NA	~~893.8~~ 1,364.5
Mitigation Control Efficiency (percent)	40.0	0.0	NA	NA	
Residual	~~532.6~~ 814.3	~~6.2~~ 10.1	**NA**	**NA**	~~538.8~~ 824.4
ROG	~~51.7~~ 67.1	~~3.8~~ 3.3	NA	0.1	~~55.6~~ 70.4
Mitigation Control Efficiency (percent)	15.0	0.0	NA	0.0	
Residual	~~43.9~~ 57.1	~~3.8~~ 3.3	**NA**	**0.1**	~~47.8~~ 60.4
SOx (as SO_2)	~~93.4~~ 90.9	~~0.5~~ NV	NA	NA	~~93.9~~ 90.9
Mitigation Control Efficiency (percent)	40.0	0.0	NA	NA	
Residual	~~56.0~~ 54.6	~~0.5~~ NV	**NA**	**NA**	~~56.5~~ 54.6
PM_{10}	~~60.1~~ 8.5	~~0.7~~ 0.8	~~170.0~~ 537.0	NA	~~230.8~~ 546.3
Mitigation Control Efficiency (percent)	~~40.0~~ 0	0.0	65.0	NA	
Residual	~~36.1~~ 8.5	~~0.7~~ 0.8	**188.0**	**NA**	~~206.8~~ 197.3

Source: Ultrasystems Environmental Incorporated

Notes:

1. All emissions are in pounds per day. Mitigation measures are as presented in the text. Where available, control efficiencies are considered conservative for SCAQMD and CARB control factors. Where no control efficiencies are published, control efficiencies are speculative but considered conservative based on various reports and bulletins published by the CARB and discussions with CARB and SCAQMD staff.
2. Mitigation is inherent in emissions calculated using manufacturer specifications or EMFAC7G. Therefore, no mitigation control efficiency was applied to heavy equipment emissions calculated using these methodologies.

4.2.12 Operations

Exhaust Emissions

As shown in **Table 4.2-8**, exhaust emissions from project operations are anticipated to exceed the significance criteria for CO, NO_x, SO_x and ROG. Additionally, the 289.1 pounds of PM_{10} produced as a combustion by-product would be additive with the 688.9 pounds of PM_{10} associated with fugitive dust, resulting in a combined daily total of 978.0 pounds. This value also exceeds its respective significance criterion. Therefore, significant air quality impacts are ~~anticipated~~ projected to remain significant.

Construction Equipment

The applicant will implement same mitigation measures during operations for heavy equipment as presented for site construction.

- The project proponent will maintain equipment in tune per manufacturer's specifications.
- The project proponent will use catalytic converters on gasoline-powered equipment.
- The project proponent will retard diesel engine injection timing by 2 degrees.
- High-pressure fuel injectors will be installed.
- Heavy equipment will use reformulated, low-emission diesel fuel.
- The project proponent will substitute electric and gasoline-powered equipment for diesel-powered equipment where feasible.
- Where applicable, equipment will not be left idling for prolonged periods.
- The project proponent will curtail (cease or reduce) construction during periods of high ambient pollutant concentrations (i.e., Stage II smog alerts).

Refuse Trucks

In addition to the mitigation measures presented for onsite operations, the project proponent has made a commitment to reduce traffic congestion with the recommended traffic mitigation measures stated in Section 4.13, Transportation and Circulation. These measures include recommendations for roadway improvements that will reduce any vehicle queuing at the landfill, thereby reducing idle emissions. These mitigation measures will reduce air quality impacts from all vehicles entering the landfill.

Most of the refuse trucks delivering waste loads to the landfill are not operated by the project proponent. Therefore, the project proponent has no control over these emissions. However, the project proponent does have some control over emissions generated from project proponent-operated trucks and any other refuse trucks, once these trucks are onsite.

The following measures will be applied to the project proponent's operated trucks that utilize the project site:

- Refuse trucks shall be maintained in proper tune. Trucks observed to emit excessive amounts of smoke (particulate matter) shall either be tuned up or repaired, as applicable.

- Where applicable, high-pressure fuel injector nozzles shall be used, and diesel engine timing shall be retarded by 2 degrees.

The following measures will be applied to all refuse trucks accessing the project site:

- Using a progressive fee schedule, the project proponent shall encourage trucks to carry full loads.

- The project proponent shall encourage trucking to be performed during off-peak hours. This shall be accomplished through coordination of deliveries with the transfer stations that supply refuse, restrictions in the hours of operation, and/or a fee schedule that penalizes haul trucks arriving during peak congestion periods. This will reduce emissions by increasing truck speeds and eliminating prolonged idling in traffic.

- When operating onsite, trucks shall not be left idling for periods in excess of 5 minutes.

- Private owner-operators shall be warned that, if their trucks emit excessive amounts of smoke as determined by scale house workers, they will not be allowed future access to the landfill facility.

The landfill gas flares emit significant amounts of CO, NO_x, SO_x, ROG and PM_{10}. They are required by the SCAQMD to be constructed using Best Available Control Technology (BACT) which represents the lowest achievable emission rate utilizing currently available technology. Even after the installation of BACT, emissions would remain significant.

Table 4.2-158 recounts the projected operational emissions, projected control efficiencies of the mitigation measures, and residual emissions. It is expected that the inclusion of these recommended mitigation measures will reduce emissions to the extent feasible but is not anticipated to reduce them to a level of less than significant.

Fugitive Dust

Fugitive dust emissions in combination with PM_{10} emissions generated from vehicular and flare exhaust are anticipated to create a significant impact. This would be especially true during above-average and occasionally high wind conditions (i.e., Santa Ana). Past operations have shown that the higher-elevation upper plateau and southern berm areas of the existing inactive landfill have experienced greater wind-

Table 4.2-158 (Revised)
OPERATIONAL EMISSIONS, CONTROL MEASURE REDUCTION EFFICIENCY, AND RESIDUAL EMISSIONS[1]

Emissions Source	Heavy Equipment Operation[2]	Worker Vehicles	Delivery Trucks[33]	Combustion of Landfill Gas[34]	Fugitive PM_{10} Dust	Fuel Storage and Transfer	Total
CO	~~233.7~~ 194.0	~~46.0~~ 35.6	~~1,338.0~~ 954.2	~~1,440.0~~ 520.0	NA	NA	~~3,057.7~~ 1,703.8
Mitigation Control Efficiency (percent)	40.0	0.0	0.0	0.0	NA	NA	
Residual	~~140.2~~ 120.1	~~46.0~~ 35.6	~~1,338.0~~ 954.2	~~1,440.0~~ 520.0	**NA**	**NA**	~~2964.2~~ 1,629.9
NO_x (as NO_2)	~~414.9~~ 766.7	~~3.0~~ 3.3	~~396.4~~ 875.1	~~289.4~~ 870.0	NA	NA	~~1,103.7~~ 2,515.1
Mitigation Control Efficiency (percent)	40.0	0.0	0.0	0.0	NA	NA	
Residual	~~248.9~~ 461.7	~~3.0~~ 3.3	~~396.6~~ 875.1	~~289.4~~ 870.0	**NA**	**NA**	~~937.9~~ 2,210.1
ROG	~~35.3~~ 54.0	~~3.2~~ 2.8	~~140.0~~ 151.1	~~30.4~~ 125.0	NA	~~1.3~~ 1.2	~~210.2~~ 334.1
Mitigation Control Efficiency (percent)	15.0	0.0	0.0	0.0	NA	0.0	
Residual	~~30.0~~ 46.0	~~3.2~~ 2.8	~~140.0~~ 151.1	~~30.4~~ 125.0	**NA**	~~1.3~~ 1.2	~~204.9~~ 324.9
SO_x (as SO_2)	~~41.9~~ 68.6	~~0.2~~ NV	~~24.8~~ NV	~~68.4~~ 535.0	NA	NA	~~135.3~~ 603.6
Mitigation Control Efficiency (percent)	40.0	0.0	0.0	0.0	NA	NA	
Residual	~~25.1~~ 41.2	~~0.2~~ NV	~~24.8~~ NV	~~68.4~~ 535.0	**NA**	**NA**	~~118.5~~ 576.2
PM_{10}	~~26.2~~ 16.6	0.1	~~39.8~~ 67.4	~~36.0~~ 205.0	~~3,594~~ 688.9	NA	~~3,696.5~~ 978.0
Mitigation Control Efficiency (percent)	0.0 or 40.0	0.0	0.0	0.0	~~93~~[4] 89[5]	NA	
Residual	~~15.7~~ 15.0	**0.1**	~~39.8~~ 67.4	~~36.0~~ 205.0	~~252.9~~ 75.8	NA	~~344.9~~ 363.3

Source: Ultrasystems Environmental Incorporated

Notes:

1. All emissions are in pounds per day. Mitigation measures are as presented in the text. Where available, control efficiencies are considered conservative for SCAQMD and CARB control factors. Where no control efficiencies are published, control efficiencies are speculative but considered conservative.
2. Mitigation is inherent in emissions calculated using manufacturer specifications or EMFAC7G. Therefore, no mitigation control efficiency was applied to heavy equipment emissions calculated using these methodologies.
~~2~~3. Although mitigation measures are proposed to reduce these emissions, the overall control efficiency will be very low and is not considered in this analysis.
~~3~~4. This value is the result of thermal destruction of LFG from 5 flares at the permitted levels.
~~4~~5. See **Table 4.2-169**.

generated fugitive dust occurrences than the lower elevations within the canyon. The lack of revegetation on the active face of the landfill surface has exacerbated difficulties in adequately controlling fugitive dust emissions during periods of high wind conditions. However, the project proponent has successfully established ground cover and other revegetation on portions of the existing inactive landfill site. Additionally, the project proponent has implemented enhanced soil treatment measures to stabilize soil conditions and further enhance onsite revegetation.

The proposed project would be located farther away from adjacent urban land uses than the existing inactive City Landfill. The closest residential unit to the proposed landfill footprint is approximately 1,700 feet. Although the more sheltered location of proposed landfill operations relative to the existing inactive landfill site may reduce, to some extent, the likelihood of fugitive dust generation, the site would still be subject to winds conditions that have created prior dust control problems at the existing facility. Therefore, the project proponent shall be required toprovide adequate mitigation measures to control fugitive dust in accordance with the SCAQMD Rules 402 and 403 and to minimize offsite migration of windblown dust from the landfill extension site.

Mitigation measures and control efficiencies for each dust-generating operation are presented in the following discussion. **Table 4.2-~~16~~19** includes the unmitigated emissions, assumed control efficiency, and the mitigated emissions for landfill operations.

Truck Travel and Fugitive Dust Emissions

The following mitigation measures shall be implemented by the project proponent:

- To minimize fugitive dust emissions, the access roadways shall be paved and haul roads to the working face areas shall be hard packed with crushed stone. Paved and/or ~~gravel~~ crushed stone covered roadways shall extend up to new active fill areas as development of the landfill progresses. Crushed stone may consist of purchased rock, recycled asphalt, recycled cement, and/or recycled rock.

For paved roads, mitigation shall include:

- Use of curbs and gutters. At least twice daily watering or wet sweeping to remove windblown surface dust. AP-42 assigns a control efficiency of 50 percent for twice weekly cleaning of industrial paved roads. With twice daily cleaning, a control efficiency in excess of ~~95~~0 percent is predicted.

Table 4.2-~~16~~19 (Revised)
OPERATIONAL FUGITIVE DUST PM_{10} EMISSIONS, CONTROL MEASURE REDUCTION EFFICIENCY, AND RESIDUAL EMISSIONS

Source	Unmitigated PM_{10} Emissions (lb/day)	Mitigation Control Efficiency (percent)*[1]	Residual PM_{10} (lb/day)
Active Working Face Area[2]	~~19~~ 13.8	~~50~~ 65	~~9.5~~ 4.8
Landfill Cell ~~Excavation~~ Preparation	~~38~~ 2.2	~~50~~ 65	~~19~~ 0.8
Cover Procurement	~~8~~ 34.3	~~50~~ 65	~~4~~ 12.0
Other Landfill Areas	13.5	65	4.7
Surface Erosion	~~12~~ 10.3	~~50~~ 90	~~6~~ 1.0
Stockpile Erosion	~~35~~ 8.6	~~50~~ 90	~~17.5~~ 0.9
Travel on Paved Roadway Surfaces[3]	~~3,330~~ 277.4	~~95~~ 90	~~166.5~~ 27.7
Travel on Unpaved Crushed Stone Covered Roadway Surfaces	178.3	95	8.9
Travel on Unpaved Clay Roadway Surfaces[4]	~~152~~ 150.5	~~80~~ 90	~~30.4~~ 15.0
Total	**~~3,594~~ 688.9**	**~~93~~ 89[5]**	**~~252.9~~ 75.8**

Source: Ultrasystems Environmental Incorporated

Notes:

*1: Control efficiencies are in accordance with *AP-42: Compilation of Air Pollutant Emission Factors,* op. cit., and ~~are conservative.~~ *Draft South Coast Air Quality Management District Consultation No. 4, Work in Progress Air Quality Analysis Refinements El Sobrante Landfill Expansion,* TRC Environmental Solutions, Inc., May 2, 1997.

2. Does not include truck turnaround area.

3. Represents worst-case daily emissions.

~~3~~4. Includes truck turnaround area.

~~4~~5. Mitigation Control Efficiency was derived by dividing Residual PM_{10} Emissions in (lb/day) by Unmitigated PM_{10} Emissions in (lb/day).

For unpaved clay roads, mitigation shall include:

- The regular application of ~~an~~ SCAQMD-approved chemical dust suppressant with a manufacturer's demonstrated control efficiency ~~of 80~~ in excess of 90 percent and subsequent watering. Note that this control efficiency is less than (i.e., more conservative than) the 95 percent value used at the El Sobrante Landfill (*Draft South Coast Air Quality Management District Consultation No. 4, Work in Progress Air Quality Analysis Refinements El Sobrante Landfill Expansion*, TRC Environmental Solutions, Inc., May 2, 1997).

For unpaved crushed stone covered roads, mitigation shall include:

- With the use of a crushed stone topcoat consisting of purchased rock, recycled asphalt, recycled cement, and/or recycled rock, in addtion to the regular application of a SCAQMD-approved chemical dust suppressant and subsequent watering, a control efficiency in excess of 95 percent is predicted.

To reduce the amount of dust being carried onto San Fernando Road, mitigation shall include:

- The placement and proper operation of a wheel washer for trucks at the site exit to minimize dust and dirt entrainment prior to trucks leaving the site.

Heavy Equipment Operations

Fugitive dust associated with w~~W~~ind erosion and heavy equipment involved in landfilling waste, procuring cover material, ~~excavating~~ preparing ~~new~~ landfill ~~cells~~ areas, and covering active working cells ~~is~~ are projected to add as much as ~~77~~ 74.1 pounds of PM_{10} per day. (Note that this value does not include the ~~35~~ 8.6 pounds per day estimated for erosion of ~~an initial~~ stockpile that will be constructed during initial site construction and depleted for daily cover. It will not ~~to~~ be reconstructed.) In addition, onsite travel will add an additional 606.2 pounds of PM_{10} per day.

As required by SCAQMD Rule 403, these emissions will be controlled using a water truck with a projected dust-reduction efficiency of at least ~~50~~ 65 percent.

~~Additionally,~~ Mitigation pertaining to heavy equipment operations ~~and site erosion~~ shall include the following:

- Operations shall be restricted to encompass no more than a 10-acre active working face area.

- To the extent technically feasible, material excavated from one portion of the project site shall be used as daily cover material in an adjacent area to minimize travel distances for such cover material.

With the inclusion of these additional measures, control efficiency is estimated to be in excess of 65 percent. This value is more conservative than the 68 percent value used in the El Sobrante Landfill documentation.

Additionally, mitigation pertaining to site erosion shall include the following:

- Subject to approval by the California Integrated Waste Management Board (CIWMB), filling in each active area shall be prolonged through the utilization of a 20-foot maximum cell height. This would

reduce the area of excavation and minimize the disturbances to the landfill, thereby providing an effective control of fugitive dust.

- A temporary vegetation cover shall be established on all slopes that are to remain inactive for a period longer than 180 days.

- An SCAQMD approved soil stabilization (sealant) product shall be used to retard soil erosion and enhance revegetation. Soil sealant shall be applied when necessary to selected working areas of the landfill. The sealant will also be used as a binder or tackifier to hold seed during revegetation, mulch, and fertilizers in-place until grasses become established and stabilize on the landfill surface.

Control efficiency of site erosion is estimated to be greater than 90 percent.

However, even after the incorporation of mitigation measures, PM_{10} emissions are projected to remain significant. **Tables 4.2-20-1, 4.2-20-2, and 4.2-20-3** provide a summary of source by source uncontrolled and mitigated PM_{10} emissions for worst-case daily emissions of road dust, the disturbed area, and exhaust, respectively.

COUNTY MITIGATION MEASURES

For a discussion of adopted County Landfill mitigation measures, timing, and monitoring responsibilities, with respect to air quality refer to Appendix C9, FEIR Mitigation Monitoring and Reporting Summary, pp. 24-27, within this Draft SEIR. Implementation of the proposed project shall require an amendment to this Summary to provide for the development of ±42 acres in the County portion of Sunshine Canyon. The same mitigation measures imposed for the County Landfill project would be adopted for this development in the County. (Refer to Appendix C17, Amended Mitigation Monitoring and Reporting Summary.)

LEVEL OF SIGNIFICANCE AFTER MITIGATION

The mitigation measures would reduce impacts; however, even with the implementation of these mitigation measures, project-generated and project related cumulative impacts are considered significant and unavoidable.

4.2.13 Odor Impacts[19]

ENVIRONMENTAL SETTING

Waste materials received on a daily basis at the proposed City/County Landfill have the potential to emit detectable odors prior to the application of daily cover material. Two potential sources of odors are generally associated with most landfilling operations. The first source of odor is directly related to the specific types of refuse brought to the landfill prior to emplacement, compaction, and the application of daily cover material. The second source of odor is from the methane-related gases produced from the anaerobic (oxygen-free) microbial decomposition of organic matter in the buried refuse.

19/ *FEIR, Sunshine Canyon Landfill Extension*, Volume I, Ultrasystems Engineers & Constructors, Inc., pp.181-186.

Table 4.2-20-1
CONTROLLED FUGITIVE PM_{10} EMISSIONS FROM ROAD DUST

Emissions Source	Uncontrolled PM_{10} Emissions (lb/day)[1]	Control Technology	Efficiency (%)	Mitigated PM_{10} Emissions (lb/day)
Paved Road				
Transfer Truck	105.9	Soil Stabilizers; Enhanced Watering	90%	10.6
Curbside Collection Truck	167.6	Soil Stabilizers; Enhanced Watering	90%	16.8
Light Duty Truck	3.9	Soil Stabilizers; Enhanced Watering	90%	0.4
SUBTOTAL	*277.4*			*27.7*
Industrial Unpaved Road (w/crushed stone)*				
Transfer Truck	65.1	Crushed Stone; Soil Stabilizers; Enhanced Watering	95%	3.3
Curbside Collection Truck	106.2	Crushed Stone; Soil Stabilizers; Enhanced Watering	95%	5.3
Light Duty Truck	7.1	Crushed Stone; Soil Stabilizers; Enhanced Watering	95%	0.4
SUBTOTAL	*178.3*			*8.9*
Unpaved Road				
Dirt Truck	92.3	Soil Stabilizers; Enhanced Watering	90%	9.2
SUBTOTAL	*92.3*			*9.2*
Total Uncontrolled PM_{10} Emissions	**548**	**Total Controlled PM_{10} Emissions**		**46**

Source: Browning-Ferris Industries

Note: * Crushed stone may consist of purchased rock, recycled asphalt, recycled cement, and/or recycled rock.

Table 4.2-20-2
CONTROLLED FUGITIVE PM_{10} EMISSIONS FROM THE DISTURBED AREA

Emissions Source	Uncontrolled PM_{10} Emissions (lb/day)	Control Technology	Efficiency (%)	Mitigated PM_{10} Emissions (lb/day)
Fugitive PM_{10} Emissions at the Working Face - Truck Turnaround Area				
Transfer Truck	21.3	Soil Stabilizers; Enhanced Watering	90%	2.1
Curbside Collection Truck	34.7	Soil Stabilizers; Enhanced Watering	90%	3.5
Light Duty Truck	2.3	Soil Stabilizers; Enhanced Watering	90%	0.2
SUBTOTAL	***58.2***			***5.8***
Fugitive PM_{10} Emissions from Heavy Equipment				
Bulldozer	1.4	Watering	65%	0.5
	4.5	Watering	65%	1.6
	13.5	Watering	65%	4.7
Grader	1.6	Watering	65%	0.6
Compactor	9.6	Watering	65%	3.3
SUBTOTAL	***30.6***			***10.7***
Fugitive PM_{10} Emissions from Material Handling Activities				
Stockpile Dirt Digging	32.0	Watering	65%	11.2
Dumping of Solid Waste	0.9	Watering	65%	0.3
Dumping of Daily Cover	0.3	Watering	65%	0.1
SUBTOTAL	***33.2***			***11.6***
Wind Erosion				
Active Working Face	0.9	Soil Stabilizers; Enhanced Watering	90%	0.1
Daily Cover Stockpile	8.6	Soil Stabilizers; Enhanced Watering	90%	0.9
Landfill Area Excavation	9.4	Soil Stabilizers; Enhanced Watering	90%	0.9
SUBTOTAL	***18.9***			***1.9***
Total Uncontrolled PM_{10} Emissions	**141.0**	**Total Controlled PM_{10} Emissions**		**30.0**

Source: Browning-Ferris Industries

Table 4.2-20-3
CONTROLLED PM_{10} EMISSIONS FROM HEAVY EQUIPMENT EXHAUST

Equipment	Uncontrolled PM_{10} Emissions (lb/day)	Control Technology	Efficiency (%)	Mitigated PM_{10} Emissions (lb/day)
Active Working Face				
Bulldozer (1)	0.6	Inherent in emission factor	0%	0.6
Grader (1)	0.3	Inherent in emission factor	0%	0.3
Compactor (6)	5.7	Inherent in emission factor	0%	5.7
Dirt Truck (3)	1.4	Inherent in emission factor	0%	1.4
Water Pull (1)	1.9	High Pressure Fuel Injectors; Fuel Injection Retardation	40%	1.2
SUBTOTAL	***9.8***			***9.0***
Cover Procurement / Landfill Excavation				
Bulldozer (1)	0.6	Inherent in emission factor	0%	0.6
SUBTOTAL	***0.6***			***0.6***
Other Landfill Areas				
Bulldozer (3)	1.8	Inherent in emission factor	0%	1.8
Dirt Truck (4)	1.8	Inherent in emission factor	0%	1.8
Excavator (2)	0.5	Inherent in emission factor	0%	0.5
Water Truck (3)	0.2	Inherent in emission factor	0%	0.2
Water Pull (1)	1.9	High Pressure Fuel Injectors; Fuel Injection Retardation	40%	1.2
SUBTOTAL	***6.2***			***5.4***
Total Uncontrolled PM_{10} Emissions	**16.6**	**Total Controlled PM_{10} Emissions**		**15.0**

Source: Browning-Ferris Industries

The first potential source of odor is produced from the decomposition of refuse in a landfill and is primarily based on factors that include the type of materials comprising waste, age of the refuse, acidic content of the waste (pH level), moisture content in the refuse, degree to which the refuse is compacted at the landfill, particle size, temperature, and degree of mixing and types of organics present.

Additionally, certain types of household wastes, including cooked and uncooked foodstuff and meats, green waste, and wet wood shavings, may begin decomposition before being delivered to the landfill. These types of wastes release low levels of distinct scents that can contribute to odor levels. In addition, the waste stream will change seasonally. For example, many communities produce greater levels of yard waste during the spring and summer seasons. Waste generation usually falls during the late fall and winter periods. An exception takes place during the holiday season (i.e., Christmas) where many communities experience large increases in paper and packaged goods.

By receiving the refuse, compacting it, and covering it with a minimum layer of 6 inches (i.e., State standard) of cover material at the end of each working day, the potential for these odors is substantially reduced. The odors that may be released directly from the refuse prior to being covered with cover material are usually at low levels and are dispersed in the atmosphere at levels of concentration below which they do not create a nuisance to local receptors. The proposed landfilling operations are located at sufficient distances from the potential receptors (residential) and separated by sufficient terrain (1,700 feet to the nearest residence) so that no odor nuisance from refuse emplacement should occur. Additionally, between the proposed City/County Landfill footprint and the residential areas in Granada Hills, formidable barriers to odor migration include the inactive landfill, which is approximately 300 feet in height, and a ±100 acre buffer area. These two features pose sufficient screening and distance to inhibit the transmission of odors beyond the project site boundaries.

The second source of odor is produced by the anaerobic microbial decomposition of organic matter in refuse that produces natural LFGs. CO_2 (38 to 46 percent) and methane (53 to 60 percent) are the two main constituents of the natural gases produced, neither of which has a perceptible odor to humans. However, trace amounts of other gases that are malodorous are also produced during anaerobic decomposition. As the natural gases are generated within the landfill cells, internal landfill cell pressures move the gases within and away from the landfill along paths of least resistance. Generally, anaerobic processes begin locally and are then followed by the depletion of oxygen in isolated pockets. Processes peak in CO_2 production that typically occurs approximately 11 to 40 days after refuse emplacement. The methane-forming microorganisms begin formation approximately 1 to 2 years after landfilling.

~~The amount of gas produced by the landfill was predicted by comparison of gas flow to the existing flare and known refuse volume to a predicted City/County Landfill volume of 90 million tons. Estimated gas generation is on the order of 4.0 million cubic feet per day (Mcfd). (Note that the health risk assessment was based on a maximum daily generation rate of 6.3 Mcfd.) In 1989 projections were made regarding the LFG generation for the combined County/City Landfill Project (215-million-ton landfill facility). Note that the 4.0 Mcfd value is far less than the previously modeled data. Revisions in LFG generation calculations, as well as experience gained in the generation rates associated with the existing inactive landfill, have shown gas generation to be substantially lower than previously believed.~~

Odors can occur when the landfill surface, due to differential waste settlement, subsidence, or cracks, allows the LFG to escape into the atmosphere. At the existing inactive landfill, cracks found on the landfill surface are filled as part of a continuous maintenance programs. A similar procedure would be performed on the proposed landfill footprint area.

The proposed LFG collection and flaring system would be installed to collect gases generated by the decomposition of refuse through a series of horizontal and vertical gas collector wells designed to minimize the potential of onsite and offsite gas emissions and odors. The proposed LFG collection and disposal system would consist of gas extraction wells and installed piping. This system would be constructed of polyethylene pipe, which would flex as differential settlement occurs at the landfill. Once LFG is generated, it would be drawn into the horizontal collectors or wells and subsequently to the collection piping system by the vacuum blowers. To avoid drawing air into the system, the gas is extracted at the same rate it is being produced by controlling the vacuum level in the piping system. Extraction wells would be spaced so that the volume of refuse influenced by the wells is sufficiently balanced to capture the maximum amount of gas being generated by the landfill. The wells would be located so that the volume of well influence will slightly overlap that of the adjoining wells. Furthermore, project-engineering practice dictates that the collection system piping be sized so that sufficient vacuum is available to all wells in the system.

The horizontal gas collection system would be installed when preparing each new cell area and would be expanded as necessary to ensure compliance with SCAQMD Rule 1150.1 (Control of Gaseous Emissions from Active Landfills). Moreover, in order to control odors and help prevent potential migration of methane gas, ~~two~~ high-efficiency flares would be constructed ~~(in addition to the existing flaring station) in the City portion of Sunshine Canyon~~ to incinerate and destroy the collected gas. These proposed gas flaring stations would each have a total volume capacity of approximately 6 Mcfd.

Surface and ambient air monitoring is an ongoing regime dictated ~~throughout the landfill permitting process~~ by SCAQMD Rule 1150.1. Both the gas collection and flaring system and sampling program for the proposed extension will require approval by the SCAQMD. Surface sampling is used to identify areas of the landfill where gas may be escaping.

THRESHOLDS FOR DETERMINING SIGNIFICANCE

The *SCAQMD CEQA Air Quality Handbook* recommends that the following indicator be used as an air quality screening criterion for odors:

- creation of (or subject sensitive receptors to) an objectionable odor over 10:1 dilution to thresholds.[20]

ENVIRONMENTAL IMPACT

The proposed City/County Landfill Project would be operated in a manner to preclude odor nuisances emanating from the incoming refuse and/or landfill operations. The landfilling operations, including cell orientation, gas collection, and cover application, would effectively confine and seal in odors associated with deposited wastes within landfill areas.

Existing prevailing winds in the vicinity of the Santa Susana Mountains and Sunshine Canyon will help reduce the potential impact of any temporary odorous emissions. The prevailing 24-hour wind direction is south to southwest, away from sensitive receptors. Any other potential odor impacts will also be minimized by the large volumes of air masses associated with open space conditions, wind turbulence, and the intervening topography in the Sunshine Canyon area.

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[20]/ A methodology established by the American Society of Testing Materials (ASTM, Standard Method D 1391) to determine how many times an air sample must be diluted with "clean" air before the odor is no longer detectable to an average adult with average odor sensitivity.

Based on an expected average intake rate of 11,000 tpd and a maximum intake rate of 12,100 tpd, it will be several years before landfilling occurs adjacent to the southern portion of the existing inactive landfill, which is now in the process of closure. The distance of separation between the proposed landfill footprint and the nearest residential receptor on the end of Timber Ridge (Granada Hills) is approximately 1,700 feet. This distance of separation should eliminate potential odor nuisance problems emanating from the working face area of the landfill.

Based on the volume of solid waste projected to be deposited at the proposed City/County Landfill, there will be an increase in the amount of LFG being generated. The potential for odor emissions from decomposing refuse exists at the proposed landfill and all landfill facilities. However, application of daily cover, as well as the expanded LFG collection and disposal system, is expected to effectively remove the gases produced and prevent any significant odor problems from developing.

During the prior landfill's (now in the process of closure) operation, concerns were raised in connection with odor emissions at the landfill. The SCAQMD, which regulates landfill odors, conducted numerous inspections and concluded that the existing landfill was not the source of odors that had caused complaints from residents within Granada Hills. The SCAQMD determined that the odor source was derived from natural sulfur compounds found in the adjacent watershed area or a nearby refinery that has since been closed. Sulfur compounds from the adjacent watershed area are naturally released into the air when groundwater reaches the surface through natural seeps and springs. These natural seeps and springs are located north and west of Sunshine Canyon, near Bee Canyon and O'Melveny Park, and adjacent to existing residential areas. Additionally, oil well extraction and gas injection storage operations located northerly of these existing residential areas are another potential source of odor emissions.

The SCAQMD further noted that the odor control procedures being implemented by the project proponent were effective in controlling refuse odors. Odor control measures used at the existing landfill when in full operation were proven to be effective at controlling odors at the landfill. The project proponent still uses odor control measures such as operation of the gas collection system and repair of cracks found in the landfill cover. Similar control measures will be utilized at the proposed City/County Landfill facility.

CUMULATIVE IMPACT

The development and operation of the proposed City/County Landfill Project in combination with current and future proposed projects located in the general vicinity would not result in any significant cumulative odor impacts. Odor impacts associated with the proposed project can be fully mitigated to a less than significant level.

CITY MITIGATION MEASURES

The mitigation measures listed and described below are designed to eliminate the potential for odor emissions to ambient air quality. The implementation of mitigation measures would reduce the potential for odor impacts to a less than significant level.

- The natural biological processes that generate odors in a landfill through anaerobic decomposition cannot be prevented or avoided. However, the LFGs shall be prevented from escaping to the atmosphere through the use of control measures. These measures include using daily and intermediate cover material over deposited wastes, filling any surface cracks with clean dirt as

necessary, and extracting LFG through the use of an LFG collection and recovery system and destroying collected gases by combustion.

- Operational techniques shall be utilized to control odor sources at the landfill. The size of the working face shall be limited so that the area of waste exposed to the atmosphere is kept to a minimum.

- Solid waste shall be compacted within 1 hour of its arrival at the working face.

- The LFG collection and recovery system shall be installed in phases as each portion of the landfill site is filled. The final system shall contain a network of gas extraction wells, collection system piping, and flaring facilities. Because the LFG generation begins at lower levels of volume and increases during the landfill site life, the gas will be flared initially until sufficient quantities are available for processing into electricity.

- If an odor problem should develop, appropriate control measures shall be implemented. These measures include the application of daily cover material or more frequent application of the cover material to seal the landfill surface, or adjustments to the wells, equipment, and operation of the LFG collection and recovery system.

- To ensure that odors are kept to a minimum, the following odor/LFG monitoring program shall be implemented for the proposed landfill project. The monitoring program shall comply with the requirements of SCAQMD Rule 1150.1 and include the following:

  - Sample Probe Installation: At a minimum of one monitoring per 1,000 feet around the landfill perimeter shall be installed to identify potential areas of subsurface LFG migration. These probes shall be monitored to ensure that large quantities of LFG do not vent offsite through subsurface soils.

  - Integrated Landfill Surface Sampling: The landfill surface shall be monitored to ensure that the average concentration of total organic compounds over the landfill surface does not exceed SCAQMD's standard of 50 ppm.

  - Ambient Air Samples: 24-hour integrated gas samples and required meteorological data shall be taken to assess any impact the landfill is having on the ambient air quality at the landfill perimeter.

  - Instantaneous Landfill Surface Monitoring: Spot checks on the landfill surface shall be made to determine the maximum concentration of total organic compounds measured as methane, measured at any one point on the surface of the landfill does not exceed the SCAQMD's standard of 500 ppm.

  - Regular Monitoring and Annual Testing: LFG concentrations at perimeter probes, gas collection system headers, the landfill surface, and in ambient air downwind of the landfill shall be monitored once per month or less frequently (but no less than quarterly) as required by the SCAQMD. The LFG collection system shall be adjusted and improved based on quarterly monitoring data and annual stack testing results.

- LFG flaring systems shall be sited as required by the SCAQMD and constructed using BACT. The flames shall be totally contained within the stack. Flame arresters shall be provided to the satisfaction of the SCAQMD and City Local Enforcement Agency. To the extent technically and economically feasible, gas recovered at the landfill site shall be converted to energy or developed for other beneficial uses rather than flared.

COUNTY MITIGATION MEASURES

For a discussion of adopted County Landfill mitigation measures, timing, and monitoring responsibilities, with respect to odors refer to Appendix C9, Mitigation Monitoring and Reporting Summary, pp. ~~28-29~~ 24-27, within ~~this~~ the Draft SEIR. Implementation of the proposed project shall require an amendment to this Summary to provide for the development of ±42 acres in the County portion of Sunshine Canyon. The same mitigation measures imposed for the County Landfill project would be adopted for this development in the County. (Refer to Appendix C17, Amended Mitigation Monitoring and Reporting Summary.)

LEVEL OF SIGNIFICANCE AFTER MITIGATION

With the implementation of mitigation measures, no significant odor impacts will occur.

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ISCST3 MODEL RUN

Attachment 257

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29
PAGE 1

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** MODEL SETUP OPTIONS SUMMARY ***

**Intermediate Terrain Processing is Selected

**Model Is Setup For Calculation of Average CONCentration Values.
**Model Is Setup For Calculation of Dry DEPosition Values.

-- SCAVENGING/DEPOSITION LOGIC --
**Model Uses DRY DEPLETION. DDPLETE = T
**Model Uses NO WET DEPLETION. WDPLETE = F
**NO WET SCAVENGING Data Provided.
**Model Uses GRIDDED TERRAIN Data for Depletion Calculations

**Model Uses RURAL Dispersion.

**Model Uses User-Specified Options:
1. Final Plume Rise.
2. Not Use Stack-tip Downwash.
3. Not Use Buoyancy-induced Dispersion.
4. Not Use Calms Processing Routine.
5. Missing Data Processing Routine.
6. Default Wind Profile Exponents.
7. Default Vertical Potential Temperature Gradients.

**Model Accepts Receptors on ELEV Terrain.

**Model Assumes No FLAGPOLE Receptor Heights.

**Model Calculates 1 Short Term Average(s) of: 24-HR
and Calculates PERIOD Averages

**This Run Includes: 40 Source(s); 1 Source Group(s); and 1 Receptor(s)

**The Model Assumes A Pollutant Type of: PM10

**Model Set To Continue RUNning After the Setup Testing.

**Output Options Selected:
Model Outputs Tables of PERIOD Averages by Receptor
Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE Keyword)
Model Outputs Tables of Overall Maximum Short Term Values (MAXTABLE Keyword)
Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)

**NOTE: The Following Flags May Appear Following CONC Values: c for Calm Hours
m for Missing Hours
b for Both Calm and Missing Hours

**Misc. Inputs: Anem. Hgt. (m) = 10.00 ; Decay Coef. = 0.0000 ; Rot. Angle = 0.0
Emission Units = GRAMS/SEC ; Emission Rate Unit Factor = 0.10000E+07
Output Units = MICROGRAMS/M**3

**Input Runstream File: C:\ISC3VIEW\SUNSHINE\SUNSHINE.inp ; **Output Print File: C:\ISC3VIEW\SUNSHINE\SUNSHINE.out

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FLARE1	2	0.21300E+00	360403.8	3798758.8	596.0	15.30	1180.00	10.00	3.80	NO	
FLARE2	2	0.21300E+00	361026.3	3798461.3	549.0	15.30	1180.00	10.00	3.80	NO	
FLARE3	2	0.21300E+00	361270.0	3799383.0	458.0	15.30	1180.00	10.00	3.80	NO	
FLARE4	2	0.21300E+00	361374.2	3799175.5	475.0	15.30	1180.00	10.00	3.80	NO	
FLARE5	2	0.21300E+00	359456.0	3799223.0	500.0	15.30	1180.00	10.00	3.80	NO	

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29
PAGE 3

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** AREA SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC /METER**2)	COORD (SW CORNER) X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	X-DIM OF AREA (METERS)	Y-DIM OF AREA (METERS)	ORIENT. OF AREA (DEG.)	INIT. SZ (METERS)	EMISSION RATE SCALAR VARY BY
BLDZR	3	0.13000E-05	361374.0	3798721.0	530.0	3.00	63.60	63.60	0.00	2.00	HROFDY
GRADER	3	0.56400E-06	361374.0	3798721.0	530.0	3.00	63.60	63.60	0.00	2.00	HROFDY
CMPCTR	3	0.12600E-04	361374.0	3798721.0	530.0	3.00	63.60	63.60	0.00	2.00	HROFDY
H2OPLL	3	0.25900E-05	361374.0	3798721.0	530.0	3.00	63.60	63.60	0.00	2.00	HROFDY
ACTVFCE	3	0.10700E-04	361374.0	3798721.0	530.0	0.00	63.60	63.60	0.00	1.00	HROFDY
LNDFLEX	3	0.17500E-06	361374.0	3798721.0	530.0	0.00	201.00	201.00	0.00	1.00	HROFDY
EXEROS1	3	0.12200E-06	361374.0	3798721.0	530.0	0.00	201.00	201.00	0.00	0.00	
UXFRTK	3	0.20300E-04	361435.0	3798922.0	440.0	0.00	12.00	120.00	0.00	1.00	HROFDY
UCURBTRK	3	0.33200E-04	361435.0	3798922.0	440.0	0.00	12.00	120.00	0.00	1.00	HROFDY
UDELVTRK	3	0.22000E-05	361435.0	3798922.0	440.0	0.00	12.00	120.00	0.00	1.00	HROFDY
PXFRTRK1	2	0.49300E-05	361437.0	3799047.0	410.0	0.00	12.00	87.00	60.00	1.00	HROFDY
PCRBTRK1	2	0.78100E-05	361437.0	3799047.0	410.0	0.00	12.00	87.00	60.00	1.00	HROFDY
PDLVRY1	2	0.18300E-06	361437.0	3799047.0	410.0	0.00	12.00	87.00	60.00	1.00	HROFDY
PXFRTRK2	2	0.49300E-05	361513.0	3799093.0	400.0	0.00	12.00	87.00	75.00	1.00	HROFDY
PCRBTRK2	2	0.78100E-05	361513.0	3799093.0	400.0	0.00	12.00	87.00	75.00	1.00	HROFDY
PDLVRY2	2	0.18300E-06	361513.0	3799093.0	400.0	0.00	12.00	87.00	75.00	1.00	HROFDY
STKESN1	3	0.37300E-07	360584.8	3799194.3	512.0	0.00	284.50	284.50	0.00	0.00	
STKESN2	3	0.37300E-07	360584.8	3799278.8	512.0	0.00	201.00	201.00	0.00	0.00	
ACTERSN	3	0.12200E-06	361374.0	3798721.0	530.0	0.00	63.60	63.60	0.00	0.00	
DRTRCK2	3	0.10000E-06	360584.8	3799076.8	512.0	3.00	402.00	402.00	0.00	2.00	HROFDY
TRCKTRN	3	0.14400E-05	361374.0	3798721.0	530.0	0.00	191.00	191.00	0.00	2.00	HROFDY
BLLDZR2	3	0.13000E-06	360584.8	3799076.8	512.0	3.00	402.00	402.00	0.00	2.00	HROFDY
EXCVTR2	3	0.25900E-07	360584.8	3799076.8	512.0	3.00	402.00	402.00	0.00	2.00	HROFDY
H2OTRK2	3	0.12500E-07	360584.8	3799076.8	512.0	3.00	402.00	402.00	0.00	2.00	HROFDY
H2OPLL2	3	0.64600E-07	360584.8	3799076.8	512.0	3.00	402.00	402.00	0.00	2.00	HROFDY
STKPL1	3	0.88900E-06	360584.8	3799194.3	512.0	0.00	284.50	284.50	0.00	1.00	HROFDY
STKPL2	3	0.88900E-06	360584.8	3799278.8	512.0	0.00	201.00	201.00	0.00	1.00	HROFDY
ENTRLF	3	0.26300E-06	360584.8	3799076.8	512.0	0.00	402.00	402.00	0.00	1.00	HROFDY
UDRTRK1	3	0.10400E-04	360865.0	3799194.0	512.0	0.00	120.00	12.00	40.00	1.00	HROFDY
UDRTRK2	3	0.10400E-04	360956.0	3799117.0	512.0	0.00	120.00	12.00	40.00	1.00	HROFDY
UDRTRK3	3	0.10400E-04	361047.0	3799040.0	520.0	0.00	120.00	12.00	40.00	1.00	HROFDY
UDRTRK4	3	0.10400E-04	361138.0	3798962.0	520.0	0.00	120.00	12.00	40.00	1.00	HROFDY
UDRTRK5	3	0.10400E-04	361230.0	3798884.0	520.0	0.00	120.00	12.00	40.00	1.00	HROFDY
UDRTRK6	3	0.10400E-04	361322.0	3798807.0	530.0	0.00	65.00	12.00	40.00	1.00	HROFDY
DRTRCK	3	0.30100E-05	361374.0	3798721.0	530.0	3.00	63.60	63.60	0.00	2.00	HROFDY

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
ALL	BLDZR , GRADER , CMPCTR , H2OPLL , ACTVFCE , LNDFLEX , EXEROS1 , UXFRTK , UCURBTRK, UDELVTRK, PXFRTRK PDLVRY1 , PXFRTRK2, PCRBTRK2, PDLVRY2 , STKESN1 , STKESN2 , FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 , ACTE DRTRCK2 , TRCKTRN , BLLDZR2 , EXCVTR2 , H2OTRK2 , H2OPLL2 , STKPL1 , STKPL2 , ENTRLF , UDRTRK1 , UDRTRK2 , UD UDRTRK4 , UDRTRK5 , UDRTRK6 , DRTRCK ,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = BLDZR ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.93750, 0.03125, 0.03125,

PARTICLE DIAMETER (MICRONS) =
1.25000, 4.25000, 8.00000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000, 2.00000,

*** SOURCE ID = GRADER ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.93750, 0.03125, 0.03125,

PARTICLE DIAMETER (MICRONS) =
1.25000, 4.25000, 8.00000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000, 2.00000,

*** SOURCE ID = CMPCTR ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.93750, 0.03125, 0.03125,

PARTICLE DIAMETER (MICRONS) =
1.25000, 4.25000, 8.00000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000, 2.00000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = H2OPLL ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.93750, 0.03125, 0.03125,

PARTICLE DIAMETER (MICRONS) =
1.25000, 4.25000, 8.00000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000, 2.00000,

*** SOURCE ID = ACTVFCE ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.09300, 0.27900, 0.62800,

PARTICLE DIAMETER (MICRONS) =
1.00000, 3.50000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = LNDFLEX ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.09300, 0.27900, 0.62800,

PARTICLE DIAMETER (MICRONS) =
1.00000, 3.50000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = EXEROS1 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.09300, 0.27900, 0.62800,

PARTICLE DIAMETER (MICRONS) =
1.00000, 3.50000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = UXFRTK ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.26400, 0.29200, 0.44400,

PARTICLE DIAMETER (MICRONS) =
1.25000, 3.75000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = UCURBTRK; SOURCE TYPE = AREA ***

MASS FRACTION =
0.26400, 0.29200, 0.44400,

PARTICLE DIAMETER (MICRONS) =
1.25000, 3.75000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = UDELVTRK; SOURCE TYPE = AREA ***

MASS FRACTION =
0.26400, 0.29200, 0.44400,

PARTICLE DIAMETER (MICRONS) =
1.25000, 3.75000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = PXFRTRK1; SOURCE TYPE = AREA ***

MASS FRACTION =
0.23900, 0.76100,

PARTICLE DIAMETER (MICRONS) =
1.25000, 6.25000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000,

*** SOURCE ID = PCRBTRK1; SOURCE TYPE = AREA ***

MASS FRACTION =
0.23900, 0.76100,

PARTICLE DIAMETER (MICRONS) =
1.25000, 6.25000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = PDLVRY1 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.23900, 0.76100,

PARTICLE DIAMETER (MICRONS) =
1.25000, 6.25000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000,

*** SOURCE ID = PXFRTRK2; SOURCE TYPE = AREA ***

MASS FRACTION =
0.23900, 0.76100,

PARTICLE DIAMETER (MICRONS) =
1.25000, 6.25000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000,

*** SOURCE ID = PCRBTRK2; SOURCE TYPE = AREA ***

MASS FRACTION =
0.23900, 0.76100,

PARTICLE DIAMETER (MICRONS) =
1.25000, 6.25000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = PDLVRY2 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.23900, 0.76100,

PARTICLE DIAMETER (MICRONS) =
1.25000, 6.25000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000,

*** SOURCE ID = STKESN1 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.09300, 0.27900, 0.62800,

PARTICLE DIAMETER (MICRONS) =
1.00000, 3.50000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = STKESN2 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.09300, 0.27900, 0.62800,

PARTICLE DIAMETER (MICRONS) =
1.00000, 3.50000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = FLARE1 ; SOURCE TYPE = POINT ***

MASS FRACTION =
0.60000, 0.40000,

PARTICLE DIAMETER (MICRONS) =
1.25000, 6.25000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000,

*** SOURCE ID = FLARE2 ; SOURCE TYPE = POINT ***

MASS FRACTION =
0.60000, 0.40000,

PARTICLE DIAMETER (MICRONS) =
1.25000, 6.25000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000,

*** SOURCE ID = FLARE3 ; SOURCE TYPE = POINT ***

MASS FRACTION =
0.60000, 0.40000,

PARTICLE DIAMETER (MICRONS) =
1.25000, 6.25000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = FLARE4 ; SOURCE TYPE = POINT ***

MASS FRACTION =
0.60000, 0.40000,

PARTICLE DIAMETER (MICRONS) =
1.25000, 6.25000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000,

*** SOURCE ID = FLARE5 ; SOURCE TYPE = POINT ***

MASS FRACTION =
0.60000, 0.40000,

PARTICLE DIAMETER (MICRONS) =
1.25000, 6.25000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000,

*** SOURCE ID = ACTERSN ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.09300, 0.27900, 0.62800,

PARTICLE DIAMETER (MICRONS) =
1.00000, 3.50000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = DRTRCK2 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.93750, 0.03125, 0.03125,

PARTICLE DIAMETER (MICRONS) =
1.25000, 4.25000, 8.00000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000, 2.00000,

*** SOURCE ID = TRCKTRN ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.26400, 0.29200, 0.44400,

PARTICLE DIAMETER (MICRONS) =
1.25000, 3.75000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = BLLDZR2 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.93750, 0.03125, 0.03125,

PARTICLE DIAMETER (MICRONS) =
1.25000, 4.25000, 8.00000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000, 2.00000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = EXCVTR2 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.93750, 0.03125, 0.03125,

PARTICLE DIAMETER (MICRONS) =
1.25000, 4.25000, 8.00000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000, 2.00000,

*** SOURCE ID = H2OTRK2 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.93750, 0.03125, 0.03125,

PARTICLE DIAMETER (MICRONS) =
1.25000, 4.25000, 8.00000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000, 2.00000,

*** SOURCE ID = H2OPLL2 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.93750, 0.03125, 0.03125,

PARTICLE DIAMETER (MICRONS) =
1.25000, 4.25000, 8.00000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000, 2.00000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = STKPL1 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.09300, 0.27900, 0.62800,

PARTICLE DIAMETER (MICRONS) =
1.00000, 3.50000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = STKPL2 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.09300, 0.27900, 0.62800,

PARTICLE DIAMETER (MICRONS) =
1.00000, 3.50000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = ENTRLF ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.09300, 0.27900, 0.62800,

PARTICLE DIAMETER (MICRONS) =
1.00000, 3.50000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = UDRTRK1 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.26400, 0.29200, 0.44400,

PARTICLE DIAMETER (MICRONS) =
1.25000, 3.75000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = UDRTRK2 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.26400, 0.29200, 0.44400,

PARTICLE DIAMETER (MICRONS) =
1.25000, 3.75000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = UDRTRK3 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.26400, 0.29200, 0.44400,

PARTICLE DIAMETER (MICRONS) =
1.25000, 3.75000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = UDRTRK4 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.26400, 0.29200, 0.44400,

PARTICLE DIAMETER (MICRONS) =
1.25000, 3.75000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = UDRTRK5 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.26400, 0.29200, 0.44400,

PARTICLE DIAMETER (MICRONS) =
1.25000, 3.75000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

*** SOURCE ID = UDRTRK6 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.26400, 0.29200, 0.44400,

PARTICLE DIAMETER (MICRONS) =
1.25000, 3.75000, 7.50000,

PARTICLE DENSITY (G/CM**3) =
2.65000, 2.65000, 2.65000,

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = DRTRCK ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.93750, 0.03125, 0.03125,

PARTICLE DIAMETER (MICRONS) =
1.25000, 4.25000, 8.00000,

PARTICLE DENSITY (G/CM**3) =
2.00000, 2.00000, 2.00000,

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**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH HOUR OF THE DAY *

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR

SOURCE ID = BLDZR ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = GRADER ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = CMPCTR ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = H2OPLL ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = ACTVFCE ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

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**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH HOUR OF THE DAY *

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR

SOURCE ID = LNDFLEX ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = UXFRTK ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = UCURBTRK ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = UDELVTRK ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = PXFRTRK1 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

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**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH HOUR OF THE DAY *

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR

SOURCE ID = PCRBTRK1 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = PDLVRY1 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = PXFRTRK2 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = PCRBTRK2 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = PDLVRY2 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

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**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH HOUR OF THE DAY *

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR

SOURCE ID = DRTRCK2 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.00000E+00	9	.00000E+00	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = TRCKTRN ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = BLLDZR2 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = EXCVTR2 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = H2OTRK2 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

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**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH HOUR OF THE DAY *

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR

SOURCE ID = H2OPLL2 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = STKPL1 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = STKPL2 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = ENTRLF ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = UDRTRK1 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH HOUR OF THE DAY *

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR

SOURCE ID = UDRTRK2 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = UDRTRK3 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = UDRTRK4 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = UDRTRK5 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = UDRTRK6 ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH HOUR OF THE DAY *

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR

SOURCE ID = DRTRCK ; SOURCE TYPE = AREA :

1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.10000E+01
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.10000E+01	17	.10000E+01	18	.10000E+01
19	.10000E+01	20	.10000E+01	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** DISCRETE CARTESIAN RECEPTORS ***
(X-COORD, Y-COORD, ZELEV, ZFLAG)
(METERS)

(361515.5, 3796885.0, 392.0, 0.0);

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
(1=YES; 0=NO)

1 1 1

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

FILE: C:\ISC3VIEW\SUNSHINE\SUN.ASC FORMAT: (4I2,2F9.4,F6.1,I2,2F7.1,f9.4,f10.1,f8.4,i4,f7.2)
SURFACE STATION NO.: 51115 UPPER AIR STATION NO.: 99999
NAME: UNKNOWN NAME: UNKNOWN
YEAR: 1981 YEAR: 1981

YR	MN	DY	HR	FLOW VECTOR	SPEED (M/S)	TEMP (K)	STAB CLASS	MIXING HEIGHT (M) RURAL	MIXING HEIGHT (M) URBAN	USTAR (M/S)	M-O LENGTH (M)	Z-0 (M)	IPCODE	PRATE (mm/HR)
81	1	1	1	314.8	1.00	285.9	7	522.6	170.0	0.0898	13.7	0.7000	0	0.00
81	1	1	2	304.9	0.00	284.8	7	507.0	170.0	0.0000	0.0	0.7000	0	0.00
81	1	1	3	310.0	0.00	284.8	7	491.4	170.0	0.0000	0.0	0.7000	0	0.00
81	1	1	4	346.0	1.00	284.8	7	475.8	170.0	0.0897	13.7	0.7000	0	0.00
81	1	1	5	309.0	1.00	285.4	7	460.3	170.0	0.0898	13.7	0.7000	0	0.00
81	1	1	6	342.0	1.00	284.3	7	444.7	170.0	0.0898	13.7	0.7000	0	0.00
81	1	1	7	342.0	0.00	284.3	7	429.1	170.0	0.0000	0.0	0.7000	0	0.00
81	1	1	8	337.1	0.00	284.3	6	43.0	190.2	0.0000	0.0	0.7000	0	0.00
81	1	1	9	6.5	1.00	287.6	5	89.2	211.8	0.2138	-30.8	0.7000	0	0.00
81	1	1	10	9.1	0.00	291.5	4	135.3	233.4	0.0000	0.0	0.7000	0	0.00
81	1	1	11	291.6	1.00	297.0	3	181.5	255.1	0.2414	-9.1	0.7000	0	0.00
81	1	1	12	80.6	1.00	298.7	2	227.7	276.7	0.2443	-8.1	0.7000	0	0.00
81	1	1	13	87.2	0.00	299.3	2	273.8	298.4	0.0000	0.0	0.7000	0	0.00
81	1	1	14	326.7	2.24	299.3	3	320.0	320.0	0.4511	-60.1	0.7000	0	0.00
81	1	1	15	337.3	2.24	298.7	3	320.0	320.0	0.4397	-84.5	0.7000	0	0.00
81	1	1	16	345.7	2.24	297.6	4	320.0	320.0	0.4161	-259.0	0.7000	0	0.00
81	1	1	17	20.1	1.34	294.8	5	325.5	318.6	0.1203	13.7	0.7000	0	0.00
81	1	1	18	97.6	1.00	293.1	6	357.1	310.3	0.0897	13.7	0.7000	0	0.00
81	1	1	19	178.0	1.00	290.9	7	388.7	302.1	0.0898	13.7	0.7000	0	0.00
81	1	1	20	303.2	1.00	289.8	7	420.3	293.9	0.0898	13.7	0.7000	0	0.00
81	1	1	21	358.6	1.00	289.3	7	451.9	285.7	0.0898	13.7	0.7000	0	0.00
81	1	1	22	272.0	1.00	287.6	7	483.5	277.4	0.0897	13.7	0.7000	0	0.00
81	1	1	23	0.7	1.00	287.6	7	515.1	269.2	0.0897	13.7	0.7000	0	0.00
81	1	1	24	337.2	1.00	287.6	7	546.7	261.0	0.0897	13.7	0.7000	0	0.00

*** NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** THE PERIOD (8760 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): BLDZR , GRADER , CMPCTR , H2OPLL , ACTVFCE , LNDFLEX , EXEROS1 , UXFRTK , UCURBTRK, UDELVTRK, PXFRTRK1, PCRBTRK1, PDLVRY1 , PXFRTRK2, PCRBTRK2, PDLVRY2 , STKESN1 , STKES FLARE2 , FLARE3 , FLARE4 , FLARE5 , ACTERSN , DRTRCK2 , TRCKTRN , BLLDZR2 , EXCVTR2 , H2OTRK2 , H2OPLL2 , ... ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
361515.50	3796885.00	0.26726			

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** THE PERIOD (8760 HRS) DRY DEPOSITION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): BLDZR , GRADER , CMPCTR , H2OPLL , ACTVFCE , LNDFLEX , EXEROS1 , UXFRTK , UCURBTRK, UDELVTRK, PXFRTRK1, PCRBTRK1, PDLVRY1 , PXFRTRK2, PCRBTRK2, PDLVRY2 , STKESN1 , STKES FLARE2 , FLARE3 , FLARE4 , FLARE5 , ACTERSN , DRTRCK2 , TRCKTRN , BLLDZR2 , EXCVTR2 , H2OTRK2 , H2OPLL2 , ... ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** DEPO OF PM10 IN GRAMS/M**2 **

X-COORD (M)	Y-COORD (M)	DEPO	X-COORD (M)	Y-COORD (M)	DEPO
361515.50	3796885.00	0.03795			

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): BLDZR , GRADER , CMPCTR , H2OPLL , ACTVFCE , LNDFLEX , EXEROS1 , UXFRTK , UCURBTRK, UDELVTRK, PXFRTRK1, PCRBTRK1, PDLVRY1 , PXFRTRK2, PCRBTRK2, PDLVRY2 , STKESN1 , STKES FLARE2 , FLARE3 , FLARE4 , FLARE5 , ACTERSN , DRTRCK2 , TRCKTRN , BLLDZR2 , EXCVTR2 , H2OTRK2 , H2OPLL2 , ... ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
361515.50	3796885.00	2.23803	(81011524)				

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** THE 1ST HIGHEST 24-HR DRY DEPOSITION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): BLDZR , GRADER , CMPCTR , H2OPLL , ACTVFCE , LNDFLEX , EXEROS1 , UXFRTK , UCURBTRK, UDELVTRK, PXFRTRK1, PCRBTRK1, PDLVRY1 , PXFRTRK2, PCRBTRK2, PDLVRY2 , STKESN1 , STKES FLARE2 , FLARE3 , FLARE4 , FLARE5 , ACTERSN , DRTRCK2 , TRCKTRN , BLLDZR2 , EXCVTR2 , H2OTRK2 , H2OPLL2 , ... ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** DEPO OF PM10 IN GRAMS/M**2 **

X-COORD (M)	Y-COORD (M)	DEPO	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	DEPO	(YYMMDDHH)
361515.50	3796885.00	0.00123	(81011224)				

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29
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**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): BLDZR , GRADER , CMPCTR , H2OPLL , ACTVFCE , LNDFLEX , EXEROS1 , UXFRTK , UCURBTRK, UDELVTRK, PXFRTRK1, PCRBTRK1, PDLVRY1 , PXFRTRK2, PCRBTRK2, PDLVRY2 , STKESN1 , STKES FLARE2 , FLARE3 , FLARE4 , FLARE5 , ACTERSN , DRTRCK2 , TRCKTRN , BLLDZR2 , EXCVTR2 , H2OTRK2 , H2OPLL2 , ... ,

** CONC OF PM10 IN MICROGRAMS/M**3 **

RANK	CONC	(YYMMDDHH) AT	RECEPTOR (XR,YR)	OF TYPE	RANK	CONC	(YYMMDDHH) AT	RECEPTOR (XR,YR)	OF TYPE
1.	2.23803	(81011524) AT	(361515.50, 3796885.00)	DC	26.	0.88785	(81082324) AT	(361515.50, 3796885.00)	DC
2.	2.17018	(81080524) AT	(361515.50, 3796885.00)	DC	27.	0.88426	(81041524) AT	(361515.50, 3796885.00)	DC
3.	2.16094	(81100924) AT	(361515.50, 3796885.00)	DC	28.	0.87183	(81102124) AT	(361515.50, 3796885.00)	DC
4.	1.90497	(81010124) AT	(361515.50, 3796885.00)	DC	29.	0.84453	(81101924) AT	(361515.50, 3796885.00)	DC
5.	1.88914	(81091524) AT	(361515.50, 3796885.00)	DC	30.	0.83106	(81032124) AT	(361515.50, 3796885.00)	DC
6.	1.81746	(81052724) AT	(361515.50, 3796885.00)	DC	31.	0.79537	(81120824) AT	(361515.50, 3796885.00)	DC
7.	1.72740	(81092424) AT	(361515.50, 3796885.00)	DC	32.	0.79389	(81011024) AT	(361515.50, 3796885.00)	DC
8.	1.59454	(81112824) AT	(361515.50, 3796885.00)	DC	33.	0.79015	(81122024) AT	(361515.50, 3796885.00)	DC
9.	1.58083	(81021224) AT	(361515.50, 3796885.00)	DC	34.	0.78407	(81033024) AT	(361515.50, 3796885.00)	DC
10.	1.57164	(81012524) AT	(361515.50, 3796885.00)	DC	35.	0.78400	(81010524) AT	(361515.50, 3796885.00)	DC
11.	1.54346	(81031424) AT	(361515.50, 3796885.00)	DC	36.	0.78278	(81011324) AT	(361515.50, 3796885.00)	DC
12.	1.51381	(81120124) AT	(361515.50, 3796885.00)	DC	37.	0.77660	(81051524) AT	(361515.50, 3796885.00)	DC
13.	1.46567	(81020124) AT	(361515.50, 3796885.00)	DC	38.	0.75482	(81080124) AT	(361515.50, 3796885.00)	DC
14.	1.30288	(81110124) AT	(361515.50, 3796885.00)	DC	39.	0.75213	(81081324) AT	(361515.50, 3796885.00)	DC
15.	1.28201	(81030824) AT	(361515.50, 3796885.00)	DC	40.	0.72885	(81032324) AT	(361515.50, 3796885.00)	DC
16.	1.20765	(81112624) AT	(361515.50, 3796885.00)	DC	41.	0.72616	(81010424) AT	(361515.50, 3796885.00)	DC
17.	1.13401	(81080624) AT	(361515.50, 3796885.00)	DC	42.	0.72545	(81112424) AT	(361515.50, 3796885.00)	DC
18.	1.12311	(81111724) AT	(361515.50, 3796885.00)	DC	43.	0.72350	(81041024) AT	(361515.50, 3796885.00)	DC
19.	1.10519	(81111924) AT	(361515.50, 3796885.00)	DC	44.	0.67728	(81060724) AT	(361515.50, 3796885.00)	DC
20.	1.09056	(81010224) AT	(361515.50, 3796885.00)	DC	45.	0.66612	(81101724) AT	(361515.50, 3796885.00)	DC
21.	1.05406	(81032624) AT	(361515.50, 3796885.00)	DC	46.	0.66362	(81032224) AT	(361515.50, 3796885.00)	DC
22.	1.01439	(81072724) AT	(361515.50, 3796885.00)	DC	47.	0.64165	(81061224) AT	(361515.50, 3796885.00)	DC
23.	1.01245	(81082624) AT	(361515.50, 3796885.00)	DC	48.	0.63765	(81032724) AT	(361515.50, 3796885.00)	DC
24.	1.00350	(81012324) AT	(361515.50, 3796885.00)	DC	49.	0.63320	(81081024) AT	(361515.50, 3796885.00)	DC
25.	0.91768	(81012724) AT	(361515.50, 3796885.00)	DC	50.	0.62338	(81011224) AT	(361515.50, 3796885.00)	DC

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** THE MAXIMUM 50 24-HR DRY DEPOSITION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): BLDZR , GRADER , CMPCTR , H2OPLL , ACTVFCE , LNDFLEX , EXEROS1 , UXFRTK , UCURBTRK, UDELVTRK, PXFRTRK1, PCRBTRK1, PDLVRY1 , PXFRTRK2, PCRBTRK2, PDLVRY2 , STKESN1 , STKES FLARE2 , FLARE3 , FLARE4 , FLARE5 , ACTERSN , DRTRCK2 , TRCKTRN , BLLDZR2 , EXCVTR2 , H2OTRK2 , H2OPLL2 , ... ,

** DEPO OF PM10 IN GRAMS/M**2 **

RANK	DEPO	(YYMMDDHH) AT	RECEPTOR (XR,YR)	OF TYPE	RANK	DEPO	(YYMMDDHH) AT	RECEPTOR (XR,YR)	OF TYPE
1.	0.00123	(81011224) AT	(361515.50, 3796885.00)	DC	26.	0.00039	(81052724) AT	(361515.50, 3796885.00)	DC
2.	0.00103	(81061224) AT	(361515.50, 3796885.00)	DC	27.	0.00036	(81010624) AT	(361515.50, 3796885.00)	DC
3.	0.00099	(81010524) AT	(361515.50, 3796885.00)	DC	28.	0.00033	(81080524) AT	(361515.50, 3796885.00)	DC
4.	0.00098	(81011124) AT	(361515.50, 3796885.00)	DC	29.	0.00033	(81050624) AT	(361515.50, 3796885.00)	DC
5.	0.00096	(81022124) AT	(361515.50, 3796885.00)	DC	30.	0.00032	(81112824) AT	(361515.50, 3796885.00)	DC
6.	0.00088	(81013124) AT	(361515.50, 3796885.00)	DC	31.	0.00031	(81100924) AT	(361515.50, 3796885.00)	DC
7.	0.00082	(81103024) AT	(361515.50, 3796885.00)	DC	32.	0.00031	(81022224) AT	(361515.50, 3796885.00)	DC
8.	0.00071	(81122224) AT	(361515.50, 3796885.00)	DC	33.	0.00031	(81040524) AT	(361515.50, 3796885.00)	DC
9.	0.00068	(81102924) AT	(361515.50, 3796885.00)	DC	34.	0.00031	(81040424) AT	(361515.50, 3796885.00)	DC
10.	0.00067	(81032624) AT	(361515.50, 3796885.00)	DC	35.	0.00030	(81120324) AT	(361515.50, 3796885.00)	DC
11.	0.00067	(81120124) AT	(361515.50, 3796885.00)	DC	36.	0.00029	(81012524) AT	(361515.50, 3796885.00)	DC
12.	0.00064	(81021524) AT	(361515.50, 3796885.00)	DC	37.	0.00029	(81010424) AT	(361515.50, 3796885.00)	DC
13.	0.00063	(81110124) AT	(361515.50, 3796885.00)	DC	38.	0.00029	(81010124) AT	(361515.50, 3796885.00)	DC
14.	0.00062	(81021624) AT	(361515.50, 3796885.00)	DC	39.	0.00028	(81121724) AT	(361515.50, 3796885.00)	DC
15.	0.00055	(81111724) AT	(361515.50, 3796885.00)	DC	40.	0.00028	(81091524) AT	(361515.50, 3796885.00)	DC
16.	0.00051	(81032724) AT	(361515.50, 3796885.00)	DC	41.	0.00027	(81092424) AT	(361515.50, 3796885.00)	DC
17.	0.00050	(81103124) AT	(361515.50, 3796885.00)	DC	42.	0.00027	(81021224) AT	(361515.50, 3796885.00)	DC
18.	0.00048	(81122324) AT	(361515.50, 3796885.00)	DC	43.	0.00026	(81031424) AT	(361515.50, 3796885.00)	DC
19.	0.00045	(81122724) AT	(361515.50, 3796885.00)	DC	44.	0.00024	(81011724) AT	(361515.50, 3796885.00)	DC
20.	0.00044	(81013024) AT	(361515.50, 3796885.00)	DC	45.	0.00024	(81120824) AT	(361515.50, 3796885.00)	DC
21.	0.00044	(81122124) AT	(361515.50, 3796885.00)	DC	46.	0.00024	(81050324) AT	(361515.50, 3796885.00)	DC
22.	0.00044	(81112524) AT	(361515.50, 3796885.00)	DC	47.	0.00024	(81051624) AT	(361515.50, 3796885.00)	DC
23.	0.00040	(81101724) AT	(361515.50, 3796885.00)	DC	48.	0.00022	(81011024) AT	(361515.50, 3796885.00)	DC
24.	0.00040	(81011524) AT	(361515.50, 3796885.00)	DC	49.	0.00022	(81112624) AT	(361515.50, 3796885.00)	DC
25.	0.00039	(81020124) AT	(361515.50, 3796885.00)	DC	50.	0.00021	(81010224) AT	(361515.50, 3796885.00)	DC

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** THE SUMMARY OF MAXIMUM PERIOD (8760 HRS) RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

GROUP ID	AVERAGE CONC	NETWORK RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	GRID-ID
ALL	1ST HIGHEST VALUE IS	0.26726 AT (361515.50, 3796885.00, 392.00, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.00000 AT (0.00, 0.00, 0.00, 0.00)		
	3RD HIGHEST VALUE IS	0.00000 AT (0.00, 0.00, 0.00, 0.00)		
	4TH HIGHEST VALUE IS	0.00000 AT (0.00, 0.00, 0.00, 0.00)		
	5TH HIGHEST VALUE IS	0.00000 AT (0.00, 0.00, 0.00, 0.00)		
	6TH HIGHEST VALUE IS	0.00000 AT (0.00, 0.00, 0.00, 0.00)		

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** THE SUMMARY OF HIGHEST 24-HR RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

GROUP ID	AVERAGE CONC	DATE (YYMMDDHH)	NETWORK RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	GRID-ID
ALL	HIGH 1ST HIGH VALUE IS	2.23803	ON 81011524: AT (361515.50, 3796885.00, 392.00, 0.00)	DC	NA

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** THE SUMMARY OF MAXIMUM PERIOD (8760 HRS) RESULTS ***

** DEPO OF PM10 IN GRAMS/M**2 **

GROUP ID		DRY DEPO	NETWORK RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	GRID-ID
ALL	1ST HIGHEST VALUE IS	0.03795 AT (	361515.50, 3796885.00, 392.00, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.00000 AT (	0.00, 0.00, 0.00, 0.00)		
	3RD HIGHEST VALUE IS	0.00000 AT (	0.00, 0.00, 0.00, 0.00)		
	4TH HIGHEST VALUE IS	0.00000 AT (	0.00, 0.00, 0.00, 0.00)		
	5TH HIGHEST VALUE IS	0.00000 AT (	0.00, 0.00, 0.00, 0.00)		
	6TH HIGHEST VALUE IS	0.00000 AT (	0.00, 0.00, 0.00, 0.00)		

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

*** OPERATIONAL EMISSIONS - (WITH MITIGATION) W/ FLARES *** 16:53:29

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** THE SUMMARY OF HIGHEST 24-HR RESULTS ***

** DEPO OF PM10 IN GRAMS/M**2 **

GROUP ID	DATE DRY DEPO	(YYMMDDHH)	NETWORK RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	GRID-ID
ALL	HIGH 1ST HIGH VALUE IS	0.00123	ON 81011224: AT (361515.50, 3796885.00, 392.00, 0.00)	DC	NA

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

**MODELOPTs: CONC DDEP RURAL ELEV NOSTD NOBID NOCALM MSGPRO DRYDPL

*** Message Summary : ISCST3 Model Execution ***

--------- Summary of Total Messages --------

A Total of 0 Fatal Error Message(s)
A Total of 0 Warning Message(s)
A Total of 1085 Informational Message(s)

A Total of 1085 Calm Hours Identified

******** FATAL ERROR MESSAGES ********
*** NONE ***

******** WARNING MESSAGES ********
*** NONE ***

****
*** ISCST3 Finishes Successfully ***
****

Table 257-1 Sunshine Canyon Area Sou

Onsite PM_{10} Emissions from Heavy Vehicles

Heavy Equipment	Source ID	Source Type	Time of Operation
Working Area			
Bulldozer	BLDZR	AREA	6 AM - 8 PM
Grader	GRADER	AREA	6 AM - 8 PM
Compactor	CMPCTR	AREA	6 AM - 8 PM
Dirt Truck	DRTRCK	AREA	6 AM - 8 PM
Water Pull	H20PLL	AREA	6 AM - 8 PM
Other Landfill Areas			
Bulldozer	BLLDZR2	AREA	6 AM - 8 PM
Dirt Truck	DRTRCK2	AREA	6 AM - 8 PM
Excavator	EXCVTR2	AREA	6 AM - 8 PM
Water Truck	H2OTRK2	AREA	6 AM - 8 PM
Water Pull	H20PLL2	AREA	6 AM - 8 PM

Deposition Parameters		
Particle Diameter (μm)	Mass Fraction	Particle Density (g/cm^3)
0.5	0.854	2
1.5	0.0625	2
2.25	0.0208	2
2.75	0	2
3.5	0.0208	2
4.5	0.0104	2
5.5	0	2
8	0.0313	2

Onsite PM_{10} Emissions from Fugitive Dust Sourc

Landfill Operations	Source ID	Source Type	Time of Operation
Active Working Face Area	ACTVFCE	AREA	6 AM - 8 PM
Landfill Excavation	LNDFLEX	AREA	6 AM - 8 PM
Stockpile Area #1	STKPL1	AREA	6 AM - 8 PM
Stockpile Area #2	STKPL2	AREA	6 AM - 8 PM
Other Landfill Areas	ENTRLF	AREA	6 AM - 8 PM
Truck Turnaround	TRCKTRN	AREA	6 AM - 8 PM
Excavation Erosion#1	EXEROS1	AREA	--
Active Face Erosion#2	ACTERSN	AREA	--
Stockpile Erosion #1	STKESN1	AREA	--
Stockpile Erosion #2	STKESN2	AREA	--

Deposition Parameters		
Particle Diameter (μm)	Mass Fraction	Particle Density (g/cm^3)
0.5	0.093	2.65
5.5	0.628	2.65

Onsite PM_{10} Emissions from Unpaved Road Dus

Unpaved Roads	Source ID	Source Type	Time of Operation
Trucks			
Transfer Trucks	UXFRTK	AREA	6 AM - 8 PM
Curbside Trucks	UCURBTRK	AREA	6 AM - 8 PM
Delivery Trucks	UDELVTRK	AREA	6 AM - 8 PM
Dirt Trucks	UDRTRK1	AREA	6 AM - 8 PM
	UDRTRK2	AREA	6 AM - 8 PM
	UDRTRK3	AREA	6 AM - 8 PM
	UDRTRK4	AREA	6 AM - 8 PM
	UDRTRK5	AREA	6 AM - 8 PM
	UDRTRK6	AREA	6 AM - 8 PM

Deposition Parameters		
Particle Diameter (μm)	Mass Fraction	Particle Density (g/cm^3)
1.25	0.264	2.65
3.75	0.292	2.65
7.5	0.444	2.65

Onsite PM_{10} Emissions from Paved Road Dust

Paved Roads	Source ID	Source Type	Time of Operation
Truck Segment 1			
Transfer Trucks	PXFRTRK1	AREA	6 AM - 8 PM
Curbside Trucks	PCRBTRK1	AREA	6 AM - 8 PM
Delivery Trucks	PDLVRY1	AREA	6 AM - 8 PM
Truck Segment 2			
Transfer Trucks	PXFRTRK2	AREA	6 AM - 8 PM
Curbside Trucks	PCRBTRK2	AREA	6 AM - 8 PM
Delivery Trucks	PDLVRY2	AREA	6 AM - 8 PM

Deposition Parameters		
Particle Diameter (μm)	Mass Fraction	Particle Density (g/cm^3)
1.25	0.239	2.65
6.25	0.761	2.65

Table 257-1 Sunshine Canyon Area Source PM_{10} ISC3 Modeling Assumptions

Onsite PM_{10} Emissions from Heavy Vehicles

Heavy Equipment	Source ID	Source Type	Southwest Corner Location UTM X	UTM Y	Emission Area (acres)	Elevation (m-msl)	Daily Emissions Uncontrolled (#/day)	Controlled (#/day)	Area Source Emissions Uncontrolled (g/sec-m2)	Controlled (g/sec-m2)	Source Height (meters)	Hours of Operation (hr/day)	Length X (meters)	Length Y (meters)	Angle of Rotation (degrees)	Initial Verticle Dimension (meters)	Time of Operation
Working Area																	
Bulldozer	BLDZR	AREA	361374	3798721	1	530	0.6	0.6	1.30E-06	1.30E-06	3	14	63.6	63.6	0	2	6 AM - 8 PM
Grader	GRADER	AREA	361374	3798721	1	530	0.25	0.25	5.64E-07	5.64E-07	3	14	63.6	63.6	0	2	6 AM - 8 PM
Compactor	CMPCTR	AREA	361374	3798721	1	530	5.7	5.7	1.26E-05	1.26E-05	3	14	63.6	63.6	0	2	6 AM - 8 PM
Dirt Truck	DRTRCK	AREA	361374	3798721	1	530	1.4	1.4	3.01E-06	3.01E-06	3	14	63.6	63.6	0	2	6 AM - 8 PM
Water Pull	H20PLL	AREA	361374	3798721	1	530	1.9	1.2	4.31E-06	2.59E-06	3	14	63.6	63.6	0	2	6 AM - 8 PM
Other Landfill Areas																	
Bulldozer	BLLDZR2	AREA	360584.76	3799478.86	40	512	2.3	2.3	1.30E-07	1.30E-07	3	14	402	402	0	2	6 AM - 8 PM
Dirt Truck	DRTRCK2	AREA	360584.76	3799478.86	40	512	1.80	1.80	1.00E-07	1.00E-07	3	14	402	402	0	2	6 AM - 8 PM
Excavator	EXCVTR2	AREA	360584.76	3799478.86	40	512	0.5	0.5	2.59E-08	2.59E-08	3	14	402	402	0	2	6 AM - 8 PM
Water Truck	H2OTRK2	AREA	360584.76	3799478.86	40	512	0.23	0.23	1.25E-08	1.25E-08	3	14	402	402	0	2	6 AM - 8 PM
Water Pull	H20PLL2	AREA	360584.76	3799478.86	40	512	1.9	1.2	1.08E-07	6.46E-08	3	14	402	402	0	2	6 AM - 8 PM

Deposition Parameters		
Particle Diameter (μm)	Mass Fraction	Particle Density (g/cm^3)
0.5	0.854	2
1.5	0.0625	2
2.25	0.0208	2
2.75	0	2
3.5	0.0208	2
4.5	0.0104	2
5.5	0	2
8	0.0313	2

Onsite PM_{10} Emissions from Fugitive Dust Sources

Landfill Operations	Source ID	Source Type	Southwest Corner Location UTM X	UTM Y	Emission Area (acres)	Elevation (m-msl)	Daily Emissions Uncontrolled (#/day)	Controlled (#/day)	Area Source Emissions Uncontrolled (g/sec-m2)	Controlled (g/sec-m2)	Source Height (meters)	Hours of Operation (hr/day)	Length X (meters)	Length Y (meters)	Angle of Rotation (degrees)	Initial Verticle Dimension (meters)	Time of Operation
Active Working Face Area	ACTVFCE	AREA	361374	3798721	1	530	13.77	4.82	3.06E-05	1.07E-05	0	14	63.6	63.6	0	1	6 AM - 8 PM
Landfill Excavation	LNDFLEX	AREA	361374	3798721	10	530	2.25	0.79	5.00E-07	1.75E-07	0	14	201	201	0	1	6 AM - 8 PM
Stockpile Area #1	STKPL1	AREA	360584.76	3799194.36	20	512	22.84	8.00	2.54E-06	8.89E-07	0	14	284.5	284.5	0	1	6 AM - 8 PM
Stockpile Area #2	STKPL2	AREA	360584.76	3799278.86	10	512	11.42	4.00	2.54E-06	8.89E-07	0	14	201	201	0	1	6 AM - 8 PM
Other Landfill Areas	ENTRLF	AREA	360584.76	3799478.86	40	512	13.49	4.72	7.50E-07	2.63E-07	0	14	402	402	0	1	6 AM - 8 PM
Truck Turnaround	TRCKTRN	AREA	361374	3798721	9	530	58.23	5.82	1.44E-05	1.44E-06	0	14	191	191	0	1	6 AM - 8 PM
Excavation Erosion#1	EXEROS1	AREA	361374	3798721	10	530	9.37	0.94	1.22E-06	1.22E-07	0	24	201	201	0	0	--
Active Face Erosion#2	ACTERSN	AREA	361374	3798721	1	530	0.94	0.09	1.22E-06	1.22E-07	0	24	63.6	63.6	0	0	--
Stockpile Erosion #1	STKESN1	AREA	360584.76	3799194.36	20	512	5.75	0.57	3.73E-07	3.73E-08	0	24	261	356	0	0	--
Stockpile Erosion #2	STKESN2	AREA	360584.76	3799278.86	10	512	2.87	0.29	3.73E-07	3.73E-08	0	24	261	200	0	0	--

Deposition Parameters		
Particle Diameter (μm)	Mass Fraction	Particle Density (g/cm^3)
0.5	0.093	2.65
5.5	0.628	2.65

Onsite PM_{10} Emissions from Unpaved Road Dust

Unpaved Roads	Source ID	Source Type	Southwest Corner Location UTM X	UTM Y	Emission Area (acres)	Elevation (m-msl)	Daily Emissions Uncontrolled (#/day)	Controlled (#/day)	Area Source Emissions Uncontrolled (g/sec-m2)	Controlled (g/sec-m2)	Source Height (meters)	Hours of Operation (hr/day)	Length X (meters)	Length Y (meters)	Angle of Rotation (degrees)	Initial Verticle Dimension (meters)	Time of Operation
Trucks																	
Transfer Trucks	UXFRTK	AREA	361435	3798922	0.36	440	65.08	3.25	4.07E-04	2.03E-05	0	14	12	120	0	1	6 AM - 8 PM
Curbside Trucks	UCURBTRK	AREA	361435	3798922	0.36	440	106.22	5.31	6.64E-04	3.32E-05	0	14	12	120	0	1	6 AM - 8 PM
Delivery Trucks	UDELVTRK	AREA	361435	3798922	0.36	440	7.05	0.35	4.41E-05	2.20E-06	0	14	12	120	0	1	6 AM - 8 PM
Dirt Trucks	UDRTRK1	AREA	360845	3799478.86	0.36	512	16.65	1.66	1.04E-04	1.04E-05	0	14	120	12	45	1	6 AM - 8 PM
	UDRTRK2	AREA	360928	3799394	0.36	512	16.65	1.66	1.04E-04	1.04E-05	0	14	120	12	45	1	6 AM - 8 PM
	UDRTRK3	AREA	361012	3799307	0.36	520	16.65	1.66	1.04E-04	1.04E-05	0	14	120	12	45	1	6 AM - 8 PM
	UDRTRK4	AREA	361096	37992223	0.36	520	16.65	1.66	1.04E-04	1.04E-05	0	14	120	12	45	1	6 AM - 8 PM
	UDRTRK5	AREA	361180	3799139	0.36	520	16.65	1.66	1.04E-04	1.04E-05	0	14	120	12	45	1	6 AM - 8 PM
	UDRTRK6	AREA	361264	3799054	0.19	530	9.02	0.90	1.04E-04	1.04E-05	0	14	65	12	45	1	6 AM - 8 PM

Deposition Parameters		
Particle Diameter (μm)	Mass Fraction	Particle Density (g/cm^3)
1.25	0.264	2.65
3.75	0.292	2.65
7.5	0.444	2.65

Onsite PM_{10} Emissions from Paved Road Dust

Paved Roads	Source ID	Source Type	Southwest Corner Location UTM X	UTM Y	Emission Area (acres)	Elevation (m-msl)	Daily Emissions Uncontrolled (#/day)	Controlled (#/day)	Area Source Emissions Uncontrolled (g/sec-m2)	Controlled (g/sec-m2)	Source Height (meters)	Hours of Operation (hr/day)	Length X (meters)	Length Y (meters)	Angle of Rotation (degrees)	Initial Verticle Dimension (meters)	Time of Operation
Truck Segment 1																	
Transfer Trucks	PXFRTRK1	AREA	361435	3799040	0.26	410	11.43	1.14	4.93E-05	4.93E-06	0	14	12	87	60	1	6 AM - 8 PM
Curbside Trucks	PCRBTRK1	AREA	361435	3799040	0.26	410	18.10	1.81	7.80E-05	7.80E-06	0	14	12	87	60	1	6 AM - 8 PM
Delivery Trucks	PDLVRY1	AREA	361435	3799040	0.26	410	0.42	0.04	1.81E-06	1.81E-07	0	14	12	87	60	1	6 AM - 8 PM
Truck Segment 2																	
Transfer Trucks	PXFRTRK2	AREA	361500	3799078	0.26	400	11.43	1.14	4.93E-05	4.93E-06	0	14	12	87	75	1	6 AM - 8 PM
Curbside Trucks	PCRBTRK2	AREA	361500	3799078	0.26	400	18.10	1.81	7.80E-05	7.80E-06	0	14	12	87	75	1	6 AM - 8 PM
Delivery Trucks	PDLVRY2	AREA	361500	3799078	0.26	400	0.42	0.04	1.81E-06	1.81E-07	0	14	12	87	75	1	6 AM - 8 PM

Deposition Parameters		
Particle Diameter (μm)	Mass Fraction	Particle Density (g/cm^3)
1.25	0.239	2.65
6.25	0.761	2.65

Table 257-2 Sunshine Canyon Point Source PM_{10} ISC3 Modeling Assumptions

Onsite PM_{10} Emissions from Landfill Gas Flares

Flare Vents - Source ID	Source Type	Location		Elevation (m-msl)	Emission Rate (g/s)	Stack Height (meters)	Gas Exit Temperature (K)	Gas Exit Velocity (mps)	Inside Stack Diameter (meters)
		UTM X	UTM Y						
FLARE1	POINT	360404	3798759	596	0.213	15.3	1180	10	3.8
FLARE2	POINT	361026	3798461	549	0.213	15.3	1180	10	3.8
FLARE3	POINT	361270	3799383	458	0.213	15.3	1180	10	3.8
FLARE4	POINT	361374	3799176	475	0.213	15.3	1180	10	3.8
FLARE5	POINT	359456	3799223	500	0.213	15.3	1180	10	3.8

Deposition Parameters		
Particle Diameter (μm)	Mass Fraction	Particle Density (g/cm^3)
1.25	0.6	2.65
6.25	0.4	2.65

HEAVY EQUIPMENT
EMISSIONS CALCULATIONS

Uncontrolled Criteria Pollutant Emissions from Heavy Equipment Exhaust

Sunshine Canyon Landfill

Long-Term Operation

Equipment	Hp	Equip. hrs	PM10 EF	Units	Source	ROG	SOx	Units	Assumptions	Source	NOx	CO	Units	Assumptions	Source
Bulldozer (5)	280	50	45	g/hr	Equipment Manufacturer	0.003	0.002	lb/hp-hr	other construction equip	CEQA	7.64	1.85	g/hp-hr	ave. of '88-95 and '96-02 EF	Nonroad
Grader (1)	150	10	20	g/hr	Equipment Manufacturer	0.039	0.086	lb/hr	grader	CEQA	7.64	1.85	g/hp-hr	ave. of '88-96 and '97-02 EF	Nonroad
Compactor (6)	569	60	0.14	g/hp-hr	Equipment Manufacturer	0.15	0.143	lb/hr	misc.	CEQA	7.64	1.85	g/hp-hr	ave. of '88-95 and '96-00 EF	Nonroad
Dirt Truck (7)	398	56	0.16	g/hp-hr	Equipment Manufacturer	0.19	0.45	lb/hr	off-highway truck	CEQA	7.64	1.85	g/hp-hr	ave. of '88-95 and '96-00 EF	Nonroad
Excavator (2)	365	20	0.05	g/hp-hr	Equipment Manufacturer	0.001	0.002	lb/hp-hr	excavator	CEQA	7.64	1.85	g/hp-hr	ave. of '88-95 and '96-00 EF	Nonroad
Water Truck (3)		30													
Water Pull (2)	536	20	0.4	g/hp-hr	Nonroad Engine Modeling	0.19	0.45	lb/hr	off-highway truck	CEQA	7.64	1.85	g/hp-hr	ave. of '88-95 and '96-00 EF	Nonroad

Construction

Equipment	Hp	Equip. hrs	PM10 EF	Units	Source	ROG	SOx	Units	Assumptions	Source	NOx	CO	Units	Assumptions	Source
Bulldozer (4)	280	40	45	g/hr	Equipment Manufacturer	0.003	0.002	lb/hp-hr	other construction equip	CEQA	7.64	1.85	g/hp-hr	ave. of '88-95 and '96-02 EF	Nonroad
Scraper (13) (2 engines)	200 / 550	130	8 / 10	g/hr	Equipment Manufacturer	0.27	0.46	lb/hr	grader	CEQA	7.64	1.85	g/hp-hr	ve. of '88-95 and '96-02/00 E	Nonroad
Small Compactor (2)	190	20	0.05	g/hp-hr	Equipment Manufacturer	0.15	0.143	lb/hr	misc.	CEQA	7.64	1.85	g/hp-hr	ave. of '88-96 and '97-02 EF	Nonroad
Rock Truck (2)	398	20	0.16	g/hp-hr	Equipment Manufacturer	0.19	0.45	lb/hr	off-highway truck	CEQA	7.64	1.85	g/hp-hr	ave. of '88-95 and '96-00 EF	Nonroad
Excavator (1)	365	10	0.05	g/hp-hr	Equipment Manufacturer	0.001	0.002	lb/hp-hr	excavator	CEQA	7.64	1.85	g/hp-hr	ave. of '88-95 and '96-00 EF	Nonroad
Water Truck (2)		20													
Loader (1)	398	10	0.30	g/hp-hr	Equipment Manufacturer	0.23	0.182	lb/hr	wheeled loader	CEQA	7.64	1.85	g/hp-hr	ave. of '88-95 and '96-00 EF	Nonroad

Uncontrolled Criteria Pollutant Emissions from Heavy Equipment Exhaust
Sunshine Canyon Landfill

Long-Term Operation

Equipment	Hp	Equip. hrs	Load Factor	Assumptions	PM_{10} (lb/day)	ROG (lb/day)	SOx (lb/day)	NOx (lb/day)	CO (lb/day)
Bulldozer (5)	280	50	0.59	crawler dozer	2.9	24.8	16.5	139.0	33.7
Grader (1)	150	10	0.575	motor grader	0.3	0.4	0.9	14.5	3.5
Compactor (6)	569	60	0.54	Manufacturer	5.7	9.0	8.6	309.9	75
Dirt Truck (7)	398	56	0.41	Off-Highway Truck	3.2	10.6	25.2	153.8	37.2
Excavator (2)	365	20	0.58	excavator	0.5	4.2	8.5	71.3	17.3
Water Truck (3)		30			0.2	1.1	NV	4.3	9.4
Water Pull (2)	536	20	0.41	Off-Highway Truck	3.87	3.80	9.00	73.96	17.91
				Uncontrolled Emissions - pounds/day	*16.6*	*54.0*	*68.6*	*766.7*	*194.0*

Construction

Equipment	Hp	Equip. hrs	Load Factor	Assumptions	PM_{10} (lb/day)	ROG (lb/day)	SOx (lb/day)	NOx (lb/day)	CO (lb/day)
Bulldozer (4)	280	40	0.59	crawler dozer	2.3	19.8	13.2	111.2	26.9
Scraper (13) (2 engines)	200 / 550	130	0.66	motor grader	3.4	35.1	59.8	1082.9	262.2
Small Compactor (2)	190	20	0.54	Manufacturer	0.2	3.0	2.9	34.4	8.3
Rock Truck (2)	398	20	0.41	Off-Highway Truck	1.1	3.8	9.0	54.9	13.3
Excavator (1)	365	10	0.58	excavator	0.2	2.1	4.2	35.6	8.6
Water Truck (2)		20			0.2	0.8	NV	2.9	6.3
Loader (1)	398	10	0.465	wheel loader	1.22	2.3	1.8	31.14	7.54
				Uncontrolled Emissions - pounds/day	8.7	66.9	90.9	1353.1	333.2

EMFAC7G MODEL RUN

PREDICTED CALIFORNIA VEHICLE EMISSIONS RUN DATE: 01/09/98

SCENARIO TITLE: 1997 MVEI7G EMISSION FACTORS OZONE PLANNING INVENTORY

CALENDAR YEAR: 1997 -- Model Years 1963 to 1997 inclusive SOUTH COAST Air Basin EMISSION UNIT: TONS PER DAY

MVEI7G ver 1.0 /DAILY EMISSIONS SEE COUNTY DETAIL FOR I & M STATUS

ALL ON-ROAD EMISSIONS

	LIGHT DUTY AUTOMOBILES				LIGHT DUTY TRUCKS				MEDIUM DUTY TRUCKS(1)				HEAVY DUTY TRUCKS						
			< 6,000 lbs				6,001 to 14,000 lbs				> 14,001 lbs				URBAN				
	------ GAS ------			LDA	------ GAS -----			LDT	------ GAS -----			MDT	------ GAS -----			HDT	DIESEL	MOTOR-	ALL
	NON-CAT	CAT	DIESEL	TOTAL	NON-CAT	CAT	DIESEL	TOTAL	NON-CAT	CAT	DIESEL	TOTAL	NON-CAT	CAT	DIESEL	TOTAL	BUSES	CYCLES	VEHICLES
NO. OF IN USE VEHS	321623	6336440	61073	6719136	86810	2406442	28913	2522165	45150	430061	74151	549362	15275	8885	130230	154390	2986	203852	10151891
DAILY VMT (X 1000)	4933	191595	1237	197765	1086	73341	501	74928	1293	16330	3007	20630	459	728	13003	14190	414	1236	309163
NO. OF DAILY STARTS	1491685	35772686	331968	37596339	461472	14279649	165840	14906961	218376	2807322	0	3025698	83561	132668	0	216229	0	102243	55847470

FUEL CONSUMED IN 1000 GALLONS

GASOLINE	395.43	7363.27	7758.70	87.53	3295.93	3383.45	223.12	1624.95	1848.06	80.56	127.91	208.47	24.72	13223.39	
DIESEL		41.16	41.16		19.06	19.06		506.67	506.67		2206.45	2206.45	71.47	2844.81	

1 Scenario Title: 1997 MVEI7G EMISSION FACTORS REPORT RUN DATE: 01/09/98
YEAR: 1997 -- MODEL YEARS 1963 TO 1997 INCLUSIVE -- SUMMERTIME
EMFAC7G EMISSION FACTORS

TABLE 1: SUMMERTIME RUNNING I/M EXHAUST EMISSION FACTORS AT 75 DEG F

POLLUTANT NAME: REACTIVE ORGANIC GASES UNITS: GRAMS PER MILE

SPEED	LIGHT DUTY AUTOS			LIGHT DUTY TRUCKS			MD. DUTY TRUCKS		LIGHT HEAVY TRUCKS			MEDIUM HEAVY TRUCKS			HH TRK	URBAN BUS	MCY
MPH	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	NCAT	CAT	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	DIESEL	DIESEL	ALL
5	17.04	1.27	0.92	16.71	1.72	0.88	18.04	2.14	10.54	1.60	2.05	19.26	3.09	3.59	4.71	5.66	8.68
10	13.62	0.60	0.72	13.37	0.81	0.69	14.42	1.05	6.91	1.05	1.61	12.62	2.02	2.82	3.70	4.10	4.57
15	10.69	0.42	0.58	10.49	0.56	0.56	11.32	0.73	4.72	0.72	1.29	8.62	1.38	2.26	2.97	3.08	3.22
16	10.17	0.40	0.55	9.98	0.54	0.53	10.76	0.70	4.39	0.67	1.24	8.03	1.29	2.17	2.85	2.92	3.07
20	8.25	0.36	0.47	8.10	0.48	0.46	8.72	0.62	3.36	0.51	1.06	6.14	0.98	1.86	2.43	2.40	2.61
25	6.29	0.33	0.40	6.18	0.45	0.38	6.65	0.57	2.49	0.38	0.89	4.55	0.73	1.56	2.04	1.93	2.24
30	4.81	0.31	0.34	4.73	0.42	0.33	5.08	0.53	1.93	0.29	0.76	3.52	0.56	1.33	1.75	1.61	1.95
35	3.82	0.28	0.30	3.76	0.37	0.29	4.03	0.48	1.55	0.24	0.67	2.84	0.46	1.17	1.53	1.39	1.72
40	3.32	0.24	0.27	3.26	0.31	0.26	3.50	0.42	1.31	0.20	0.60	2.39	0.38	1.05	1.37	1.25	1.56
45	3.30	0.20	0.24	3.24	0.26	0.24	3.48	0.36	1.14	0.17	0.55	2.09	0.34	0.96	1.26	1.16	1.47
50	3.76	0.18	0.23	3.70	0.24	0.22	3.97	0.33	1.05	0.16	0.51	1.91	0.31	0.90	1.18	1.11	1.43
55	4.71	0.20	0.22	4.63	0.26	0.21	4.97	0.35	1.00	0.15	0.49	1.82	0.29	0.86	1.13	1.10	1.37
60	6.15	0.30	0.21	6.04	0.41	0.21	6.49	0.52	0.99	0.15	0.48	1.80	0.29	0.84	1.10	1.14	1.21
65	8.06	0.84	0.21	7.92	1.22	0.21	8.53	1.28	1.02	0.15	0.48	1.87	0.30	0.84	1.10	1.21	0.83

POLLUTANT NAME: CARBON MONOXIDE UNITS: GRAMS PER MILE

SPEED	LIGHT DUTY AUTOS			LIGHT DUTY TRUCKS			MD. DUTY TRUCKS		LIGHT HEAVY TRUCKS			MEDIUM HEAVY TRUCKS			HH TRK	URBAN BUS	MCY
MPH	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	NCAT	CAT	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	DIESEL	DIESEL	ALL
5	250.21	22.88	4.77	244.28	26.14	4.68	280.83	17.29	156.64	18.91	19.13	292.98	33.34	28.51	35.05	8.20	52.43
10	152.37	12.88	3.29	148.76	14.26	3.23	171.01	9.62	104.21	12.58	13.19	194.92	22.18	19.66	24.17	5.16	25.21
15	98.23	8.85	2.37	95.90	9.81	2.33	110.25	6.66	73.26	8.84	9.52	137.02	15.59	14.19	17.44	3.45	16.55
16	90.59	8.35	2.24	88.44	9.28	2.20	101.67	6.30	68.72	8.30	8.97	128.53	14.63	13.36	16.43	3.21	15.56
20	67.04	6.88	1.79	65.45	7.75	1.76	75.24	5.27	54.40	6.57	7.19	101.76	11.58	10.71	13.17	2.45	12.70
25	48.44	5.75	1.42	47.29	6.59	1.39	54.37	4.48	42.69	5.15	5.68	79.85	9.09	8.47	10.41	1.85	10.39
30	37.05	4.99	1.17	36.17	5.76	1.15	41.58	3.92	35.39	4.27	4.70	66.19	7.53	7.00	8.61	1.48	8.73
35	30.00	4.42	1.01	29.29	5.08	1.00	33.67	3.47	31.00	3.74	4.07	57.98	6.60	6.06	7.45	1.25	7.47
40	25.72	4.01	0.92	25.11	4.55	0.90	28.87	3.13	28.69	3.46	3.69	53.66	6.11	5.49	6.75	1.13	6.59
45	23.34	3.82	0.87	22.79	4.25	0.86	26.20	2.96	28.05	3.39	3.49	52.46	5.97	5.21	6.40	1.08	6.08
50	22.43	3.98	0.86	21.90	4.38	0.85	25.17	3.07	28.98	3.50	3.47	54.20	6.17	5.17	6.35	1.10	5.84
55	22.81	4.82	0.90	22.27	5.37	0.88	25.60	3.77	31.63	3.82	3.60	59.15	6.73	5.37	6.60	1.19	5.65
60	24.56	7.38	0.98	23.98	8.68	0.96	27.57	6.03	36.47	4.40	3.91	68.21	7.76	5.83	7.17	1.37	5.07
65	28.00	16.07	1.11	27.34	21.40	1.09	31.43	14.34	44.43	5.36	4.45	83.10	9.46	6.63	8.16	1.66	3.65

POLLUTANT NAME: OXIDES OF NITROGEN UNITS: GRAMS PER MILE

SPEED	LIGHT DUTY AUTOS			LIGHT DUTY TRUCKS			MD. DUTY TRUCKS		LIGHT HEAVY TRUCKS			MEDIUM HEAVY TRUCKS			HH TRK	URBAN BUS	MCY
MPH	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	NCAT	CAT	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	DIESEL	DIESEL	ALL
5	4.86	1.48	2.23	5.31	2.39	2.09	5.79	2.87	4.65	2.29	8.00	7.39	4.27	13.17	19.27	34.36	0.71

10	2.55	1.10	1.85	2.78	1.78	1.74	3.04	2.15	4.89	2.41	6.64	7.77	4.49	10.93	15.99	26.28	0.64
15	1.92	0.88	1.59	2.09	1.42	1.49	2.28	1.71	5.12	2.52	5.70	8.14	4.70	9.39	13.75	21.13	0.66
16	1.86	0.84	1.55	2.03	1.37	1.46	2.21	1.65	5.17	2.55	5.56	8.22	4.75	9.15	13.39	20.35	0.66
20	1.76	0.73	1.42	1.91	1.19	1.33	2.09	1.42	5.36	2.64	5.08	8.52	4.92	8.37	12.24	17.86	0.71
25	1.82	0.64	1.31	1.99	1.04	1.23	2.17	1.25	5.60	2.75	4.69	8.89	5.14	7.72	11.30	15.88	0.79
30	2.04	0.61	1.25	2.22	0.98	1.17	2.43	1.18	5.83	2.87	4.48	9.27	5.35	7.38	10.80	14.83	0.87
35	2.37	0.62	1.24	2.58	1.01	1.16	2.82	1.21	6.07	2.99	4.44	9.64	5.57	7.31	10.71	14.57	0.94
40	2.80	0.68	1.27	3.05	1.12	1.19	3.33	1.34	6.30	3.10	4.56	10.02	5.79	7.51	10.99	15.04	0.99
45	3.31	0.80	1.35	3.61	1.30	1.27	3.94	1.56	6.54	3.22	4.85	10.39	6.00	7.99	11.69	16.33	1.02
50	3.91	0.96	1.49	4.26	1.57	1.40	4.65	1.88	6.77	3.33	5.35	10.77	6.22	8.80	12.88	18.63	1.08
55	4.58	1.17	1.70	5.00	1.91	1.60	5.45	2.30	7.01	3.45	6.11	11.14	6.44	10.05	14.71	22.35	1.20
60	5.33	1.43	2.01	5.82	2.34	1.89	6.35	2.81	7.25	3.57	7.22	11.51	6.65	11.90	17.41	28.19	1.48
65	6.16	1.73	2.47	6.72	2.84	2.32	7.33	3.42	7.48	3.68	8.86	11.89	6.87	14.58	21.34	37.37	2.17

POLLUTANT NAME: EXHAUST PARTICULATES, PMEX10 UNITS: GRAMS PER MILE

SPEED	LIGHT DUTY AUTOS			LIGHT DUTY TRUCKS			MD. DUTY TRUCKS		LIGHT HEAVY TRUCKS			MEDIUM HEAVY TRUCKS			HH TRK	URBAN BUS	MCY
MPH	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	NCAT	CAT	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	DIESEL	DIESEL	ALL
5	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.56	0.04
10	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.41	0.04
15	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.31	0.04
16	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.29	0.04
20	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.24	0.04
25	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.19	0.04
30	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.16	0.04
35	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.14	0.04
40	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.12	0.04
45	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.12	0.04
50	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.11	0.04
55	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.11	0.04
60	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.11	0.04
65	0.03	0.00	0.31	0.03	0.01	0.38	0.05	0.00	0.30	0.05	0.44	0.28	0.05	0.65	0.95	0.12	0.04

POLLUTANT NAME: TIRE WEAR PARTICULATES, PMTW10 UNITS: GRAMS PER MILE

SPEED	LIGHT DUTY AUTOS			LIGHT DUTY TRUCKS			MD. DUTY TRUCKS		LIGHT HEAVY TRUCKS			MEDIUM HEAVY TRUCKS			HH TRK	URBAN BUS	MCY
MPH	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	NCAT	CAT	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	DIESEL	DIESEL	ALL
ALL	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.03	0.00

POLLUTANT NAME: BRAKE WEAR PARTICULATES PMBW10 UNITS: GRAMS PER MILE

SPEED	LIGHT DUTY AUTOS			LIGHT DUTY TRUCKS			MD. DUTY TRUCKS		LIGHT HEAVY TRUCKS			MEDIUM HEAVY TRUCKS			HH TRK	URBAN BUS	MCY
MPH	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	NCAT	CAT	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	DIESEL	DIESEL	ALL
ALL	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

TABLE 2: VARIABLE START EMISSION RATES IN GRAMS PER TRIP

TIMES	LIGHT DUTY AUTOS			LIGHT DUTY TRUCKS			MD. DUTY TRUCKS		LIGHT HEAVY TRUCKS			MEDIUM HEAVY TRUCKS			HH TRK	URBAN BUS	MCY
MIN	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	NCAT	CAT	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	DIESEL	DIESEL	ALL

POLLUTANT NAME: REACTIVE ORGANIC GASES UNITS: GRAMS PER TRIP

1	4.49	0.05	0.18	4.82	0.06	0.31	4.92	0.07	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.16
5	4.44	0.26	0.18	4.76	0.31	0.31	4.86	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.16
10	4.40	0.51	0.18	4.72	0.61	0.31	4.82	0.69	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.16
20	4.44	0.96	0.18	4.76	1.16	0.31	4.86	1.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.16
40	5.00	1.71	0.18	5.36	2.06	0.31	5.47	2.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.16
60	5.73	2.25	0.59	6.15	2.71	0.95	6.28	3.06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.16
90	6.01	2.66	0.59	6.45	3.21	0.95	6.58	3.62	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.16
120	6.29	2.75	0.59	6.74	3.31	0.95	6.89	3.73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.16
180	6.84	2.92	0.59	7.34	3.51	0.95	7.50	3.96	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.16
300	7.96	3.24	0.59	8.54	3.90	0.95	8.72	4.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.58
480	9.63	3.68	0.59	10.33	4.43	0.95	10.55	4.99	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.58
720	11.85	4.19	0.59	12.72	5.05	0.95	12.99	5.69	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.58

POLLUTANT NAME: CARBON MONOXIDE UNITS: GRAMS PER TRIP

1	36.47	0.58	3.49	38.75	0.69	3.88	41.05	0.67	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
5	33.21	2.84	3.49	35.29	3.38	3.88	37.38	3.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
10	29.41	5.57	3.49	31.25	6.61	3.88	33.10	6.49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
20	22.70	10.68	3.49	24.12	12.68	3.88	25.55	12.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
40	12.88	19.51	3.49	13.68	23.17	3.88	14.49	22.73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
60	7.83	26.50	7.08	8.32	31.46	5.75	8.82	30.87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
90	9.23	33.52	7.08	9.81	39.79	5.75	10.39	39.03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
120	21.11	36.35	7.08	22.44	43.15	5.75	23.76	42.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
180	33.36	37.42	7.08	35.45	44.42	5.75	37.55	43.56	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
300	53.96	39.66	7.08	57.34	47.08	5.75	60.74	46.16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	53.11
480	75.13	43.27	7.08	79.83	51.38	5.75	84.56	50.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	53.11
720	85.18	48.57	7.08	90.51	57.66	5.75	95.87	56.53	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	53.11

POLLUTANT NAME: OXIDES OF NITROGEN UNITS: GRAMS PER TRIP

1	0.64	0.29	0.12	0.72	0.45	0.72	0.78	0.52	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
5	0.69	0.51	0.12	0.77	0.78	0.72	0.84	0.91	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
10	0.75	0.76	0.12	0.84	1.16	0.72	0.92	1.38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
20	0.86	1.20	0.12	0.96	1.83	0.72	1.05	2.19	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
40	1.04	1.84	0.12	1.16	2.81	0.72	1.26	3.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
60	1.16	2.15	0.34	1.29	3.28	1.06	1.40	3.94	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
90	1.22	2.16	0.34	1.36	3.30	1.06	1.48	3.95	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
120	1.16	2.16	0.34	1.29	3.30	1.06	1.41	3.95	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
180	1.13	2.15	0.34	1.26	3.29	1.06	1.37	3.93	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
300	1.05	2.13	0.34	1.17	3.24	1.06	1.27	3.88	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.61
480	0.86	2.05	0.34	0.96	3.13	1.06	1.04	3.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.61
720	0.48	1.89	0.34	0.53	2.88	1.06	0.58	3.46	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.61

TABLE 4: HOT SOAK EMISSION RATES IN GRAMS PER TRIP

TIMES	LIGHT DUTY AUTOS			LIGHT DUTY TRUCKS			MD. DUTY TRUCKS		LIGHT HEAVY TRUCKS			MEDIUM HEAVY TRUCKS			HH TRK	URBAN BUS	MCY
MIN	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	NCAT	CAT	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	DIESEL	DIESEL	ALL
TOG	6.31	0.66	N/A	5.40	0.70	N/A	5.20	0.38	1.21	0.60	N/A	2.18	0.60	N/A	N/A	N/A	0.53

PREDICTED CALIFORNIA VEHICLE EMISSIONS — RUN DATE: 01/09/98

SCENARIO TITLE: 1998 MVEI7G EMISSION FACTORS — OZONE PLANNING INVENTORY

CALENDAR YEAR: 1998 -- Model Years 1964 to 1998 inclusive — SOUTH COAST Air Basin — EMISSION UNIT: TONS PER DAY

MVEI7G ver 1.0 /DAILY EMISSIONS — SEE COUNTY DETAIL FOR I & M STATUS

ALL ON-ROAD EMISSIONS

	LIGHT DUTY AUTOMOBILES				LIGHT DUTY TRUCKS				MEDIUM DUTY TRUCKS(1)				HEAVY DUTY TRUCKS						
			< 6,000 lbs				6,001 to 14,000 lbs				> 14,001 lbs URBAN								
	------ GAS ------			LDA	------ GAS -----			LDT	------ GAS -----			MDT	------ GAS -----		HDT	DIESEL		MOTOR-	ALL
	NON-CAT	CAT	DIESEL	TOTAL	NON-CAT	CAT	DIESEL	TOTAL	NON-CAT	CAT	DIESEL	TOTAL	NON-CAT	CAT	DIESEL	TOTAL	BUSES	CYCLES	VEHICLES
NO. OF IN USE VEHS	284056	6483925	53873	6821854	59346	2490667	25622	2575635	40996	464657	79888	585541	13111	9865	133249	156225	3016	203852	10346123
DAILY VMT (X 1000)	4285	193969	1020	199274	732	74807	416	75955	1089	17318	3178	21585	376	775	13291	14442	419	1249	312924
NO. OF DAILY STARTS	1282565	36260272	288332	37831169	311289	14629407	144578	15085274	186923	3000396	0	3187319	67105	138535	0	205640	0	103203	56412605
FUEL CONSUMED IN 1000 GALLONS																			
GASOLINE	343.41	7381.54		7724.94	58.62	3344.79		3403.42	188.20	1712.74		1900.95	65.95	136.16		202.11	24.99	13256.40	
DIESEL			33.97	33.97			15.90	15.90			529.23	529.23			2227.15	2227.15	71.53	2877.77	

1 Scenario Title: 1998 MVEI7G EMISSION FACTORS
YEAR: 1998 -- MODEL YEARS 1964 TO 1998 INCLUSIVE -- SUMMERTIME
EMFAC7G EMISSION FACTORS

REPORT RUN DATE: 01/09/98

TABLE 1: SUMMERTIME RUNNING I/M EXHAUST EMISSION FACTORS AT 75 DEG F

POLLUTANT NAME: REACTIVE ORGANIC GASES UNITS: GRAMS PER MILE

SPEED	LIGHT DUTY AUTOS			LIGHT DUTY TRUCKS			MD. DUTY TRUCKS		LIGHT HEAVY TRUCKS			MEDIUM HEAVY TRUCKS			HH TRK	URBAN BUS	MCY
MPH	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	NCAT	CAT	NCAT	CAT	DIESEL	NCAT	CAT	DIESEL	DIESEL	DIESEL	ALL
5	17.34	1.16	0.93	16.03	1.55	0.90	18.33	1.99	10.62	1.55	1.77	18.88	3.32	3.33	4.35	5.64	8.67
10	13.86	0.55	0.73	12.82	0.73	0.71	14.65	0.98	6.96	1.02	1.39	12.37	2.18	2.62	3.41	4.09	4.57
15	10.88	0.38	0.59	10.07	0.51	0.57	11.49	0.68	4.75	0.69	1.12	8.45	1.49	2.10	2.74	3.07	3.22
16	10.34	0.37	0.56	9.58	0.49	0.54	10.93	0.65	4.43	0.65	1.07	7.87	1.38	2.02	2.63	2.92	3.06
20	8.38	0.33	0.48	7.78	0.44	0.46	8.86	0.58	3.39	0.49	0.92	6.02	1.06	1.72	2.25	2.39	2.61
25	6.39	0.30	0.40	5.93	0.41	0.39	6.75	0.53	2.51	0.37	0.77	4.46	0.79	1.45	1.88	1.93	2.23
30	4.88	0.28	0.35	4.55	0.38	0.33	5.16	0.50	1.94	0.28	0.66	3.45	0.61	1.24	1.62	1.61	1.95
35	3.88	0.25	0.30	3.62	0.34	0.29	4.10	0.45	1.57	0.23	0.58	2.78	0.49	1.09	1.42	1.39	1.72
40	3.36	0.22	0.27	3.14	0.29	0.26	3.55	0.39	1.32	0.19	0.52	2.34	0.41	0.97	1.27	1.24	1.56
45	3.34	0.18	0.25	3.13	0.24	0.24	3.53	0.34	1.15	0.17	0.47	2.05	0.36	0.89	1.16	1.15	1.47
50	3.81	0.17	0.23	3.56	0.22	0.22	4.03	0.31	1.05	0.15	0.44	1.87	0.33	0.83	1.09	1.11	1.42
55	4.78	0.18	0.22	4.45	0.24	0.21	5.05	0.33	1.00	0.15	0.42	1.78	0.31	0.80	1.04	1.10	1.37
60	6.24	0.27	0.22	5.80	0.37	0.21	6.60	0.48	1.00	0.15	0.42	1.77	0.31	0.78	1.02	1.13	1.21
65	8.20	0.75	0.22	7.60	1.08	0.21	8.66	1.15	1.03	0.15	0.42	1.83	0.32	0.78	1.02	1.21	0.83

POLLUTANT NAME: CARBON MONOXIDE UNITS: GRAMS PER MILE

5	253.07	21.22	4.88	232.34	23.83	4.79	276.43	16.47	157.65	19.20	18.89	285.06	35.51	28.33	34.56	8.06	52.42
10	154.11	11.98	3.37	141.49	13.03	3.30	168.33	9.22	104.89	12.77	13.03	189.65	23.63	19.54	23.83	5.07	25.20
15	99.35	8.23	2.43	91.22	8.97	2.38	108.52	6.39	73.73	8.98	9.40	133.31	16.61	14.10	17.20	3.39	16.55
16	91.62	7.76	2.29	84.12	8.48	2.24	100.08	6.04	69.16	8.42	8.85	125.06	15.58	13.28	16.20	3.15	15.56
20	67.81	6.40	1.83	62.25	7.09	1.80	74.07	5.04	54.76	6.67	7.10	99.01	12.33	10.65	12.99	2.40	12.69
25	48.99	5.34	1.45	44.98	6.02	1.42	53.51	4.27	42.96	5.23	5.61	77.69	9.68	8.42	10.27	1.81	10.39
30	37.47	4.63	1.20	34.41	5.26	1.18	40.93	3.73	35.62	4.34	4.64	64.40	8.02	6.96	8.49	1.45	8.72
35	30.35	4.10	1.04	27.86	4.65	1.02	33.15	3.31	31.20	3.80	4.02	56.41	7.03	6.03	7.35	1.23	7.47
40	26.01	3.73	0.94	23.88	4.16	0.92	28.42	3.00	28.87	3.52	3.64	52.21	6.50	5.46	6.66	1.11	6.59
45	23.61	3.56	0.89	21.68	3.90	0.87	25.79	2.84	28.23	3.44	3.45	51.04	6.36	5.18	6.31	1.06	6.08
50	22.68	3.71	0.88	20.83	4.02	0.87	24.78	2.96	29.16	3.55	3.42	52.73	6.57	5.14	6.27	1.08	5.84
55	23.07	4.49	0.92	21.18	4.93	0.90	25.20	3.62	31.83	3.88	3.56	57.55	7.17	5.33	6.51	1.17	5.65
60	24.84	6.84	1.00	22.81	7.93	0.98	27.14	5.72	36.70	4.47	3.86	66.37	8.27	5.80	7.07	1.34	5.07
65	28.32	14.73	1.14	26.00	19.43	1.11	30.94	13.29	44.72	5.45	4.40	80.86	10.07	6.59	8.04	1.63	3.65

POLLUTANT NAME: OXIDES OF NITROGEN UNITS: GRAMS PER MILE

5	4.89	1.37	2.25	5.66	2.21	2.11	6.14	2.77	4.69	2.20	7.66	7.40	4.34	12.84	18.44	33.97	0.71
10	2.57	1.02	1.87	2.97	1.65	1.75	3.22	2.07	4.92	2.31	6.36	7.78	4.56	10.66	15.30	25.99	0.64
15	1.93	0.82	1.61	2.23	1.31	1.51	2.42	1.65	5.16	2.42	5.47	8.15	4.78	9.16	13.15	20.90	0.66
16	1.87	0.78	1.57	2.16	1.26	1.47	2.35	1.58	5.21	2.45	5.33	8.23	4.83	8.92	12.81	20.13	0.66
20	1.77	0.68	1.43	2.04	1.09	1.34	2.22	1.37	5.40	2.53	4.87	8.53	5.00	8.16	11.71	17.67	0.71
25	1.83	0.60	1.32	2.12	0.96	1.24	2.30	1.20	5.64	2.65	4.49	8.90	5.22	7.53	10.81	15.70	0.79
30	2.05	0.56	1.26	2.37	0.91	1.19	2.57	1.13	5.87	2.76	4.30	9.28	5.44	7.20	10.34	14.67	0.87
35	2.38	0.58	1.25	2.75	0.93	1.17	2.99	1.16	6.11	2.87	4.26	9.65	5.66	7.13	10.24	14.41	0.94
40	2.81	0.63	1.28	3.25	1.03	1.21	3.53	1.28	6.35	2.98	4.37	10.03	5.88	7.32	10.51	14.87	0.99
45	3.33	0.74	1.37	3.85	1.20	1.28	4.18	1.50	6.59	3.09	4.65	10.40	6.10	7.79	11.18	16.14	1.02
50	3.93	0.89	1.51	4.54	1.45	1.41	4.93	1.81	6.82	3.20	5.12	10.78	6.32	8.59	12.32	18.42	1.08
55	4.61	1.08	1.72	5.33	1.77	1.61	5.79	2.21	7.06	3.32	5.85	11.15	6.54	9.80	14.07	22.10	1.20
60	5.37	1.32	2.03	6.20	2.16	1.91	6.73	2.70	7.30	3.43	6.92	11.53	6.76	11.60	16.65	27.87	1.48
65	6.20	1.61	2.49	7.16	2.62	2.34	7.78	3.29	7.54	3.54	8.49	11.90	6.98	14.22	20.42	36.95	2.17

POLLUTANT NAME: EXHAUST PARTICULATES, PMEX10 UNITS: GRAMS PER MILE

5	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.52	0.04
10	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.38	0.04
15	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.28	0.04
16	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.27	0.04
20	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.22	0.04
25	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.18	0.04
30	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.15	0.04
35	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.13	0.04
40	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.11	0.04
45	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.11	0.04
50	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.10	0.04
55	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.10	0.04
60	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.10	0.04
65	0.03	0.00	0.31	0.03	0.00	0.38	0.05	0.00	0.05	0.05	0.40	0.05	0.05	0.57	0.84	0.11	0.04

POLLUTANT NAME: TIRE WEAR PARTICULATES, PMTW10 UNITS: GRAMS PER MILE

ALL	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.03	0.00

POLLUTANT NAME: BRAKE WEAR PARTICULATES PMBW10 UNITS: GRAMS PER MILE

ALL	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

TABLE 2: VARIABLE START EMISSION RATES IN GRAMS PER TRIP

POLLUTANT NAME: REACTIVE ORGANIC GASES UNITS: GRAMS PER TRIP

1	4.57	0.05	0.19	4.79	0.06	0.32	5.00	0.07	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.15
5	4.51	0.24	0.19	4.73	0.29	0.32	4.94	0.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.15

10	4.47	0.48	0.19	4.69	0.57	0.32	4.89	0.65	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.15
20	4.52	0.90	0.19	4.73	1.08	0.32	4.94	1.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.15
40	5.08	1.61	0.19	5.32	1.93	0.32	5.56	2.20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.15
60	5.83	2.11	0.59	6.11	2.54	0.96	6.38	2.90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.15
90	6.11	2.50	0.59	6.40	3.00	0.96	6.69	3.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.15
120	6.39	2.59	0.59	6.70	3.11	0.96	7.00	3.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.15
180	6.96	2.75	0.59	7.29	3.30	0.96	7.62	3.76	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.15
300	8.09	3.05	0.59	8.48	3.66	0.96	8.85	4.17	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.58
480	9.79	3.46	0.59	10.26	4.16	0.96	10.71	4.74	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.58
720	12.06	3.95	0.59	12.63	4.74	0.96	13.19	5.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.58

POLLUTANT NAME: CARBON MONOXIDE UNITS: GRAMS PER TRIP

1	37.17	0.53	3.58	37.53	0.63	3.96	40.74	0.63	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
5	33.85	2.63	3.58	34.18	3.11	3.96	37.10	3.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
10	29.97	5.15	3.58	30.26	6.09	3.96	32.85	6.07	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
20	23.14	9.88	3.58	23.36	11.68	3.96	25.36	11.64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
40	13.12	18.05	3.58	13.25	21.34	3.96	14.38	21.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
60	7.98	24.51	7.29	8.06	28.99	5.87	8.75	28.89	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
90	9.41	31.02	7.29	9.50	36.68	5.87	10.32	36.54	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
120	21.52	33.65	7.29	21.73	39.80	5.87	23.59	39.63	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
180	34.00	34.65	7.29	34.33	40.99	5.87	37.27	40.81	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.68
300	55.00	36.75	7.29	55.53	43.47	5.87	60.28	43.26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	53.10
480	76.57	40.12	7.29	77.31	47.45	5.87	83.93	47.21	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	53.10
720	86.82	45.01	7.29	87.65	53.23	5.87	95.16	52.98	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	53.10

POLLUTANT NAME: OXIDES OF NITROGEN UNITS: GRAMS PER TRIP

1	0.64	0.30	0.12	0.76	0.46	0.72	0.82	0.53	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
5	0.70	0.50	0.12	0.82	0.77	0.72	0.89	0.92	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
10	0.76	0.73	0.12	0.89	1.13	0.72	0.97	1.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
20	0.87	1.14	0.12	1.02	1.76	0.72	1.11	2.14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
40	1.04	1.74	0.12	1.23	2.67	0.72	1.33	3.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
60	1.16	2.03	0.34	1.37	3.12	1.06	1.48	3.82	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
90	1.23	2.04	0.34	1.45	3.14	1.06	1.57	3.84	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
120	1.16	2.04	0.34	1.37	3.13	1.06	1.49	3.84	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
180	1.13	2.03	0.34	1.34	3.12	1.06	1.45	3.83	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.64
300	1.05	2.01	0.34	1.24	3.08	1.06	1.34	3.78	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.61
480	0.86	1.94	0.34	1.02	2.97	1.06	1.10	3.64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.61
720	0.48	1.78	0.34	0.57	2.73	1.06	0.61	3.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.61

TABLE 4: HOT SOAK EMISSION RATES IN GRAMS PER TRIP

TOG	6.51	0.64	N/A	5.49	0.68	N/A	5.33	0.37	1.22	0.61	N/A	2.11	0.61	N/A	N/A	N/A	0.53

APPENDIX D3

Revisions to Draft SEIR, Appendix B6, Low-Level Health Risk Assessment

INTRODUCTION

A health risk assessment (HRA) was conducted to evaluate the carcinogenic and noncarcinogenic risks associated with toxic air contaminant (TAC) emissions from the Sunshine Canyon Landfill. The risks due to the cumulative emissions from both the "City" and "County" portions of the project were calculated.

The approaches and methodologies used in this risk assessment are from the document entitled, "Air Toxics Hot Spots Program, Revised 1992 - Risk Assessment Guidelines", prepared by the AB 2588 Risk Assessment Committee of the California Air Pollution Control Officers Association (CAPCOA), October 1993. Input assumptions were coordinated with the staff of the South Coast Air Quality Management District (SCAQMD). The CAPCOA procedures for risk assessments from airborne contaminants is the methodology recommended for use by the SCAQMD. All emission estimates used to calculate risk values were from monthly analyses of landfill gas and from periodic emission source tests of the existing flare conducted pursuant to SCAQMD requirements.

Per the requirements of the SCAQMD, the HRA addressed a total of 18 substances on the SCAQMD Rules 1150.1 and/or 1401 lists for the landfill risk evaluation. The substances are listed in **Table 1**. Of the 18 substances, 10 are considered carcinogenic and were evaluated as part of the cancer risk evaluation. The noncancer health effects evaluation addressed 17 of the 18 substances for chronic impacts, and 7 of the 18 substances for acute impacts.

The lifetime carcinogenic risk was estimated for an individual assumed to reside continuously for 70 years at the off-site location of maximum ground-level concentration for the maximum exposed individual (MEI). The chronic and acute health risks were calculated in terms of a "hazard index". This index is calculated by dividing the predicted maximum short- (acute) and long-term (chronic) pollutant exposures by an established safe exposure level called the Reference Exposure Level (REL; CAPCOA, 1993).

Modeling Methodology

Health risks associated with landfill proximity were assumed to derive from landfill gas (LFG) emissions. These emissions result from that fraction of the LFG not collected by the collection/ disposal system, called "fugitive" emissions, plus the small fraction of TACs emitted by the flares. These emissions were used in a computerized dispersion model (ISCST3, Version 97363) to predict the maximum hourly, daily and annual LFG concentrations at the landfill boundary and at the nearest residences and school locations.

Modeling protocols were coordinated with the SCAQMD staff. Meteorological data from the SCAQMD "Newhall" monitoring station was used as the closest and most representative data resource.

A grid of 90 points along the landfill perimeter and 12 Granada Hills residences plus one school (e.g., Van Gogh Street Elementary School) was used to determine off-site exposure to combined flare and fugitive LFG emissions. The off-site grid is shown in **Figure 1**. The residential receptor with the calculated highest concentration of contaminants was analyzed for health risk potential as a worst-case human exposure location. The maximum exposure was determined to be at the residential receptor designated as #50 in **Figure 1**, which is the residence in the community of Granada Hills that would be the most impacted by landfill emissions.

The composition of the gas flare emissions was determined from monthly analysis data of the "raw" LFG entering the existing flare on the "City" portion of the landfill. The maximum number of flares is five flares burning slightly over 20,000 CFM. Over the 70-year risk assessment time frame, the average annual volume generation for LFG emissions will be approximately 60 percent of the highest year based on peak volumes determined from gas generation predictive models or 12,260 CFM. The input parameters for each of the five (5) flares needed during maximum LFG generations were as follows:

Stack Height	=	15.3 meters
Stack Temperature	=	1180° K
Exit Velocity	=	10 m/sec
Stack Diameter	=	3.8 meters
Max. LFG Rate	=	4167 CFM/flare
70-Year Average LFG Rate	=	2452 CFM/flare

The concentration of TACs in LFG was determined from an average of six monthly LFG composition tests conducted from July-December, 1997 by AtmAA, Inc. Flares were assumed to destroy 98 percent of TACs during combustion. Actual measurements of organic gas destruction efficiencies over the last five years have shown better than a 99 percent destruction efficiency. Use of the 98 percent destruction efficiency assumption over estimates the actual flare impact two-fold compared to actual observed flare behavior.

A total of ten percent of all LFG generated was assumed to escape collection.[1] The fugitive LFG was assumed to be uniformly emitted over approximately 2,000,000 square meters (500+ acres) of landfill surface (both City and County areas). The ISCST3 model was run for a unit emission rate (1 g/sec for each flare, 1 $\mu g/m^2$/sec for fugitive area sources). The exposure for each TAC was calculated based upon the ratio of the estimated emission rate to the reference (unit) rate.

Model Results

Output from the ISCST3 model is attached. The maximum exposed individual (MEI) is the residence in the community of Granada Hills located closest to the landfill, and is labeled as #50 in **Figure 1**. The concentration of TACs within the LFG and the maximum estimated ambient concentrations at the MEI are shown in **Table 2**. These predicted concentrations were combined with the appropriate exposure parameters and toxicity data to complete the HRA.

Individual Cancer Risk

Excess cancer risk is calculated by assuming the MEI remains outdoors for 24 hours per day for 365 days per year, for 70 years. While a 70 year exposure assumption is the standard assumption for a CAPCOA health risk assessment, the excessively conservative (over-predictive) nature of this assumption needs to be recognized.

1/ The SCAQMD recommends using a ten percent escape rate for HRA modeling.

Table 3 combines the predicted chronic exposure for 70 years of LFG emissions (1998 - 2068) to predict the excess individual cancer risk at the #50 receptor. The worst-case MEI exposure is 0.96 in one million. A risk of one in a million is considered less than significant. Risks up to ten in a million are considered acceptable if toxics best available control technology (T-BACT) is used to reduce emissions. Flares are considered T-BACT for landfills. The excess cancer risk is thus below the "de minimus" insignificance threshold, and far below the allowable exposure for a T-BACT equipped source. All other receptors have lower exposures than the MEI.

No amount of excess cancer risk is "acceptable" for the person contracting the disease. However, people accrue far higher risks from common daily activities, in comparison to a less than one in a million risk due to landfill proximity. **Table 4** shows the mortality risk from accidents and disasters for the average American. **Table 5** puts the maximum cancer risk in perspective compared to some other risk factors.

Chronic Health Risk

The TACs considered in this assessment are known to potentially affect seven organs/systems in the human body as shown in **Table 6**. Non-cancer effects are calculated through a ratio of the TAC exposure to a published level determined to have no observable health effect (the REL). The sum of all the individual ratios for every identified pollutant emitted by a source is called the health hazard index (HHI). An HHI of 0.5 is considered a potentially significant impact that would require additional analysis. If the HHI is less than 0.5 (below 50 percent of the "safe" exposure level), no additional analysis is necessary. **Table 7** calculates the HHI for any individual target receptor location in the human body. All are well below the significance level of 0.5.

Table 8 compares and combines the HHI for all organs/systems. Although HHI's are not strictly additive, the combined threat to all organs/systems of 0.0113 is well below the 0.5 HHI significance threshold. Accordingly, chronic non-cancer health effects from landfill proximity are less than significant.

Acute Health Hazard

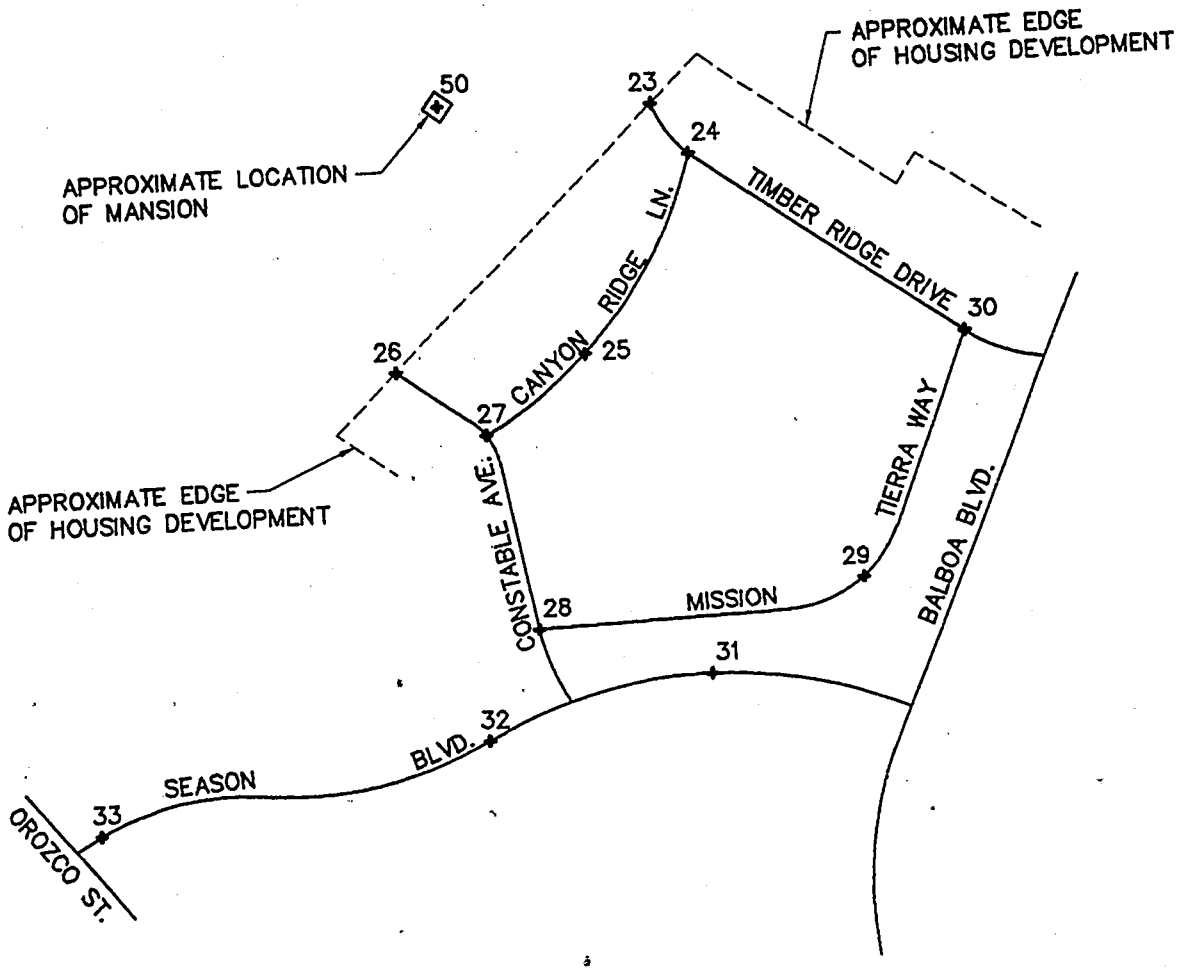
The acute health hazard was similarly calculated as the chronic HHI. **Table 9** shows the acute HHI from the seven compounds with an acute health threat. The acute HHI of 0.1618 is below the 0.5 HHI significance threshold for acute non-cancer health impacts. Therefore, acute health impacts are considered less than significant.

Table 1
TOXIC AIR CONTAMINANTS INCLUDED IN THE HEALTH RISK ASSESSMENT (SCAQMD Rule 1150.1 "Core Group")

No. Substance	HEALTH IMPACT		
		Noncarcinogenic	
	Carcinogenic	Chronic	Acute
1. Benzene	×	×	
2. Carbon Tetrachloride	×	×	×
3. Benzyl Chloride		×	×
4. Chlorobenzene		×	
5. Ethylene Dibromide	×	×	
6. Chloroform	×	×	
7. Dichlorobenzene	×	×	
8. Vinylidene Chloride		×	
9. Ethylene Dichloride	×	×	
10. Ethylidene Dichloride*			
11. Methyl Chloroform		×	×
12. Methylene Chloride	×	×	×
13. Perchloroethylene	×	×	×
14. Toluene		×	
15. Trichloroethylene	×	×	
16. Vinyl Chloride	×	×	
17. Xylenes		×	×
18. Hydrogen Sulfide		×	×

* Not listed in CAPCOA HRA guidelines as having carcinogenic or noncarcinogenic health risks.

Figure 1



35
POINT IN FRONT OF
VAN GOGH ELEMENTARY
SCHOOL

Table 2
DISPERSION MODELING RESULTS

Chemical	ppb	MW	Annual Conc. ($\mu g/m^3$)	Max. 1-Hr. Conc. ($\mu g/m^3$)*
Benzene	1,303	78.11	0.00616	----
Benzylchloride	<20	126.59	<0.00015	<0.0046
Chlorobenzene	402	112.56	0.00274	----
Ethylene Dibromide	1	187.88	0.00001	----
Dichlorobenzene**	1,229	147.00	0.01094	----
1, 1 - Dichloroethane	498	98.96	0.00298	----
1, 2 - Dichloroethane	49	98.96	0.00029	----
1, 1 - Dichloroethylene	88	96.94	0.00052	----
Dichloromethane	2,923	84.93	0.01503	0.4672
Perchloroethene	1,510	165.83	0.01516	0.4713
Carbon Tetrachloride	<9	153.82	<0.00008	<0.0025
Toluene	28,533	92.14	0.15916	----
1, 1, 1 - TCE (methyl chloroform)	45	133.40	0.00036	0.0112
Trichloroethene	468	131.40	0.00372	----
Chloroform	< 7	119.38	<0.00005	----
Vinyl Chloride	1,737	62.50	0.00657	----
Xylene (M+P+O)	22,522	106.17	0.14476	4.4999
Hydrogen Sulfide	105,000	34.08	0.21663	6.7340

* = Required for acute health impact analysis only for peak (2083.5 CFM) LFG escape rate.
** = Assume para isomer = 0.5 of (meta+para+ortho) isomers
ppb = LFG TAC concentration
MW = Molecular weight

Table 3
INDIVIDUAL CANCER RISK
(Maximum Exposed Individual)

Chemical	Annual Avg. Conc. ($\mu g/m^3$)	Cancer Potency (per 10^6)	Individual Risk (per 10^6)
Benzene	0.00616	29	0.18
Carbon Tetrachloride	<0.00008	42	<0.01
Chloroform	<0.00005	5.3	<0.01
p-Dichlorobenzene	0.01094	11	0.12
Ethylene Dibromide	0.00001	71	<0.01
Ethylene Dichloride	0.00029	20	0.01
Methylene Chloride	0.01503	1	<0.01
Perchloroethylene	0.01516	5.9	0.09
Trichloroethylene	0.00372	2	0.01
Vinyl Chloride	0.00657	78	0.51
		TOTAL =	**$<0.96 \times 10^{-6}$**

Table 4
LIFETIME RISK FROM ACCIDENTS AND DISASTERS

Risk Source	Lifetime Probability
Motor Vehicle Accident	35,000 in 1,000,000
Falls	5,400 in 1,000,000
Drowning	2,400 in 1,000,000
Fires	2,200 in 1,000,000
Poison	1,800 in 1,000,000
Airplane Crash	540 in 1,000,000
Railway Accident	280 in 1,000,000
Lightning	54 in 1,000,000
Tornadoes	30 in 1,000,000
Dam Failure	12 in 1,000,000
Gasoline Tanker Accident	9 in 1,000,000
Chlorine Rail Car Accident	3 in 1,000,000
Plane Crash (person on ground)	2 in 1,000,000
Living Near Sunshine Canyon	<1 in 1,000,000

Source: "An Assessment of the Risk of Transporting Liquid Chlorine by Rail," PNL-3376, Richland, WA, 1980.

Table 5
LIFETIME CANCER RISK COMPARISON

Risk Source	Lifetime Probability
All types of Cancer	270,000 in 1,000,000
Smoking (1 pack/day)	100,000 in 1,000,000
Medical & Dental X-rays	1,500 in 1,000,000
Living Near a Freeway	1,000 in 1,000,000
Sharing Home with a Smoker	700 in 1,000,000
Saccharin Diet Soda (1 can/day)	600 in 1,000,000
Living in Denver (cosmic rays)	500 in 1,000,000
Peanut Butter Aflatoxin (4 tsp./day)	400 in 1,000,000
Living in a Brick House (radon)	300 in 1,000,000
Proposition 65 Alert Level	10 in 1,000,000
Living Near Sunshine Canyon	<1 in 1,000,000

Table 6
CHRONIC HEALTH RISK TARGET ORGANS/SYSTEMS

Substance	RESP	CNS	G/L	Kid.	Rep.	Imm.	Skin
Benzene		×					
Carbon Tetrachloride			×				
Benzyl Chloride	×						
Chlorobenzene			×	×	×		×
Chloroform			×				
Dichlorobenzene			×				
Ethylene Dibromide	×				×		
Ethylene Dichloride			×	×		×	
Methyl Chloroform		×	×		×		
Methylene Chloride		×	×				
Perchloroethylene			×	×			
Toluene		×			×		
Trichloroethylene		×	×				
Vinyl Chloride			×		×		
Vinylidene Chloride							
Xylenes	×				×		
Hydrogen Sulfide		×					

Notes:

RESP = Respiratory System
Imm. = Immune System
CNS = Central Nervous System
Skin = Skin
G/L = Gastrointestinal/Liver
Kid. = Kidneys
Rep. = Reproductive System

Table 7
CHRONIC HEALTH RISK
(Maximum Exposed Individual)

Chemical	Ref. Exp. Level ($\mu g/m^3$)	Annual Avg. Conc. ($\mu g/m^3$)	Hazard Index
Respiratory System			
Ethylene Dibromide	46	0.00001	<0.0001
Benzyl Chloride	12	<0.00015	<0.0001
Xylene	300	0.14476	0.0005
		TOTAL =	**<0.0006**
Central Nervous System			
Benzene	71	0.00616	0.0001
Methyl Chloroform	320	0.00036	<0.0001
Methylene Chloride	3000	0.01503	<0.0001
Toluene	200	0.15916	0.0008
Trichloroethylene	640	0.00372	<0.0001
Hydrogen Sulfide	42	0.21663	0.0052
		TOTAL =	**<0.0064**
Kidneys			
Chlorobenzene	70	0.00274	<0.0001
Ethylene Dibromide	46	0.00001	<0.0001
Ethylene Dichloride	95	0.00029	<0.0001
Perchloroethylene	35	0.01516	0.0004
		TOTAL =	**<0.0006**
Skin			
Chlorobenzene	70	0.00274	<0.0001
		TOTAL =	**<0.0001**
Gastrointestinal/Liver System			
Carbon Tetrachloride	2.4	<0.00008	<0.0001
Chlorobenzene	70	0.00274	<0.0001
Chloroform	35	<0.00005	<0.0001
p-Dichlorobenzene	700	0.01094	<0.0001
Ethylene Dichloride	95	0.00029	<0.0001
Methyl Chloroform	320	0.00036	<0.0001

Table 7 (Cont.)
CHRONIC HEALTH RISK
(Maximum Exposed Individual)

Chemical	Ref. Exp. Level ($\mu g/m^3$)	Annual Avg. Conc. ($\mu g/m^3$)	Hazard Index
Methylene Chloride	3000	0.01503	<0.0001
Perchloroethylene	35	0.01516	0.0004
Trichloroethylene	640	0.00372	<0.0001
Vinyl Chloride	26	0.00657	0.0003
		TOTAL =	**<0.0015**
Reproductive System			
Chlorobenzene	70	0.00274	<0.0001
Methyl Chloroform	320	0.00036	<0.0001
Toluene	200	0.15916	0.0008
Vinyl Chloride	26	0.00657	0.0003
Xylene	300	0.14476	0.0005
		TOTAL =	**<0.0018**
Immune System			
Ethylene Dichloride	95	0.00029	<0.0001
		TOTAL =	**<0.0001**

Table 8
COMBINED CHRONIC HEALTH HAZARD INDEX

System/Organ	Hazard Index
Respiratory System	< 0.0007
Central Nervous System	< 0.0064
Kidneys	< 0.0006
Skin	< 0.0001
Gastrointestinal/Liver	< 0.0015
Reproductive System	< 0.0019
Immune System	< 0.0001
TOTAL =	**< 0.0113**

Table 9
ACUTE HAZARD INDEX
(Maximum Exposed Individual)

Chemical	Ref. Exp. Level ($\mu g/m^3$)	Max. Indiv. Exposure ($\mu g/m^3$)	Hazard Index
Benzyl Chloride	50	<0.0046	<0.0001
Carbon Tetrachloride	190	<0.0025	<0.0001
Methyl Chloroform	190000	0.0112	<0.0001
Methylene Chloride	3500	0.4672	0.0001
Perchloroethylene	6800	0.4713	<0.0001
Xylene	4400	4.4999	0.0010
Hydrogen Sulfide	42	6.7340	0.1603
		TOTAL =	**<0.1618**

ISCST3 COMPUTER MODEL

INPUT/OUTPUT

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**
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** ISCST3 Input Produced by:
** ISC View Ver. 1.97
** Lakes Environmental Software Inc.
****************************************
**
**
****************************************
** ISC Control Options Pathway
****************************************
**
CO STARTING
   TITLEONE  Sunshine Landfill - PM10 Impact Assessment Total Facility
   TITLETWO  Operational Emissions - (Without Mitigation) 5/29/97
   MODELOPT  CONC  RURAL  NOSTD  NOCALM  NOBID  MSGPRO
   AVERTIME  1 24 PERIOD
   POLLUTID  PM10
   TERRHGTS  ELEV
   RUNORNOT  RUN
CO FINISHED

**
****************************************
** ISC Source Pathway
****************************************
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   Location FLARE2 POINT 3.610260E+05 3.798461E+06 549.
   Location FLARE3 POINT 3.613740E+05 3.799176E+06 476.
   Location FLARE4 POINT 3.608440E+05 3.800040E+06 580.
   Location FLARE5 POINT 3.594560E+05 3.799223E+06 732.
   Location AREA1 AREA 3.608400E+05 3.798498E+06 650.
   Location AREA2 AREA 3.601700E+05 3.798900E+06 570.
   Location AREA3 AREA 3.596970E+05 3.799210E+06 570.
   Location AREA4 AREA 3.596970E+05 3.799520E+06 570.
   Location AREA5 AREA 3.596970E+05 3.799820E+06 570.
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   SRCPARAM  FLARE2 1. 15.3 1180. 10. 3.8
   SRCPARAM  FLARE3 1. 15.3 1180. 10. 3.8
   SRCPARAM  FLARE4 1. 15.3 1180. 10. 3.8
   SRCPARAM  FLARE5 1. 15.3 1180. 10. 3.8
   SRCPARAM  AREA1 1.0000E-06 1. 915. 396. 0 0
   SRCPARAM  AREA2 1.0000E-06 1. 1484. 305. 0 0
   SRCPARAM  AREA3 1.0000E-06 1. 1524. 305. 0 0
   SRCPARAM  AREA4 1.0000E-06 1. 1356. 305. 0 0
   SRCPARAM  AREA5 1.0000E-06 1. 1067. 426. 0 0
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** No Building Downwash **
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   SRCGROUP  AREA AREA1-AREA5
   SRCGROUP  ALL
SO FINISHED

**
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** ISC Receptor Pathway
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   DISCCART  360022. 3799068. 610.
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   DISCCART  360108. 3798965. 632.
   DISCCART  360124. 3798884. 655.
   DISCCART  360164. 3798808. 648.
   DISCCART  360380. 3798747. 663.
   DISCCART  360554. 3798747. 655.
   DISCCART  360642. 3798671. 617.
   DISCCART  360730. 3798601. 625.
   DISCCART  360748. 3798500. 625.
   DISCCART  360910. 3798506. 602.
   DISCCART  361000. 3798506. 594.
   DISCCART  361060. 3798365. 587.
   DISCCART  361121. 3798243. 526.
   DISCCART  361133. 3798121. 488.
   DISCCART  361301. 3798121. 442.
   DISCCART  361454. 3798121. 488.
   DISCCART  361606. 3798121. 427.
   DISCCART  361774. 3798121. 457.
   DISCCART  361940. 3798121. 457.
   DISCCART  361940. 3798234. 472.
   DISCCART  361940. 3798347. 480.
   DISCCART  361940. 3798499. 503.
   DISCCART  361940. 3798651. 480.
   DISCCART  361940. 3799000. 442.
   DISCCART  361910. 3799128. 411.
   DISCCART  361773. 3799227. 411.
   DISCCART  361605. 3799326. 450.
   DISCCART  361501. 3799425. 503.
   DISCCART  361422. 3799524. 488.
   DISCCART  361337. 3799623. 480.
   DISCCART  361241. 3799723. 503.
   DISCCART  361363. 3799879. 503.
   DISCCART  361283. 3800033. 564.
   DISCCART  361165. 3800188. 533.
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   DISCCART  361088. 3800343. 503.
   DISCCART  360844. 3800498. 526.
   DISCCART  360386. 3800651. 526.
   DISCCART  360203. 3800651. 579.
   DISCCART  360050. 3800651. 625.
   DISCCART  359918. 3800651. 595.
   DISCCART  359745. 3800651. 648.
   DISCCART  359593. 3800651. 693.
   DISCCART  359441. 3800651. 716.
   DISCCART  359288. 3800651. 701.
   DISCCART  359136. 3800651. 701.
   DISCCART  358983. 3800651. 671.
   DISCCART  358984. 3800651. 686.
   DISCCART  358832. 3800651. 640.
   DISCCART  358679. 3800651. 594.
   DISCCART  358527. 3800651. 533.
   DISCCART  358374. 3800651. 518.
   DISCCART  358222. 3800651. 556.
   DISCCART  358036. 3800651. 671.
   DISCCART  358036. 3800498. 671.
   DISCCART  358036. 3800279. 716.
   DISCCART  357850. 3800279. 640.
   DISCCART  357697. 3800279. 640.
   DISCCART  357525. 3800279. 564.
   DISCCART  357554. 3800190. 663.
   DISCCART  357552. 3800041. 625.
   DISCCART  357554. 3799889. 640.
   DISCCART  357554. 3799736. 724.
   DISCCART  357554. 3799584. 747.
   DISCCART  361123. 3797899. 433.
   DISCCART  361435. 3797019. 393.
   DISCCART  361080. 3795827. 381.
   DISCCART  361506. 3795614. 363.
   DISCCART  3.617200E+05 3.797883E+06 428.
   DISCCART  3.617470E+05 3.797843E+06 423.
   DISCCART  3.616560E+05 3.797691E+06 417.
   DISCCART  3.615070E+05 3.797685E+06 419.
   DISCCART  3.615750E+05 3.797633E+06 414.
   DISCCART  3.616080E+05 3.797478E+06 402.
   DISCCART  3.618650E+05 3.797503E+06 407.
   DISCCART  3.619550E+05 3.797690E+06 409.
   DISCCART  3.617420E+05 3.797433E+06 399.
   DISCCART  3.615650E+05 3.797392E+06 401.
   DISCCART  3.612560E+05 3.797337E+06 409.
   DISCCART  3.615150E+05 3.796885E+06 392.
   DISCCART  3.615530E+05 3.797892E+06 440.
RE FINISHED

**
**********************************
** ISC Meteorology Pathway
**********************************
**
ME STARTING
   INPUTFIL  D:\SUNSHINE\NEWHALL.ASC
   SURFDATA  51115  1981  NEWHALL-AQMD81
   UAIRDATA  99999  1981
   ANEMHGHT  10.  METERS
ME FINISHED
```

```
**
****************************************
** ISC Output Pathway
****************************************
**
OU STARTING
   RECTABLE  ALLAVE  FIRST
   MAXTABLE  ALLAVE  50
   MAXTABLE  1  50
   MAXTABLE  24  50
   PLOTFILE  24 ALL 1ST D:\SUNSHINE\SUNKST5.FIL
OU FINISHED

***********************************
*** SETUP Finishes Successfully ***
***********************************
```

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** MODEL SETUP OPTIONS SUMMARY ***

**Intermediate Terrain Processing is Selected

**Model Is Setup For Calculation of Average CONCentration Values.

-- SCAVENGING/DEPOSITION LOGIC --
**Model Uses NO DRY DEPLETION. DDPLETE = F
**Model Uses NO WET DEPLETION. WDPLETE = F
**NO WET SCAVENGING Data Provided.
**Model Does NOT Use GRIDDED TERRAIN Data for Depletion Calculations

**Model Uses RURAL Dispersion.

**Model Uses User-Specified Options:
1. Final Plume Rise.
2. Not Use Stack-tip Downwash.
3. Not Use Buoyancy-induced Dispersion.
4. Not Use Calms Processing Routine.
5. Missing Data Processing Routine.
6. Default Wind Profile Exponents.
7. Default Vertical Potential Temperature Gradients.

**Model Accepts Receptors on ELEV Terrain.

**Model Assumes No FLAGPOLE Receptor Heights.

**Model Calculates 2 Short Term Average(s) of: 1-HR 24-HR
and Calculates PERIOD Averages

**This Run Includes: 10 Source(s); 3 Source Group(s); and 103 Receptor(s)

**The Model Assumes A Pollutant Type of: PM10

**Model Set To Continue RUNning After the Setup Testing.

**Output Options Selected:
Model Outputs Tables of PERIOD Averages by Receptor
Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE Keyword)
Model Outputs Tables of Overall Maximum Short Term Values (MAXTABLE Keyword)
Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)

**NOTE: The Following Flags May Appear Following CONC Values: c for Calm Hours
m for Missing Hours
b for Both Calm and Missing Hours

**Misc. Inputs: Anem. Hgt. (m) = 10.00 ; Decay Coef. = 0.0000 ; Rot. Angle = 0.0
Emission Units = GRAMS/SEC ; Emission Rate Unit Factor = 0.10000E+07
Output Units = MICROGRAMS/M**3

**Input Runstream File: D:\SUNSHINE\SUNKST5.inp ; **Output Print File: D:\SUNSHINE\SUNKST5.out

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FLARE1	0	0.10000E+01	360404.0	3798758.0	596.0	15.30	1180.00	10.00	3.80	NO	
FLARE2	0	0.10000E+01	361026.0	3798461.0	549.0	15.30	1180.00	10.00	3.80	NO	
FLARE3	0	0.10000E+01	361374.0	3799176.0	476.0	15.30	1180.00	10.00	3.80	NO	
FLARE4	0	0.10000E+01	360844.0	3800040.0	580.0	15.30	1180.00	10.00	3.80	NO	
FLARE5	0	0.10000E+01	359456.0	3799223.3	732.0	15.30	1180.00	10.00	3.80	NO	

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** AREA SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC /METER**2)	COORD (SW CORNER) X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	X-DIM OF AREA (METERS)	Y-DIM OF AREA (METERS)	ORIENT. OF AREA (DEG.)	INIT. SZ (METERS)	EMISSION RATE SCALAR VARY BY
AREA1	0	0.10000E-05	360840.0	3798498.0	650.0	1.00	915.00	396.00	0.00	0.00	
AREA2	0	0.10000E-05	360170.0	3798900.0	570.0	1.00	1484.00	305.00	0.00	0.00	
AREA3	0	0.10000E-05	359697.0	3799210.0	570.0	1.00	1524.00	305.00	0.00	0.00	
AREA4	0	0.10000E-05	359697.0	3799520.0	570.0	1.00	1356.00	305.00	0.00	0.00	
AREA5	0	0.10000E-05	359697.0	3799820.0	570.0	1.00	1067.00	426.00	0.00	0.00	

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
FLARES	FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 ,
AREA	AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,
ALL	FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 , AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** DISCRETE CARTESIAN RECEPTORS ***
(X-COORD, Y-COORD, ZELEV, ZFLAG)
(METERS)

(357554.0,	3799458.0,	732.0,	0.0);	(357736.0,	3799458.0,	815.0,	0.0);
(357889.0,	3799458.0,	823.0,	0.0);	(358050.0,	3799458.0,	762.0,	0.0);
(358194.0,	3799458.0,	762.0,	0.0);	(358346.0,	3799458.0,	716.0,	0.0);
(358498.0,	3799458.0,	732.0,	0.0);	(358651.0,	3799458.0,	747.0,	0.0);
(358764.0,	3799458.0,	732.0,	0.0);	(358764.0,	3799656.0,	732.0,	0.0);
(358764.0,	3799854.0,	686.0,	0.0);	(358965.0,	3799854.0,	640.0,	0.0);
(358965.0,	3799656.0,	732.0,	0.0);	(358965.0,	3799458.0,	723.0,	0.0);
(359108.0,	3799458.0,	739.0,	0.0);	(359260.0,	3799458.0,	747.0,	0.0);
(359413.0,	3799458.0,	716.0,	0.0);	(359559.0,	3799458.0,	686.0,	0.0);
(359450.0,	3799260.0,	655.0,	0.0);	(359523.0,	3799037.0,	701.0,	0.0);
(359718.0,	3799068.0,	671.0,	0.0);	(359870.0,	3799068.0,	663.0,	0.0);
(360022.0,	3799068.0,	610.0,	0.0);	(360196.0,	3799068.0,	594.0,	0.0);
(360108.0,	3798965.0,	632.0,	0.0);	(360124.0,	3798884.0,	655.0,	0.0);
(360164.0,	3798808.0,	648.0,	0.0);	(360380.0,	3798747.0,	663.0,	0.0);
(360554.0,	3798747.0,	655.0,	0.0);	(360642.0,	3798671.0,	617.0,	0.0);
(360730.0,	3798601.0,	625.0,	0.0);	(360748.0,	3798500.0,	625.0,	0.0);
(360910.0,	3798506.0,	602.0,	0.0);	(361000.0,	3798506.0,	594.0,	0.0);
(361060.0,	3798365.0,	587.0,	0.0);	(361121.0,	3798243.0,	526.0,	0.0);
(361133.0,	3798121.0,	488.0,	0.0);	(361301.0,	3798121.0,	442.0,	0.0);
(361454.0,	3798121.0,	488.0,	0.0);	(361606.0,	3798121.0,	427.0,	0.0);
(361774.0,	3798121.0,	457.0,	0.0);	(361940.0,	3798121.0,	457.0,	0.0);
(361940.0,	3798234.0,	472.0,	0.0);	(361940.0,	3798347.0,	480.0,	0.0);
(361940.0,	3798499.0,	503.0,	0.0);	(361940.0,	3798651.0,	480.0,	0.0);
(361940.0,	3799000.0,	442.0,	0.0);	(361910.0,	3799128.0,	411.0,	0.0);
(361773.0,	3799227.0,	411.0,	0.0);	(361605.0,	3799326.0,	450.0,	0.0);
(361501.0,	3799425.0,	503.0,	0.0);	(361422.0,	3799524.0,	488.0,	0.0);
(361337.0,	3799623.0,	480.0,	0.0);	(361241.0,	3799723.0,	503.0,	0.0);
(361363.0,	3799879.0,	503.0,	0.0);	(361283.0,	3800033.0,	564.0,	0.0);
(361165.0,	3800188.0,	533.0,	0.0);	(361088.0,	3800343.0,	503.0,	0.0);
(360844.0,	3800498.0,	526.0,	0.0);	(360386.0,	3800651.0,	526.0,	0.0);
(360203.0,	3800651.0,	579.0,	0.0);	(360050.0,	3800651.0,	625.0,	0.0);
(359918.0,	3800651.0,	595.0,	0.0);	(359745.0,	3800651.0,	648.0,	0.0);
(359593.0,	3800651.0,	693.0,	0.0);	(359441.0,	3800651.0,	716.0,	0.0);
(359288.0,	3800651.0,	701.0,	0.0);	(359136.0,	3800651.0,	701.0,	0.0);
(358983.0,	3800651.0,	671.0,	0.0);	(358984.0,	3800651.0,	686.0,	0.0);
(358832.0,	3800651.0,	640.0,	0.0);	(358679.0,	3800651.0,	594.0,	0.0);
(358527.0,	3800651.0,	533.0,	0.0);	(358374.0,	3800651.0,	518.0,	0.0);
(358222.0,	3800651.0,	556.0,	0.0);	(358036.0,	3800651.0,	671.0,	0.0);
(358036.0,	3800498.0,	671.0,	0.0);	(358036.0,	3800279.0,	716.0,	0.0);
(357850.0,	3800279.0,	640.0,	0.0);	(357697.0,	3800279.0,	640.0,	0.0);
(357525.0,	3800279.0,	564.0,	0.0);	(357554.0,	3800190.0,	663.0,	0.0);
(357552.0,	3800041.0,	625.0,	0.0);	(357554.0,	3799889.0,	640.0,	0.0);
(357554.0,	3799736.0,	724.0,	0.0);	(357554.0,	3799584.0,	747.0,	0.0);
(361123.0,	3797899.0,	433.0,	0.0);	(361435.0,	3797019.0,	393.0,	0.0);
(361080.0,	3795827.0,	381.0,	0.0);	(361506.0,	3795614.0,	363.0,	0.0);

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** DISCRETE CARTESIAN RECEPTORS ***
(X-COORD, Y-COORD, ZELEV, ZFLAG)
(METERS)

(361720.0,	3797883.0,	428.0,	0.0);	(361747.0,	3797843.0,	423.0,	0.0);
(361656.0,	3797690.8,	417.0,	0.0);	(361507.0,	3797685.3,	419.0,	0.0);
(361575.0,	3797633.3,	414.0,	0.0);	(361608.0,	3797478.3,	402.0,	0.0);
(361865.0,	3797503.0,	407.0,	0.0);	(361955.0,	3797690.0,	409.0,	0.0);
(361742.0,	3797433.3,	399.0,	0.0);	(361565.0,	3797391.8,	401.0,	0.0);
(361256.0,	3797336.8,	409.0,	0.0);	(361515.0,	3796885.0,	392.0,	0.0);
(361553.0,	3797891.5,	440.0,	0.0);				

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
(1=YES; 0=NO)

1 1 1

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

FILE: D:\SUNSHINE\NEWHALL.ASC FORMAT: (4I2,2F9.4,F6.1,I2,2F7.1,f9.4,f10.1,f8.4,i4,f7.2)
SURFACE STATION NO.: 51115 UPPER AIR STATION NO.: 99999
NAME: NEWHALL-AQMD81 NAME: UNKNOWN
YEAR: 1981 YEAR: 1981

YR	MN	DY	HR	FLOW VECTOR	SPEED (M/S)	TEMP (K)	STAB CLASS	MIXING HEIGHT (M) RURAL	MIXING HEIGHT (M) URBAN	USTAR (M/S)	M-O LENGTH (M)	Z-O (M)	IPCODE	PRATE (mm/HR)
81	1	1	1	314.8	1.00	285.9	7	522.6	170.0	0.0000	0.0	0.0000	0	0.00
81	1	1	2	304.9	0.00	284.8	7	507.0	170.0	0.0000	0.0	0.0000	0	0.00
81	1	1	3	310.0	0.00	284.8	7	491.4	170.0	0.0000	0.0	0.0000	0	0.00
81	1	1	4	346.0	1.00	284.8	7	475.8	170.0	0.0000	0.0	0.0000	0	0.00
81	1	1	5	309.0	1.00	285.4	7	460.3	170.0	0.0000	0.0	0.0000	0	0.00
81	1	1	6	342.0	1.00	284.3	7	444.7	170.0	0.0000	0.0	0.0000	0	0.00
81	1	1	7	342.0	0.00	284.3	7	429.1	170.0	0.0000	0.0	0.0000	0	0.00
81	1	1	8	337.1	0.00	284.3	6	43.0	190.2	0.0000	0.0	0.0000	0	0.00
81	1	1	9	6.5	1.00	287.6	5	89.2	211.8	0.0000	0.0	0.0000	0	0.00
81	1	1	10	9.1	0.00	291.5	4	135.3	233.4	0.0000	0.0	0.0000	0	0.00
81	1	1	11	291.6	1.00	297.0	3	181.5	255.1	0.0000	0.0	0.0000	0	0.00
81	1	1	12	80.6	1.00	298.7	2	227.7	276.7	0.0000	0.0	0.0000	0	0.00
81	1	1	13	87.2	0.00	299.3	2	273.8	298.4	0.0000	0.0	0.0000	0	0.00
81	1	1	14	326.7	2.24	299.3	3	320.0	320.0	0.0000	0.0	0.0000	0	0.00
81	1	1	15	337.3	2.24	298.7	3	320.0	320.0	0.0000	0.0	0.0000	0	0.00
81	1	1	16	345.7	2.24	297.6	4	320.0	320.0	0.0000	0.0	0.0000	0	0.00
81	1	1	17	20.1	1.34	294.8	5	325.5	318.6	0.0000	0.0	0.0000	0	0.00
81	1	1	18	97.6	1.00	293.1	6	357.1	310.3	0.0000	0.0	0.0000	0	0.00
81	1	1	19	178.0	1.00	290.9	7	388.7	302.1	0.0000	0.0	0.0000	0	0.00
81	1	1	20	303.2	1.00	289.8	7	420.3	293.9	0.0000	0.0	0.0000	0	0.00
81	1	1	21	358.6	1.00	289.3	7	451.9	285.7	0.0000	0.0	0.0000	0	0.00
81	1	1	22	272.0	1.00	287.6	7	483.5	277.4	0.0000	0.0	0.0000	0	0.00
81	1	1	23	0.7	1.00	287.6	7	515.1	269.2	0.0000	0.0	0.0000	0	0.00
81	1	1	24	337.2	1.00	287.6	7	546.7	261.0	0.0000	0.0	0.0000	0	0.00

*** NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE PERIOD (8760 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: FLARES ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
357554.00	3799458.00	1.72814	357736.00	3799458.00	1.75063
357889.00	3799458.00	1.84460	358050.00	3799458.00	2.35032
358194.00	3799458.00	2.54903	358346.00	3799458.00	1.83953
358498.00	3799458.00	2.53489	358651.00	3799458.00	3.28317
358764.00	3799458.00	2.93589	358764.00	3799656.00	3.53262
358764.00	3799854.00	1.72190	358965.00	3799854.00	0.96436
358965.00	3799656.00	4.19864	358965.00	3799458.00	2.87491
359108.00	3799458.00	4.62098	359260.00	3799458.00	6.52160
359413.00	3799458.00	3.68732	359559.00	3799458.00	2.76018
359450.00	3799260.00	1.26271	359523.00	3799037.00	2.75081
359718.00	3799068.00	1.48299	359870.00	3799068.00	1.53244
360022.00	3799068.00	0.52277	360196.00	3799068.00	0.05625
360108.00	3798965.00	1.46891	360124.00	3798884.00	1.36375
360164.00	3798808.00	1.15339	360380.00	3798747.00	1.00635
360554.00	3798747.00	1.32802	360642.00	3798671.00	0.57190
360730.00	3798601.00	1.48836	360748.00	3798500.00	1.50777
360910.00	3798506.00	0.07421	361000.00	3798506.00	0.03543
361060.00	3798365.00	0.03537	361121.00	3798243.00	0.00277
361133.00	3798121.00	0.00261	361301.00	3798121.00	0.00230
361454.00	3798121.00	0.00235	361606.00	3798121.00	0.00226
361774.00	3798121.00	0.00257	361940.00	3798121.00	0.00308
361940.00	3798234.00	0.00326	361940.00	3798347.00	0.00338
361940.00	3798499.00	0.00418	361940.00	3798651.00	0.00270
361940.00	3799000.00	0.00204	361910.00	3799128.00	0.00192
361773.00	3799227.00	0.00185	361605.00	3799326.00	0.00169
361501.00	3799425.00	0.00157	361422.00	3799524.00	0.00135
361337.00	3799623.00	0.00134	361241.00	3799723.00	0.00310
361363.00	3799879.00	0.00330	361283.00	3800033.00	0.00654
361165.00	3800188.00	0.00652	361088.00	3800343.00	0.00733
360844.00	3800498.00	0.01380	360386.00	3800651.00	0.02822
360203.00	3800651.00	0.14149	360050.00	3800651.00	2.95555
359918.00	3800651.00	0.63691	359745.00	3800651.00	2.77420
359593.00	3800651.00	3.56278	359441.00	3800651.00	4.62549
359288.00	3800651.00	3.60316	359136.00	3800651.00	3.42690
358983.00	3800651.00	1.92292	358984.00	3800651.00	2.55350
358832.00	3800651.00	1.20034	358679.00	3800651.00	0.34625
358527.00	3800651.00	0.03792	358374.00	3800651.00	0.03268
358222.00	3800651.00	0.05072	358036.00	3800651.00	1.08382
358036.00	3800498.00	1.02070	358036.00	3800279.00	2.26140
357850.00	3800279.00	0.59613	357697.00	3800279.00	0.56096

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE PERIOD (8760 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: FLARES ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
357525.00	3800279.00	0.04027	357554.00	3800190.00	0.67687
357552.00	3800041.00	0.47395	357554.00	3799889.00	0.50302
357554.00	3799736.00	1.62995	357554.00	3799584.00	1.93811
361123.00	3797899.00	0.00323	361435.00	3797019.00	0.00424
361080.00	3795827.00	0.00440	361506.00	3795614.00	0.00438
361720.00	3797883.00	0.00302	361747.00	3797843.00	0.00320
361656.00	3797690.75	0.00392	361507.00	3797685.25	0.00390
361575.00	3797633.25	0.00413	361608.00	3797478.25	0.00450
361865.00	3797503.00	0.00430	361955.00	3797690.00	0.00363
361742.00	3797433.25	0.00454	361565.03	3797391.75	0.00454
361256.00	3797336.75	0.00421	361515.00	3796885.00	0.00427
361553.00	3797891.50	0.00295			

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE PERIOD (8760 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: AREA ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
357554.00	3799458.00	1.85181	357736.00	3799458.00	2.02297
357889.00	3799458.00	2.19227	358050.00	3799458.00	2.40210
358194.00	3799458.00	2.62242	358346.00	3799458.00	2.89591
358498.00	3799458.00	3.22475	358651.00	3799458.00	3.63895
358764.00	3799458.00	4.02253	358764.00	3799656.00	4.43845
358764.00	3799854.00	4.78932	358965.00	3799854.00	6.18091
358965.00	3799656.00	5.46309	358965.00	3799458.00	4.94806
359108.00	3799458.00	5.90297	359260.00	3799458.00	7.43779
359413.00	3799458.00	10.24959	359559.00	3799458.00	17.22571
359450.00	3799260.00	8.80889	359523.00	3799037.00	7.47128
359718.00	3799068.00	12.38072	359870.00	3799068.00	16.31440
360022.00	3799068.00	21.14310	360196.00	3799068.00	49.59440
360108.00	3798965.00	20.64720	360124.00	3798884.00	16.17973
360164.00	3798808.00	14.46363	360380.00	3798747.00	16.06901
360554.00	3798747.00	18.54602	360642.00	3798671.00	17.02350
360730.00	3798601.00	17.31328	360748.00	3798500.00	13.56998
360910.00	3798506.00	28.19256	361000.00	3798506.00	30.48901
361060.00	3798365.00	13.84958	361121.00	3798243.00	10.05573
361133.00	3798121.00	7.87636	361301.00	3798121.00	7.67762
361454.00	3798121.00	7.26356	361606.00	3798121.00	6.61100
361774.00	3798121.00	5.36524	361940.00	3798121.00	4.25835
361940.00	3798234.00	4.81543	361940.00	3798347.00	5.51462
361940.00	3798499.00	6.72178	361940.00	3798651.00	7.33033
361940.00	3799000.00	6.11304	361910.00	3799128.00	5.86406
361773.00	3799227.00	7.40490	361605.00	3799326.00	10.91606
361501.00	3799425.00	11.34295	361422.00	3799524.00	11.01178
361337.00	3799623.00	11.08479	361241.00	3799723.00	11.90505
361363.00	3799879.00	7.15977	361283.00	3800033.00	6.79966
361165.00	3800188.00	6.66982	361088.00	3800343.00	6.03735
360844.00	3800498.00	6.85264	360386.00	3800651.00	10.40465
360203.00	3800651.00	12.98368	360050.00	3800651.00	14.85119
359918.00	3800651.00	15.96069	359745.00	3800651.00	16.25122
359593.00	3800651.00	15.65882	359441.00	3800651.00	14.61468
359288.00	3800651.00	13.12666	359136.00	3800651.00	11.33637
358983.00	3800651.00	9.52409	358984.00	3800651.00	9.53536
358832.00	3800651.00	7.92558	358679.00	3800651.00	6.52127
358527.00	3800651.00	5.36349	358374.00	3800651.00	4.42341
358222.00	3800651.00	3.68144	358036.00	3800651.00	2.98914
358036.00	3800498.00	2.79188	358036.00	3800279.00	2.69724
357850.00	3800279.00	2.40202	357697.00	3800279.00	2.20643

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE PERIOD (8760 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: AREA ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
357525.00	3800279.00	2.02151	357554.00	3800190.00	2.06271
357552.00	3800041.00	2.08978	357554.00	3799889.00	2.10668
357554.00	3799736.00	2.07702	357554.00	3799584.00	1.96948
361123.00	3797899.00	5.64357	361435.00	3797019.00	2.37418
361080.00	3795827.00	1.50927	361506.00	3795614.00	1.22871
361720.00	3797883.00	4.22514	361747.00	3797843.00	3.93578
361656.00	3797690.75	3.60163	361507.00	3797685.25	3.91358
361575.00	3797633.25	3.58216	361608.00	3797478.25	3.04133
361865.00	3797503.00	2.59704	361955.00	3797690.00	2.82554
361742.00	3797433.25	2.68879	361565.03	3797391.75	2.90153
361256.00	3797336.75	3.15825	361515.00	3796885.00	2.10098
361553.00	3797891.50	4.85814			

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE PERIOD (8760 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 , AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
357554.00	3799458.00	3.57994	357736.00	3799458.00	3.77360
357889.00	3799458.00	4.03686	358050.00	3799458.00	4.75242
358194.00	3799458.00	5.17143	358346.00	3799458.00	4.73545
358498.00	3799458.00	5.75964	358651.00	3799458.00	6.92212
358764.00	3799458.00	6.95838	358764.00	3799656.00	7.97105
358764.00	3799854.00	6.51121	358965.00	3799854.00	7.14525
358965.00	3799656.00	9.66173	358965.00	3799458.00	7.82296
359108.00	3799458.00	10.52392	359260.00	3799458.00	13.95937
359413.00	3799458.00	13.93690	359559.00	3799458.00	19.98573
359450.00	3799260.00	10.07158	359523.00	3799037.00	10.22208
359718.00	3799068.00	13.86370	359870.00	3799068.00	17.84685
360022.00	3799068.00	21.66584	360196.00	3799068.00	49.65057
360108.00	3798965.00	22.11609	360124.00	3798884.00	17.54345
360164.00	3798808.00	15.61696	360380.00	3798747.00	17.07528
360554.00	3798747.00	19.87399	360642.00	3798671.00	17.59540
360730.00	3798601.00	18.80163	360748.00	3798500.00	15.07775
360910.00	3798506.00	28.26674	361000.00	3798506.00	30.52438
361060.00	3798365.00	13.88495	361121.00	3798243.00	10.05849
361133.00	3798121.00	7.87897	361301.00	3798121.00	7.67992
361454.00	3798121.00	7.26591	361606.00	3798121.00	6.61326
361774.00	3798121.00	5.36781	361940.00	3798121.00	4.26143
361940.00	3798234.00	4.81869	361940.00	3798347.00	5.51799
361940.00	3798499.00	6.72595	361940.00	3798651.00	7.33303
361940.00	3799000.00	6.11508	361910.00	3799128.00	5.86598
361773.00	3799227.00	7.40674	361605.00	3799326.00	10.91774
361501.00	3799425.00	11.34452	361422.00	3799524.00	11.01313
361337.00	3799623.00	11.08613	361241.00	3799723.00	11.90813
361363.00	3799879.00	7.16307	361283.00	3800033.00	6.80620
361165.00	3800188.00	6.67634	361088.00	3800343.00	6.04468
360844.00	3800498.00	6.86643	360386.00	3800651.00	10.43284
360203.00	3800651.00	13.12516	360050.00	3800651.00	17.80676
359918.00	3800651.00	16.59756	359745.00	3800651.00	19.02543
359593.00	3800651.00	19.22154	359441.00	3800651.00	19.24009
359288.00	3800651.00	16.72976	359136.00	3800651.00	14.76326
358983.00	3800651.00	11.44695	358984.00	3800651.00	12.08878
358832.00	3800651.00	9.12588	358679.00	3800651.00	6.86754
358527.00	3800651.00	5.40139	358374.00	3800651.00	4.45608
358222.00	3800651.00	3.73216	358036.00	3800651.00	4.07296
358036.00	3800498.00	3.81255	358036.00	3800279.00	4.95862
357850.00	3800279.00	2.99814	357697.00	3800279.00	2.76739

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE PERIOD (8760 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 , AREA1 , AREA2 ,
AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
357525.00	3800279.00	2.06178	357554.00	3800190.00	2.73958
357552.00	3800041.00	2.56371	357554.00	3799889.00	2.60969
357554.00	3799736.00	3.70696	357554.00	3799584.00	3.90758
361123.00	3797899.00	5.64680	361435.00	3797019.00	2.37842
361080.00	3795827.00	1.51366	361506.00	3795614.00	1.23309
361720.00	3797883.00	4.22816	361747.00	3797843.00	3.93898
361656.00	3797690.75	3.60554	361507.00	3797685.25	3.91748
361575.00	3797633.25	3.58629	361608.00	3797478.25	3.04582
361865.00	3797503.00	2.60134	361955.00	3797690.00	2.82917
361742.00	3797433.25	2.69333	361565.03	3797391.75	2.90606
361256.00	3797336.75	3.16246	361515.00	3796885.00	2.10525
361553.00	3797891.50	4.86110			

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: FLARES ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357554.00	3799458.00	36.96059	(81022606)	357736.00	3799458.00	37.28822	(81090823)
357889.00	3799458.00	38.94313	(81090823)	358050.00	3799458.00	50.93144	(81090823)
358194.00	3799458.00	54.76234	(81090823)	358346.00	3799458.00	40.74738	(81022606)
358498.00	3799458.00	54.46066	(81022606)	358651.00	3799458.00	72.84104	(81122401)
358764.00	3799458.00	61.64740	(81010804)	358764.00	3799656.00	59.53923	(81010807)
358764.00	3799854.00	34.67165	(81122903)	358965.00	3799854.00	24.45311	(81082421)
358965.00	3799656.00	65.54857	(81022706)	358965.00	3799458.00	57.06931	(81101606)
359108.00	3799458.00	85.36284	(81012603)	359260.00	3799458.00	89.50423	(81030906)
359413.00	3799458.00	46.21644	(81061022)	359559.00	3799458.00	33.48212	(81082723)
359450.00	3799260.00	33.94661	(81082723)	359523.00	3799037.00	46.05816	(81022706)
359718.00	3799068.00	40.52662	(81082723)	359870.00	3799068.00	47.58114	(81082723)
360022.00	3799068.00	37.20095	(81050803)	360196.00	3799068.00	25.62010	(81020119)
360108.00	3798965.00	63.58728	(81011821)	360124.00	3798884.00	61.05438	(81061523)
360164.00	3798808.00	63.46708	(81061523)	360380.00	3798747.00	75.46881	(81061523)
360554.00	3798747.00	94.78450	(81061523)	360642.00	3798671.00	77.51585	(81111203)
360730.00	3798601.00	97.30450	(81020102)	360748.00	3798500.00	90.36223	(81020102)
360910.00	3798506.00	63.95538	(81010618)	361000.00	3798506.00	29.74977	(81010618)
361060.00	3798365.00	28.84912	(81111720)	361121.00	3798243.00	1.72368	(81071210)
361133.00	3798121.00	1.44248	(81050811)	361301.00	3798121.00	1.13391	(81050713)
361454.00	3798121.00	1.32509	(81050713)	361606.00	3798121.00	1.54527	(81061210)
361774.00	3798121.00	1.95872	(81061210)	361940.00	3798121.00	2.14379	(81050812)
361940.00	3798234.00	2.18732	(81050812)	361940.00	3798347.00	1.98646	(81051611)
361940.00	3798499.00	2.32112	(81050811)	361940.00	3798651.00	1.56755	(81082011)
361940.00	3799000.00	1.10572	(81070312)	361910.00	3799128.00	0.98916	(81082711)
361773.00	3799227.00	1.19262	(81052011)	361605.00	3799326.00	1.29700	(81050811)
361501.00	3799425.00	0.99377	(81082711)	361422.00	3799524.00	1.11423	(81082711)
361337.00	3799623.00	1.27607	(81083012)	361241.00	3799723.00	1.42109	(81082812)
361363.00	3799879.00	2.71869	(81083012)	361283.00	3800033.00	2.22486	(81062410)
361165.00	3800188.00	2.64668	(81061811)	361088.00	3800343.00	2.64942	(81061811)
360844.00	3800498.00	1.76309	(81081911)	360386.00	3800651.00	2.39940	(81062311)
360203.00	3800651.00	10.50895	(81042920)	360050.00	3800651.00	32.84527	(81020406)
359918.00	3800651.00	14.46077	(81061022)	359745.00	3800651.00	29.48246	(81022607)
359593.00	3800651.00	43.02488	(81022707)	359441.00	3800651.00	49.54710	(81121301)
359288.00	3800651.00	40.34134	(81022220)	359136.00	3800651.00	38.00331	(81021724)
358983.00	3800651.00	25.92696	(81020106)	358984.00	3800651.00	31.92438	(81020106)
358832.00	3800651.00	19.71050	(81112904)	358679.00	3800651.00	8.66129	(81121521)
358527.00	3800651.00	2.04035	(81072910)	358374.00	3800651.00	2.21589	(81111212)
358222.00	3800651.00	2.20820	(81052422)	358036.00	3800651.00	19.31231	(81022705)
358036.00	3800498.00	19.68259	(81040406)	358036.00	3800279.00	33.15659	(81022706)
357850.00	3800279.00	14.67316	(81022706)	357697.00	3800279.00	13.97678	(81022706)

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: FLARES ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357525.00	3800279.00	2.18818	(81121521)	357554.00	3800190.00	16.05046	(81022706)
357552.00	3800041.00	12.79977	(81022706)	357554.00	3799889.00	13.74153	(81022606)
357554.00	3799736.00	33.05302	(81022606)	357554.00	3799584.00	41.12645	(81030301)
361123.00	3797899.00	1.97337	(81050811)	361435.00	3797019.00	1.87742	(81061210)
361080.00	3795827.00	2.01494	(81042210)	361506.00	3795614.00	1.75021	(81042210)
361720.00	3797883.00	1.70967	(81050811)	361747.00	3797843.00	1.91954	(81050811)
361656.00	3797690.75	2.56812	(81050811)	361507.00	3797685.25	2.28977	(81050811)
361575.00	3797633.25	2.49376	(81050811)	361608.00	3797478.25	2.37395	(81050811)
361865.00	3797503.00	2.49891	(81050811)	361955.00	3797690.00	2.06034	(81050811)
361742.00	3797433.25	2.47610	(81050811)	361565.03	3797391.75	2.18106	(81051611)
361256.00	3797336.75	1.88463	(81050713)	361515.00	3796885.00	1.87517	(81061210)
361553.00	3797891.50	1.56877	(81050811)				

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: AREA ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357554.00	3799458.00	50.23999	(81110701)	357736.00	3799458.00	52.59799	(81092422)
357889.00	3799458.00	54.86546	(81052302)	358050.00	3799458.00	57.62753	(81122602)
358194.00	3799458.00	60.45900	(81020606)	358346.00	3799458.00	63.90685	(81052101)
358498.00	3799458.00	67.80656	(81092204)	358651.00	3799458.00	72.28847	(81042723)
358764.00	3799458.00	76.07030	(81041122)	358764.00	3799656.00	80.32646	(81120619)
358764.00	3799854.00	82.37119	(81111502)	358965.00	3799854.00	89.60698	(81042822)
358965.00	3799656.00	88.41029	(81010318)	358965.00	3799458.00	84.02512	(81030302)
359108.00	3799458.00	91.28819	(81040401)	359260.00	3799458.00	101.83847	(81110805)
359413.00	3799458.00	117.00501	(81021703)	359559.00	3799458.00	140.74500	(81100622)
359450.00	3799260.00	118.42120	(81070905)	359523.00	3799037.00	144.96867	(81070905)
359718.00	3799068.00	127.28606	(81070905)	359870.00	3799068.00	108.50698	(81070905)
360022.00	3799068.00	118.58339	(81090503)	360196.00	3799068.00	162.57631	(81051722)
360108.00	3798965.00	139.37791	(81090723)	360124.00	3798884.00	129.35591	(81112703)
360164.00	3798808.00	124.80923	(81091221)	360380.00	3798747.00	110.79833	(81102102)
360554.00	3798747.00	112.29385	(81100824)	360642.00	3798671.00	100.68903	(81032805)
360730.00	3798601.00	97.53632	(81061905)	360748.00	3798500.00	102.91698	(81101806)
360910.00	3798506.00	165.97891	(81051622)	361000.00	3798506.00	173.16415	(81070522)
361060.00	3798365.00	131.16885	(81070522)	361121.00	3798243.00	111.58423	(81102102)
361133.00	3798121.00	98.91117	(81011020)	361301.00	3798121.00	101.54161	(81081203)
361454.00	3798121.00	104.56392	(81020220)	361606.00	3798121.00	106.40034	(81122219)
361774.00	3798121.00	107.90086	(81013106)	361940.00	3798121.00	109.37707	(81122507)
361940.00	3798234.00	122.10361	(81060724)	361940.00	3798347.00	139.54059	(81032803)
361940.00	3798499.00	138.92397	(81020219)	361940.00	3798651.00	137.02455	(81102719)
361940.00	3799000.00	113.41878	(81081822)	361910.00	3799128.00	112.04956	(81122519)
361773.00	3799227.00	117.67024	(81122224)	361605.00	3799326.00	89.69073	(81010704)
361501.00	3799425.00	98.91422	(81092105)	361422.00	3799524.00	108.69004	(81032321)
361337.00	3799623.00	94.05191	(81042323)	361241.00	3799723.00	106.62398	(81070602)
361363.00	3799879.00	89.61681	(81081603)	361283.00	3800033.00	81.10597	(81011107)
361165.00	3800188.00	72.85905	(81010707)	361088.00	3800343.00	80.32306	(81052220)
360844.00	3800498.00	95.97255	(81080820)	360386.00	3800651.00	97.80017	(81082505)
360203.00	3800651.00	100.67023	(81012820)	360050.00	3800651.00	104.29224	(81052805)
359918.00	3800651.00	133.48183	(81052805)	359745.00	3800651.00	151.56451	(81052805)
359593.00	3800651.00	157.41071	(81052805)	359441.00	3800651.00	158.25868	(81052805)
359288.00	3800651.00	149.46997	(81052805)	359136.00	3800651.00	126.74933	(81052805)
358983.00	3800651.00	100.23505	(81052805)	358984.00	3800651.00	100.41620	(81052805)
358832.00	3800651.00	89.54799	(81050603)	358679.00	3800651.00	84.17034	(81080201)
358527.00	3800651.00	79.66570	(81100723)	358374.00	3800651.00	75.73619	(81112023)
358222.00	3800651.00	72.31934	(81121205)	358036.00	3800651.00	68.71499	(81100802)
358036.00	3800498.00	68.02059	(81100101)	358036.00	3800279.00	67.10619	(81111501)
357850.00	3800279.00	64.18536	(81033023)	357697.00	3800279.00	62.02060	(81041704)

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: AREA ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357525.00	3800279.00	59.76616	(81122701)	357554.00	3800190.00	59.66066	(81042124)
357552.00	3800041.00	58.61862	(81120619)	357554.00	3799889.00	57.22136	(81041124)
357554.00	3799736.00	55.37063	(81030302)	357554.00	3799584.00	52.90371	(81092204)
361123.00	3797899.00	83.89066	(81072922)	361435.00	3797019.00	59.88158	(81070123)
361080.00	3795827.00	37.77319	(81062301)	361506.00	3795614.00	41.95190	(81082221)
361720.00	3797883.00	90.57514	(81022004)	361747.00	3797843.00	88.64345	(81022004)
361656.00	3797690.75	80.21270	(81072221)	361507.00	3797685.25	78.35938	(81080621)
361575.00	3797633.25	77.04433	(81062201)	361608.00	3797478.25	72.13012	(81091101)
361865.00	3797503.00	75.26774	(81051724)	361955.00	3797690.00	83.24403	(81080903)
361742.00	3797433.25	71.90318	(81101205)	361565.03	3797391.75	69.33029	(81072723)
361256.00	3797336.75	65.09686	(81051822)	361515.00	3796885.00	58.13779	(81052623)
361553.00	3797891.50	88.86433	(81082924)				

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 , AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357554.00	3799458.00	86.83304	(81032102)	357736.00	3799458.00	89.11258	(81122602)
357889.00	3799458.00	92.26846	(81050406)	358050.00	3799458.00	105.19407	(81042301)
358194.00	3799458.00	110.96272	(81100901)	358346.00	3799458.00	98.76407	(81040302)
358498.00	3799458.00	114.26350	(81110801)	358651.00	3799458.00	135.92018	(81121202)
358764.00	3799458.00	127.34248	(81010706)	358764.00	3799656.00	137.49831	(81120306)
358764.00	3799854.00	116.89119	(81022706)	358965.00	3799854.00	114.05459	(81042822)
358965.00	3799656.00	149.63512	(81032901)	358965.00	3799458.00	130.71387	(81052102)
359108.00	3799458.00	163.09642	(81112307)	359260.00	3799458.00	172.56752	(81120921)
359413.00	3799458.00	146.58920	(81121623)	359559.00	3799458.00	174.13127	(81060323)
359450.00	3799260.00	142.25201	(81042221)	359523.00	3799037.00	144.96867	(81070905)
359718.00	3799068.00	127.28606	(81070905)	359870.00	3799068.00	144.24390	(81070303)
360022.00	3799068.00	137.79951	(81030305)	360196.00	3799068.00	162.57631	(81051722)
360108.00	3798965.00	202.96518	(81090723)	360124.00	3798884.00	190.04564	(81112703)
360164.00	3798808.00	148.11040	(81082223)	360380.00	3798747.00	138.55284	(81072124)
360554.00	3798747.00	159.62793	(81100623)	360642.00	3798671.00	132.21140	(81111203)
360730.00	3798601.00	189.40285	(81031407)	360748.00	3798500.00	189.89308	(81010906)
360910.00	3798506.00	165.97891	(81051622)	361000.00	3798506.00	173.16415	(81070522)
361060.00	3798365.00	131.16885	(81070522)	361121.00	3798243.00	111.58423	(81102102)
361133.00	3798121.00	98.91117	(81011020)	361301.00	3798121.00	101.54161	(81081203)
361454.00	3798121.00	104.56392	(81020220)	361606.00	3798121.00	106.40034	(81122219)
361774.00	3798121.00	107.90086	(81013106)	361940.00	3798121.00	109.37707	(81122507)
361940.00	3798234.00	122.10361	(81060724)	361940.00	3798347.00	139.54059	(81032803)
361940.00	3798499.00	138.92397	(81020219)	361940.00	3798651.00	137.02455	(81102719)
361940.00	3799000.00	113.41878	(81081822)	361910.00	3799128.00	112.04956	(81122519)
361773.00	3799227.00	117.67024	(81122224)	361605.00	3799326.00	89.69073	(81010704)
361501.00	3799425.00	98.91422	(81092105)	361422.00	3799524.00	108.69004	(81032321)
361337.00	3799623.00	94.05191	(81042323)	361241.00	3799723.00	106.62398	(81070602)
361363.00	3799879.00	89.61681	(81081603)	361283.00	3800033.00	81.10597	(81011107)
361165.00	3800188.00	72.85905	(81010707)	361088.00	3800343.00	80.32306	(81052220)
360844.00	3800498.00	95.97255	(81080820)	360386.00	3800651.00	97.80017	(81082505)
360203.00	3800651.00	101.49861	(81112604)	360050.00	3800651.00	135.04170	(81020406)
359918.00	3800651.00	133.48183	(81052805)	359745.00	3800651.00	151.56451	(81052805)
359593.00	3800651.00	157.41071	(81052805)	359441.00	3800651.00	158.25868	(81052805)
359288.00	3800651.00	149.46997	(81052805)	359136.00	3800651.00	142.07678	(81100721)
358983.00	3800651.00	121.79067	(81113004)	358984.00	3800651.00	127.51891	(81113004)
358832.00	3800651.00	109.24803	(81012604)	358679.00	3800651.00	89.71017	(81040305)
358527.00	3800651.00	79.68051	(81100723)	358374.00	3800651.00	75.73862	(81112023)
358222.00	3800651.00	72.63713	(81121205)	358036.00	3800651.00	87.84950	(81041502)
358036.00	3800498.00	87.62675	(81122403)	358036.00	3800279.00	100.21613	(81122903)
357850.00	3800279.00	78.83920	(81022706)	357697.00	3800279.00	75.96062	(81041704)

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 , AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357525.00	3800279.00	60.56361	(81122701)	357554.00	3800190.00	75.64984	(81010807)
357552.00	3800041.00	71.30770	(81101407)	357554.00	3799889.00	70.93181	(81121404)
357554.00	3799736.00	88.28395	(81030302)	357554.00	3799584.00	93.96819	(81122307)
361123.00	3797899.00	83.89066	(81072922)	361435.00	3797019.00	59.88158	(81070123)
361080.00	3795827.00	37.77319	(81062301)	361506.00	3795614.00	41.95190	(81082221)
361720.00	3797883.00	90.57514	(81022004)	361747.00	3797843.00	88.64345	(81022004)
361656.00	3797690.75	80.21270	(81072221)	361507.00	3797685.25	78.35938	(81080621)
361575.00	3797633.25	77.04433	(81062201)	361608.00	3797478.25	72.13012	(81091101)
361865.00	3797503.00	75.26774	(81051724)	361955.00	3797690.00	83.24403	(81080903)
361742.00	3797433.25	71.90318	(81101205)	361565.03	3797391.75	69.33029	(81072723)
361256.00	3797336.75	65.09686	(81051822)	361515.00	3796885.00	58.13779	(81052623)
361553.00	3797891.50	88.86433	(81082924)				

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: FLARES ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357554.00	3799458.00	7.94033	(81122624)	357736.00	3799458.00	8.76074	(81122624)
357889.00	3799458.00	8.67543	(81122624)	358050.00	3799458.00	12.32045	(81122624)
358194.00	3799458.00	12.35670	(81120324)	358346.00	3799458.00	8.48707	(81120324)
358498.00	3799458.00	12.56548	(81120324)	358651.00	3799458.00	17.97326	(81120324)
358764.00	3799458.00	14.15312	(81120324)	358764.00	3799656.00	15.09619	(81011824)
358764.00	3799854.00	7.38678	(81122624)	358965.00	3799854.00	6.03815	(81122624)
358965.00	3799656.00	16.32635	(81011824)	358965.00	3799458.00	11.67860	(81120324)
359108.00	3799458.00	20.16184	(81120324)	359260.00	3799458.00	25.81857	(81011824)
359413.00	3799458.00	11.84460	(81121324)	359559.00	3799458.00	10.30477	(81050524)
359450.00	3799260.00	6.67966	(81030324)	359523.00	3799037.00	13.65507	(81120324)
359718.00	3799068.00	7.30210	(81050524)	359870.00	3799068.00	7.91105	(81080424)
360022.00	3799068.00	3.22262	(81031824)	360196.00	3799068.00	1.15189	(81020124)
360108.00	3798965.00	10.59788	(81040124)	360124.00	3798884.00	10.12184	(81040124)
360164.00	3798808.00	9.35217	(81011624)	360380.00	3798747.00	12.06147	(81091724)
360554.00	3798747.00	11.85256	(81061824)	360642.00	3798671.00	4.94364	(81111224)
360730.00	3798601.00	11.63952	(81032024)	360748.00	3798500.00	10.36843	(81043024)
360910.00	3798506.00	3.72586	(81010624)	361000.00	3798506.00	2.32495	(81010624)
361060.00	3798365.00	1.20465	(81111724)	361121.00	3798243.00	0.14244	(81061224)
361133.00	3798121.00	0.12388	(81061224)	361301.00	3798121.00	0.14581	(81061224)
361454.00	3798121.00	0.16248	(81061224)	361606.00	3798121.00	0.16566	(81061224)
361774.00	3798121.00	0.17124	(81061224)	361940.00	3798121.00	0.18826	(81051624)
361940.00	3798234.00	0.20017	(81051624)	361940.00	3798347.00	0.19808	(81051624)
361940.00	3798499.00	0.25139	(81051624)	361940.00	3798651.00	0.15502	(81050824)
361940.00	3799000.00	0.10610	(81050824)	361910.00	3799128.00	0.09324	(81050824)
361773.00	3799227.00	0.09095	(81050824)	361605.00	3799326.00	0.08816	(81050824)
361501.00	3799425.00	0.06773	(81050824)	361422.00	3799524.00	0.04928	(81061624)
361337.00	3799623.00	0.05344	(81083024)	361241.00	3799723.00	0.08859	(81082824)
361363.00	3799879.00	0.12361	(81082824)	361283.00	3800033.00	0.16112	(81082824)
361165.00	3800188.00	0.15977	(81082824)	361088.00	3800343.00	0.16058	(81082824)
360844.00	3800498.00	0.15880	(81062324)	360386.00	3800651.00	0.20320	(81071124)
360203.00	3800651.00	1.08042	(81081124)	360050.00	3800651.00	12.08186	(81010924)
359918.00	3800651.00	2.41812	(81112224)	359745.00	3800651.00	10.97363	(81112224)
359593.00	3800651.00	15.11092	(81010924)	359441.00	3800651.00	14.95345	(81112224)
359288.00	3800651.00	13.06297	(81121824)	359136.00	3800651.00	11.82432	(81121824)
358983.00	3800651.00	7.58445	(81121324)	358984.00	3800651.00	9.34991	(81112224)
358832.00	3800651.00	6.21152	(81011824)	358679.00	3800651.00	1.69226	(81011824)
358527.00	3800651.00	0.25726	(81062724)	358374.00	3800651.00	0.24389	(81062724)
358222.00	3800651.00	0.30185	(81062724)	358036.00	3800651.00	4.89590	(81120324)
358036.00	3800498.00	4.99998	(81120324)	358036.00	3800279.00	8.62132	(81121424)
357850.00	3800279.00	3.60603	(81122624)	357697.00	3800279.00	3.97240	(81122624)

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: FLARES ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357525.00	3800279.00	0.27698	(81121424)	357554.00	3800190.00	3.70399	(81122624)
357552.00	3800041.00	2.65079	(81122624)	357554.00	3799889.00	2.55802	(81112324)
357554.00	3799736.00	7.90067	(81120324)	357554.00	3799584.00	9.09081	(81122624)
361123.00	3797899.00	0.15500	(81061224)	361435.00	3797019.00	0.27809	(81061224)
361080.00	3795827.00	0.25867	(81061224)	361506.00	3795614.00	0.26558	(81061224)
361720.00	3797883.00	0.16710	(81061224)	361747.00	3797843.00	0.16826	(81061224)
361656.00	3797690.75	0.20042	(81061224)	361507.00	3797685.25	0.22556	(81061224)
361575.00	3797633.25	0.22916	(81061224)	361608.00	3797478.25	0.24854	(81061224)
361865.00	3797503.00	0.22077	(81051624)	361955.00	3797690.00	0.18064	(81051624)
361742.00	3797433.25	0.23944	(81051624)	361565.03	3797391.75	0.26285	(81061224)
361256.00	3797336.75	0.27285	(81061224)	361515.00	3796885.00	0.27862	(81061224)
361553.00	3797891.50	0.16757	(81061224)				

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: AREA ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357554.00	3799458.00	7.73885	(81030324)	357736.00	3799458.00	8.29637	(81030324)
357889.00	3799458.00	8.79834	(81030324)	358050.00	3799458.00	9.37934	(81030324)
358194.00	3799458.00	10.18500	(81040124)	358346.00	3799458.00	11.20257	(81040124)
358498.00	3799458.00	12.30507	(81040124)	358651.00	3799458.00	13.49827	(81040124)
358764.00	3799458.00	14.85258	(81041624)	358764.00	3799656.00	17.51181	(81041624)
358764.00	3799854.00	20.24940	(81122624)	358965.00	3799854.00	23.33257	(81120324)
358965.00	3799656.00	20.88250	(81041624)	358965.00	3799458.00	18.81469	(81041624)
359108.00	3799458.00	22.37462	(81041624)	359260.00	3799458.00	27.65796	(81041624)
359413.00	3799458.00	34.93055	(81041624)	359559.00	3799458.00	47.67904	(81041624)
359450.00	3799260.00	29.90703	(81041624)	359523.00	3799037.00	24.46924	(81011624)
359718.00	3799068.00	31.84257	(81011624)	359870.00	3799068.00	44.43851	(81100924)
360022.00	3799068.00	49.17485	(81100924)	360196.00	3799068.00	80.08987	(81100924)
360108.00	3798965.00	47.15110	(81011624)	360124.00	3798884.00	41.71814	(81011624)
360164.00	3798808.00	39.58457	(81100924)	360380.00	3798747.00	52.19961	(81100924)
360554.00	3798747.00	54.13451	(81100924)	360642.00	3798671.00	48.54251	(81100924)
360730.00	3798601.00	45.55342	(81100924)	360748.00	3798500.00	39.03828	(81100924)
360910.00	3798506.00	76.39574	(81100924)	361000.00	3798506.00	77.70751	(81100924)
361060.00	3798365.00	52.08231	(81100924)	361121.00	3798243.00	41.13543	(81100924)
361133.00	3798121.00	33.98251	(81100924)	361301.00	3798121.00	33.34742	(81010524)
361454.00	3798121.00	38.41948	(81010524)	361606.00	3798121.00	41.72595	(81010524)
361774.00	3798121.00	41.95171	(81010524)	361940.00	3798121.00	38.72015	(81010524)
361940.00	3798234.00	41.97142	(81010524)	361940.00	3798347.00	43.26329	(81010524)
361940.00	3798499.00	38.16629	(81022224)	361940.00	3798651.00	37.57708	(81111924)
361940.00	3799000.00	36.22166	(81111924)	361910.00	3799128.00	32.63962	(81111924)
361773.00	3799227.00	30.33211	(81111924)	361605.00	3799326.00	32.34849	(81052024)
361501.00	3799425.00	33.34608	(81111924)	361422.00	3799524.00	32.50407	(81111924)
361337.00	3799623.00	32.84511	(81110224)	361241.00	3799723.00	35.56897	(81110224)
361363.00	3799879.00	22.18747	(81110224)	361283.00	3800033.00	20.51959	(81110224)
361165.00	3800188.00	20.37418	(81110324)	361088.00	3800343.00	21.51813	(81110324)
360844.00	3800498.00	26.17178	(81110324)	360386.00	3800651.00	37.71046	(81102324)
360203.00	3800651.00	38.48850	(81102224)	360050.00	3800651.00	42.57173	(81102224)
359918.00	3800651.00	46.24104	(81120624)	359745.00	3800651.00	49.30616	(81120624)
359593.00	3800651.00	48.19361	(81120624)	359441.00	3800651.00	45.10159	(81120624)
359288.00	3800651.00	42.89125	(81112224)	359136.00	3800651.00	39.46729	(81112224)
358983.00	3800651.00	34.44318	(81112224)	358984.00	3800651.00	34.47670	(81112224)
358832.00	3800651.00	29.30375	(81112224)	358679.00	3800651.00	25.63721	(81011824)
358527.00	3800651.00	22.58019	(81011824)	358374.00	3800651.00	19.32228	(81011824)
358222.00	3800651.00	17.27055	(81120324)	358036.00	3800651.00	16.25244	(81120324)
358036.00	3800498.00	16.20147	(81120324)	358036.00	3800279.00	15.75437	(81122624)
357850.00	3800279.00	14.25158	(81122624)	357697.00	3800279.00	12.83678	(81122624)

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: AREA ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357525.00	3800279.00	11.16106	(81122624)	357554.00	3800190.00	10.04075	(81122624)
357552.00	3800041.00	9.74227	(81122724)	357554.00	3799889.00	8.36549	(81122724)
357554.00	3799736.00	8.99192	(81030324)	357554.00	3799584.00	8.61742	(81030324)
361123.00	3797899.00	26.38767	(81100924)	361435.00	3797019.00	13.92661	(81100924)
361080.00	3795827.00	10.85939	(81100924)	361506.00	3795614.00	9.31920	(81100924)
361720.00	3797883.00	30.67993	(81010524)	361747.00	3797843.00	29.33865	(81010524)
361656.00	3797690.75	21.91308	(81010524)	361507.00	3797685.25	19.23188	(81100924)
361575.00	3797633.25	18.55143	(81010524)	361608.00	3797478.25	15.71750	(81100924)
361865.00	3797503.00	19.26319	(81010524)	361955.00	3797690.00	25.02072	(81010524)
361742.00	3797433.25	16.22852	(81010524)	361565.03	3797391.75	15.42550	(81100924)
361256.00	3797336.75	17.39334	(81100924)	361515.00	3796885.00	12.44875	(81100924)
361553.00	3797891.50	27.58714	(81010524)				

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 , AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357554.00	3799458.00	14.75028	(81030324)	357736.00	3799458.00	15.46458	(81030324)
357889.00	3799458.00	15.80680	(81030324)	358050.00	3799458.00	18.67318	(81122624)
358194.00	3799458.00	18.94464	(81122424)	358346.00	3799458.00	17.05259	(81121224)
358498.00	3799458.00	21.06885	(81121224)	358651.00	3799458.00	27.25846	(81122424)
358764.00	3799458.00	25.20889	(81041624)	358764.00	3799656.00	28.66390	(81041624)
358764.00	3799854.00	27.63618	(81122624)	358965.00	3799854.00	29.31321	(81122624)
358965.00	3799656.00	31.44154	(81122624)	358965.00	3799458.00	27.66652	(81041624)
359108.00	3799458.00	36.34209	(81120324)	359260.00	3799458.00	43.65840	(81041624)
359413.00	3799458.00	44.94401	(81041624)	359559.00	3799458.00	53.61797	(81120324)
359450.00	3799260.00	33.44986	(81011624)	359523.00	3799037.00	33.14112	(81011624)
359718.00	3799068.00	35.55792	(81031824)	359870.00	3799068.00	44.43877	(81100924)
360022.00	3799068.00	49.17485	(81100924)	360196.00	3799068.00	80.08987	(81100924)
360108.00	3798965.00	55.09952	(81011624)	360124.00	3798884.00	49.31084	(81011624)
360164.00	3798808.00	40.38114	(81011624)	360380.00	3798747.00	52.19961	(81100924)
360554.00	3798747.00	56.77814	(81100924)	360642.00	3798671.00	50.18158	(81100924)
360730.00	3798601.00	49.39842	(81100924)	360748.00	3798500.00	42.69383	(81100924)
360910.00	3798506.00	76.47997	(81100924)	361000.00	3798506.00	77.70751	(81100924)
361060.00	3798365.00	52.08231	(81100924)	361121.00	3798243.00	41.13543	(81100924)
361133.00	3798121.00	33.98251	(81100924)	361301.00	3798121.00	33.34742	(81010524)
361454.00	3798121.00	38.41948	(81010524)	361606.00	3798121.00	41.72595	(81010524)
361774.00	3798121.00	41.95171	(81010524)	361940.00	3798121.00	38.72015	(81010524)
361940.00	3798234.00	41.97142	(81010524)	361940.00	3798347.00	43.26329	(81010524)
361940.00	3798499.00	38.16629	(81022224)	361940.00	3798651.00	37.57710	(81111924)
361940.00	3799000.00	36.22166	(81111924)	361910.00	3799128.00	32.63962	(81111924)
361773.00	3799227.00	30.33211	(81111924)	361605.00	3799326.00	32.38681	(81052024)
361501.00	3799425.00	33.34608	(81111924)	361422.00	3799524.00	32.50407	(81111924)
361337.00	3799623.00	32.84511	(81110224)	361241.00	3799723.00	35.56897	(81110224)
361363.00	3799879.00	22.18747	(81110224)	361283.00	3800033.00	20.51959	(81110224)
361165.00	3800188.00	20.37418	(81110324)	361088.00	3800343.00	21.51813	(81110324)
360844.00	3800498.00	26.17178	(81110324)	360386.00	3800651.00	37.71046	(81102324)
360203.00	3800651.00	38.62176	(81102224)	360050.00	3800651.00	51.85929	(81120624)
359918.00	3800651.00	48.23006	(81120624)	359745.00	3800651.00	59.86741	(81120624)
359593.00	3800651.00	60.58525	(81120624)	359441.00	3800651.00	58.48358	(81112224)
359288.00	3800651.00	55.02809	(81112224)	359136.00	3800651.00	51.17073	(81112224)
358983.00	3800651.00	41.67581	(81112224)	358984.00	3800651.00	43.82661	(81112224)
358832.00	3800651.00	34.67316	(81011824)	358679.00	3800651.00	27.32947	(81011824)
358527.00	3800651.00	22.58806	(81011824)	358374.00	3800651.00	19.32652	(81011824)
358222.00	3800651.00	17.34735	(81120324)	358036.00	3800651.00	21.14834	(81120324)
358036.00	3800498.00	21.20146	(81120324)	358036.00	3800279.00	23.98778	(81122624)
357850.00	3800279.00	17.85761	(81122624)	357697.00	3800279.00	16.80918	(81122624)

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 , AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
357525.00	3800279.00	11.36956	(81122624)	357554.00	3800190.00	13.74474	(81122624)
357552.00	3800041.00	11.84880	(81122724)	357554.00	3799889.00	10.65361	(81122724)
357554.00	3799736.00	14.38840	(81121224)	357554.00	3799584.00	15.91086	(81030324)
361123.00	3797899.00	26.38767	(81100924)	361435.00	3797019.00	13.92661	(81100924)
361080.00	3795827.00	10.85939	(81100924)	361506.00	3795614.00	9.31920	(81100924)
361720.00	3797883.00	30.67993	(81010524)	361747.00	3797843.00	29.33865	(81010524)
361656.00	3797690.75	21.91308	(81010524)	361507.00	3797685.25	19.23188	(81100924)
361575.00	3797633.25	18.55143	(81010524)	361608.00	3797478.25	15.71750	(81100924)
361865.00	3797503.00	19.26319	(81010524)	361955.00	3797690.00	25.02072	(81010524)
361742.00	3797433.25	16.22852	(81010524)	361565.03	3797391.75	15.42550	(81100924)
361256.00	3797336.75	17.39334	(81100924)	361515.00	3796885.00	12.44875	(81100924)
361553.00	3797891.50	27.58714	(81010524)				

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE MAXIMUM 50 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: FLARES ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 ,

** CONC OF PM10 IN MICROGRAMS/M**3 **

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE
1.	97.30450	(81020102)	AT (	360730.00, 3798601.00)	DC	26.	94.54948	(81022506)	AT (	360730.00, 3798601.00)	DC
2.	96.80122	(81010906)	AT (	360730.00, 3798601.00)	DC	27.	94.54948	(81032701)	AT (	360730.00, 3798601.00)	DC
3.	96.80122	(81031407)	AT (	360730.00, 3798601.00)	DC	28.	94.54843	(81021624)	AT (	360554.00, 3798747.00)	DC
4.	96.80122	(81040306)	AT (	360730.00, 3798601.00)	DC	29.	94.54842	(81060322)	AT (	360554.00, 3798747.00)	DC
5.	95.88127	(81022604)	AT (	360730.00, 3798601.00)	DC	30.	94.54842	(81071722)	AT (	360554.00, 3798747.00)	DC
6.	95.46426	(81030804)	AT (	360730.00, 3798601.00)	DC	31.	94.54842	(81071723)	AT (	360554.00, 3798747.00)	DC
7.	94.96478	(81012403)	AT (	360730.00, 3798601.00)	DC	32.	94.54842	(81072124)	AT (	360554.00, 3798747.00)	DC
8.	94.96478	(81112106)	AT (	360730.00, 3798601.00)	DC	33.	94.54842	(81082223)	AT (	360554.00, 3798747.00)	DC
9.	94.78450	(81061523)	AT (	360554.00, 3798747.00)	DC	34.	94.53197	(81071724)	AT (	360554.00, 3798747.00)	DC
10.	94.75555	(81082420)	AT (	360554.00, 3798747.00)	DC	35.	94.53197	(81083124)	AT (	360554.00, 3798747.00)	DC
11.	94.66774	(81082603)	AT (	360554.00, 3798747.00)	DC	36.	94.53196	(81080824)	AT (	360554.00, 3798747.00)	DC
12.	94.63815	(81070424)	AT (	360554.00, 3798747.00)	DC	37.	94.53194	(81091422)	AT (	360554.00, 3798747.00)	DC
13.	94.62194	(81110318)	AT (	360554.00, 3798747.00)	DC	38.	94.51544	(81100520)	AT (	360554.00, 3798747.00)	DC
14.	94.59212	(81061803)	AT (	360554.00, 3798747.00)	DC	39.	94.51543	(81021423)	AT (	360554.00, 3798747.00)	DC
15.	94.59211	(81070504)	AT (	360554.00, 3798747.00)	DC	40.	94.51543	(81021521)	AT (	360554.00, 3798747.00)	DC
16.	94.59211	(81080422)	AT (	360554.00, 3798747.00)	DC	41.	94.51543	(81071101)	AT (	360554.00, 3798747.00)	DC
17.	94.59211	(81082905)	AT (	360554.00, 3798747.00)	DC	42.	94.51543	(81071201)	AT (	360554.00, 3798747.00)	DC
18.	94.59211	(81091702)	AT (	360554.00, 3798747.00)	DC	43.	94.51543	(81083004)	AT (	360554.00, 3798747.00)	DC
19.	94.57850	(81021921)	AT (	360554.00, 3798747.00)	DC	44.	94.51543	(81100623)	AT (	360554.00, 3798747.00)	DC
20.	94.57850	(81091903)	AT (	360554.00, 3798747.00)	DC	45.	94.51542	(81061903)	AT (	360554.00, 3798747.00)	DC
21.	94.56211	(81061804)	AT (	360554.00, 3798747.00)	DC	46.	94.51542	(81080402)	AT (	360554.00, 3798747.00)	DC
22.	94.56211	(81061823)	AT (	360554.00, 3798747.00)	DC	47.	94.50163	(81071803)	AT (	360554.00, 3798747.00)	DC
23.	94.56211	(81090905)	AT (	360554.00, 3798747.00)	DC	48.	94.50163	(81091002)	AT (	360554.00, 3798747.00)	DC
24.	94.56211	(81091705)	AT (	360554.00, 3798747.00)	DC	49.	94.50163	(81092622)	AT (	360554.00, 3798747.00)	DC
25.	94.56211	(81100620)	AT (	360554.00, 3798747.00)	DC	50.	94.50162	(81052722)	AT (	360554.00, 3798747.00)	DC

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE MAXIMUM 50 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: AREA ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

** CONC OF PM10 IN MICROGRAMS/M**3 **

RANK	CONC	(YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE	RANK	CONC	(YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE
1.	173.16415	(81070522) AT	(361000.00, 3798506.00) DC	26.	172.74802	(81072301) AT	(361000.00, 3798506.00) DC
2.	173.14789	(81120118) AT	(361000.00, 3798506.00) DC	27.	172.70937	(81052324) AT	(361000.00, 3798506.00) DC
3.	173.14671	(81122202) AT	(361000.00, 3798506.00) DC	28.	172.67889	(81091021) AT	(361000.00, 3798506.00) DC
4.	173.14583	(81073023) AT	(361000.00, 3798506.00) DC	29.	172.67439	(81071304) AT	(361000.00, 3798506.00) DC
5.	173.14503	(81052321) AT	(361000.00, 3798506.00) DC	30.	172.67244	(81101707) AT	(361000.00, 3798506.00) DC
6.	173.14250	(81010506) AT	(361000.00, 3798506.00) DC	31.	172.64406	(81073121) AT	(361000.00, 3798506.00) DC
7.	173.14165	(81032621) AT	(361000.00, 3798506.00) DC	32.	172.63078	(81052623) AT	(361000.00, 3798506.00) DC
8.	173.12549	(81021604) AT	(361000.00, 3798506.00) DC	33.	172.62057	(81090722) AT	(361000.00, 3798506.00) DC
9.	173.12056	(81120119) AT	(361000.00, 3798506.00) DC	34.	172.59589	(81080704) AT	(361000.00, 3798506.00) DC
10.	173.10834	(81033102) AT	(361000.00, 3798506.00) DC	35.	172.59102	(81051901) AT	(361000.00, 3798506.00) DC
11.	173.10358	(81090122) AT	(361000.00, 3798506.00) DC	36.	172.55681	(81051003) AT	(361000.00, 3798506.00) DC
12.	173.08215	(81102102) AT	(361000.00, 3798506.00) DC	37.	172.49939	(81070102) AT	(361000.00, 3798506.00) DC
13.	173.07813	(81110120) AT	(361000.00, 3798506.00) DC	38.	172.46985	(81070123) AT	(361000.00, 3798506.00) DC
14.	173.04155	(81092321) AT	(361000.00, 3798506.00) DC	39.	172.38570	(81092920) AT	(361000.00, 3798506.00) DC
15.	173.04060	(81050722) AT	(361000.00, 3798506.00) DC	40.	172.37480	(81072823) AT	(361000.00, 3798506.00) DC
16.	173.03040	(81111803) AT	(361000.00, 3798506.00) DC	41.	172.34801	(81082921) AT	(361000.00, 3798506.00) DC
17.	173.02341	(81081701) AT	(361000.00, 3798506.00) DC	42.	172.32773	(81101206) AT	(361000.00, 3798506.00) DC
18.	172.94476	(81031821) AT	(361000.00, 3798506.00) DC	43.	172.31946	(81103002) AT	(361000.00, 3798506.00) DC
19.	172.94336	(81080120) AT	(361000.00, 3798506.00) DC	44.	172.31007	(81072822) AT	(361000.00, 3798506.00) DC
20.	172.92618	(81102120) AT	(361000.00, 3798506.00) DC	45.	172.23679	(81091523) AT	(361000.00, 3798506.00) DC
21.	172.86964	(81110420) AT	(361000.00, 3798506.00) DC	46.	172.22247	(81100904) AT	(361000.00, 3798506.00) DC
22.	172.85388	(81011020) AT	(361000.00, 3798506.00) DC	47.	172.21533	(81102807) AT	(361000.00, 3798506.00) DC
23.	172.81186	(81082220) AT	(361000.00, 3798506.00) DC	48.	172.19254	(81072722) AT	(361000.00, 3798506.00) DC
24.	172.78041	(81011906) AT	(361000.00, 3798506.00) DC	49.	172.18039	(81072104) AT	(361000.00, 3798506.00) DC
25.	172.76328	(81110506) AT	(361000.00, 3798506.00) DC	50.	172.17772	(81071105) AT	(361000.00, 3798506.00) DC

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE MAXIMUM 50 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 , AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

** CONC OF PM10 IN MICROGRAMS/M**3 **

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE
1.	202.96518	(81090723)	AT (	360108.00, 3798965.00)	DC	26.	202.92850	(81011821)	AT (	360108.00, 3798965.00)	DC
2.	202.96263	(81062704)	AT (	360108.00, 3798965.00)	DC	27.	202.92850	(81020923)	AT (	360108.00, 3798965.00)	DC
3.	202.95717	(81031806)	AT (	360108.00, 3798965.00)	DC	28.	202.92810	(81071204)	AT (	360108.00, 3798965.00)	DC
4.	202.95470	(81031024)	AT (	360108.00, 3798965.00)	DC	29.	202.92786	(81042004)	AT (	360108.00, 3798965.00)	DC
5.	202.94836	(81070524)	AT (	360108.00, 3798965.00)	DC	30.	202.92656	(81021002)	AT (	360108.00, 3798965.00)	DC
6.	202.94781	(81121901)	AT (	360108.00, 3798965.00)	DC	31.	202.92638	(81012620)	AT (	360108.00, 3798965.00)	DC
7.	202.94766	(81121207)	AT (	360108.00, 3798965.00)	DC	32.	202.92624	(81110802)	AT (	360108.00, 3798965.00)	DC
8.	202.94717	(81050702)	AT (	360108.00, 3798965.00)	DC	33.	202.92587	(81091401)	AT (	360108.00, 3798965.00)	DC
9.	202.94621	(81031107)	AT (	360108.00, 3798965.00)	DC	34.	202.92432	(81071501)	AT (	360108.00, 3798965.00)	DC
10.	202.94583	(81090202)	AT (	360108.00, 3798965.00)	DC	35.	202.92120	(81071904)	AT (	360108.00, 3798965.00)	DC
11.	202.94431	(81083006)	AT (	360108.00, 3798965.00)	DC	36.	202.91998	(81091202)	AT (	360108.00, 3798965.00)	DC
12.	202.94421	(81102319)	AT (	360108.00, 3798965.00)	DC	37.	202.91887	(81071805)	AT (	360108.00, 3798965.00)	DC
13.	202.94202	(81080404)	AT (	360108.00, 3798965.00)	DC	38.	202.91473	(81052105)	AT (	360108.00, 3798965.00)	DC
14.	202.94066	(81122702)	AT (	360108.00, 3798965.00)	DC	39.	202.91399	(81032324)	AT (	360108.00, 3798965.00)	DC
15.	202.94061	(81031804)	AT (	360108.00, 3798965.00)	DC	40.	202.91374	(81081506)	AT (	360108.00, 3798965.00)	DC
16.	202.94044	(81081401)	AT (	360108.00, 3798965.00)	DC	41.	202.91353	(81091006)	AT (	360108.00, 3798965.00)	DC
17.	202.94035	(81122818)	AT (	360108.00, 3798965.00)	DC	42.	202.91283	(81071102)	AT (	360108.00, 3798965.00)	DC
18.	202.93964	(81122103)	AT (	360108.00, 3798965.00)	DC	43.	202.91171	(81080405)	AT (	360108.00, 3798965.00)	DC
19.	202.93936	(81072903)	AT (	360108.00, 3798965.00)	DC	44.	202.90852	(81013105)	AT (	360108.00, 3798965.00)	DC
20.	202.93721	(81101901)	AT (	360108.00, 3798965.00)	DC	45.	202.90208	(81050823)	AT (	360108.00, 3798965.00)	DC
21.	202.93623	(81121907)	AT (	360108.00, 3798965.00)	DC	46.	202.90186	(81080401)	AT (	360108.00, 3798965.00)	DC
22.	202.93309	(81072306)	AT (	360108.00, 3798965.00)	DC	47.	202.89941	(81100706)	AT (	360108.00, 3798965.00)	DC
23.	202.93285	(81072802)	AT (	360108.00, 3798965.00)	DC	48.	202.89841	(81040103)	AT (	360108.00, 3798965.00)	DC
24.	202.93114	(81102307)	AT (	360108.00, 3798965.00)	DC	49.	202.89752	(81042906)	AT (	360108.00, 3798965.00)	DC
25.	202.92883	(81031422)	AT (	360108.00, 3798965.00)	DC	50.	202.89650	(81092202)	AT (	360108.00, 3798965.00)	DC

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
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BD = BOUNDARY

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: FLARES ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 ,

** CONC OF PM10 IN MICROGRAMS/M**3 **

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE
1.	25.81857	(81011824)	AT (	359260.00, 3799458.00)	DC	26.	17.36183	(81100824)	AT (	359260.00, 3799458.00)	DC
2.	20.75805	(81112224)	AT (	359260.00, 3799458.00)	DC	27.	17.05155	(81120224)	AT (	359260.00, 3799458.00)	DC
3.	20.72927	(81122324)	AT (	359260.00, 3799458.00)	DC	28.	16.94048	(81122824)	AT (	359108.00, 3799458.00)	DC
4.	20.59954	(81120324)	AT (	359260.00, 3799458.00)	DC	29.	16.79972	(81090824)	AT (	359260.00, 3799458.00)	DC
5.	20.16184	(81120324)	AT (	359108.00, 3799458.00)	DC	30.	16.71286	(81031724)	AT (	359260.00, 3799458.00)	DC
6.	19.70651	(81010224)	AT (	359260.00, 3799458.00)	DC	31.	16.32635	(81011824)	AT (	358965.00, 3799656.00)	DC
7.	19.70543	(81030824)	AT (	359260.00, 3799458.00)	DC	32.	16.30367	(81120424)	AT (	359260.00, 3799458.00)	DC
8.	19.47735	(81011824)	AT (	359108.00, 3799458.00)	DC	33.	16.25961	(81012424)	AT (	359260.00, 3799458.00)	DC
9.	19.36499	(81121324)	AT (	359260.00, 3799458.00)	DC	34.	16.21723	(81031024)	AT (	359260.00, 3799458.00)	DC
10.	19.26861	(81121624)	AT (	359260.00, 3799458.00)	DC	35.	16.08756	(81012624)	AT (	359108.00, 3799458.00)	DC
11.	19.01521	(81020724)	AT (	359260.00, 3799458.00)	DC	36.	16.00044	(81041624)	AT (	359260.00, 3799458.00)	DC
12.	18.54279	(81050524)	AT (	359260.00, 3799458.00)	DC	37.	15.74636	(81010124)	AT (	359260.00, 3799458.00)	DC
13.	18.32313	(81020224)	AT (	359260.00, 3799458.00)	DC	38.	15.63404	(81042124)	AT (	359260.00, 3799458.00)	DC
14.	18.28677	(81121424)	AT (	359260.00, 3799458.00)	DC	39.	15.59350	(81041224)	AT (	359260.00, 3799458.00)	DC
15.	18.24236	(81122824)	AT (	359260.00, 3799458.00)	DC	40.	15.45236	(81021724)	AT (	359260.00, 3799458.00)	DC
16.	18.20570	(81121824)	AT (	359260.00, 3799458.00)	DC	41.	15.39442	(81011324)	AT (	359260.00, 3799458.00)	DC
17.	18.00343	(81021824)	AT (	359260.00, 3799458.00)	DC	42.	15.29647	(81101524)	AT (	359260.00, 3799458.00)	DC
18.	17.97326	(81120324)	AT (	358651.00, 3799458.00)	DC	43.	15.24041	(81042224)	AT (	359260.00, 3799458.00)	DC
19.	17.87049	(81012624)	AT (	359260.00, 3799458.00)	DC	44.	15.15774	(81010724)	AT (	359260.00, 3799458.00)	DC
20.	17.81122	(81030924)	AT (	359260.00, 3799458.00)	DC	45.	15.11092	(81010924)	AT (	359593.00, 3800651.00)	DC
21.	17.72407	(81080224)	AT (	359260.00, 3799458.00)	DC	46.	15.09619	(81011824)	AT (	358764.00, 3799656.00)	DC
22.	17.65143	(81122424)	AT (	359260.00, 3799458.00)	DC	47.	14.98759	(81090924)	AT (	359260.00, 3799458.00)	DC
23.	17.64457	(81122624)	AT (	359260.00, 3799458.00)	DC	48.	14.95345	(81112224)	AT (	359441.00, 3800651.00)	DC
24.	17.42368	(81122424)	AT (	358651.00, 3799458.00)	DC	49.	14.88688	(81042224)	AT (	359108.00, 3799458.00)	DC
25.	17.39658	(81120524)	AT (	359260.00, 3799458.00)	DC	50.	14.81339	(81080224)	AT (	359108.00, 3799458.00)	DC

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
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DP = DISCPOLR
BD = BOUNDARY

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: AREA ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

** CONC OF PM10 IN MICROGRAMS/M**3 **

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE
1.	80.08987	(81100924)	AT (	360196.00, 3799068.00)	DC	26.	65.96247	(81011524)	AT (	360196.00, 3799068.00)	DC
2.	77.70751	(81100924)	AT (	361000.00, 3798506.00)	DC	27.	65.93085	(81011824)	AT (	360196.00, 3799068.00)	DC
3.	76.39574	(81100924)	AT (	360910.00, 3798506.00)	DC	28.	65.91299	(81122424)	AT (	360196.00, 3799068.00)	DC
4.	76.04749	(81011624)	AT (	360196.00, 3799068.00)	DC	29.	65.86710	(81080224)	AT (	360196.00, 3799068.00)	DC
5.	75.24897	(81041624)	AT (	360196.00, 3799068.00)	DC	30.	65.73164	(81121224)	AT (	360196.00, 3799068.00)	DC
6.	74.26025	(81072824)	AT (	360196.00, 3799068.00)	DC	31.	65.65625	(81040424)	AT (	360196.00, 3799068.00)	DC
7.	74.17512	(81010524)	AT (	361000.00, 3798506.00)	DC	32.	65.36774	(81012624)	AT (	360196.00, 3799068.00)	DC
8.	71.68494	(81031424)	AT (	360196.00, 3799068.00)	DC	33.	65.26806	(81041224)	AT (	360196.00, 3799068.00)	DC
9.	71.51612	(81052724)	AT (	360196.00, 3799068.00)	DC	34.	65.23670	(81072824)	AT (	361000.00, 3798506.00)	DC
10.	70.67065	(81112324)	AT (	360196.00, 3799068.00)	DC	35.	64.98923	(81122824)	AT (	360196.00, 3799068.00)	DC
11.	69.61410	(81111724)	AT (	360196.00, 3799068.00)	DC	36.	64.94224	(81080724)	AT (	360196.00, 3799068.00)	DC
12.	69.56750	(81031824)	AT (	360196.00, 3799068.00)	DC	37.	64.85049	(81050524)	AT (	360196.00, 3799068.00)	DC
13.	68.52602	(81092424)	AT (	360196.00, 3799068.00)	DC	38.	64.84462	(81101224)	AT (	360196.00, 3799068.00)	DC
14.	68.43421	(81092724)	AT (	360196.00, 3799068.00)	DC	39.	64.67547	(81031024)	AT (	360196.00, 3799068.00)	DC
15.	68.13683	(81111524)	AT (	360196.00, 3799068.00)	DC	40.	64.37727	(81091524)	AT (	360196.00, 3799068.00)	DC
16.	67.98931	(81102824)	AT (	360196.00, 3799068.00)	DC	41.	63.99959	(81022724)	AT (	360196.00, 3799068.00)	DC
17.	67.81245	(81121024)	AT (	360196.00, 3799068.00)	DC	42.	63.83272	(81111724)	AT (	361000.00, 3798506.00)	DC
18.	67.61697	(81010824)	AT (	360196.00, 3799068.00)	DC	43.	63.76924	(81122624)	AT (	360196.00, 3799068.00)	DC
19.	67.08057	(81122724)	AT (	360196.00, 3799068.00)	DC	44.	63.54670	(81070924)	AT (	360196.00, 3799068.00)	DC
20.	67.06351	(81020924)	AT (	360196.00, 3799068.00)	DC	45.	63.33457	(81092624)	AT (	360196.00, 3799068.00)	DC
21.	66.89295	(81120324)	AT (	360196.00, 3799068.00)	DC	46.	63.28814	(81041024)	AT (	360196.00, 3799068.00)	DC
22.	66.74149	(81020124)	AT (	360196.00, 3799068.00)	DC	47.	63.22853	(81072824)	AT (	360910.00, 3798506.00)	DC
23.	66.42278	(81020524)	AT (	360196.00, 3799068.00)	DC	48.	63.22555	(81071524)	AT (	360196.00, 3799068.00)	DC
24.	66.41235	(81040924)	AT (	360196.00, 3799068.00)	DC	49.	63.19403	(81072924)	AT (	360196.00, 3799068.00)	DC
25.	66.03763	(81072724)	AT (	360196.00, 3799068.00)	DC	50.	62.86964	(81121824)	AT (	360196.00, 3799068.00)	DC

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): FLARE1 , FLARE2 , FLARE3 , FLARE4 , FLARE5 , AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,

** CONC OF PM10 IN MICROGRAMS/M**3 **

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE
1.	80.08987	(81100924)	AT (	360196.00, 3799068.00)	DC	26.	66.03434	(81011524)	AT (	360196.00, 3799068.00)	DC
2.	77.70751	(81100924)	AT (	361000.00, 3798506.00)	DC	27.	66.00024	(81011824)	AT (	360196.00, 3799068.00)	DC
3.	76.47997	(81100924)	AT (	360910.00, 3798506.00)	DC	28.	65.99738	(81122424)	AT (	360196.00, 3799068.00)	DC
4.	76.19976	(81011624)	AT (	360196.00, 3799068.00)	DC	29.	65.93935	(81080224)	AT (	360196.00, 3799068.00)	DC
5.	75.39449	(81041624)	AT (	360196.00, 3799068.00)	DC	30.	65.90263	(81121224)	AT (	360196.00, 3799068.00)	DC
6.	74.33719	(81072824)	AT (	360196.00, 3799068.00)	DC	31.	65.73975	(81040424)	AT (	360196.00, 3799068.00)	DC
7.	74.17532	(81010524)	AT (	361000.00, 3798506.00)	DC	32.	65.51898	(81012624)	AT (	360196.00, 3799068.00)	DC
8.	71.92602	(81031424)	AT (	360196.00, 3799068.00)	DC	33.	65.35262	(81041224)	AT (	360196.00, 3799068.00)	DC
9.	71.58313	(81052724)	AT (	360196.00, 3799068.00)	DC	34.	65.24978	(81072824)	AT (	361000.00, 3798506.00)	DC
10.	70.74600	(81112324)	AT (	360196.00, 3799068.00)	DC	35.	65.06185	(81122824)	AT (	360196.00, 3799068.00)	DC
11.	69.87608	(81031824)	AT (	360196.00, 3799068.00)	DC	36.	65.02453	(81080724)	AT (	360196.00, 3799068.00)	DC
12.	69.68839	(81111724)	AT (	360196.00, 3799068.00)	DC	37.	65.01331	(81050524)	AT (	360196.00, 3799068.00)	DC
13.	68.80042	(81092424)	AT (	360196.00, 3799068.00)	DC	38.	64.92239	(81101224)	AT (	360196.00, 3799068.00)	DC
14.	68.64974	(81092724)	AT (	360196.00, 3799068.00)	DC	39.	64.81655	(81031024)	AT (	360196.00, 3799068.00)	DC
15.	68.13683	(81111524)	AT (	360196.00, 3799068.00)	DC	40.	64.45440	(81091524)	AT (	360196.00, 3799068.00)	DC
16.	68.06360	(81102824)	AT (	360196.00, 3799068.00)	DC	41.	64.07655	(81022724)	AT (	360196.00, 3799068.00)	DC
17.	67.89338	(81020124)	AT (	360196.00, 3799068.00)	DC	42.	63.84982	(81122624)	AT (	360196.00, 3799068.00)	DC
18.	67.82549	(81121024)	AT (	360196.00, 3799068.00)	DC	43.	63.83301	(81111724)	AT (	361000.00, 3798506.00)	DC
19.	67.70136	(81010824)	AT (	360196.00, 3799068.00)	DC	44.	63.58426	(81070924)	AT (	360196.00, 3799068.00)	DC
20.	67.21134	(81020924)	AT (	360196.00, 3799068.00)	DC	45.	63.47557	(81092624)	AT (	360196.00, 3799068.00)	DC
21.	67.15931	(81122724)	AT (	360196.00, 3799068.00)	DC	46.	63.36336	(81041024)	AT (	360196.00, 3799068.00)	DC
22.	66.89298	(81120324)	AT (	360196.00, 3799068.00)	DC	47.	63.34867	(81071524)	AT (	360196.00, 3799068.00)	DC
23.	66.50439	(81020524)	AT (	360196.00, 3799068.00)	DC	48.	63.31654	(81072824)	AT (	360910.00, 3798506.00)	DC
24.	66.42939	(81040924)	AT (	360196.00, 3799068.00)	DC	49.	63.29672	(81072924)	AT (	360196.00, 3799068.00)	DC
25.	66.06618	(81072724)	AT (	360196.00, 3799068.00)	DC	50.	62.93227	(81011424)	AT (	360196.00, 3799068.00)	DC

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE SUMMARY OF MAXIMUM PERIOD (8760 HRS) RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
FLARES	1ST HIGHEST VALUE IS	6.52160 AT (	359260.00, 3799458.00, 747.00, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	4.62549 AT (	359441.00, 3800651.00, 716.00, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	4.62098 AT (	359108.00, 3799458.00, 739.00, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	4.19864 AT (	358965.00, 3799656.00, 732.00, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	3.68732 AT (	359413.00, 3799458.00, 716.00, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	3.60316 AT (	359288.00, 3800651.00, 701.00, 0.00)	DC	NA
AREA	1ST HIGHEST VALUE IS	49.59440 AT (	360196.00, 3799068.00, 594.00, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	30.48901 AT (	361000.00, 3798506.00, 594.00, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	28.19256 AT (	360910.00, 3798506.00, 602.00, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	21.14310 AT (	360022.00, 3799068.00, 610.00, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	20.64720 AT (	360108.00, 3798965.00, 632.00, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	18.54602 AT (	360554.00, 3798747.00, 655.00, 0.00)	DC	NA
ALL	1ST HIGHEST VALUE IS	49.65057 AT (	360196.00, 3799068.00, 594.00, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	30.52438 AT (	361000.00, 3798506.00, 594.00, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	28.26674 AT (	360910.00, 3798506.00, 602.00, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	22.11609 AT (	360108.00, 3798965.00, 632.00, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	21.66584 AT (	360022.00, 3799068.00, 610.00, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	19.98573 AT (	359559.00, 3799458.00, 686.00, 0.00)	DC	NA

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

GROUP ID	AVERAGE CONC	DATE (YYMMDDHH)	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
FLARES HIGH 1ST HIGH VALUE IS	97.30450	ON 81020102:	AT (360730.00, 3798601.00, 625.00, 0.00)	DC	NA
AREA HIGH 1ST HIGH VALUE IS	173.16415	ON 81070522:	AT (361000.00, 3798506.00, 594.00, 0.00)	DC	NA
ALL HIGH 1ST HIGH VALUE IS	202.96518	ON 81090723:	AT (360108.00, 3798965.00, 632.00, 0.00)	DC	NA

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** THE SUMMARY OF HIGHEST 24-HR RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

GROUP ID	AVERAGE CONC	DATE (YYMMDDHH)	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
FLARES HIGH 1ST HIGH VALUE IS	25.81857	ON 81011824: AT (	359260.00, 3799458.00, 747.00, 0.00)	DC	NA
AREA HIGH 1ST HIGH VALUE IS	80.08987	ON 81100924: AT (	360196.00, 3799068.00, 594.00, 0.00)	DC	NA
ALL HIGH 1ST HIGH VALUE IS	80.08987	ON 81100924: AT (	360196.00, 3799068.00, 594.00, 0.00)	DC	NA

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

**MODELOPTs: CONC RURAL ELEV NOSTD NOBID NOCALM MSGPRO

*** Message Summary : ISCST3 Model Execution ***

--------- Summary of Total Messages --------

A Total of 0 Fatal Error Message(s)
A Total of 0 Warning Message(s)
A Total of 1085 Informational Message(s)

A Total of 1085 Calm Hours Identified

******** FATAL ERROR MESSAGES ********
*** NONE ***

******** WARNING MESSAGES ********
*** NONE ***

****
*** ISCST3 Finishes Successfully ***
****

APPENDIX D4

Revisions to Draft SEIR, Appendix B8, Air Quality Modeling and Wind Speed and Direction Summary

SUNSHINE
Landfill
Site 1
Wind Direction (16Pt)
Hourly Average

February, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	14	13	9	12	13	9	10	15	13	6	6	6	6	6	6	6	6	7	7	7	7	7	7
2	7	7	6	7	7	13	15	15	14	14	15	15	15	15	14	14	15	11	7	7	7	14	14	14
3	15	15	14	15	15	15	15	15	15	16	16	1	7	6	6	6	7	7	10	13	14	14	14	15
4	15	15	15	15	15	15	15	15	14	14	14	15	15	14	14	14	15	15	15	14	14	14	14	14
5	14	14	15	15	15	15	15	15	15															
6											15	15	16	16	15	16	16	16	15	14	14	14	15	15
7	15	15	15	15	15	15	15	15	15	15	14	14	14	14	14	14	14	13	11	14	15	15	14	15
8	15	15	15	15	14	15	13	7	6	6	6	6	6	6	6	8	14	14	14	14	15	14	15	14
9	14	14	15	15	15	15	15	15	15	12	6	6	6	6	6	6	7	7	6	1	16	8	6	7
10	6	13	9	7	7	10	14	14	14	15	9	6	6	6	7	7	6	5	13	14	11	14	12	11
11	14	15	14	14	15	15	15	15	14	14	14	15	14	14	14	14	7	6	6	7	8	9	8	8
12	7	7	6	6	7	12	14	15	5	16	8	6	6	6	14	15	15	15	15	15	15	15	15	14
13	14	14	14	15	15	15	15	15	16	16	16	16	16	16	16	16	16	16	16	15	14	14	14	14
14	14	14	14	14	14	14	14	14	14	14	15	15	16	15	16	16	15	15	15	14	14	14	14	14
15	14	14	14	14	14	14	14	14	14	14	15	15	15	16	15	15	15	15	15	14	14	14	14	15
16	14	14	14	15	14	14	15	15	15	15	15	15	16	7	6	7	7	7	7	11	7	7	6	8
17	7	8	7	7	7	8	7	8	7	6	6	6	6	7	16	15	15	15	15	15	15	15	15	15
18	14	14	14	15	14	14	15	15	15	15	15	15	16	16	16	16	16	15	14	14	14	14	15	15
19	14	14	14	14	14	14	15	14	15	15	15	15	15	15	14	15	15	15	14	14	15	15	15	15
20	15	14	15	15	15	15	15	14	14	15	14	14	14	14	14	14	14	14	14	15	14	14	14	14
21	15	14	15	14	15	15	14	14	15	14	15	15	15	15	15	14	14	13	13	9	14	14	14	14
22	14	14	14	14	14	14	14	14	14	15	15	16	16	16	16	15	15	6	7	14	15	14	14	14
23	14	15	15	15	15	15	15	14	14	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
24	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	15	15	15	15	14
25	14	15	15	15	15	15	15	15	15	15	16	16	16	15	15	15	14	15	14	14	14	14	14	14
26	9	7	7	7	7	7	7	7	7	6	6	6	6	6	6	6	6	8	7	9	7	7	7	7
27	6	6	6	7	6	6	7	7	6	6	6	6	15	14	15	14	15	15	13	10	15	15	15	15
28	15	15	16	15	15	14	14	15	15	15	15	14	15	16	15	15	15	14	14	14	15	15	15	14

SUNSHINE
Landfill
Site 1
Wind Speed (mph)
Hourly Average

February, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	6.2	7.7	5.2	3.1	1.7	1.9	1.8	1.3	2.9	3.1	3.2	5.6	8.7	8.0	8.2	9.5	11.6	10.1	7.8	6.7	6.5	7.4	5.3	3.7
2	5.8	6.7	9.6	9.4	3.2	1.2	3.3	8.1	10.5	14.8	17.6	18.5	22.4	10.0	9.6	9.3	9.0	6.0	5.1	3.1	2.9	7.7	11.6	12.3
3	13.1	14.9	15.2	10.3	12.3	14.5	13.1	10.0	6.2	5.2	6.4	4.4	5.1	7.0	9.7	6.7	5.6	4.5	3.8	3.3	4.3	7.9	8.0	10.5
4	7.8	7.9	6.9	7.8	9.7	11.8	11.4	14.0	17.3	15.7	14.9	12.1	11.8	8.9	8.0	7.1	11.4	18.3	18.0	14.6	10.6	10.8	23.4	19.3
5	18.0	17.0	18.6	20.8	17.7	15.4	13.5	18.8	20.6															
6											27.0	28.8	28.9	23.1	20.1	20.1	20.9	20.8	14.5	13.7	16.7	16.7	15.6	11.5
7	13.0	14.3	13.5	14.3	13.0	12.1	13.0	14.8	13.5	14.4	14.3	12.8	12.3	9.2	7.5	6.1	3.6	3.6	4.1	6.7	8.3	9.0	10.9	12.3
8	9.4	7.3	9.2	10.4	9.3	7.1	2.3	2.7	4.4	6.9	9.1	11.0	10.0	9.5	11.3	8.4	10.5	13.5	14.1	7.2	6.4	9.4	10.3	11.4
9	14.2	14.1	7.4	10.7	11.9	14.6	9.4	10.9	11.3	4.3	8.2	8.6	7.5	7.6	8.8	7.7	5.5	6.2	4.9	2.1	1.5	2.5	3.2	2.8
10	1.8	1.4	1.1	1.9	2.5	2.1	3.2	5.6	6.0	3.8	4.4	9.4	8.7	8.7	8.9	9.7	7.6	3.8	3.7	3.1	4.9	10.6	4.6	1.9
11	4.7	7.5	6.2	6.5	10.6	13.6	13.5	11.0	11.5	10.6	13.1	12.1	12.9	11.6	10.2	9.9	8.1	7.3	5.5	3.6	2.7	2.3	2.8	3.4
12	4.3	5.7	5.3	5.7	3.0	2.6	3.0	0.9	1.6	1.2	2.6	5.5	6.7	6.0	9.5	17.1	29.8	32.8	48.6	47.5	41.1	31.7	30.1	27.7
13	19.3	18.1	15.5	17.3	21.8	25.7	33.4	30.5	28.9	36.1	33.7	24.6	21.7	23.8	25.1	23.0	26.3	23.6	25.2	21.2	18.8	21.5	20.9	23.7
14	25.4	26.9	27.2	27.5	25.5	28.4	27.2	28.8	25.9	24.9	28.1	27.1	28.9	29.2	32.3	31.5	28.4	25.0	21.0	18.9	20.4	18.3	18.2	19.5
15	22.3	21.9	18.8	17.6	24.5	25.8	25.3	22.7	25.5	23.2	17.7	17.1	17.1	17.9	19.2	17.7	16.3	15.7	13.1	13.8	15.0	15.6	15.4	13.2
16	13.7	14.3	12.8	13.1	14.9	13.7	12.7	12.8	15.4	15.3	14.2	12.5	6.0	3.1	4.6	5.2	6.4	5.1	2.8	2.2	2.7	2.1	2.1	3.4
17	3.6	4.9	5.6	5.3	5.2	4.6	3.8	3.6	5.5	7.5	11.3	10.5	14.6	15.2	15.9	19.8	11.3	24.4	24.3	21.8	24.6	30.7	33.6	35.1
18	40.0	37.4	33.1	38.4	32.1	32.6	32.9	32.7	30.9	24.0	25.8	22.2	23.2	12.5	15.1	17.4	16.4	15.2	15.4	13.1	15.2	15.3	14.7	20.1
19	24.1	23.4	24.6	21.5	22.3	20.7	19.5	16.1	13.3	11.0	11.8	15.5	20.4	20.0	20.5	17.8	15.7	13.8	10.8	21.1	26.9	23.1	28.7	30.7
20	29.5	23.7	20.8	23.4	26.5	27.2	29.5	28.1	22.5	25.7	33.4	32.0	26.1	25.6	26.7	26.5	25.9	24.8	23.8	18.5	20.6	24.9	23.0	24.9
21	27.3	25.9	26.3	21.6	24.3	25.8	22.0	26.7	28.3	19.6	18.6	18.6	17.6	15.6	12.8	10.2	7.3	6.9	5.9	3.1	4.9	11.6	15.6	15.5
22	15.2	15.7	16.0	18.0	19.2	18.4	20.0	21.7	26.8	24.0	20.8	23.3	24.2	20.6	12.4	10.3	6.7	10.5	6.9	5.7	13.1	21.0	23.9	23.2
23	21.5	22.3	24.0	23.7	26.0	30.6	27.6	28.9	27.0	26.5	25.1	24.3	22.4	19.2	19.4	20.9	22.6	24.6	23.1	25.5	24.9	23.9	27.7	29.0
24	30.3	29.8	33.3	33.0	32.3	29.9	25.4	24.4	26.6	29.8	30.0	34.0	29.3	29.6	25.5	27.1	23.2	21.0	16.8	15.3	15.4	14.8	14.7	15.8
25	12.6	14.4	22.4	24.7	21.6	20.8	13.9	17.7	25.0	27.0	27.2	24.8	19.1	22.0	22.9	17.1	15.4	13.0	17.7	22.3	17.2	17.8	14.0	11.4
26	3.3	6.1	8.7	8.0	7.0	9.2	6.0	4.5	6.5	7.0	6.5	8.6	10.6	10.1	11.2	9.1	9.2	5.1	7.4	6.5	5.6	7.2	7.3	7.3
27	8.9	11.4	9.3	9.2	10.2	13.3	11.7	10.4	9.2	8.0	6.1	5.0	7.9	9.1	10.5	4.8	10.2	12.8	6.5	5.1	2.9	10.7	26.8	30.3
28	23.7	15.5	13.2	19.1	16.6	15.6	13.0	8.6	14.9	22.0	21.2	20.0	20.0	17.8	22.1	21.4	20.6	16.6	18.8	21.9	20.3	18.1	16.3	17.9

SUNSHINE
Landfill
Site 1
Maximum Gust (mph)
Hourly Average

February, 1997

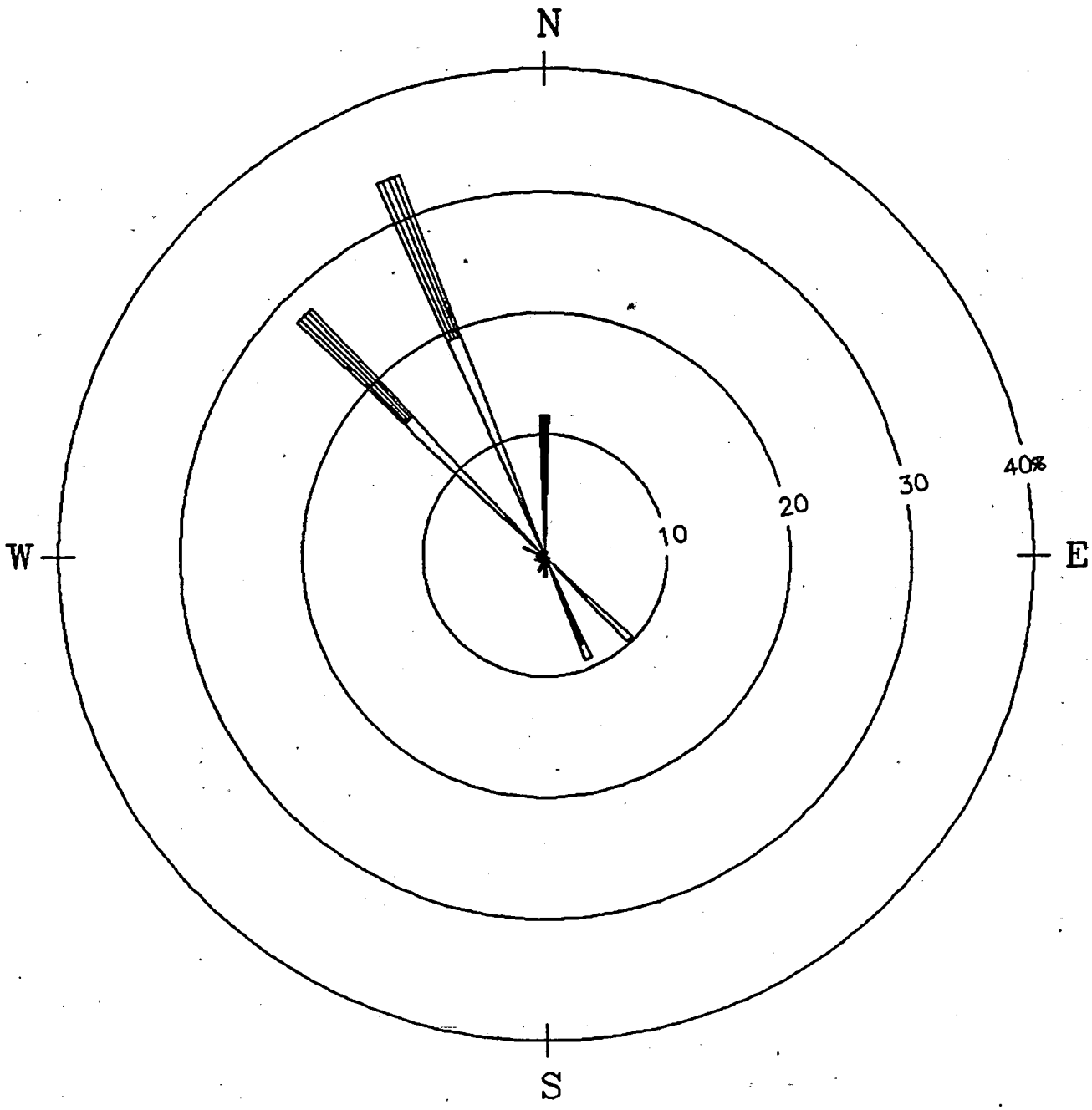
	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	9.7	9.8	8.0	6.2	3.8	4.0	4.0	3.3	4.4	6.9	6.1	9.5	11.8	12.8	13.1	15.1	14.6	14.8	10.3	9.2	10.0	10.1	9.1	6.5
2	9.8	12.0	13.4	15.4	8.0	2.8	6.4	13.4	14.6	19.4	24.6	26.1	35.9	18.7	15.0	17.2	15.3	13.3	11.1	7.8	6.4	14.0	14.1	16.5
3	16.2	17.5	18.0	13.9	15.9	18.6	16.5	13.3	9.1	9.1	9.6	7.6	11.5	13.8	14.7	12.8	13.9	12.6	7.4	6.8	9.3	10.4	13.1	13.2
4	10.8	9.8	9.3	13.5	12.2	14.5	16.5	20.7	22.5	21.5	20.7	17.2	18.3	14.6	12.4	11.7	17.5	24.6	24.9	19.1	14.9	22.4	33.5	26.2
5	23.0	22.5	26.9	27.3	22.7	21.8	19.3	25.4	27.3															
6											35.9	41.3	39.8	31.4	30.1	28.1	28.8	28.5	24.6	17.6	24.7	22.6	20.0	16.2
7	15.9	16.9	17.5	18.1	16.6	14.3	16.4	19.2	16.7	18.3	18.8	18.6	17.7	13.7	11.9	9.3	6.3	5.6	6.3	10.0	10.9	13.5	13.9	14.7
8	14.9	11.9	11.7	12.8	11.8	9.3	4.7	4.7	7.6	10.1	13.0	16.4	14.0	15.7	18.2	16.1	15.3	18.4	19.8	13.1	10.7	15.2	14.9	14.3
9	19.6	19.7	13.6	13.8	19.8	21.3	13.9	17.6	20.6	9.7	12.9	13.2	13.0	11.9	13.6	12.0	10.0	13.3	13.3	4.5	4.0	4.5	5.6	4.5
10	3.6	3.3	2.2	3.1	5.1	4.8	4.5	6.9	8.6	6.8	9.0	14.3	14.6	19.2	16.1	17.4	13.7	9.5	7.4	5.2	13.0	14.5	8.2	4.5
11	8.7	12.5	8.4	9.1	15.3	17.2	16.0	14.9	16.9	17.8	17.6	21.3	18.1	19.6	16.9	16.4	14.1	10.7	9.7	5.8	5.3	7.0	6.7	5.9
12	8.0	9.9	12.0	12.7	5.0	5.6	4.9	2.5	5.3	3.0	4.7	10.2	11.3	11.2	19.5	30.2	46.1	54.7	56.1	56.4	56.9	49.7	45.0	38.8
13	28.7	23.6	22.7	27.0	33.6	38.9	45.6	44.5	43.4	52.7	50.7	46.6	40.6	39.2	38.2	36.1	36.5	34.5	36.9	30.8	25.5	30.0	32.0	30.3
14	31.4	33.8	32.9	32.7	29.8	36.4	37.6	38.4	35.4	34.5	38.4	39.4	41.1	41.5	43.9	42.2	41.0	41.4	29.1	23.7	25.5	22.2	22.0	26.2
15	28.4	30.0	30.0	31.0	34.6	34.8	31.5	30.6	34.1	31.8	26.6	26.4	26.5	27.6	28.6	27.1	24.4	23.5	19.7	20.1	20.5	20.7	22.2	19.6
16	18.5	20.4	16.6	16.1	18.5	18.1	16.5	16.4	19.5	19.7	18.8	16.1	12.3	6.3	7.8	8.1	12.2	9.6	7.1	4.6	4.6	3.8	3.7	6.1
17	5.7	8.8	8.4	7.7	8.0	8.3	6.2	7.6	7.8	11.2	15.8	16.4	19.5	24.7	35.0	31.4	29.6	36.6	37.6	38.3	44.6	47.9	45.7	47.1
18	52.5	46.4	42.5	53.1	46.3	40.2	41.2	41.7	40.2	30.1	35.6	34.3	33.1	28.7	31.0	25.9	26.5	24.7	23.0	20.1	19.6	20.7	19.4	26.3
19	32.2	29.8	30.4	28.7	29.9	26.1	26.9	21.2	19.3	16.1	16.9	21.7	30.5	30.8	27.8	28.0	24.4	22.1	16.6	29.5	37.0	33.7	36.7	40.4
20	37.0	30.4	26.9	34.5	36.0	40.8	41.9	41.4	40.0	46.0	46.1	44.7	39.6	33.6	34.5	37.2	34.3	32.9	33.3	27.9	28.4	31.2	29.2	31.3
21	33.7	32.1	33.8	29.0	31.0	33.2	29.4	39.6	37.4	27.8	29.1	25.2	24.4	24.5	20.2	16.6	11.2	9.0	9.1	7.8	10.2	14.3	21.1	19.3
22	18.4	18.5	23.1	22.8	22.8	22.5	24.6	26.9	35.9	34.3	29.8	33.6	30.8	30.0	24.5	17.4	13.6	15.1	11.9	11.4	18.9	29.0	29.3	28.0
23	25.9	27.6	32.3	32.0	37.3	44.2	41.7	41.6	34.9	43.4	38.6	37.1	34.9	31.3	29.9	33.3	34.1	35.7	37.9	38.0	40.1	44.2	47.5	44.3
24	44.7	52.6	52.1	50.4	47.9	49.3	48.0	34.5	44.0	48.0	47.9	55.5	48.5	44.6	43.9	41.4	36.3	34.7	30.0	22.9	23.1	22.0	20.3	19.6
25	16.1	23.1	30.4	36.4	30.8	28.0	20.3	27.7	33.3	38.2	35.4	35.7	28.2	34.2	33.4	28.2	27.5	22.9	27.9	31.5	26.4	25.7	18.6	19.4
26	7.8	10.0	13.4	12.2	10.8	16.8	14.1	8.7	10.0	12.0	11.6	14.5	17.3	18.3	17.2	15.6	14.4	11.9	10.9	11.9	11.2	10.3	11.4	9.3
27	12.4	14.5	13.1	12.8	15.8	18.1	16.1	15.7	12.4	10.3	8.6	10.2	14.0	13.9	18.0	11.9	21.2	19.1	15.2	13.4	5.9	22.2	46.5	45.6
28	37.0	22.2	19.6	31.7	26.9	26.0	21.1	17.1	25.8	34.4	29.5	28.6	32.0	27.3	33.5	32.9	29.0	27.6	25.3	30.9	28.0	24.6	22.7	23.1

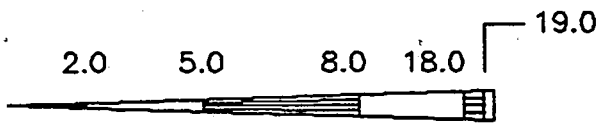
Sunshine Landfill
Site 1

Data: Wind Rose
Station: Sunshine Landfill, Site 1
Period: Feb 1, 1997 - Feb 28, 1997
Hours: 00:00 - 23:00

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.3	0.2	0.3	1.5	9.1	74	11.44	23.11
1	0.2	0.2	0.0	0.0	0.0	2	0.31	3.25
2	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
3	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
4	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
5	0.2	0.2	0.0	0.0	0.0	2	0.31	2.70
6	0.3	1.0	3.4	4.9	0.0	63	9.74	8.09
7	0.3	3.7	3.8	1.3	0.0	60	9.27	5.91
8	0.0	1.5	0.2	0.0	0.0	11	1.70	4.00
9	0.5	0.6	0.2	0.0	0.0	8	1.24	3.20
10	0.3	0.3	0.0	0.0	0.0	4	0.62	3.08
11	0.3	0.3	0.2	0.0	0.0	5	0.77	3.82
12	0.2	0.5	0.0	0.0	0.0	4	0.62	3.30
13	0.6	0.8	0.5	0.0	0.0	12	1.85	3.75
14	0.0	1.2	2.4	12.0	12.0	185	28.59	17.29
15	0.2	0.6	2.3	16.0	14.0	217	33.54	18.02
MSG	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
TOT	3.2	11.0	13.0	36.0	35.0	647	100.00	6.22





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 11.6 PERCENT OF THE TIME.

WINDROSE

SUNSHINE 1
PERIOD: FEB 1997

SUNSHINE
Landfill
Site 1
Wind Direction (16Pt)
Hourly Average

March, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	14	15	15	15	14	15	14	15	14	14	14	14	6	6	7	6	7	7	6	6	9	9	8
2	6	13	15	13	14	6	15	15	15	8	6	6	6	6	6	6	6	6	6	7	7	10	7	9
3	10	12	9	15	14	14	14	14	14	14	14	14	8	6	6	6	6	6	14	15	15	14	14	14
4	14	14	14	14	14	14	14	15	16	16	16	16	16	16	16	16	16	16	15	15	15	15	15	14
5	14	14	14	14	14	14	14	14	14	14	14	14	15	15	15	15	15	14	14	14	14	14	14	15
6	15	15	15	15	15	15	15	15	15	15	16	7	6	6	6	7	7	9	13	14	14	14	14	14
7	14	14	14	14	15	15	15	15	15	15	15	15	11	6	6	6	6	6	7	8	14	15	14	14
8	14	15	14	14	14	14	15	15	15	15	15	15	10	6	6	6	6	6	7	13	15	15	15	15
9	15	15	15	14	15	15	14	14	14	14	14	15	14	15	15	15	16	15	15	14	14	14	14	14
10	15	14	14	14	14	14	14	14	14	14	14	14	15	16	16	16	16	16	14	16	14	15	15	14
11	14	15	15	15	15	15	15	15	16	1	6	6	6	6	6	6	6	6	8	6	7	8	8	15
12	15	15	14	15	15	15	15	15	15	15	15	14	14	15	14	15	15	15	14	15	15	15	15	15
13	15	15	15	14	14	14	14	14	14	14	14	15	15	15	15	14	14	14	14	14	14	14	14	14
14	14	15	14	14	14	14	15	15	15	15	14	15	8	6	6	6	6	6	7	7	8	8	6	7
15	8	6	7	11	6	13	9	12	13	6	6	6	6	6	6	6	6	6	6	6	7	7	7	6
16	7	7	7	7	6	6	7	7	6	6	6	6	6	6	6	7	6	6	7	7	6	7	7	7
17	8																							
26																			7	6	7	7	6	7
27	7	7	6	6	6	6	7	6	7	6	6	6	6	6	6	6	6	6	7	6	6	6	6	6
28	6	16	16	16	16	16	16	16	16	16	16	16	5	6	7	7	6	6	6	7	7	16	16	16
29	16	16	16	16	16	16	16	16	16	16	16	15	16	16	16	16	16	14	7	6	15	11	16	16
30	16	16	16	16	16	16	16	16	16	16	16	16	16	16	6	6	6	6	4	16	16	16	16	16
31	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16

SUNSHINE
Landfill
Site 1
Wind Speed (mph)
Hourly Average

March, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	14.3	16.8	18.9	20.9	20.6	16.4	18.6	21.4	19.9	15.6	10.7	6.8	5.0	7.2	9.2	9.3	11.4	5.5	4.2	4.8	5.4	2.3	4.1	2.7
2	1.2	2.0	2.7	1.8	1.5	2.8	2.8	6.4	4.6	6.9	6.9	8.4	7.9	7.8	8.7	8.4	11.9	11.4	9.9	4.6	3.3	1.8	1.5	0.9
3	0.8	1.6	2.4	13.2	19.6	24.7	25.1	24.7	22.4	18.8	16.5	8.0	7.0	9.8	8.6	9.6	9.4	7.2	5.2	12.6	16.9	24.0	26.8	30.5
4	28.6	25.6	24.8	30.5	29.8	27.5	30.3	29.9	34.3	29.5	33.5	34.9	36.0	32.9	30.2	28.8	32.8	30.8	22.7	21.8	22.4	23.0	24.2	23.5
5	22.5	24.2	27.8	27.9	27.5	27.2	27.4	26.9	25.4	26.4	23.4	23.4	24.7	24.7	22.6	19.7	16.3	17.7	18.0	18.1	16.8	14.6	15.3	15.9
6	16.5	16.4	15.5	17.3	17.3	16.2	13.8	15.7	17.3	12.6	8.4	7.1	9.6	9.9	8.4	6.9	5.6	3.7	6.7	12.9	19.0	22.6	23.3	27.6
7	22.4	20.2	18.1	16.9	17.7	17.0	14.0	14.0	13.8	15.5	13.6	9.5	5.4	7.7	7.2	7.3	10.9	9.9	8.5	3.7	9.3	12.1	12.5	13.5
8	12.6	12.7	17.8	24.4	24.0	12.4	10.2	13.1	19.9	16.7	16.8	10.3	5.1	7.0	10.3	11.1	9.9	7.3	4.3	4.1	15.8	16.1	15.9	14.5
9	13.5	13.6	14.9	15.5	18.8	18.4	21.3	25.8	22.4	21.7	20.6	19.4	15.5	12.2	11.7	13.8	12.3	13.0	11.7	11.6	19.0	21.0	25.1	25.5
10	26.2	22.8	19.2	23.3	24.1	21.9	20.1	23.4	21.5	18.0	19.5	18.9	16.7	15.5	17.4	17.3	15.2	9.0	3.1	1.9	5.6	9.4	11.0	12.8
11	14.4	11.9	7.5	9.0	10.2	9.0	7.3	5.3	3.4	3.0	7.9	11.0	12.5	11.9	11.1	14.1	15.1	9.8	4.4	4.6	4.2	4.2	2.9	3.4
12	5.8	6.0	4.4	8.5	10.3	6.8	10.3	9.7	14.5	16.4	16.5	12.6	7.5	7.7	6.5	14.7	19.3	20.5	23.6	22.2	29.2	32.6	31.9	30.6
13	22.1	21.0	26.1	29.1	24.3	27.5	33.6	32.4	33.1	30.6	27.3	24.6	27.5	26.5	27.0	25.7	27.7	26.9	27.3	22.9	20.2	25.4	25.6	21.4
14	20.2	18.9	19.3	17.2	16.9	17.2	16.1	15.9	17.0	16.6	12.5	7.9	5.9	9.0	9.5	11.9	10.9	9.4	6.6	4.1	3.0	2.7	2.7	3.1
15	2.7	2.1	2.5	2.2	2.0	1.8	1.1	2.4	2.5	5.1	8.1	9.6	10.6	12.4	13.6	13.5	15.0	12.9	9.8	10.9	8.9	7.4	6.6	7.6
16	6.9	6.8	7.5	5.8	4.8	5.2	5.1	5.4	7.3	7.9	8.3	10.3	12.3	13.6	12.9	12.2	11.9	10.4	6.5	8.7	8.5	7.3	7.7	5.8
17	2.0																							
26																			4.4	6.8	5.6	5.6	7.1	9.8
27	9.8	7.4	4.9	6.4	7.1	5.7	3.8	2.9	4.3	6.9	9.3	9.9	10.8	10.3	9.3	9.7	13.0	14.5	9.4	7.3	8.5	10.3	12.1	10.0
28	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	12.7	10.7	10.5	10.3	12.4	11.8	6.4	3.6	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	20.2	19.3	16.7	13.9	10.6	6.4	4.6	2.6	1.1	1.7	0.0	0.0
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	11.9	13.3	13.5	8.7	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SUNSHINE
Landfill
Site 1
Maximum Gust (mph)
Hourly Average

March, 1997

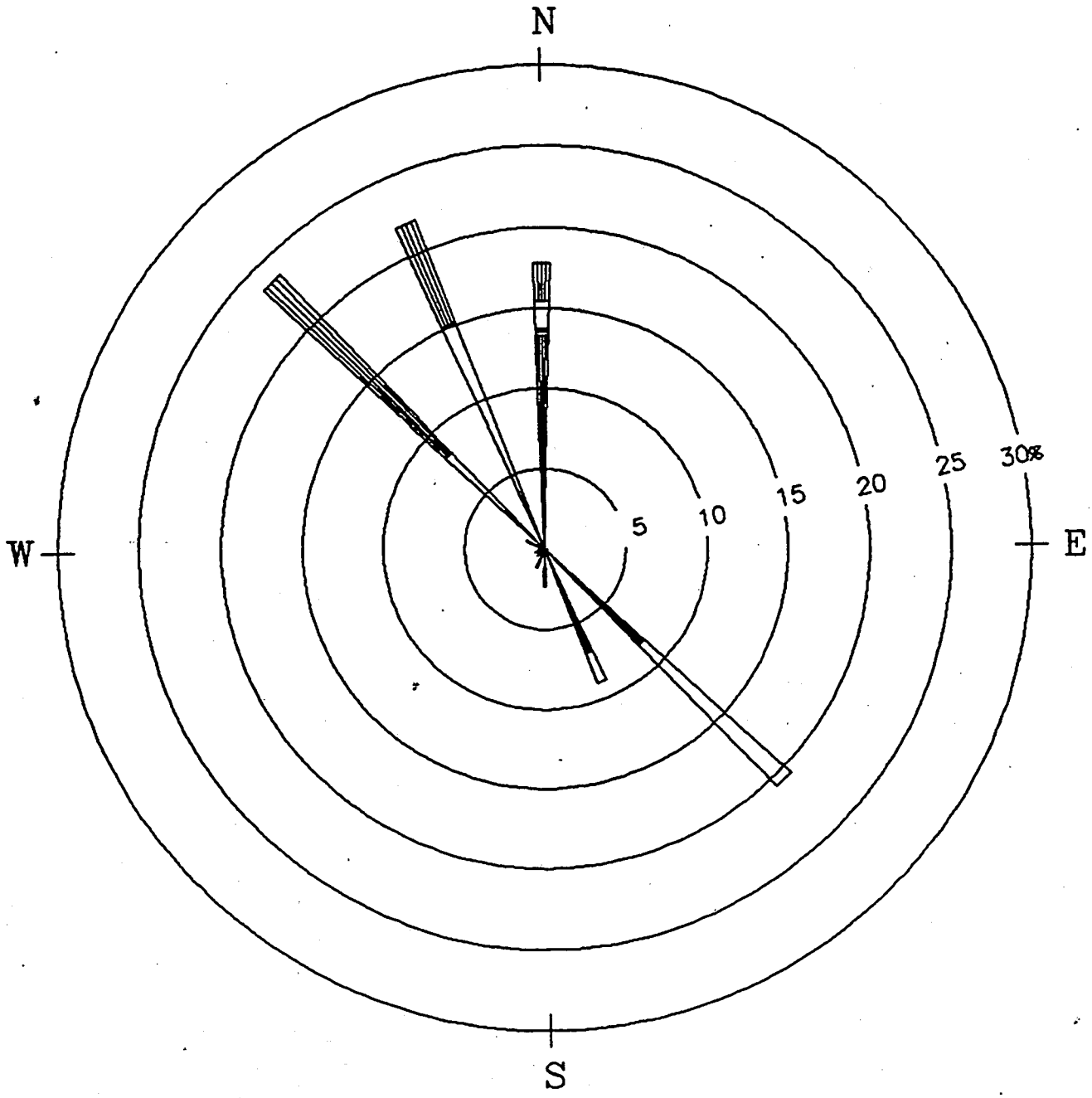
	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	20.7	20.9	25.2	33.8	32.7	21.8	25.0	26.7	25.8	22.7	16.1	13.1	10.4	16.0	15.4	19.0	19.5	12.3	7.8	8.5	10.8	5.8	7.6	5.2
2	2.4	4.0	4.6	3.7	3.5	4.7	5.1	9.3	7.6	12.7	11.4	12.9	13.5	12.9	14.2	16.3	17.8	15.2	16.1	8.4	5.8	5.0	4.5	2.8
3	2.8	4.1	5.5	19.4	26.4	32.2	33.8	29.0	30.8	25.4	23.6	20.7	15.7	16.6	14.1	17.0	14.0	11.4	10.3	21.9	26.3	30.3	34.7	38.6
4	34.0	33.0	29.8	42.4	38.8	34.1	38.8	39.5	46.1	43.5	46.6	48.5	49.7	45.5	47.7	41.8	44.1	41.3	38.0	29.0	29.8	30.4	34.9	32.1
5	29.3	31.4	34.7	34.9	34.3	35.1	33.8	37.0	31.5	34.0	31.1	32.7	33.0	32.7	30.1	29.7	24.4	22.0	21.6	22.3	20.9	18.8	18.9	19.5
6	20.6	19.8	19.7	21.6	21.4	20.3	16.5	22.8	22.0	19.2	14.2	14.2	15.1	16.1	15.7	13.4	12.6	8.1	14.3	17.5	27.2	28.1	29.0	35.6
7	30.4	25.3	22.0	22.5	21.6	20.8	18.6	18.9	18.4	19.0	17.8	15.8	10.9	12.7	12.2	12.0	16.9	13.8	13.8	9.3	13.3	14.4	20.6	19.1
8	17.8	16.6	23.8	32.6	32.6	23.2	15.5	17.2	32.1	25.1	23.6	16.6	11.8	12.1	15.3	16.1	13.7	10.9	7.9	11.0	23.5	22.7	19.9	18.3
9	18.2	17.9	18.4	20.4	23.3	25.4	31.5	34.4	30.6	29.7	28.7	27.8	24.4	18.5	19.7	21.7	23.4	19.5	20.8	17.8	24.3	27.5	30.8	30.8
10	32.6	32.0	26.9	31.0	31.2	30.4	28.5	32.5	32.8	26.7	26.4	27.6	25.1	24.9	26.6	24.6	24.0	20.0	7.6	4.6	11.2	13.5	16.7	16.0
11	18.2	14.8	10.2	10.8	12.6	11.2	9.2	8.3	4.9	4.7	13.8	17.2	18.6	19.1	17.0	20.8	19.8	14.7	8.9	10.0	8.6	6.3	6.1	5.5
12	7.1	9.1	8.8	10.8	13.6	11.6	12.0	13.2	20.7	21.6	23.3	17.4	14.0	15.5	14.2	22.4	30.5	30.9	41.3	34.2	38.4	44.3	43.0	41.1
13	32.4	28.0	36.2	38.0	32.1	41.3	42.6	40.9	40.8	40.1	36.3	34.8	39.5	37.9	35.9	35.0	39.2	34.1	35.3	36.1	26.5	32.4	31.3	28.2
14	28.3	26.4	25.8	22.9	21.9	22.9	20.1	18.7	21.8	22.1	18.3	11.9	11.5	15.6	15.7	16.0	15.3	13.4	10.0	6.2	5.3	5.1	4.5	4.9
15	5.9	4.5	4.1	4.5	3.3	4.0	3.2	4.3	5.1	8.9	13.8	14.5	16.5	16.9	21.8	18.5	19.7	18.2	12.6	14.0	13.3	9.7	11.5	12.3
16	11.1	11.2	11.1	9.3	7.0	7.7	8.0	8.9	10.5	10.6	12.3	17.9	18.6	20.3	18.1	18.0	15.9	16.1	11.5	13.3	11.5	10.1	10.5	9.3
17	4.9																							
26																			9.2	10.8	7.7	8.1	11.6	13.6
27	12.9	12.4	7.8	10.9	10.7	9.5	7.7	6.3	8.5	11.9	15.0	17.1	17.6	18.4	15.1	15.0	21.4	19.4	14.7	9.4	11.6	15.9	16.2	13.2
28	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	18.2	17.6	16.1	15.5	18.5	16.7	12.2	6.5	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.5	28.9	29.8	25.6	27.0	18.4	15.9	8.9	4.7	2.9	7.1	0.0	0.0
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.2	18.7	23.6	19.5	27.5	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

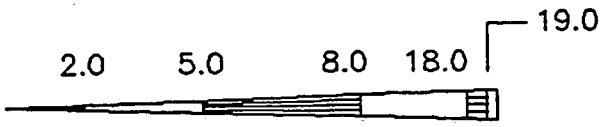
Sunshine Landfill
Site 1

Data: Wind Rose
Station: Sunshine Landfill, Site 1
Period: Mar 1, 1997 - Mar 31, 1997
Hours: 00:00 - 23:00

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	13.0	0.2	0.2	1.7	2.3	94	18.40	5.37
1	0.0	0.2	0.0	0.0	0.0	1	0.20	3.00
2	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
3	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
4	0.0	0.0	0.0	0.2	0.0	1	0.20	8.70
5	0.0	0.2	0.0	0.0	0.0	1	0.20	2.80
6	0.6	2.3	5.2	12.0	0.0	106	20.74	9.11
7	0.2	2.9	3.7	1.9	0.0	45	8.81	6.35
8	0.2	1.5	0.6	0.0	0.0	12	2.35	4.01
9	0.8	0.4	0.0	0.0	0.0	6	1.17	2.42
10	0.4	0.2	0.0	0.0	0.0	3	0.59	2.57
11	0.4	0.2	0.0	0.0	0.0	3	0.59	3.10
12	0.4	0.0	0.0	0.0	0.0	2	0.39	2.00
13	0.6	0.4	0.2	0.0	0.0	6	1.17	3.15
14	0.2	0.8	1.1	6.0	15.0	119	23.29	20.34
15	0.2	1.1	1.5	12.0	6.6	112	21.92	15.72
MSG	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
TOT	17.0	10.0	12.0	34.0	24.0	511	100.00	5.54





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 17.8 PERCENT OF THE TIME.

WINDROSE

SUNSHINE 1
PERIOD: MAR 1997

SUNSHINE
Landfill
Site 1
Wind Direction (Deg)
Hourly Average

April, 1997

	Clock Time (PST)																						
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0																							
9																		334	336	336	334	339	334	336
10	353	347	336	331	328	326	323	320	331	336	336	320	334	323	358	336	355	342	310	310	307	256	117	310
11	328	279	232	305	326	318	336	320	326	331	328	331	320	331	326	247	198	266	315	307	323	334	320	307
12	334	336	331	323	323	331	331	318	336	334	344	358	6	355	350	344	336	342	336	336	336	339	331	328
13	328	331	331	339	326	326	331	328	336	328	323	328	156	137	149	135	140	147	177	225	254	312	318	315
14	326	326	320	347	17	182	323	320	358	358	331	328	172	144	144	144	147	147	168	227	310	328	310	315
15	331	326	312	261	342	328	326	344	336	4	12	179	137	140	140	140	142	151	172	264	334	326	320	328
16	339	299	320	326	318	318	315	344	342	1	220	135	135	137	137	142	156	184	249	305	305	137	328	326
17	284	156	154	170	299	310	318	339	12	137	142	137	140	137	140	140	147	144	147	163	170	140	156	310
18	239	158	154	156	165	328	213	274	274	140	130	133	137	140	137	144	140	144	147	149	154	149	144	156
19	151	149	137	142	149	144	142	140	142	137	133	133	142	137	140	137	140	144	144	140	147	168	168	249
20	342	336	334	339	339	331	331	328	320	323	320	326	323	323	331	328	331	323	328	323	336	328	328	328
21	323	328	328	331	336	323	323	331	331	331	334	334	339	339	342	342	339	334	342	342	328	326	334	334
22	320	328	326	326	320	326	328	331	328	331	323	334	328	315	331	320	320	334	328	328	336	339	339	336
23	336	336	328	334	326	326	328	328	334	334	336	336	336	334	336	334	334	334	339	331	334	339	339	336
24	336	336	336	331	331	331	334	331	318	323	320	318	326	312	312	320	323	328	328	339	328	320	320	320
25	334	334	334	339	347	326	331	339	353	4	6	4	15	6	358	1	12	307	140	147	119	193	193	326
26	334	334	331	328	326	328	336	334	339	336	355	205	140	147	161	172	201	232	284	269	318	256	87	144
27	184	161	154	168	182	165	170	220	144	137	142	140	142	144	142	142	144	142	144	144	144	161	158	161
28	149	144	140	140	147	147	142	137	144	135	137	135	140	140	142	142	142	144	142	140	142	151	151	156
29	161	165	156	151	140	137	193	315	326	318	331	328	320	163	142	140	144	142	142	140	137	156	156	156
30	126	161	193	161	320	331	276	215	220	320	220	292	205	140	140	142	156	339	331	334	339	339	339	334

SUNSHINE
Landfill
Site 1
Wind Direction (16Pt)
Hourly Average

April, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
2	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
3	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
4	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
5	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
6	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
7	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
8	16																							
9																		15	15	15	15	15	15	15
10	16	15	15	15	15	14	14	14	15	15	15	14	15	14	16	15	16	15	14	14	14	11	5	14
11	15	12	10	14	14	14	15	14	14	15	15	15	14	15	14	11	9	12	14	14	14	15	14	14
12	15	15	15	14	14	15	15	14	15	15	15	16	16	16	16	15	15	15	15	15	15	15	15	15
13	15	15	15	15	14	14	15	15	15	15	14	15	7	6	7	6	6	7	8	10	11	14	14	14
14	14	14	14	15	1	8	14	14	16	16	15	15	8	6	6	6	7	7	7	10	14	15	14	14
15	15	14	14	12	15	15	14	15	15	16	1	8	6	6	6	6	6	7	8	12	15	14	14	15
16	15	13	14	14	14	14	14	15	15	16	10	6	6	6	6	6	7	8	11	14	14	6	15	14
17	13	7	7	8	13	14	14	15	1	6	6	6	6	6	6	6	7	6	7	7	8	6	7	14
18	11	7	7	7	7	15	9	12	12	6	6	6	6	6	6	6	6	6	7	7	7	7	6	7
19	7	7	6	6	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	11
20	15	15	15	15	15	15	15	15	14	14	14	14	14	14	15	15	15	14	15	14	15	15	15	15
21	14	15	15	15	15	14	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	14	15	15
22	14	15	14	14	14	14	15	15	15	15	14	15	15	14	15	14	14	15	15	15	15	15	15	15
23	15	15	15	15	14	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
24	15	15	15	15	15	15	15	15	14	14	14	14	14	14	14	14	14	15	15	15	15	14	14	14
25	15	15	15	15	15	14	15	15	16	16	16	16	1	16	16	16	1	14	6	7	5	9	9	14
26	15	15	15	15	14	15	15	15	15	15	16	9	6	7	7	8	9	10	13	12	14	11	4	6
27	8	7	7	7	8	7	8	10	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7
28	7	6	6	6	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7
29	7	7	7	7	6	6	9	14	14	14	15	15	14	7	6	6	6	6	6	6	6	7	7	7
30	6	7	9	7	14	15	12	10	10	14	10	13	9	6	6	6	7	15	15	15	15	15	15	15

SUNSHINE
Landfill
Site 1
Wind Speed (mph)
Hourly Average

April, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0																							
9																		21.9	22.3	23.2	24.1	29.0	23.7	21.6
10	16.4	24.0	27.8	22.9	24.0	22.7	19.6	19.3	19.7	16.9	16.0	12.8	15.6	10.4	10.2	7.9	11.1	12.4	13.3	9.3	7.4	2.3	2.9	2.9
11	8.1	6.4	4.8	6.1	5.9	5.3	7.0	11.4	13.5	17.9	11.9	8.4	7.3	10.6	12.2	9.5	9.9	6.2	8.4	8.2	5.6	5.6	12.0	13.0
12	14.7	21.6	23.3	18.4	20.6	18.6	17.8	13.6	11.7	11.0	12.7	19.9	16.7	14.7	14.1	11.8	11.1	15.6	15.6	17.2	18.0	17.5	18.0	17.1
13	16.7	14.6	13.1	12.3	15.3	14.0	12.4	12.5	12.2	15.2	12.5	8.1	5.5	9.5	7.7	9.3	11.0	9.8	4.9	3.9	5.1	4.4	8.3	11.0
14	12.2	12.9	10.7	4.9	2.6	1.9	5.6	8.6	1.7	5.6	11.5	8.8	7.7	9.2	9.6	12.4	11.4	7.4	3.8	3.6	3.1	6.6	5.6	9.5
15	8.4	3.5	2.3	0.9	4.8	9.9	8.3	7.2	9.7	6.9	6.1	5.8	8.3	9.9	10.7	11.1	13.3	8.4	4.0	3.8	4.7	7.2	9.0	8.8
16	5.0	1.8	4.3	9.8	12.1	12.1	10.1	6.7	3.9	5.4	4.5	6.4	7.6	9.2	9.5	10.1	8.9	6.0	6.4	4.5	4.7	2.9	6.8	7.6
17	4.4	3.3	3.0	2.7	3.4	8.7	6.6	5.7	5.6	6.2	7.7	9.1	9.0	9.2	11.4	10.6	9.4	9.1	6.6	3.9	3.4	4.5	3.7	2.9
18	2.7	4.0	4.1	4.4	2.8	3.3	2.2	2.6	2.6	4.1	5.7	9.0	9.5	12.3	13.7	12.4	11.4	10.4	12.6	10.0	5.2	2.7	3.6	6.3
19	5.3	6.2	9.5	8.1	5.8	4.4	6.9	5.7	6.9	5.0	4.7	6.0	8.9	8.8	10.7	11.6	9.4	11.5	9.2	7.4	5.9	3.8	2.4	4.7
20	30.9	41.5	42.2	30.5	25.8	27.7	25.9	31.8	31.4	27.4	25.7	21.6	17.7	22.2	26.6	30.2	27.2	27.8	27.5	36.0	43.0	39.4	36.4	43.3
21	33.8	34.8	33.4	33.3	36.9	39.2	40.1	37.0	34.1	33.2	28.6	25.9	32.2	35.6	34.0	25.5	29.4	26.9	32.3	35.5	30.7	35.0	39.0	42.9
22	40.8	42.9	39.6	37.3	35.6	35.0	33.9	34.4	29.4	27.0	27.5	26.6	22.5	24.9	22.9	23.3	24.3	23.6	19.7	17.1	26.7	41.6	43.6	34.9
23	38.1	33.8	24.2	27.2	25.0	23.1	23.6	20.7	24.5	30.1	33.7	36.6	31.6	21.9	16.9	19.6	21.4	25.8	21.8	18.8	20.2	24.3	28.5	32.6
24	32.1	34.7	28.4	22.7	26.5	27.8	28.2	32.1	30.5	27.7	31.8	30.5	25.2	26.8	25.8	26.5	30.4	29.1	27.7	27.6	26.9	20.5	19.5	17.2
25	11.6	10.3	13.4	16.2	13.3	15.3	19.8	18.4	21.6	17.8	17.2	17.3	16.8	20.4	17.2	17.2	16.3	10.1	6.6	6.6	3.8	2.4	1.5	6.3
26	10.3	11.8	11.1	10.8	12.0	12.3	12.8	14.3	15.9	13.8	7.7	5.4	9.4	11.4	5.7	5.0	2.9	7.3	9.4	4.6	4.9	2.3	2.6	1.2
27	2.5	2.5	2.6	6.2	4.8	4.5	3.4	1.6	4.4	7.5	9.3	12.6	14.2	16.4	17.4	18.5	19.2	18.2	16.4	11.6	9.1	5.7	6.9	8.6
28	7.7	8.8	7.0	7.4	5.5	5.9	6.9	7.5	7.2	7.2	8.3	9.8	11.0	11.0	10.5	13.4	13.8	16.4	15.3	12.2	8.5	5.7	4.9	6.6
29	4.3	4.5	5.9	6.1	4.9	2.9	1.5	2.1	14.8	16.8	13.1	12.3	7.3	8.8	15.0	14.7	15.2	12.5	10.9	6.6	2.9	2.2	3.3	3.3
30	1.8	3.6	3.6	3.6	1.5	4.2	3.0	1.9	2.4	4.7	6.1	9.2	8.5	11.1	11.9	8.5	6.3	21.1	22.4	23.3	21.2	25.5	29.1	22.9

SUNSHINE
Landfill
Site 1
Maximum Gust (mph)
Hourly Average

April, 1997

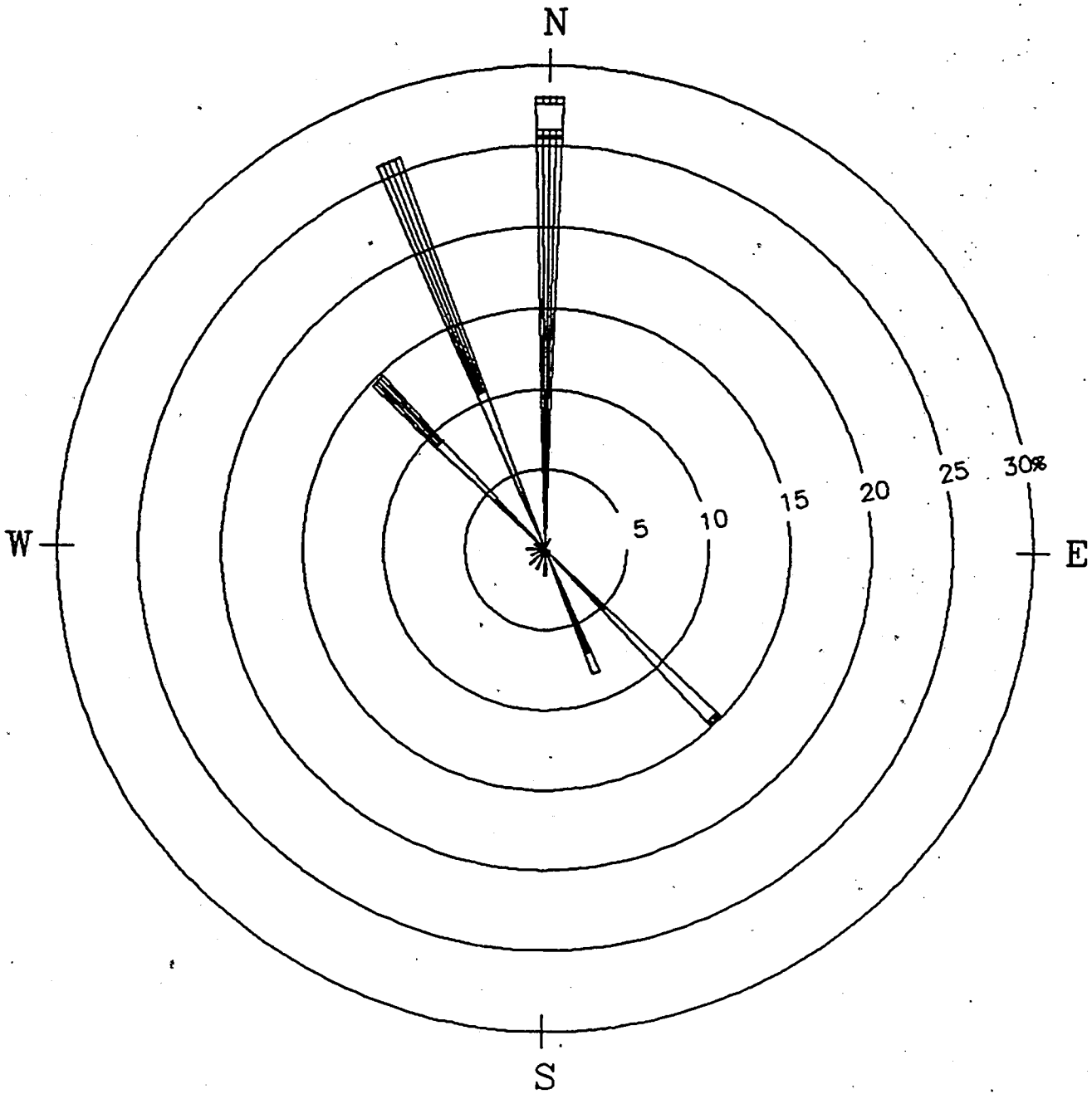
	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0																							
9																		33.7	36.7	37.5	32.1	42.6	37.1	34.5
10	23.4	36.6	37.5	32.7	30.9	29.0	28.4	24.0	24.5	23.6	23.6	25.0	25.3	20.9	19.8	18.4	21.1	21.3	23.7	15.8	16.7	6.9	7.7	7.2
11	12.1	13.5	11.6	12.0	14.1	13.1	12.1	16.7	23.6	23.2	18.5	14.9	15.3	21.0	21.1	21.2	23.1	15.3	15.8	15.0	8.3	11.1	23.8	25.5
12	25.0	28.2	35.1	26.9	28.9	25.7	25.2	17.6	15.9	17.5	26.0	29.8	26.9	27.4	23.4	21.1	27.7	24.4	24.2	27.1	25.8	26.1	22.5	22.2
13	23.2	21.1	17.2	17.9	20.1	18.4	19.2	17.5	17.8	19.2	16.7	15.8	16.1	18.3	16.4	17.5	19.0	17.6	15.5	8.8	9.1	7.9	11.5	15.6
14	14.9	16.0	13.2	9.7	6.2	4.6	17.2	15.8	4.2	12.6	18.0	14.1	15.7	16.1	18.9	21.2	19.9	14.6	8.1	7.3	6.1	8.9	8.8	12.6
15	11.8	6.0	4.3	2.9	8.7	12.1	11.3	11.0	12.7	10.5	9.0	11.8	15.0	15.6	17.5	20.3	19.8	16.3	10.2	7.7	7.3	9.2	11.6	11.2
16	8.0	3.9	8.5	13.1	15.3	16.1	14.2	10.8	5.8	7.6	7.8	9.7	12.7	14.3	14.8	16.9	15.9	14.3	12.4	9.3	7.2	7.6	12.3	11.0
17	7.8	6.7	6.5	6.4	8.6	11.8	9.0	8.3	8.1	9.5	11.6	12.6	13.6	14.3	17.7	18.8	17.0	14.7	12.6	7.5	5.6	8.7	5.6	5.7
18	4.1	8.3	7.4	7.4	6.0	6.3	4.4	5.4	5.1	7.0	10.1	15.0	14.6	17.9	20.1	18.6	16.6	16.4	22.2	15.9	11.6	4.9	7.8	9.3
19	8.3	9.3	12.5	10.8	11.2	7.7	11.4	10.0	10.8	10.6	8.1	11.8	13.7	14.5	19.8	19.9	17.4	16.2	13.6	12.1	9.9	8.0	6.9	26.1
20	48.6	54.9	56.5	44.6	37.5	36.4	33.9	42.2	39.9	36.6	36.5	29.8	26.8	34.8	40.3	41.9	43.5	42.4	39.1	54.2	55.7	50.8	53.0	55.8
21	44.2	49.9	46.3	50.7	53.3	50.0	53.3	50.5	42.9	42.4	37.3	36.4	48.5	46.7	51.1	41.0	41.6	46.8	49.4	48.1	45.7	47.0	52.2	54.9
22	55.0	53.8	53.2	47.5	42.5	45.5	46.8	43.9	39.3	39.9	40.5	39.4	35.9	34.1	32.0	33.2	34.3	33.1	32.1	24.9	46.9	54.2	54.9	46.1
23	49.6	48.1	36.5	38.1	38.8	33.2	32.9	32.7	43.0	39.6	49.2	52.6	50.4	34.7	27.5	28.8	32.5	40.7	34.4	27.7	34.7	36.6	43.1	44.6
24	46.6	50.4	42.4	35.2	37.6	38.9	39.7	41.3	41.1	42.6	40.4	44.2	36.9	36.6	35.7	40.2	43.1	43.0	42.4	40.1	40.9	30.4	25.7	24.0
25	19.3	15.2	17.3	20.0	18.3	22.4	28.9	26.2	32.8	32.4	34.0	35.0	32.6	36.0	32.7	31.9	29.1	26.8	15.7	14.0	9.9	7.4	4.7	9.8
26	13.7	13.5	12.8	12.8	14.5	13.8	14.8	17.2	19.3	18.4	12.0	13.5	15.6	20.5	19.8	16.3	9.8	16.8	18.9	14.4	7.9	4.8	6.7	3.0
27	4.2	4.2	5.2	9.2	7.1	7.6	7.2	4.1	8.0	10.3	15.0	17.0	19.8	23.5	23.8	25.2	26.5	24.7	21.7	18.1	13.6	9.6	9.8	11.9
28	10.3	11.9	11.3	11.3	8.6	9.4	10.1	11.2	11.0	10.4	12.7	16.9	17.5	18.0	19.0	23.4	22.4	21.9	20.5	17.7	12.2	8.7	8.1	11.1
29	7.3	6.7	8.6	8.6	7.9	5.0	3.1	10.4	22.7	24.6	20.5	19.4	16.8	19.4	22.4	23.0	22.9	18.4	16.7	10.5	5.7	5.2	5.3	5.8
30	4.2	7.8	8.1	6.8	4.2	12.5	8.6	4.6	6.3	11.5	13.2	15.9	18.5	16.7	19.5	14.8	14.0	33.5	34.1	34.4	29.3	33.5	39.0	34.6

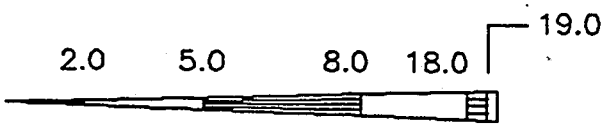
Sunshine Landfill
Site 1

Data: Wind Rose
Station: Sunshine Landfill, Site 1
Period: Apr 1, 1997 - Apr 30, 1997
Hours: 00:00 - 23:00

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	25.0	0.1	0.4	1.6	0.4	188	27.65	1.38
1	0.0	0.1	0.3	0.3	0.0	5	0.74	9.48
2	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
3	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
4	0.0	0.1	0.0	0.0	0.0	1	0.15	2.60
5	0.0	0.3	0.0	0.0	0.0	2	0.29	3.35
6	0.3	1.6	3.2	9.2	0.3	100	14.71	9.57
7	0.3	3.3	3.2	1.3	0.0	56	8.24	5.77
8	0.1	1.1	0.4	0.0	0.0	12	1.76	4.34
9	0.6	0.4	0.0	0.3	0.0	9	1.32	4.21
10	0.4	0.6	0.3	0.0	0.0	9	1.32	4.01
11	0.3	0.4	0.1	0.1	0.0	7	1.03	4.71
12	0.1	0.7	0.3	0.0	0.0	8	1.18	3.76
13	0.1	0.3	0.0	0.3	0.0	5	0.74	5.64
14	0.4	1.6	2.3	4.8	5.4	100	14.71	16.29
15	0.0	1.0	1.7	7.7	15.0	178	26.18	21.90
MSG	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
TOT	27.0	12.0	12.0	25.0	21.0	680	100.00	6.06





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 28.0 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: APRIL 1997

SUNSHINE
Landfill
Site 1
Wind Direction (Deg)
Hourly Average

May, 1997

	Clock Time (PST)																						
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	334	336	336	334	336	334	334	336	331	328	334	336	336	320	328	334	334	326	320	323	312	326	315	312
2	320	312	315	323	350	339	331	323	336	339	339	137	133	137	144	140	140	144	142	151	149	247	326	315
3	331	326	163	184	227	307	326	318	334	358	331	259	142	144	140	140	144	147	144	135	151	117	144	119
4	326	334	315	315	318	318	312	315	315	320	320	320	237	135	133	142	142	144	142	144	110	326	320	318
5	315	326	336	323	320	328	323	326	323	323	320	328	328	323	334	241	0	114	331	334	342	339	336	342
6	339	331	328	326	315	323	320	318	320	320	323	320	323	299	140	135	315	336	339	342	336	339	339	339
7	331	323	326	326	318	315	312	318	334	342	137	135	137	137	140	142	142	144	149	156	154	161	168	135
8	144	299	95	163	151	154	177	161	130	124	135	137	137	114	137	142	140	142	137	144	144	156	151	168
9	175	184	135	168	144	244	331	331	326	225	135	126	133	137	135	140	124	144	137	144	154	154	287	328
10	315	299	175	177	220	208	266	133	355	177	135	135	137	140	140	137	140	140	144	144	154	247	186	158
11	163	151	261	299	154	144	144	147	128	128	128	128	128	135	135	137	142	140	135	137	234	239	151	149	151
12	149	168	149	205	144	170	135	126	140	133	135	137	142	147	140	140	140	142	147	142	149	154	151	147
13	151	193	135	276	203	208	299	165	135	135	130	135	137	142	140	140	142	140	144	147	147	165	144	151
14	149	147	149	161	137	328	355	339	315	147	135	130	140	140	142	140	140	142	140	144	144	184	151	163
15	126	168	154	156	326	336	334	336	328	331	328	237	140	140	140	137	114	0	0	358	336	331	320	315
16	312	312	310	310	336	342	336	344	336	328	326	315	135	126	0	130	140	137	137	142	147	144	147	135
17	135	225	193	165	193	299	320	328	302	149	323	310	210	135	142	140	142	140	147	140	144	149	144	144
18	144	147	227	149	355	339	358	350	328	239	137	140	140	142	142	140	140	144	144	144	147	137	140	154
19	161	144	220	339	326	140	144	135	299	225	137	144	140	142	144	140	142	142	142	144	144	144	144	140
20	137	137	140	299	234	353	242	154	193	142	137	140	140	144	142	140	135	137	140	140	144	147	156	172
21	156	163	158	193	175	149	149	147	135	128	133	133	142	137	144	149	140	144	142	140	147	142	144	149
22	144	151	154	177	149	175	177	140	135	133	137	133	140	140	144	140	140	142	140	140	144	147	161	156
23	149	156	165	137	175	158	140	137	140	140	135	135	137	140	140	142	140	151	151	140	137	144	149	165
24	175	161	168	161	331	336	334	331	331	334	334	336	336	331	184	144	220	242	142	149	147	154	149	182
25	259	172	222	334	292	331	334	151	135	126	130	137	133	135	142	142	149	140	144	142	144	137	172	203
26	193	271	328	328	331	326	328	347	20	220	193	135	135	130	137	142	140	140	229	328	328	334	331	323
27	323	318	318	315	318	318	318	318	320	320	320	312	315	320	312	0	0	0	0	336	326	323	323	318
28	312	315	315	312	307	312	315	315	318	323	323	326	323	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	320	328	331	328	287	135	137	137	114	0	0	0	114	151	142	154	168	151
30	158	193	144	156	94	193	287	315	271	126	135	137	137	142	137	142	142	140	140	144	144	147	161	156

SUNSHINE
Landfill
Site 1
Wind Direction (16Pt)
Hourly Average

May, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	15	15	15	15	15	15	15	15	15	15	15	15	14	15	15	15	14	14	14	14	14	14	14
2	14	14	14	14	16	15	15	14	15	15	15	6	6	6	6	6	6	6	6	7	7	11	14	14
3	15	14	7	8	10	14	14	14	15	16	15	12	6	6	6	6	6	7	6	6	7	5	6	5
4	14	15	14	14	14	14	14	14	14	14	14	14	11	6	6	6	6	6	6	6	5	14	14	14
5	14	14	15	14	14	15	14	14	14	14	14	15	15	14	15	11	16	5	15	15	15	15	15	15
6	15	15	15	14	14	14	14	14	14	14	14	14	14	13	6	6	14	15	15	15	15	15	15	15
7	15	14	14	14	14	14	14	14	15	15	6	6	6	6	6	6	6	6	7	7	7	7	7	6
8	6	13	4	7	7	7	8	7	6	6	6	6	6	5	6	6	6	6	6	6	6	7	7	7
9	8	8	6	7	6	11	15	15	14	10	6	6	6	6	6	6	6	6	6	6	7	7	13	15
10	14	13	8	8	10	9	12	6	16	8	6	6	6	6	6	6	6	6	6	6	7	11	8	7
11	7	7	12	13	7	6	6	7	6	6	6	6	6	6	6	6	6	6	6	10	11	7	7	7
12	7	7	7	9	6	8	6	6	6	6	6	6	6	7	6	6	6	6	7	6	7	7	7	7
13	7	9	6	12	9	9	13	7	6	6	6	6	6	6	6	6	6	6	6	7	7	7	6	7
14	7	7	7	7	6	15	16	15	14	7	6	6	6	6	6	6	6	6	6	6	6	8	7	7
15	6	7	7	7	14	15	15	15	15	15	15	11	6	6	6	6	5	16	16	16	15	15	14	14
16	14	14	14	14	15	15	15	15	15	15	14	14	6	6	16	6	6	6	6	6	7	6	7	6
17	6	10	9	7	9	13	14	15	13	7	14	14	9	6	6	6	6	6	7	6	6	7	6	6
18	6	7	10	7	16	15	16	16	15	11	6	6	6	6	6	6	6	6	6	6	7	6	6	7
19	7	6	10	15	14	6	6	6	13	10	6	6	6	6	6	6	6	6	6	6	6	6	6	6
20	6	6	6	13	10	16	11	7	9	6	6	6	6	6	6	6	6	6	6	6	6	7	7	8
21	7	7	7	9	8	7	7	7	6	6	6	6	6	6	6	7	6	6	6	6	7	6	6	7
22	6	7	7	8	7	8	8	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7
23	7	7	7	6	8	7	6	6	6	6	6	6	6	6	6	6	6	7	7	6	6	6	7	7
24	8	7	7	7	15	15	15	15	15	15	15	15	15	15	8	6	10	11	6	7	7	7	7	8
25	12	8	10	15	13	15	15	7	6	6	6	6	6	6	6	6	7	6	6	6	6	6	8	9
26	9	12	15	15	15	14	15	15	1	10	9	6	6	6	6	6	6	6	10	15	15	15	15	14
27	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	16	16	16	16	15	14	14	14	14
28	14	14	14	14	14	14	14	14	14	14	14	14	14	16	16	16	16	16	16	16	16	16	16	16
29	16	16	16	16	16	16	14	15	15	15	13	6	6	6	5	16	16	16	5	7	6	7	7	7
30	7	9	6	7	4	9	13	14	12	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7

SUNSHINE
Landfill
Site 1
Wind Speed (mph)
Hourly Average

May, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	23.9	27.8	34.7	35.1	37.3	33.5	41.3	49.6	40.7	35.1	36.3	30.8	29.1	32.3	27.0	27.6	24.4	25.5	25.7	22.2	21.1	17.5	18.5	23.5
2	26.9	24.9	26.8	17.3	11.6	10.2	13.5	12.3	14.0	12.5	8.4	7.1	7.8	8.3	9.6	10.6	13.1	12.0	10.1	5.7	2.7	1.9	5.9	11.8
3	10.6	5.0	4.6	2.2	1.8	3.3	8.9	14.5	13.6	10.2	9.5	6.6	9.7	10.8	9.9	11.1	12.8	12.1	8.3	8.4	6.1	2.9	1.6	1.9
4	6.3	5.8	4.2	16.0	16.1	19.5	21.4	13.1	24.3	18.9	17.1	10.9	8.4	9.7	9.5	14.2	14.9	10.7	9.3	7.2	2.6	7.4	10.9	14.5
5	16.4	12.9	5.4	10.6	17.5	16.1	21.3	17.5	19.2	17.1	15.0	12.3	11.9	9.1	2.9	0.2	0.2	4.5	7.3	14.3	15.9	23.0	27.5	34.7
6	33.7	29.8	29.5	31.0	32.2	30.9	26.9	24.2	23.7	20.8	17.7	16.7	14.0	5.0	9.4	3.8	4.2	19.6	24.9	26.3	25.7	27.0	28.5	29.6
7	31.4	30.7	26.7	26.0	24.3	23.6	21.8	18.1	15.9	10.1	5.0	7.6	9.6	10.9	11.5	14.9	17.0	13.5	7.3	6.3	6.4	4.3	3.1	2.1
8	2.0	1.6	1.7	3.2	1.9	1.5	1.3	1.8	3.5	3.7	7.2	7.9	8.7	2.0	5.4	13.8	15.1	13.7	9.5	8.8	6.4	4.8	4.9	4.1
9	3.3	2.2	1.7	2.4	2.0	1.2	4.2	5.3	7.6	4.4	6.8	7.2	8.2	10.0	10.1	4.1	2.3	6.0	8.8	5.2	4.5	2.6	2.9	9.0
10	3.8	0.8	3.3	3.6	1.6	1.4	2.0	1.3	1.2	3.6	5.1	8.0	9.5	10.2	11.1	11.6	11.0	11.4	9.5	8.3	6.7	1.9	5.9	5.8
11	4.6	4.2	4.3	7.4	3.0	2.0	4.8	5.5	3.1	4.0	4.9	6.2	8.4	10.2	12.0	13.0	10.2	8.5	9.5	5.5	5.4	5.7	5.4	4.2
12	3.1	3.1	3.1	1.7	1.6	2.7	1.7	1.8	4.5	6.0	5.9	9.1	10.9	10.6	11.9	11.5	12.2	9.7	6.3	7.3	5.4	5.2	5.3	5.1
13	3.8	1.5	1.7	1.5	2.0	1.4	2.4	3.5	4.2	3.4	5.7	8.5	10.4	10.9	12.3	12.2	12.5	11.4	11.6	9.8	9.8	4.9	4.0	3.4
14	3.1	4.7	2.3	2.5	2.9	2.2	5.3	13.6	16.8	7.4	6.8	7.5	10.2	11.4	11.7	11.4	10.3	10.9	9.9	8.4	4.8	2.2	3.8	4.6
15	1.8	3.1	3.0	2.2	5.9	15.8	14.1	13.7	15.4	14.4	9.2	6.7	8.6	10.7	11.5	12.1	1.5	0.2	0.2	3.9	11.1	17.8	24.0	24.0
16	22.9	22.3	17.2	17.4	12.0	11.9	12.0	12.3	16.4	14.9	10.9	4.0	6.4	3.2	0.2	2.2	9.9	6.7	5.0	7.3	8.2	6.0	4.7	3.4
17	2.1	1.3	2.1	0.7	1.8	2.4	4.3	9.7	11.3	7.7	8.0	5.2	8.6	8.0	7.3	7.0	6.5	9.0	7.4	8.6	11.2	8.1	7.2	6.7
18	6.8	4.7	1.8	2.7	2.4	7.5	3.9	4.0	8.8	4.4	8.7	10.7	12.3	12.9	12.5	12.7	12.7	13.9	16.4	14.4	10.6	8.7	4.5	2.6
19	1.8	4.0	3.2	7.3	3.5	3.3	3.2	2.1	1.6	2.6	6.2	11.2	11.9	11.3	10.4	10.6	14.6	15.4	14.9	10.8	8.4	10.0	8.4	6.1
20	6.2	5.0	3.3	1.4	2.0	1.9	1.7	1.5	2.7	7.7	8.7	6.6	10.7	12.3	10.9	11.0	9.7	9.1	12.2	13.1	10.0	6.6	4.4	3.7
21	6.6	4.6	2.9	0.6	2.3	3.1	2.3	3.5	5.9	6.2	7.3	9.0	10.1	11.3	12.0	10.0	12.3	14.0	14.1	12.3	10.6	8.1	8.0	5.4
22	1.6	4.2	2.6	2.6	2.7	2.3	2.6	4.1	5.1	6.9	7.9	9.0	11.4	12.6	13.1	15.1	13.5	13.7	14.3	11.4	7.9	4.3	2.5	2.2
23	2.3	2.2	4.2	2.5	2.3	2.9	3.3	2.5	3.3	5.3	7.2	10.1	11.3	11.0	12.8	14.2	10.6	12.5	10.3	9.8	9.1	8.0	3.1	2.1
24	3.3	3.6	2.4	1.8	9.1	18.7	17.7	18.9	19.5	23.3	23.0	19.7	11.5	8.9	6.3	12.0	7.2	5.8	9.3	5.0	5.5	5.2	2.7	3.8
25	4.8	3.7	2.9	11.6	4.3	13.1	14.8	4.2	7.2	6.3	7.5	9.2	9.5	10.5	13.3	10.1	9.2	13.5	11.6	10.5	8.4	4.6	3.0	2.3
26	2.7	2.4	3.3	8.8	8.0	17.4	15.8	11.2	7.6	3.7	4.5	6.3	6.8	7.5	8.3	8.9	9.0	9.0	8.9	19.4	22.7	25.6	28.7	30.4
27	27.0	25.9	26.5	25.1	29.1	28.2	28.8	28.1	28.9	27.1	23.1	19.3	14.9	13.3	4.8	0.2	0.1	0.3	0.1	13.3	17.4	20.6	25.4	27.4
28	27.6	25.2	23.3	21.5	22.7	24.3	25.0	25.0	23.0	19.7	14.9	11.5	1.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	3.2	19.7	18.0	14.5	6.2	8.4	9.5	7.9	1.5	0.2	0.2	0.1	1.0	5.7	6.9	5.2	3.1	4.2
30	4.0	3.0	2.4	3.7	0.6	2.1	3.1	2.1	2.4	6.3	8.9	9.6	10.0	10.1	11.7	13.7	15.0	13.1	12.2	8.3	5.6	5.1	4.3	3.7

SUNSHINE
Landfill
Site 1
Maximum Gust (mph)
Hourly Average

May, 1997

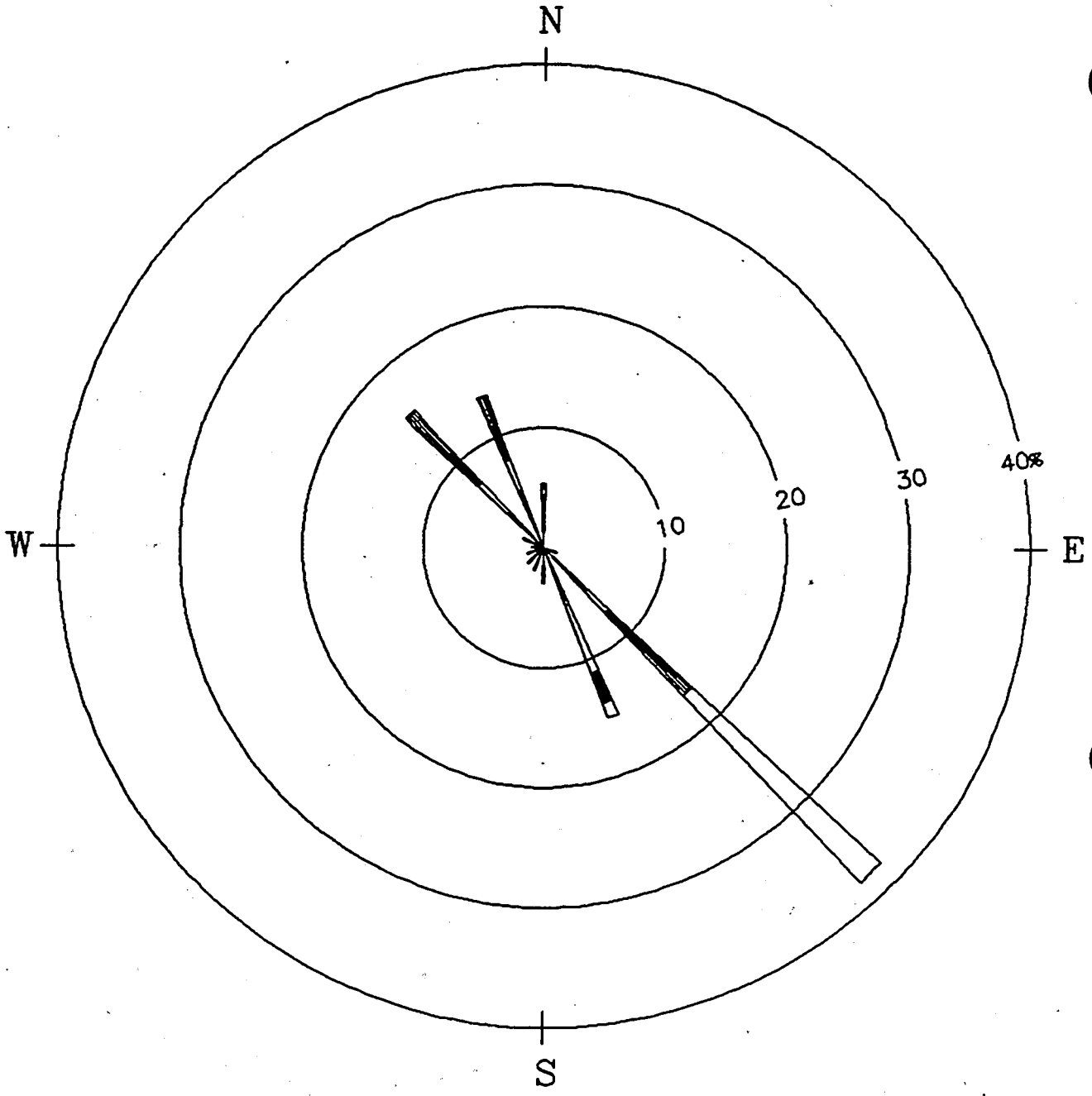
	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	34.3	42.8	47.4	49.2	49.7	48.0	53.0	56.0	54.7	47.3	48.3	45.3	42.2	43.3	39.1	39.0	38.2	37.0	36.1	32.9	29.7	26.0	26.2	32.6
2	37.0	31.8	34.5	24.2	22.4	14.7	20.0	15.2	18.3	18.9	14.6	12.0	11.8	14.1	16.2	18.1	19.0	17.8	16.0	11.5	5.0	4.8	11.8	14.0
3	13.4	9.9	7.0	6.0	5.2	9.8	11.8	21.4	20.1	13.5	13.4	14.5	16.4	16.9	16.6	19.2	17.9	19.0	12.3	11.4	10.1	5.1	3.3	3.7
4	8.2	7.9	10.8	24.7	20.4	26.6	26.2	27.1	33.6	25.4	23.3	17.4	14.7	15.5	17.5	21.0	21.7	18.6	14.8	12.3	6.6	11.3	14.6	19.8
5	21.7	16.6	13.2	17.4	23.9	24.1	28.9	23.6	25.1	22.6	20.1	19.9	20.3	16.6	11.3	0.3	0.4	13.6	17.7	21.0	20.7	33.4	41.5	42.5
6	42.9	40.3	38.6	44.3	43.5	39.2	38.9	31.4	31.5	28.7	22.5	22.5	20.7	13.5	14.9	14.8	17.9	28.5	35.0	36.3	35.5	37.1	36.9	39.3
7	41.7	40.8	37.6	34.9	30.9	27.9	27.2	26.7	19.9	17.8	8.7	12.8	13.8	18.2	18.8	21.2	21.5	22.6	12.1	11.1	9.6	8.0	5.5	4.9
8	4.9	6.5	4.2	5.8	4.6	3.3	3.3	4.3	5.1	8.4	11.4	11.9	13.4	13.7	15.8	18.7	19.4	19.1	15.1	12.8	8.9	6.9	7.3	6.2
9	6.2	3.9	3.1	5.1	3.7	2.6	8.3	9.8	10.8	6.9	10.7	11.8	13.0	15.6	15.4	14.5	8.9	13.1	13.6	7.8	8.1	4.7	6.3	11.3
10	10.7	2.5	7.0	6.9	4.1	3.3	4.6	3.4	3.4	6.3	9.1	11.4	14.1	15.1	16.2	17.3	15.7	16.2	13.2	10.9	10.6	5.6	10.8	10.7
11	8.7	7.0	9.9	15.1	5.5	3.8	8.1	8.4	5.5	7.9	9.0	10.9	13.1	14.6	20.0	17.7	15.0	13.1	17.1	12.0	9.4	19.6	7.6	8.5
12	6.5	7.8	6.8	5.3	3.9	5.5	3.9	3.8	8.5	8.7	9.8	16.2	16.0	16.7	16.3	16.8	16.3	14.7	9.8	10.0	9.8	7.8	8.6	8.6
13	6.8	3.7	3.6	4.9	5.5	4.5	5.7	6.9	7.2	6.2	9.9	14.9	15.6	16.4	17.4	17.2	17.1	15.3	15.0	13.4	13.4	9.1	6.9	5.4
14	6.0	7.8	6.2	5.3	5.4	5.3	11.6	22.8	26.1	12.4	11.2	13.7	15.1	16.8	17.6	16.6	16.5	15.5	13.2	11.9	8.7	4.3	7.2	7.0
15	3.1	4.8	5.3	5.1	15.6	21.2	19.2	22.6	20.9	20.9	19.0	12.3	13.7	16.3	19.3	19.4	13.0	0.3	0.3	11.2	17.7	27.4	32.7	30.4
16	27.9	28.5	23.4	24.9	17.1	16.8	16.2	18.1	22.4	19.7	15.4	11.6	13.4	9.8	0.3	10.9	14.0	11.2	8.8	13.1	12.6	8.7	6.9	6.4
17	6.9	3.3	5.2	2.9	4.8	5.9	11.7	18.7	18.7	15.4	17.1	14.1	19.2	16.2	15.1	12.3	14.3	14.3	13.9	12.5	15.0	12.8	11.3	10.2
18	9.7	9.2	3.8	5.7	6.6	12.1	9.2	9.6	12.5	9.8	13.3	16.7	18.4	19.2	18.6	20.0	18.4	19.3	20.8	20.7	14.9	12.5	10.1	5.9
19	4.5	7.3	6.7	11.1	7.4	6.2	6.0	5.3	4.3	7.8	12.7	17.0	16.4	15.9	15.8	16.9	20.8	22.6	19.4	14.2	13.9	14.5	11.6	9.6
20	9.4	8.5	5.5	3.3	4.3	3.9	4.1	3.4	6.2	12.7	12.7	10.8	16.0	17.9	17.2	17.5	15.7	14.8	17.2	18.1	14.1	9.9	7.2	6.2
21	10.3	9.5	5.2	2.3	6.2	5.8	4.3	6.3	9.6	10.8	11.4	14.5	18.7	19.6	18.8	18.5	20.3	20.9	19.4	16.1	14.8	11.1	10.9	8.6
22	3.0	8.5	5.1	5.7	4.4	5.4	4.8	5.9	9.3	10.1	12.8	13.4	18.2	19.0	19.9	23.8	19.8	20.1	17.8	15.5	13.5	6.4	5.0	3.7
23	4.1	3.8	5.7	5.0	5.5	7.0	5.7	4.9	6.3	10.0	11.7	14.3	17.4	17.1	23.0	24.1	20.1	28.0	20.6	17.3	13.8	11.7	7.0	4.3
24	6.4	6.7	4.3	3.5	20.6	27.8	23.5	26.6	28.9	33.4	35.6	29.3	19.3	15.1	16.7	18.5	19.8	15.5	19.4	11.5	11.9	8.9	5.6	7.0
25	8.3	7.6	9.0	18.9	13.2	22.8	25.2	8.2	10.1	11.9	12.9	15.0	16.0	20.7	22.8	20.7	19.5	19.8	16.2	14.9	12.6	9.0	6.7	5.1
26	5.5	9.5	10.1	13.8	18.5	21.9	21.6	17.5	10.4	8.2	9.4	10.5	11.9	11.7	13.7	17.5	18.3	17.4	22.5	27.9	31.3	37.4	39.1	40.3
27	39.1	33.3	32.3	33.6	36.6	35.7	34.5	36.9	36.8	33.8	31.9	26.1	22.6	20.8	15.3	0.3	0.3	3.2	0.3	21.3	25.9	29.5	35.4	36.7
28	33.0	30.1	28.0	25.6	27.9	29.6	31.4	30.3	30.0	26.9	23.5	18.5	13.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	26.7	28.6	25.0	21.5	14.3	12.9	15.5	15.4	9.9	1.0	0.8	0.3	7.5	10.3	13.6	9.1	5.8	8.6
30	7.4	5.7	5.2	6.6	3.2	7.5	8.8	4.4	6.2	10.5	13.1	13.9	15.0	18.3	17.8	19.9	19.7	17.3	17.2	11.4	8.9	8.3	6.8	5.7

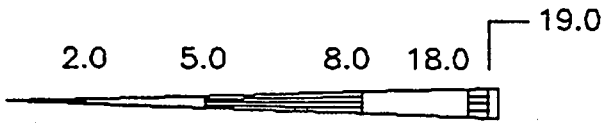
Sunshine Landfill
Site 1

Data: Wind Rose
Station: Sunshine Landfill, Site 1
Period: May 1, 1997 - May 30, 1997
Hours: 00:00 - 23:00

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	4.3	0.6	0.0	0.3	0.0	37	5.14	1.26
1	0.0	0.0	0.1	0.0	0.0	1	0.14	7.60
2	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
3	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
4	0.3	0.0	0.0	0.0	0.0	2	0.28	1.15
5	0.7	0.4	0.0	0.0	0.0	8	1.11	2.24
6	2.5	4.8	9.3	21.0	0.0	273	37.92	8.74
7	2.2	8.8	2.6	1.3	0.0	109	15.14	4.70
8	1.0	1.6	0.3	0.0	0.0	21	2.92	3.15
9	1.3	0.6	0.0	0.1	0.0	15	2.08	2.56
10	0.7	0.7	0.3	0.1	0.0	13	1.81	3.61
11	0.7	0.3	0.4	0.0	0.0	10	1.39	3.76
12	0.6	0.3	0.1	0.0	0.0	7	0.97	3.43
13	0.8	0.6	0.3	0.1	0.0	13	1.81	3.88
14	0.3	1.5	0.8	4.8	8.1	113	15.69	18.33
15	0.1	0.7	0.8	6.2	5.6	98	13.61	18.50
MSG	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
TOT	15.0	20.0	15.0	34.0	13.0	720	100.00	5.18





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 5.3 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: MAY 1997

SUNSHINE
Landfill

Wind Direction (Deg)
Hourly Average

October, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	222	312	312	299	347	315	215	234	26	117	137	147	156	149	149	163	156	156	161	163	198	156	121	151
2	165	170	189	177	182	177	193	242	165	213	198	186	189	158	137	140	158	158	144	151	149	239	282	266
3	310	344	326	336	355	342	165	274	17	203	147	151	140	149	144	154	163	158	163	165	193	203	282	299
4	310	269	299	331	342	312	339	15	242	144	128	140	135	154	156	158	149	149	177	161	208	259	234	269
5	282	312	299	299	336	244	276	318	299	254	137	147	144	156	156	151	151	163	184	172	170	165	189	156
6	175	151	144	154	189	193	193	186	177	149	175	179	191	182	158	165	196	229	242	234	259	315	4	355
7	358	336	326	320	323	320	323	336	328	328	350	1	347	339	334	334	353	323	315	320	342	353	331	347
8	358	347	326	326	331	318	323	334	334	307	130	287	175	189	147	175	186	184	217	193	310	339	326	320
9	336	336	334	328	326	326	336	344	177	20	170	151	149	144	151	154	186	205	196	182	266	318	310	299
10	299	299	299	331	320	234	251	205	161	156	149	168	201	203	198	244	247	239	227	222	227	237	220	232
11	318	344	331	342	320	315	323	350	350	1	1	6	4	1	344	336	358	347	353	336	331	331	331	328
12	328	331	328	323	336	328	350	1	342	331	1	350	358	6	318	336	336	355	355	328	318	326	336	326
13	331	331	342	331	326	331	350	342	353	358	350	353	347	342	344	347	355	358	1	353	353	347	347	344
14	323	326	326	326	323	320	326	323	323	323	331	336	342	355	358	358	358	353	342	336	326	326	326	326
15	326	328	328	328	328	323	328	328	326	323	339	355	353	358	355	347	344	353	353	344	336	334	334	336
16	334	334	326	334	342	336	331	331	342	331	320	326	323	289	220	237	355	292	328	339	344	344	336	355
17	344	334	350	350	339	342	353	353	350	339	328	242	175	186	189	179	225	247	266	299	305	334	331	331
18	244	229	299	299	326	320	320	344	29	17	282	140	135	158	168	147	140	163	220	282	312	279	274	251
19	234	299	299	299	279	282	259	347	144	64	114	147	144	161	165	154	168	168	168	186	189	168	163	172
20	175	191	172	163	154	151	161	163	175	156	163	165	175	165	156	170	175	205	220	334	193	323	299	307
21	328	328	299	307	331	320	331	334	339	334	355	9	269	165	161	156	158	147	170	299	284	282	353	239
22	251	220	165	165	234	326	355	289	4	9	256	147	144	144	144	154	154	154	161	172	165	165	189	189
23	179	182	189	189	189	154	144	151	147	149	154	161	149	170	156	151	201	242	247	261	254	133	151	179
24	201	186	203	261	336	350	323	15	358	20	347	320	320	312	312	302	144	144	203	251	339	350	358	355
25	355	4	4	342	331	315	312	358	355	358	358	271	4	328	323	20	289	4	347	347	344	342	350	339
26	342	331	336	334	334	344	331	336	323	320	339	334	355	239	347	1	1	353	331	315	344	1	344	299
27	299	344	334	331	1	350	342	342	355	355	12	172	154	154	151	158	163	215	266	239	318	312	328	299
28	299	299	326	344	342	355	15	339	323	347	205	184	151	168	168	165	196	220	299	299	326	339	342	331
29	328	334	299	266	299	234	284	339	328	320	328	305	165	149	151	158	149	168	215	282	312	320	336	344
30	350	347	350	350	353	350	339	336	323	334	318	266	144	165	144	154	177	318	318	318	320	320	323	320
31	326	323	326	323	347	342	334	347	334	347	347	334	339	331	323	315	326	331	331	326	328	326	326	328

SUNSHINE
Landfill

Wind Direction (16Pt)
Hourly Average

October, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	10	14	14	13	15	14	10	10	1	5	6	7	7	7	7	7	7	7	7	7	9	7	5	7
2	7	8	8	8	8	8	9	11	7	9	9	8	8	7	6	6	7	7	6	7	7	11	13	12
3	14	15	14	15	16	15	7	12	1	9	7	7	6	7	6	7	7	7	7	7	9	9	13	13
4	14	12	13	15	15	14	15	1	11	6	6	6	6	7	7	7	7	7	8	7	9	12	10	12
5	13	14	13	13	15	11	12	14	13	11	6	7	6	7	7	7	7	7	8	8	8	7	8	7
6	8	7	6	7	8	9	9	8	8	7	8	8	8	8	7	7	9	10	11	10	12	14	16	16
7	16	15	14	14	14	14	14	15	15	15	16	16	15	15	15	15	16	14	14	14	15	16	15	15
8	16	15	14	14	15	14	14	15	15	14	6	13	8	8	7	8	8	8	10	9	14	15	14	14
9	15	15	15	15	14	14	15	15	8	1	8	7	7	6	7	7	8	9	9	8	12	14	14	13
10	13	13	13	15	14	10	11	9	7	7	7	7	9	9	9	11	11	11	10	10	10	11	10	10
11	14	15	15	15	14	14	14	16	16	16	16	16	16	16	15	15	16	15	16	15	15	15	15	15
12	15	15	15	14	15	15	16	16	15	15	16	16	16	16	14	15	15	16	16	15	14	14	15	14
13	15	15	15	15	14	15	16	15	16	16	16	16	15	15	15	15	16	16	16	16	16	15	15	15
14	14	14	14	14	14	14	14	14	14	14	15	15	15	16	16	16	16	16	15	15	14	14	14	14
15	14	15	15	15	15	14	15	15	14	14	15	16	16	16	16	15	15	16	16	15	15	15	15	15
16	15	15	14	15	15	15	15	15	15	15	14	14	14	13	10	11	16	13	15	15	15	15	15	16
17	15	15	16	16	15	15	16	16	16	15	15	11	8	8	8	8	10	11	12	13	14	15	15	15
18	11	10	13	13	14	14	14	15	1	1	13	6	6	7	7	7	6	7	10	13	14	12	12	11
19	10	13	13	13	12	13	12	15	6	3	5	7	6	7	7	7	7	7	7	8	8	7	7	8
20	8	8	8	7	7	7	7	7	8	7	7	7	8	7	7	8	8	9	10	15	9	14	13	14
21	15	15	13	14	15	14	15	15	15	15	16	16	12	7	7	7	7	7	8	13	13	13	16	11
22	11	10	7	7	10	14	16	13	16	16	11	7	6	6	6	7	7	7	7	8	7	7	8	8
23	8	8	8	8	8	7	6	7	7	7	7	7	7	8	7	7	9	11	11	12	11	6	7	8
24	9	8	9	12	15	16	14	1	16	1	15	14	14	14	14	13	6	6	9	11	15	16	16	16
25	16	16	16	15	15	14	14	16	16	16	16	12	16	15	14	1	13	16	15	15	15	15	16	15
26	15	15	15	15	15	15	15	15	14	14	15	15	16	11	15	16	16	16	15	14	15	16	15	13
27	13	15	15	15	16	16	15	15	16	16	1	8	7	7	7	7	7	10	12	11	14	14	15	13
28	13	13	14	15	15	16	1	15	14	15	9	8	7	7	7	7	9	10	13	13	14	15	15	15
29	15	15	13	12	13	10	13	15	15	14	15	14	7	7	7	7	7	7	10	13	14	14	15	15
30	16	15	16	16	16	16	15	15	14	15	14	12	6	7	6	7	8	14	14	14	14	14	14	14
31	14	14	14	14	15	15	15	15	15	15	15	15	15	15	14	14	14	15	15	14	15	14	14	15

SUNSHINE
Landfill

Wind Speed (mph)
Hourly Average

October, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	2.1	2.3	2.3	1.2	1.4	2.1	2.7	1.0	1.6	4.4	5.4	5.9	6.6	7.3	7.7	7.1	6.3	6.3	5.7	4.6	3.5	3.3	3.3	3.8
2	4.5	4.4	4.3	3.9	3.8	3.6	3.9	1.7	2.8	15.0	4.7	5.6	5.2	5.8	5.4	5.7	6.2	5.8	5.6	4.2	2.7	2.2	1.9	2.0
3	2.9	6.0	11.3	9.7	6.0	3.2	1.4	1.3	1.3	2.3	3.9	5.3	5.7	6.5	6.4	7.1	6.0	5.8	4.6	3.5	3.6	2.3	2.1	1.8
4	3.1	3.3	2.2	6.2	6.4	6.9	6.6	4.1	1.7	3.2	6.2	6.6	7.2	6.4	7.4	7.3	7.3	5.4	2.6	2.5	1.4	1.6	1.0	1.1
5	1.9	2.3	1.2	1.8	2.7	1.2	1.5	1.7	0.8	3.7	4.6	5.9	7.1	6.6	7.0	7.2	7.2	6.0	4.4	3.0	3.4	2.1	4.0	4.4
6	5.3	4.9	4.4	4.5	4.6	6.3	6.0	6.5	6.2	6.5	6.6	7.4	7.3	7.3	6.9	6.6	7.7	8.4	4.6	3.0	3.2	1.9	8.2	12.3
7	12.1	10.4	11.3	14.1	15.5	16.5	15.3	12.0	12.7	14.5	13.2	12.7	13.8	13.2	10.5	6.5	8.3	8.4	10.1	9.2	6.2	10.0	8.2	8.9
8	9.0	7.7	9.8	6.1	7.3	3.6	4.1	6.5	7.4	3.7	4.8	3.1	5.3	5.5	5.9	6.6	7.1	5.0	5.1	2.7	2.9	5.9	7.0	6.4
9	7.2	9.7	8.3	8.6	7.4	6.3	9.7	4.4	1.3	2.1	3.4	5.7	6.5	7.2	5.7	5.6	5.9	5.1	5.3	3.2	2.0	3.6	3.1	2.4
10	1.8	1.8	1.4	2.0	1.5	1.0	1.4	3.4	6.1	5.9	6.5	6.2	4.9	11.4	8.5	9.9	13.6	11.3	11.3	8.9	9.8	8.4	5.3	3.8
11	3.4	5.8	6.4	6.2	4.7	4.0	4.1	5.9	9.9	18.6	22.2	23.0	17.3	13.2	17.3	15.1	17.4	15.9	14.8	11.5	8.2	6.4	9.5	6.8
12	9.2	12.2	9.2	12.7	10.8	10.8	11.6	8.8	5.3	8.4	12.2	13.7	9.7	10.0	8.7	8.6	8.6	11.1	10.8	14.3	16.6	13.3	11.7	10.0
13	11.7	12.8	14.7	15.8	15.5	15.5	18.6	17.5	20.4	26.7	27.6	27.3	24.6	21.9	20.6	22.7	24.6	23.0	21.7	18.1	23.4	23.0	22.6	20.6
14	23.2	23.9	24.3	23.4	25.2	24.9	24.1	25.6	25.4	22.3	21.9	20.1	18.8	16.8	17.2	15.6	17.3	14.3	15.1	15.5	18.8	18.8	19.8	17.9
15	18.8	18.4	18.0	18.4	19.3	21.9	20.7	18.9	20.7	18.3	13.6	14.0	12.6	11.2	11.5	9.8	9.5	11.9	13.8	12.0	13.8	15.7	16.6	16.2
16	18.3	19.4	19.2	17.2	14.9	16.3	16.9	14.9	13.1	13.7	11.1	8.3	6.7	3.9	3.7	4.2	5.3	4.3	9.0	8.9	10.2	13.4	15.1	9.4
17	9.0	10.1	7.3	9.9	13.0	13.3	11.0	13.1	13.0	12.3	6.6	3.9	5.6	5.6	6.1	6.1	7.3	5.7	3.1	3.6	5.3	9.6	9.5	4.2
18	2.4	2.3	1.8	3.4	8.5	9.0	8.6	6.5	4.6	3.9	3.8	6.1	6.3	6.5	6.5	6.6	6.6	3.9	2.4	2.1	2.3	1.7	1.3	1.4
19	1.5	2.0	2.2	1.8	1.7	2.1	1.6	1.4	0.8	2.8	4.0	5.9	7.1	7.5	7.3	8.2	7.2	7.2	6.2	6.2	4.6	3.1	5.3	6.7
20	6.3	6.7	7.0	7.4	8.2	5.7	5.0	5.3	4.6	4.8	6.0	6.3	5.6	6.6	5.5	5.1	5.6	6.2	4.5	2.9	1.8	1.3	2.6	3.3
21	4.4	4.6	2.4	3.3	6.9	6.2	6.4	4.9	9.3	7.8	7.2	7.8	4.6	7.0	7.2	7.0	6.5	5.9	3.4	1.8	2.3	2.1	8.3	2.7
22	1.4	5.3	4.2	4.9	3.0	3.5	2.4	4.1	8.9	9.3	5.5	6.3	6.7	7.6	6.7	6.7	6.7	5.2	4.3	4.0	5.2	5.2	4.0	4.6
23	4.5	5.1	4.6	4.6	4.6	6.7	6.7	4.2	5.1	5.8	5.6	6.1	5.4	6.1	5.9	6.1	6.4	7.3	8.1	4.3	5.8	4.7	5.3	4.2
24	3.2	3.1	2.3	1.8	4.3	4.7	4.1	7.7	7.5	5.0	8.4	10.9	9.6	11.3	11.3	6.7	4.4	4.0	2.3	2.1	6.8	10.4	9.2	8.4
25	6.5	6.7	6.4	7.1	10.0	7.4	9.2	12.8	11.8	10.2	10.7	10.2	12.6	11.0	9.5	10.8	7.4	7.9	7.0	7.0	8.8	10.6	14.1	13.6
26	11.7	17.8	15.6	17.2	17.2	16.5	14.4	15.6	17.5	16.0	13.7	9.4	8.4	4.4	6.8	8.3	7.6	8.3	6.2	3.8	5.8	10.0	5.1	3.2
27	2.8	8.1	8.7	5.1	8.6	4.5	7.1	8.7	11.5	9.6	3.3	4.7	6.0	6.0	5.7	5.1	6.0	6.2	3.1	2.7	3.4	4.6	5.7	2.6
28	2.0	2.6	6.1	8.1	11.2	8.2	9.8	10.0	6.9	5.6	3.1	4.7	4.2	5.5	6.9	5.9	5.9	4.8	2.6	2.6	5.0	8.2	10.1	10.9
29	12.5	11.6	5.6	2.0	2.2	2.5	2.5	10.0	11.6	10.5	9.0	5.3	5.2	5.8	6.1	6.5	6.2	3.1	1.9	2.1	2.5	3.0	9.0	8.6
30	8.7	8.9	11.8	11.3	10.0	8.7	10.0	9.9	11.7	11.8	10.8	7.1	4.4	4.5	5.2	4.5	2.6	3.4	13.2	16.3	19.0	17.2	15.6	15.0
31	11.8	14.9	15.0	15.3	10.5	11.2	10.1	11.2	15.4	11.5	11.9	7.8	10.7	10.0	11.7	13.7	15.0	17.3	20.4	21.1	20.6	19.4	17.6	16.2

SUNSHINE
Landfill

Wind Direction (Deg)
Hourly Average

November, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	331	328	331	331	328	318	334	328	323	331	336	342	353	358	350	350	339	350	350	328	323	318	336	331
2	334	331	326	326	326	328	331	328	326	320	342	350	339	342	342	344	347	355	342	331	328	328	326	326
3	328	326	331	339	336	339	342	342	334	336	320	344	247	163	165	175	149	161	234	249	312	318	339	353
4	342	355	353	315	347	4	350	336	282	15	4	172	140	149	147	151	156	161	244	315	310	310	323	331
5	336	342	342	344	344	299	336	328	289	17	154	137	133	135	144	151	170	179	282	284	353	339	339	344
6	299	315	312	312	299	259	318	331	350	12	128	128	135	147	163	144	165	154	175	208	137	156	225	156
7	168	186	189	130	140	147	163	163	165	186	119	140	147	156	156	165	172	170	186	203	168	149	299	279
8	284	299	326	344	328	328	339	323	350	1	1	170	151	158	172	165	182	208	276	133	215	261	299	339
9	339	336	4	353	339	299	282	331	4	339	299	175	237	151	147	184	158	189	156	299	299	168	156	156
10	147	156	149	182	130	161	161	147	154	182	179	179	168	161	170	156	186	244	292	15	242	165	189	156
11	140	151	144	147	126	177	189	182	124	137	165	154	170	168	165	156	144	154	201	310	299	318	318	312
12	299	323	347	336	334	331	328	350	334	334	331	326	302	315	358	274	261	326	339	299	334	307	342	323
13	274	259	186	170	193	217	186	203	186	175	170	179	191	175	198	177	320	220	323	328	326	328	326	305
14	307	299	310	326	315	315	331	331	26	276	46	151	151	170	232	232	237	237	251	213	210	225	284	299
15	299	282	276	193	276	193	251	299	177	140	140	168	172	191	163	198	151	284	320	271	299	326	323	334
16	355	344	339	334	334	320	326	344	344	344	355	350	307	310	269	225	237	307	318	355	344	323	334	350
17	331	342	342	339	342	342	336	347	350	342	328	326	307	305	292	310	198	193	307	323	323	320	331	336
18	331	342	336	347	339	339	339	336	334	328	326	320	334	323	310	254	168	179	225	242	299	284	299	299
19	279	261	269	287	299	299	312	312	350	299	244	151	154	154	184	242	234	205	299	135	154	126	182	126
20	208	312	353	323	320	336	326	326	328	336	331	320	326	320	320	318	344	318	318	331	344	353	353	339
21	328	350	339	350	339	344	342	344	353	350	331	339	331	326	323	318	315	310	320	326	339	1	331	342
22	339	355	339	323	334	334	331	323	323	326	328	328	355	342	334	320	310	323	312	331	336	342	347	347
23	282	326	299	299	342	299	299	299	299	147	168	165	161	165	151	154	165	168	220	287	287	320	312	305
24	323	310	276	299	274	299	331	318	310	347	299	156	144	147	184	151	156	208	271	284	261	299	282	299
25	279	299	299	328	331	342	342	339	336	4	1	154	144	126	165	156	119	144	282	225	234	172	177	189
26	193	184	168	165	154	177	158	154	158	232	217	182	232	234	261	274	251	225	271	326	184	203	205	203
27	201	299	259	312	310	336	323	334	323	292	318	1	208	175	151	161	186	168	203	208	279	310	334	344
28	350	334	344	326	334	4	4	353	344	347	353	289	170	135	161	161	165	193	229	312	315	320	326	342
29	331	282	282	318	318	299	276	269	299	251	184	126	170	175	179	182	184	172	193	247	256	144	172	177
30	172	184	193	182	147	172	175	172	163	154	156	154	144	147	133	256	222	15	342	344	353	331	355	326

SUNSHINE
Landfill

Wind Direction (16Pt)
Hourly Average

November, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	15	15	15	15	14	15	15	14	15	15	15	16	16	16	16	15	16	16	15	14	14	15	15
2	15	15	14	14	14	15	15	15	14	14	15	16	15	15	15	15	15	16	15	15	15	15	14	14
3	15	14	15	15	15	15	15	15	15	15	14	15	11	7	7	8	7	7	10	11	14	14	15	16
4	15	16	16	14	15	16	16	15	13	1	16	8	6	7	7	7	7	7	11	14	14	14	14	15
5	15	15	15	15	15	13	15	15	13	1	7	6	6	6	6	7	8	8	13	13	16	15	15	15
6	13	14	14	14	13	12	14	15	16	1	6	6	6	7	7	6	7	7	8	9	6	7	10	7
7	7	8	8	6	6	7	7	7	7	8	5	6	7	7	7	7	8	8	8	9	7	7	13	12
8	13	13	14	15	15	15	15	14	16	16	16	8	7	7	8	7	8	9	12	6	10	12	13	15
9	15	15	16	16	15	13	13	15	16	15	13	8	11	7	7	8	7	8	7	13	13	7	7	7
10	7	7	7	8	6	7	7	7	7	8	8	8	7	7	8	7	8	11	13	1	11	7	8	7
11	6	7	6	7	6	8	8	8	6	6	7	7	8	7	7	7	6	7	9	14	13	14	14	14
12	13	14	15	15	15	15	15	16	15	15	15	14	13	14	16	12	12	14	15	13	15	14	15	14
13	12	12	8	8	9	10	8	9	8	8	8	8	8	8	9	8	14	10	14	15	14	15	14	14
14	14	13	14	14	14	14	15	15	1	12	2	7	7	8	10	10	11	11	11	9	9	10	13	13
15	13	13	12	9	12	9	11	13	8	6	6	7	8	8	7	9	7	13	14	12	13	14	14	15
16	16	15	15	15	15	14	14	15	15	15	16	16	14	14	12	10	11	14	14	16	15	14	15	16
17	15	15	15	15	15	15	15	15	16	15	15	14	14	14	13	14	9	9	14	14	14	14	15	15
18	15	15	15	15	15	15	15	15	15	15	14	14	15	14	14	11	7	8	10	11	13	13	13	13
19	12	12	12	13	13	13	14	14	16	13	11	7	7	7	8	11	10	9	13	6	7	6	8	6
20	9	14	16	14	14	15	14	14	15	15	15	14	14	14	14	14	15	14	14	15	15	16	16	15
21	15	16	15	16	15	15	15	15	16	16	15	15	15	14	14	14	14	14	14	14	15	16	15	15
22	15	16	15	14	15	15	15	14	14	14	15	15	16	15	15	14	14	14	14	15	15	15	15	15
23	13	14	13	13	15	13	13	13	13	7	7	7	7	7	7	7	7	7	10	13	13	14	14	14
24	14	14	12	13	12	13	15	14	14	15	13	7	6	7	8	7	7	9	12	13	12	13	13	13
25	12	13	13	15	15	15	15	15	15	16	16	7	6	6	7	7	5	6	13	10	10	8	8	8
26	9	8	7	7	7	8	7	7	7	10	10	8	10	10	12	12	11	10	12	14	8	9	9	9
27	9	13	12	14	14	15	14	15	14	13	14	16	9	8	7	7	8	7	9	9	12	14	15	15
28	16	15	15	14	15	16	16	16	15	15	16	13	8	6	7	7	7	9	10	14	14	14	14	15
29	15	13	13	14	14	13	12	12	13	11	8	6	8	8	8	8	8	8	9	11	11	6	8	8
30	8	8	9	8	7	8	8	8	7	7	7	7	6	7	6	11	10	1	15	15	16	15	16	14

SUNSHINE
Landfill

Wind Speed (mph)
Hourly Average

November, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15.1	16.0	16.8	17.1	18.5	19.4	17.2	19.5	19.8	17.3	16.4	16.3	16.0	17.4	17.4	14.6	10.5	16.3	14.1	17.3	19.6	13.8	9.7	13.1
2	14.1	14.9	20.2	21.1	19.6	18.9	19.8	20.3	21.3	19.0	14.4	15.1	13.0	13.5	12.4	12.5	12.4	13.2	11.7	14.8	15.2	17.6	18.3	17.9
3	16.9	16.6	14.6	13.0	14.7	13.7	14.2	14.4	14.3	13.3	10.3	7.2	3.8	5.3	5.6	5.6	5.4	4.3	2.0	2.6	4.4	7.0	8.4	7.6
4	7.6	8.2	6.2	5.9	6.8	6.7	7.3	1.8	1.9	7.7	3.2	4.0	5.3	5.4	5.1	5.7	5.5	4.3	2.4	2.1	3.1	6.0	5.4	5.1
5	10.6	7.8	6.4	6.0	3.0	1.8	7.9	7.7	3.5	7.8	4.1	4.6	5.6	6.3	6.8	6.1	5.1	2.9	2.1	2.3	6.2	11.6	12.1	11.6
6	2.2	1.9	4.4	4.8	2.6	1.6	3.4	8.0	9.0	6.1	4.0	4.9	5.9	7.0	6.0	6.0	5.2	5.6	4.3	2.8	2.5	2.2	1.3	3.3
7	4.1	2.8	4.0	2.2	3.3	3.5	3.2	3.9	2.8	3.4	4.3	5.3	6.6	6.6	5.9	5.6	6.0	5.4	2.8	2.3	3.8	2.3	1.6	1.7
8	2.3	2.0	3.7	5.8	8.6	8.6	7.5	4.1	5.2	4.9	4.4	4.4	4.9	5.8	5.7	5.9	5.1	3.9	1.5	3.0	2.7	1.8	2.2	5.9
9	6.8	7.9	7.9	8.6	5.0	2.4	2.1	2.0	6.7	10.5	8.0	3.3	4.7	5.7	4.3	4.1	4.7	3.7	2.2	2.4	1.0	2.4	5.5	5.9
10	5.5	3.7	2.3	3.8	2.2	2.5	4.3	7.0	9.0	9.6	10.0	11.3	9.3	9.7	6.8	7.4	2.8	4.8	6.1	3.1	3.4	4.2	4.6	5.5
11	4.9	4.2	4.0	3.9	4.1	3.9	3.7	3.2	2.3	2.9	3.5	4.5	4.4	4.1	4.2	3.7	3.6	2.6	2.9	3.1	1.4	3.6	3.4	2.3
12	3.4	5.4	7.0	7.0	8.5	10.0	9.7	9.4	11.0	11.8	10.9	9.6	7.3	5.9	3.4	3.9	7.7	5.0	4.1	3.4	4.9	3.9	5.5	4.1
13	1.3	1.6	3.4	3.4	4.5	4.3	2.8	4.3	5.9	5.6	6.1	7.7	6.7	6.3	4.4	2.6	3.0	1.6	3.9	7.5	7.6	7.9	6.3	4.5
14	3.5	3.2	2.7	6.1	4.0	1.9	3.1	3.1	1.6	1.5	2.6	3.8	5.3	7.1	9.1	8.3	6.9	5.7	6.1	2.2	2.5	2.6	2.5	1.8
15	2.4	1.9	1.5	1.5	1.5	1.2	2.1	1.8	1.3	3.7	4.1	6.2	7.0	7.9	7.1	3.8	1.9	2.3	3.2	2.4	2.6	3.7	2.8	3.8
16	5.3	3.7	3.4	7.4	8.7	6.0	7.0	8.8	9.0	10.7	7.7	4.5	3.5	2.9	2.2	5.7	7.7	3.5	4.9	6.5	7.9	6.9	7.8	12.3
17	11.5	11.7	11.0	13.0	12.4	12.2	12.9	11.9	13.2	11.9	9.9	8.9	8.0	5.9	5.5	5.8	5.0	2.1	3.5	15.1	16.4	11.6	10.9	12.6
18	15.9	11.7	13.7	11.9	11.4	11.8	14.8	15.5	13.4	12.5	11.5	10.1	8.7	8.4	5.6	3.7	4.8	4.2	4.4	1.7	2.6	2.3	2.2	2.6
19	1.7	1.8	2.2	2.9	3.0	2.6	2.5	2.5	5.9	2.6	2.4	3.8	6.0	5.2	5.0	5.8	5.5	3.4	1.8	1.7	2.6	1.8	1.6	0.9
20	1.4	2.5	6.2	13.8	15.2	13.3	16.6	18.5	20.9	17.3	18.1	16.9	12.2	12.9	13.7	13.8	10.0	13.8	13.6	15.7	16.4	14.7	15.0	14.8
21	15.8	14.6	14.5	14.8	15.3	15.3	14.5	13.4	12.9	10.4	8.2	6.6	6.2	9.4	12.5	15.3	17.0	14.1	11.4	17.0	13.0	10.3	13.3	12.9
22	14.1	13.9	14.8	11.9	16.7	17.5	18.1	18.4	18.8	17.4	15.8	14.7	13.9	11.2	7.6	7.3	8.7	7.8	4.4	10.0	11.5	10.3	8.9	6.1
23	2.1	2.4	1.8	1.8	1.6	1.6	1.6	1.8	1.0	3.9	5.5	5.9	6.1	6.3	6.1	5.6	4.9	4.1	2.4	2.7	2.9	4.5	4.8	5.3
24	3.9	2.7	1.5	1.6	1.3	1.8	4.2	4.9	3.1	1.4	2.2	3.3	3.2	4.3	4.7	4.9	4.8	3.9	2.4	2.5	2.7	3.0	1.9	2.6
25	1.7	2.2	1.8	4.4	8.2	8.5	10.1	10.7	8.8	6.7	5.4	1.5	3.6	2.7	2.8	3.7	2.4	2.0	1.9	1.3	1.0	3.7	3.6	4.0
26	4.5	5.0	5.5	5.2	5.6	7.2	8.7	14.5	22.3	16.7	10.2	8.0	9.6	12.0	11.7	8.4	5.6	6.5	5.9	5.9	2.2	2.3	3.4	2.3
27	2.9	2.6	1.6	2.3	3.1	7.0	8.0	9.4	6.7	5.3	3.6	4.4	2.8	5.3	4.2	3.6	2.8	2.4	3.7	1.4	3.4	3.1	5.8	7.9
28	9.0	5.8	6.5	5.9	7.4	9.4	9.6	9.5	9.7	9.8	8.1	3.7	3.4	4.2	3.6	4.3	4.2	3.0	2.3	2.3	4.0	6.4	4.8	3.2
29	2.0	2.1	2.1	3.6	5.3	2.4	1.5	1.1	1.0	0.7	2.2	4.5	5.4	5.3	5.8	7.0	7.2	5.7	4.2	3.8	3.9	4.8	3.0	3.9
30	2.0	2.2	2.4	3.2	3.5	4.0	6.3	6.7	6.7	7.1	7.4	7.1	6.7	7.4	5.2	3.9	3.4	5.9	6.2	6.0	5.0	5.1	7.0	7.2

SUNSHINE
Landfill

Wind Direction (Deg)
Hourly Average

December, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	342	334	331	342	336	342	342	342	326	334	328	326	331	310	315	310	312	305	347	336	334	334	342	339
2	342	350	347	347	344	299	347	342	339	328	323	264	193	149	158	158	184	179	205	208	242	299	299	282
3	299	284	299	259	203	323	331	334	12	353	4	6	323	156	158	177	179	210	299	307	323	320	334	320
4	334	331	336	342	344	339	342	342	339	339	334	336	210	172	172	184	161	175	177	220	282	261	299	244
5	175	210	213	193	170	165	165	165	168	172	158	158	161	161	172	151	242	353	336	339	336	336	336	334
6	328	336	318	299	305	339	326	331	326	331	331	328	334	334	331	328	326	326	331	336	334	331	323	331
7	334	331	331	334	342	347	347	312	193	29	261	269	154	165	156	193	203	215	149	203	179	191	249	276
8	220	299	299	323	274	299	284	315	299	17	350	344	353	331	355	326	326	323	318	326	334	331	334	4
9	331	347	328	328	328	323	328	334	334	320	326	326	323	331	358	347	331	323	326	323	323	323	323	334
10	336	318	318	331	323	320	331	336	339	334	350	355	358	353	353	358	1	355	358	353	355	336	336	328
11	320	318	334	336	328	328	334	344	355	358	358	350	339	299	320	336	350	20	15	6	353	4	15	320
12	326	344	350	350	334	328	331	336	318	331	323	4	350	347	353	358	355	355	339	323	331	328	323	328
13	323	318	318	320	323	320	320	326	326	326	328	328	320	320	326	342	328	339	342	342	342	344	336	336
14	339	339	342	344	342	350	344	347	350	353	334	336	1	137	182	186	215	299	358	17	355	353	336	344
15	344	344	344	344	326	320	326	342	334	334	331	320	323	310	269	353	355	1	358	326	336	320	342	328
16	328	336	334	339	339	334	336	328	328	331	323	334	344	4	355	1	347	334	331	326	344	342	334	334
17	342	344	353	353	358	1	334	326	342	6	12	156	149	149	161	165	161	177	193	193	189	189	189	172
18	168	158	163	151	168	163	154	163	168	175	156	154	234	43	334	318	310	315	334	336	328	328	328	334
19	347	344	347	342	339	339	355	353	320	318	323	287	326	334	15	334	336	334	336	336	342	347	323	297
20	334	320	320	339	342	342	326	323	328	328	328	326	320	323	158	154	182	274	222	259	323	299	299	222
21	184	186	201	177	184	196	244	334	320	328	323	326	318	326	318	323	328	328	320	326	323	326	336	339
22	344	326	328	339	355	353	355	353	355	353	353	9	344	355	315	353	320	334	353	355	336	328	323	326
23	331	334	323	326	334	342	339	323	334	9	6	149	151	149	168	170	170	198	289	323	320	315	315	307
24	334	6	358	353	342	350	353	4	355	331	320	342	4	4	344	328	344	347	323	318	326	326	326	328
25	358	350	320	350	350	342	320	347	342	339	358	334	350	326	336	323	355	1	347	342	342	344	318	318
26	339	344	323	328	323	342	328	326	326	326	328	1	358	358	4	355	353	6	6	1	318	315	312	315
27	318	328	336	326	334	344	334	336	331	323	320	339	350	358	355	350	353	347	342	334	342	344	344	336
28	334	334	320	318	336	336	323	334	334	328	353	353	355	355	1	355	1	336	331	320	312	323	328	323
29	320	323	326	323	328	326	320	320	326	320	323	339	342	339	342	342	336	336	328	326	323	323	320	323
30	320	323	328	323	326	331	328	326	328	326	326	320	318	334	326	323	320	326	320	328	328	331	334	344
31	342	342	342	342	344	347	347	350	347	342	336	331	334											

SUNSHINE
Landfill

Wind Direction (16Pt)
Hourly Average

December, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	15	15	15	15	15	15	15	14	15	15	14	15	14	14	14	14	14	15	15	15	15	15	15
2	15	16	15	15	15	13	15	15	15	15	14	12	9	7	7	7	8	8	9	9	11	13	13	13
3	13	13	13	12	9	14	15	15	1	16	16	16	14	7	7	8	8	9	13	14	14	14	15	14
4	15	15	15	15	15	15	15	15	15	15	15	15	9	8	8	8	7	8	8	10	13	12	13	11
5	8	9	9	9	8	7	7	7	7	8	7	7	7	7	8	7	11	16	15	15	15	15	15	15
6	15	15	14	13	14	15	14	15	14	15	15	15	15	15	15	15	14	14	15	15	15	15	14	15
7	15	15	15	15	15	15	15	14	9	1	12	12	7	7	7	9	9	10	7	9	8	8	11	12
8	10	13	13	14	12	13	13	14	13	1	16	15	16	15	16	14	14	14	14	14	15	15	15	16
9	15	15	15	15	15	14	15	15	15	14	14	14	14	15	16	15	15	14	14	14	14	14	14	15
10	15	14	14	15	14	14	15	15	15	15	16	16	16	16	16	16	16	16	16	16	16	15	15	15
11	14	14	15	15	15	15	15	15	16	16	16	16	15	13	14	15	16	1	1	16	16	16	1	14
12	14	15	16	16	15	15	15	15	14	15	14	16	16	15	16	16	16	16	15	14	15	15	14	15
13	14	14	14	14	14	14	14	14	14	14	15	15	14	14	14	15	15	15	15	15	15	15	15	15
14	15	15	15	15	15	16	15	15	16	16	15	15	16	6	8	8	10	13	16	1	16	16	15	15
15	15	15	15	15	14	14	14	15	15	15	15	14	14	14	12	16	16	16	16	14	15	14	15	15
16	15	15	15	15	15	15	15	15	15	15	14	15	15	16	16	16	15	15	15	14	15	15	15	15
17	15	15	16	16	16	16	15	14	15	16	1	7	7	7	7	7	7	8	9	9	8	8	8	8
18	7	7	7	7	7	7	7	7	7	8	7	7	10	2	15	14	14	14	15	15	15	15	15	15
19	15	15	15	15	15	15	16	16	14	14	14	13	14	15	1	15	15	15	15	15	15	15	14	13
20	15	14	14	15	15	15	14	14	15	15	15	14	14	14	7	7	8	12	10	12	14	13	13	10
21	8	8	9	8	8	9	11	15	14	15	14	14	14	14	14	14	15	15	14	14	14	14	15	15
22	15	14	15	15	16	16	16	16	16	16	16	16	15	16	14	16	14	15	16	16	15	15	14	14
23	15	15	14	14	15	15	15	14	15	16	16	7	7	7	7	8	8	9	13	14	14	14	14	14
24	15	16	16	16	15	16	16	16	16	15	14	15	16	16	15	15	15	15	14	14	14	14	14	15
25	16	16	14	16	16	15	14	15	15	15	16	15	16	14	15	14	16	16	15	15	15	15	14	14
26	15	15	14	15	14	15	15	14	14	14	15	16	16	16	16	16	16	16	16	16	14	14	14	14
27	14	15	15	14	15	15	15	15	15	14	14	15	16	16	16	16	16	15	15	15	15	15	15	15
28	15	15	14	14	15	15	14	15	15	15	16	16	16	16	16	16	16	15	15	14	14	14	15	14
29	14	14	14	14	15	14	14	14	14	14	14	15	15	15	15	15	15	15	15	14	14	14	14	14
30	14	14	15	14	14	15	15	14	15	14	14	14	14	15	14	14	14	14	14	15	15	15	15	15
31	15	15	15	15	15	15	15	16	15	15	15	15	15											

SUNSHINE
Landfill

Wind Speed (mph)
Hourly Average

December, 1997

	Clock Time (PST)																							
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	10.1	9.8	14.2	6.9	8.8	11.7	9.9	8.0	11.3	9.8	8.8	7.4	9.5	12.6	12.4	11.2	7.3	6.1	6.8	10.4	13.0	12.5	13.8	13.0
2	11.2	9.4	10.3	10.3	7.2	5.0	5.6	11.2	9.8	10.1	8.0	2.9	3.9	4.6	4.7	4.0	4.4	4.5	5.1	2.8	1.7	2.0	1.8	2.1
3	2.2	2.3	1.8	3.4	3.7	4.1	7.3	5.6	5.6	10.0	8.9	5.5	2.6	4.4	7.3	6.5	6.1	2.5	2.8	3.3	6.7	7.5	9.2	5.8
4	11.6	8.9	8.6	11.5	12.3	12.5	11.9	14.5	15.3	15.0	14.1	8.8	3.6	6.7	6.4	6.3	5.7	4.6	3.6	1.6	1.9	1.8	2.4	2.4
5	3.3	2.5	3.0	3.6	3.4	4.2	5.2	4.5	4.8	6.4	9.5	11.7	11.8	6.8	4.0	5.3	3.9	11.0	13.1	14.3	14.2	15.4	19.1	18.5
6	13.9	13.5	7.2	6.6	8.8	18.9	18.8	19.0	19.9	19.7	18.1	19.3	17.7	16.6	16.4	16.0	17.9	17.8	16.6	16.7	17.5	18.1	14.3	14.0
7	16.5	14.9	14.9	11.0	11.2	7.5	9.1	2.3	0.9	1.9	0.9	2.2	4.5	4.2	4.8	3.9	4.0	7.3	5.8	6.0	5.8	7.0	10.9	8.6
8	2.4	2.6	3.0	2.6	2.6	2.8	2.5	3.8	2.0	2.6	5.2	6.7	4.3	6.2	6.5	5.9	7.4	5.4	11.9	10.5	8.7	9.5	10.1	10.4
9	11.3	12.6	14.5	14.5	16.2	17.5	16.3	16.3	13.0	13.3	14.6	14.2	13.8	12.9	11.6	12.6	12.9	15.6	14.8	16.2	15.8	15.8	16.0	14.1
10	15.6	20.2	19.9	17.5	19.8	20.4	19.2	18.2	18.0	13.4	14.9	11.8	9.2	11.0	10.0	10.4	12.7	11.1	11.7	12.4	13.4	11.1	11.1	14.1
11	17.2	19.4	13.6	14.7	15.4	17.6	15.4	15.5	13.2	14.6	13.3	14.8	11.6	11.0	11.6	8.8	9.4	8.7	6.4	6.0	7.6	6.9	5.9	6.4
12	8.3	5.8	8.5	10.1	14.1	15.0	12.6	13.3	15.5	14.8	12.1	13.9	13.4	10.8	14.1	17.0	13.0	13.5	12.5	18.6	18.4	19.4	21.3	20.6
13	22.0	24.1	24.0	23.3	21.3	22.7	23.6	22.6	22.5	19.2	18.7	14.3	12.9	12.4	10.9	11.2	15.4	16.6	14.9	13.5	14.0	13.2	12.8	12.0
14	12.5	14.1	14.0	13.7	14.5	13.2	13.4	13.1	12.7	10.5	8.5	8.6	4.4	2.9	3.5	3.4	3.8	2.8	5.8	5.2	8.2	8.1	7.7	8.8
15	9.3	7.2	10.4	9.0	10.7	12.4	11.8	10.3	9.8	12.3	12.4	14.1	11.0	8.1	6.8	6.9	11.3	16.1	9.2	12.9	13.3	10.5	15.1	19.4
16	19.7	17.6	18.3	18.4	17.1	16.8	16.7	18.9	19.6	20.4	20.6	17.9	16.5	12.9	12.5	12.0	11.7	11.8	13.1	13.7	12.7	11.7	12.3	13.0
17	11.2	10.9	12.8	11.0	9.0	9.1	9.2	7.0	5.5	2.5	5.1	3.3	4.6	5.0	5.4	5.2	5.4	5.2	4.2	4.5	4.0	4.9	4.3	4.7
18	5.5	8.3	6.0	4.9	3.1	3.9	6.0	6.7	6.2	5.3	7.0	4.1	1.5	2.3	6.5	4.9	5.6	7.4	10.1	16.0	18.4	19.4	20.2	18.4
19	17.8	15.7	16.1	11.7	9.8	10.5	14.6	13.3	7.9	10.4	9.3	11.0	11.8	12.3	12.8	13.0	13.3	10.5	10.8	12.0	13.8	14.0	18.1	20.5
20	21.4	16.3	16.5	20.3	22.8	23.1	22.9	25.0	20.8	19.1	16.7	11.3	8.8	4.1	2.9	3.0	3.2	2.6	2.1	3.2	4.1	3.0	3.4	2.9
21	6.0	5.9	5.5	4.9	7.2	6.2	4.1	8.7	11.6	13.4	14.3	13.5	14.9	13.9	17.6	14.2	15.0	12.5	15.6	14.4	19.6	21.6	19.0	16.1
22	14.3	16.6	15.8	15.7	19.3	20.0	20.4	21.4	21.6	24.8	21.4	15.1	10.9	10.1	8.4	7.6	7.9	8.3	13.1	13.4	13.3	16.9	21.4	20.9
23	20.7	20.3	21.9	17.4	15.4	10.1	9.3	14.0	17.5	9.1	3.0	4.6	6.1	6.5	4.8	4.4	3.4	3.5	3.3	6.9	9.4	13.1	9.9	10.1
24	15.9	19.7	18.7	10.5	8.5	11.8	10.5	10.1	7.2	8.0	9.6	8.5	7.9	7.9	9.5	7.9	7.9	10.5	14.3	11.5	11.5	9.8	8.3	7.7
25	11.6	7.8	5.8	7.3	8.7	9.9	13.9	11.2	10.8	8.4	11.6	10.3	9.9	10.0	9.7	9.7	10.6	11.3	7.5	6.9	7.6	6.7	5.1	4.9
26	7.3	11.8	17.0	14.9	15.6	13.5	14.3	17.6	19.4	18.1	13.6	12.7	10.7	13.1	9.6	8.9	8.1	8.7	13.7	10.8	11.3	12.8	16.1	18.6
27	22.6	19.7	21.8	20.9	21.9	18.8	17.7	21.2	21.2	21.4	20.2	17.1	19.5	15.6	15.8	13.0	15.3	16.9	16.0	13.2	17.6	16.0	16.9	17.2
28	15.9	13.6	18.4	12.3	14.2	17.1	22.1	20.6	23.2	25.4	20.4	19.0	17.3	16.3	17.4	13.7	12.2	14.6	17.1	19.3	15.3	16.8	20.3	20.6
29	20.2	21.0	22.4	25.3	25.2	27.5	26.8	27.1	27.6	28.1	24.9	22.9	20.4	19.5	20.9	21.4	20.0	18.2	19.6	20.4	21.4	21.6	20.2	20.5
30	21.9	20.1	18.9	18.6	17.5	17.3	20.0	18.1	17.1	17.9	17.2	16.5	14.5	14.1	14.0	14.0	14.8	14.8	14.8	14.9	13.2	12.8	11.0	10.7
31	11.2	11.0	11.3	11.5	10.2	12.9	12.2	13.2	11.5	11.9	12.0	10.0	7.6											

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: JAN, 1992

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	16	16	16	16	1	16	16	16	16	16	16	16	16	16	16	16	16	16	2	1	16	16	16	16
2	16	16	16	1	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	15	15	15	1	1
3	2	1	16	16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	1	16	2	9	10	9	10	10	12	16	2	1	2	3	9	9
5	9	9	9	9	9	9	9	9	9	9	12	12	5	9	9	8	8	9	9	9	9	9	9	9
6	16	16	16	16	1	1	1	1	3	3	3	8	9	9	9	9	9	9	9	1	15	16	1	16
7	16	2	2	16	2	8	8	8	9	9	8	9	9	9	4	41	1	16	1	16	1	2	1	1
8	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	16	1	1
9	16	16	16	16	16	16	1	1	1	1	16	16	16	16	16	1	16	16	16	16	16	16	1	16
10	16	1	1	16	16	16	16	16	16	16	1	1	1	1	1	1	1	1	1	1	1	1	1	16
11	2	1	1	1	1	1	1	1	1	1	16	16	16	16	16	16	16	16	16	16	16	16	1	1
12	16	16	16	16	16	16	16	16	16	16	16	1	16	1	16	1	1	16	15	16	16	1	1	1
13	1	16	1	16	16	16	16	1	16	16	16	1	2	1	1	16	16	1	16	1	1	1	1	1
14	1	1	1	1	1	16	16	16	1	16	16	1	1	16	1	2	16	16	16	16	16	16	1	1
15	15	1	16	15	1	16	15	16	16	16	16	16	14	16	16	1	1	10	16	16	1	16	16	1
16	16	16	16	16	16	16	16	16	16	15	1	1	16	1	1	16	1	16	15	16	15	15	15	16
17	16	16	1	16	16	16	1	15	1	16	16	1	14	11	16	1	1	16	16	16	16	16	15	15
18	15	15	15	16	15	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1
19	2	1	1	1	1	1	1	16	1	2	1	1	1	2	1	2	1	1	1	1	1	16	16	16
20	16	16	15	16	15	16	1	16	16	16	16	15	15	15	14	15	12	16	16	16	16	1	16	16
21	16	16	1	1	1	1	16	9	9	10	8	-	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	16	16	16	1	16	1	1	16	16	16	16	16	16	15	16	1
31	1	1	1	1	1	1	1	1	1	1	1	1	1	9	9	9	9	10	8	12	16	15	16	1

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: JAN, 1992

Clock Time

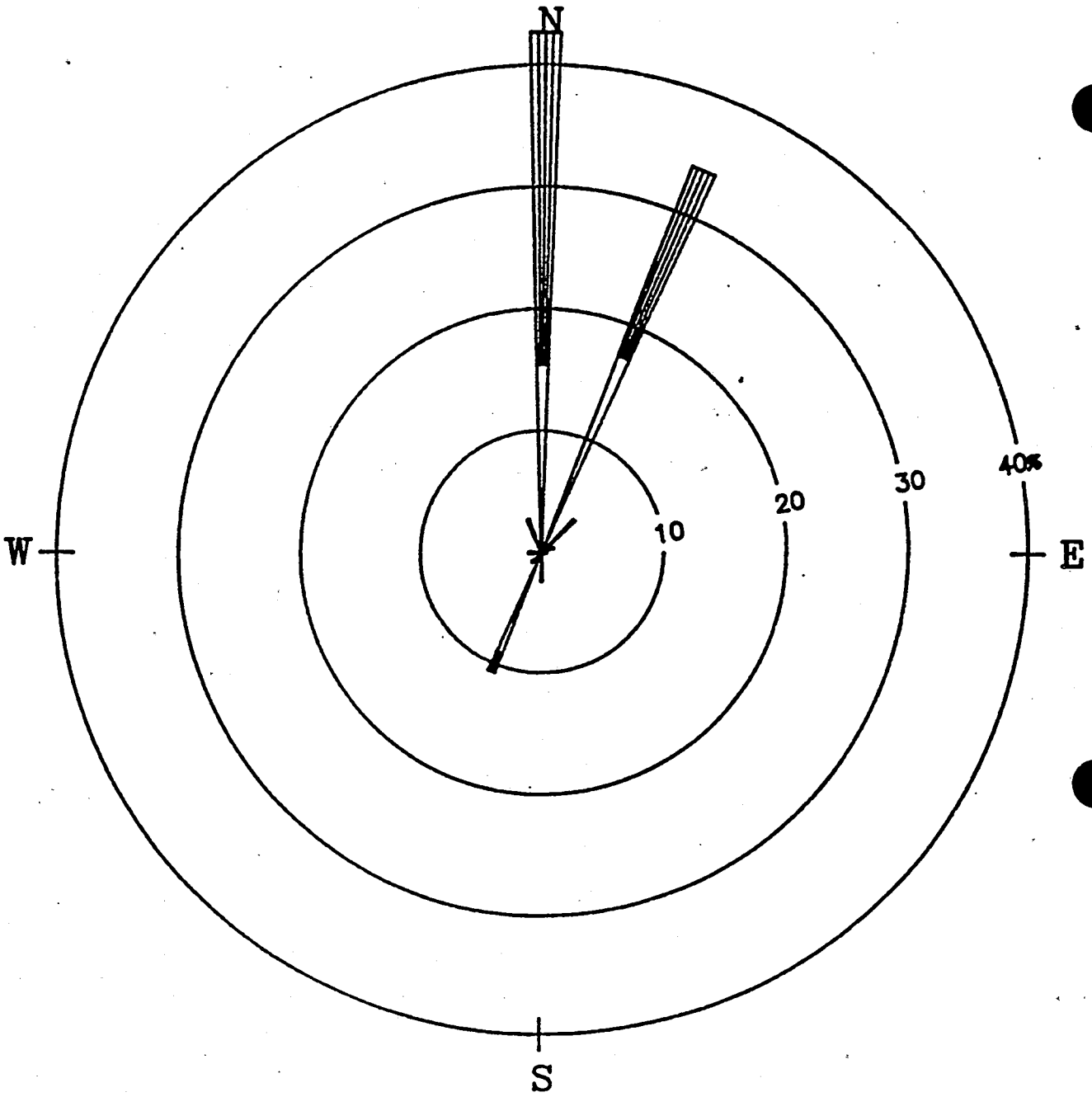
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	MAX	HR.	AVE.
1	20	22	24	28	30	28	32	32	34	28	30	18	20	28	32	31	30	28	24	30	28	28	26	28	34	8	27.46
2	30	30	32	24	32	30	32	30	28	34	30	30	32	30	26	24	26	22	24	22	24	22	21	16	34	9	27.13
3	8	14	8	16	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	3	12.20
4	-	-	-	-	-	-	-	-	9	6	5	4	5	7	5	5	5	6	5	6	8	5	16	18	18	23	7.19
5	16	16	17	20	16	20	21	22	24	30	8	10	5	6	8	6	6	7	10	9	7	4	5	5	30	9	12.42
6	5	8	7	10	8	4	4	5	6	4	4	4	18	18	6	16	18	9	5	5	4	5	6	18	18	12	8.21
7	7	7	5	4	4	5	4	4	10	5	4	6	10	5	6	10	8	28	30	10	10	12	12	16	30	18	9.25
8	28	41	40	40	36	28	27	26	38	26	18	18	24	20	30	32	24	26	26	20	28	18	26	30	41	1	27.92
9	30	24	30	24	22	28	30	28	30	21	20	24	28	30	32	28	28	30	32	40	40	38	34	32	40	19	29.29
10	38	32	40	30	30	30	30	30	30	30	32	40	40	38	34	42	34	40	40	32	30	32	30	18	42	15	33.42
11	24	26	18	20	22	16	14	10	18	14	14	14	10	10	16	10	24	30	20	20	22	20	20	20	30	17	18.00
12	20	24	24	20	20	18	18	18	28	22	20	24	24	25	24	24	16	18	18	20	14	4	4	18	28	8	19.38
13	24	24	16	16	18	14	14	14	14	16	14	18	18	14	12	12	10	10	10	8	10	8	8	10	24	0	13.83
14	12	10	10	14	8	20	20	22	30	22	16	14	20	20	24	30	20	20	20	20	14	14	14	10	30	8	17.67
15	15	10	10	14	16	14	16	16	20	24	30	30	-	-	-	-	-	-	-	-	-	-	-	-	30	10	17.9
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.0
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
30	-	-	-	-	-	-	-	-	16	16	20	22	14	12	14	12	16	16	18	14	12	10	10	8	22	11	14.38
31	8	10	10	8	10	12	14	12	12	14	10	8	6	5	8	6	8	6	4	4	6	4	3	4	14	6	8.00
AV	19	20	19	19	19	19	20	19	22	20	17	18	18	18	18	19	18	20	19	17	17	15	16	17			17.86
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

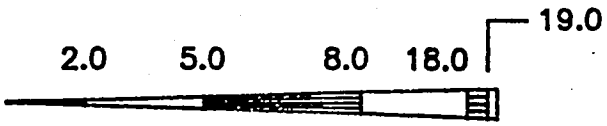
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: JAN 01, 1992 - JAN 31, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.0	0.5	0.9	6.0	13.0	153.0	20.56	21.67
1	0.0	0.9	1.7	5.7	7.9	122.0	16.40	19.77
2	0.0	0.5	0.4	0.4	0.5	14.0	1.88	14.71
3	0.0	0.4	0.1	0.0	0.0	4.0	0.54	4.75
4	0.0	0.0	0.1	0.1	0.0	2.0	0.27	8.00
5	0.0	0.1	0.0	0.0	0.0	1.0	0.13	5.00
6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
8	0.0	0.8	0.3	0.0	0.0	8.0	1.08	4.63
9	0.0	1.0	1.3	2.0	0.8	39.0	5.24	11.82
10	0.0	0.4	0.1	0.0	0.0	4.0	0.54	5.25
11	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
12	0.0	0.3	0.1	0.1	0.0	4.0	0.54	6.75
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
15	0.0	0.3	0.0	0.7	0.4	10.0	1.34	14.90
MSG	32.0	0.0	0.0	0.0	19.0	383.0	51.48	0.00
TOT	32.0	5.3	5.2	15.0	41.0	744.0	100.00	7.33





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 42.7 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: JAN 1992

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: FEB, 1992

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	13	8	8	9	9	11	13	1	1	1	1	16	12	9	9	9	9	9	16	16	16	16	16	16
2	16	16	16	16	16	1	1	1	1	1	1	1	1	1	2	1	16	16	1	1	16	16	1	1
3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16	1	16	15	16
4	16	16	16	1	16	16	16	16	16	16	16	16	15	16	10	9	9	9	14	16	1	1	1	1
5	1	16	16	1	1	1	1	1	1	1	1	2	2	12	8	9	14	14	14	12	9	9	14	1
6	12	8	8	9	9	9	9	9	8	9	9	9	13	16	1	1	1	16	12	10	11	12	15	16
7	1	8	8	9	9	9	9	9	9	9	8	8	8	8	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	8	8	8	9	9	1	16	15	1	6	9	9	9	9	9
11	9	9	9	9	9	9	9	8	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9	9
12	9	9	9	9	9	9	9	9	9	9	9	9	8	6	9	9	9	9	9	9	9	9	9	9
13	9	9	9	9	9	8	8	9	8	8	9	8	9	9	9	8	9	9	9	9	8	9	9	9
14	8	8	8	8	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
15	9	9	9	9	9	9	9	9	9	9	8	6	8	9	10	9	10	9	10	14	16	2	2	8
16	8	6	8	8	8	9	9	9	8	9	9	8	8	8	9	9	9	9	9	10	8	8	7	5
17	5	6	9	8	7	5	15	16	1	1	12	9	9	10	9	9	9	9	14	16	16	16	1	10
18	15	1	16	16	16	1	1	16	1	1	2	14	10	9	9	9	9	10	14	16	16	16	16	16
19	16	1	1	1	16	1	1	1	1	1	2	14	9	9	9	9	9	8	9	12	14	16	12	1
20	1	16	16	1	1	9	9	8	9	9	9	9	9	9	10	10	12	16	1	1	16	4	1	16
21	16	16	1	2	1	1	2	1	12	8	8	9	9	8	8	9	13	16	1	1	1	16	16	1
22	1	1	1	1	1	1	1	1	1	1	1	1	16	16	16	1	1	1	1	1	1	1	16	1
23	16	16	16	16	16	1	1	1	1	1	1	1	2	2	2	1	1	1	16	16	1	16	16	1
24	16	1	16	16	2	15	16	16	16	1	1	1	1	1	1	1	1	1	16	16	16	16	1	16
25	1	1	16	1	1	1	1	16	16	16	16	16	1	1	1	1	1	1	16	16	16	16	16	16
26	16	15	16	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	16	1
27	1	16	16	16	16	16	16	16	1	16	16	15	15	15	9	9	1	16	1	16	16	16	16	16
28	1	16	1	1	1	1	1	1	1	1	2	9	9	9	9	9	9	10	12	16	15	16	1	2
29	1	10	9	3	2	2	2	1	2	2	9	9	9	9	9	9	9	9	9	8	8	6	8	8

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: FEB, 1992

Clock Time

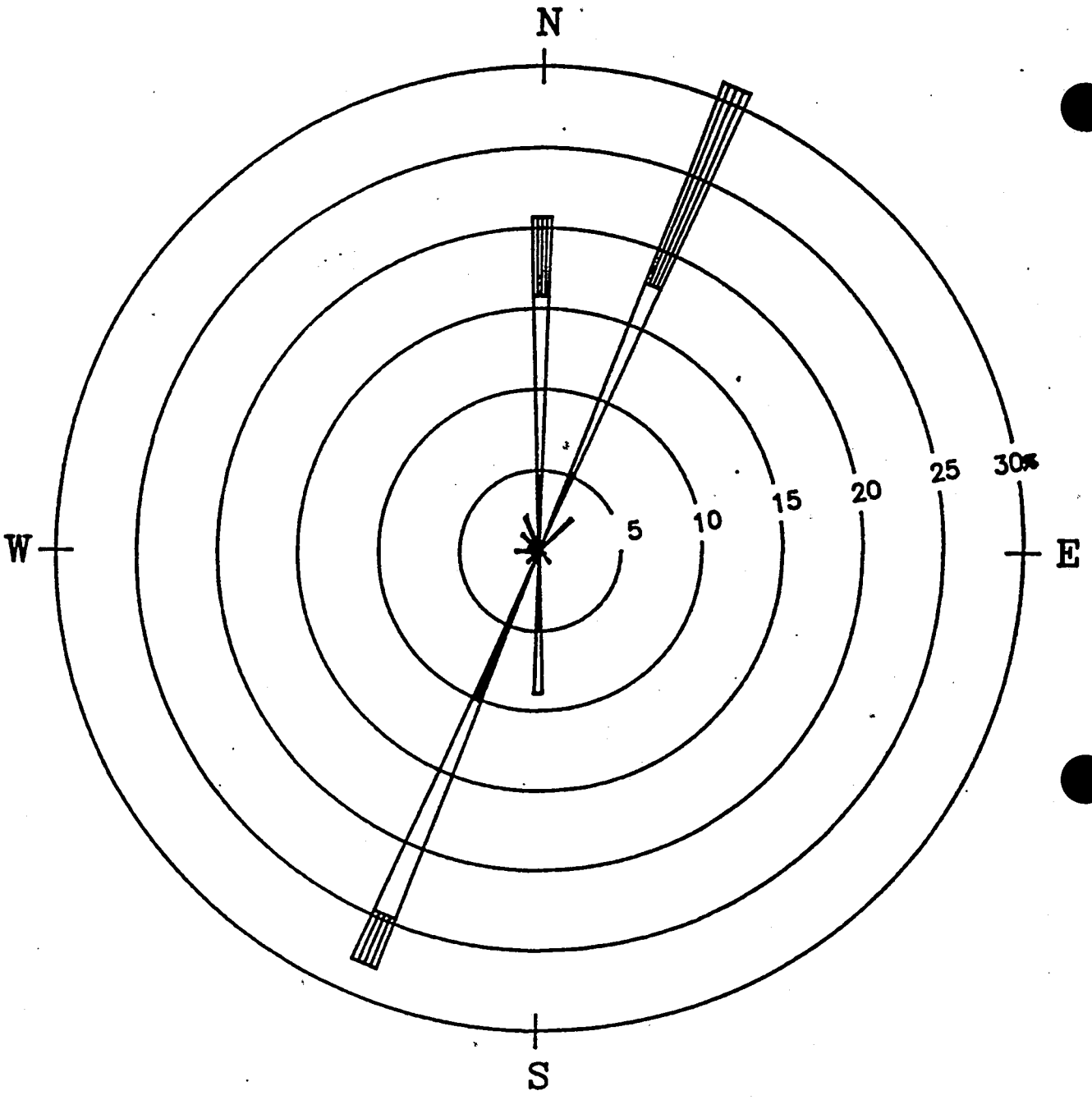
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1	2	4	2	2	1	1	2	5	4	6	6	8	5	4	4	8	6	4	8	14	22	22	24	24	24	22	7.83
2	22	26	24	26	24	22	24	30	34	36	36	32	30	24	24	26	24	22	22	22	24	24	26	28	36	9	26.33
3	34	39	34	32	34	32	28	30	30	28	34	32	30	30	32	30	30	26	20	20	14	16	16	14	39	1	27.71
4	12	12	14	12	14	16	14	12	12	14	12	8	6	4	6	6	4	2	2	4	6	6	4	4	16	5	8.58
5	4	6	6	8	6	8	10	6	8	10	4	4	2	2	4	14	2	2	2	4	4	2	2	4	14	15	5.17
6	2	4	2	4	6	6	4	4	6	4	4	2	4	4	6	8	8	6	4	2	2	2	6	4	8	15	4.33
7	4	2	4	6	6	4	4	6	4	5	6	10	10	10	-	-	-	-	-	-	-	-	-	-	10	11	5.79
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
10	-	-	-	-	-	-	-	-	-	16	16	14	16	16	17	16	16	15	16	18	18	17	19	18	19	22	16.53
11	17	18	17	16	17	16	16	15	11	10	11	12	10	12	12	11	12	13	12	14	14	15	16	20	20	23	14.04
12	18	18	20	24	22	24	22	25	30	28	26	20	10	8	8	12	10	10	8	8	9	8	9	12	30	8	16.21
13	14	13	14	16	18	16	8	8	7	8	9	8	10	10	8	9	10	9	8	10	8	8	8	8	18	4	10.21
14	9	8	8	8	7	8	9	8	8	9	10	10	12	12	14	13	10	10	12	10	12	10	14	12	14	14	10.13
15	14	10	16	18	18	20	22	24	26	30	14	14	13	14	16	15	16	17	16	15	14	14	13	13	30	9	16.
16	14	12	12	11	2	12	12	-	-	-	-	-	-	-6	-	13	13	12	12	-	-	-	11	10	14	0	11
17	10	10	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	0	10.00
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19	12	-	-	-	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	11	12	0	11.33
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21	7	10	8	-	10	9	8	10	8	6	6	-	-	8	6	6	10	20	18	20	28	26	22	20	28	20	12.67
22	18	10	15	20	18	18	25	28	25	34	32	25	26	22	35	30	30	26	34	40	32	20	14	12	40	19	24.54
23	16	22	20	15	16	18	15	18	20	28	30	25	30	24	20	15	12	12	10	8	14	12	10	12	30	10	17.58
24	14	12	10	12	8	15	16	16	15	25	26	40	30	35	36	30	28	25	22	20	10	15	18	16	40	11	20.58
25	14	20	18	15	14	12	15	14	13	12	10	20	16	15	10	14	12	10	12	8	6	10	8	6	20	1	12.67
26	8	10	12	10	12	10	8	10	14	15	20	26	28	22	32	35	32	28	22	18	10	12	18	15	35	15	17.79
27	16	14	16	15	10	12	14	15	16	14	14	10	8	6	8	6	10	8	4	6	4	10	8	6	16	0	10.42
28	8	10	12	10	8	10	12	10	8	6	4	4	6	8	6	4	6	4	2	6	4	6	4	2	12	2	6.67
29	2	2	2	4	2	2	4	4	6	2	4	6	10	12	10	12	8	6	4	2	2	4	2	2	12	13	4.75
AV	12	13	13	13	12	13	13	14	14	16	15	15	15	14	15	15	14	13	12	13	12	12	12	12			12.97
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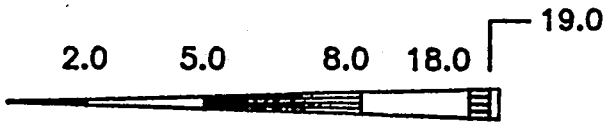
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: FEB 01, 1992 - FEB 29, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.0	0.7	2.8	8.4	3.7	106.0	15.77	14.07
1	0.0	1.4	2.5	9.5	10.0	163.0	24.26	18.74
2	0.3	0.3	0.4	0.4	0.7	15.0	2.23	13.33
3	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
4	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
5	0.0	0.0	0.0	0.3	0.0	2.0	0.30	10.00
6	0.0	0.0	0.1	0.6	0.0	5.0	0.74	12.00
7	0.0	0.0	0.0	0.1	0.0	1.0	0.15	11.00
8	0.6	0.6	2.3	3.2	0.0	46.0	6.85	8.85
9	0.7	2.3	4.6	11.0	2.5	143.0	21.28	11.74
10	0.1	0.1	0.1	0.4	0.0	6.0	0.89	10.00
11	0.3	0.0	0.0	0.0	0.0	2.0	0.30	1.50
12	0.6	0.4	0.1	0.0	0.0	8.0	1.19	3.63
13	0.3	0.1	0.0	0.1	0.0	4.0	0.60	4.50
14	0.7	0.0	0.0	0.4	0.0	8.0	1.19	6.25
15	0.0	0.1	0.6	1.0	0.0	12.0	1.79	9.75
MSG	9.9	0.0	0.0	0.0	12.0	151.0	22.47	-0.04
TOT	13.0	6.3	13.0	35.0	30.0	672.0	100.00	8.46





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 20.7 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: FEB 1992

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: MAR, 1992

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	8	2	16	9	9	8	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	8
2	16	8	8	16	16	8	1	1	14	8	8	9	9	9	9	8	8	8	5	8	9	8	9	9
3	8	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	7	9	8	13	16	16	16	14
4	16	16	14	16	8	15	14	8	8	8	8	9	9	9	9	9	9	9	9	9	9	8	9	9
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6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	1	16	12	8	9	9	12	15	8	8	9	9	9	9	8
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9	-	-	-	-	-	-	-	-	-	-	-	-	-	9	9	9	9	9	9	10	1	16	16	16
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16	16	16	2	2	2	9	8	9	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	16	16	16	16	14	16	9	9	9	9	9	9	8	4	6	8	1
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19	16	16	2	1	1	16	1	2	1	8	9	9	8	8	9	9	9	9	8	9	8	9	8	15
20	8	9	9	9	9	9	8	9	9	9	9	9	9	9	9	9	8	9	8	8	8	8	16	2
21	16	16	1	16	16	1	8	9	8	9	8	8	9	9	9	9	9	9	9	9	9	9	9	9
22	9	8	9	9	9	9	9	9	9	9	8	9	9	9	9	8	8	9	9	8	9	9	9	9
23	8	9	8	9	9	6	9	9	9	9	9	8	8	8	9	8	8	9	8	9	8	8	4	14
24	15	15	16	1	16	1	1	1	1	16	16	7	9	9	8	9	8	9	8	5	8	9	8	8
25	1	16	16	2	1	16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	2	15	6	9	9	13	9	9	9	9	9	8	15	16	16	16	1
27	16	16	2	2	7	8	8	9	9	8	8	8	9	8	9	8	3	15	16	1	16	11	8	8
28	9	16	10	8	9	8	1	1	16	1	3	8	9	9	9	9	9	9	9	1	1	1	9	8
29	7	7	6	8	8	10	9	8	8	9	8	9	9	9	8	9	9	9	9	9	9	9	9	9
30	9	9	9	9	8	9	8	9	9	10	9	9	9	9	9	9	9	9	9	9	9	9	8	8
31	8	9	9	8	8	6	8	9	8	9	3	16	9	9	9	8	9	9	8	16	1	1	2	16

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: MAR, 1992

Clock Time

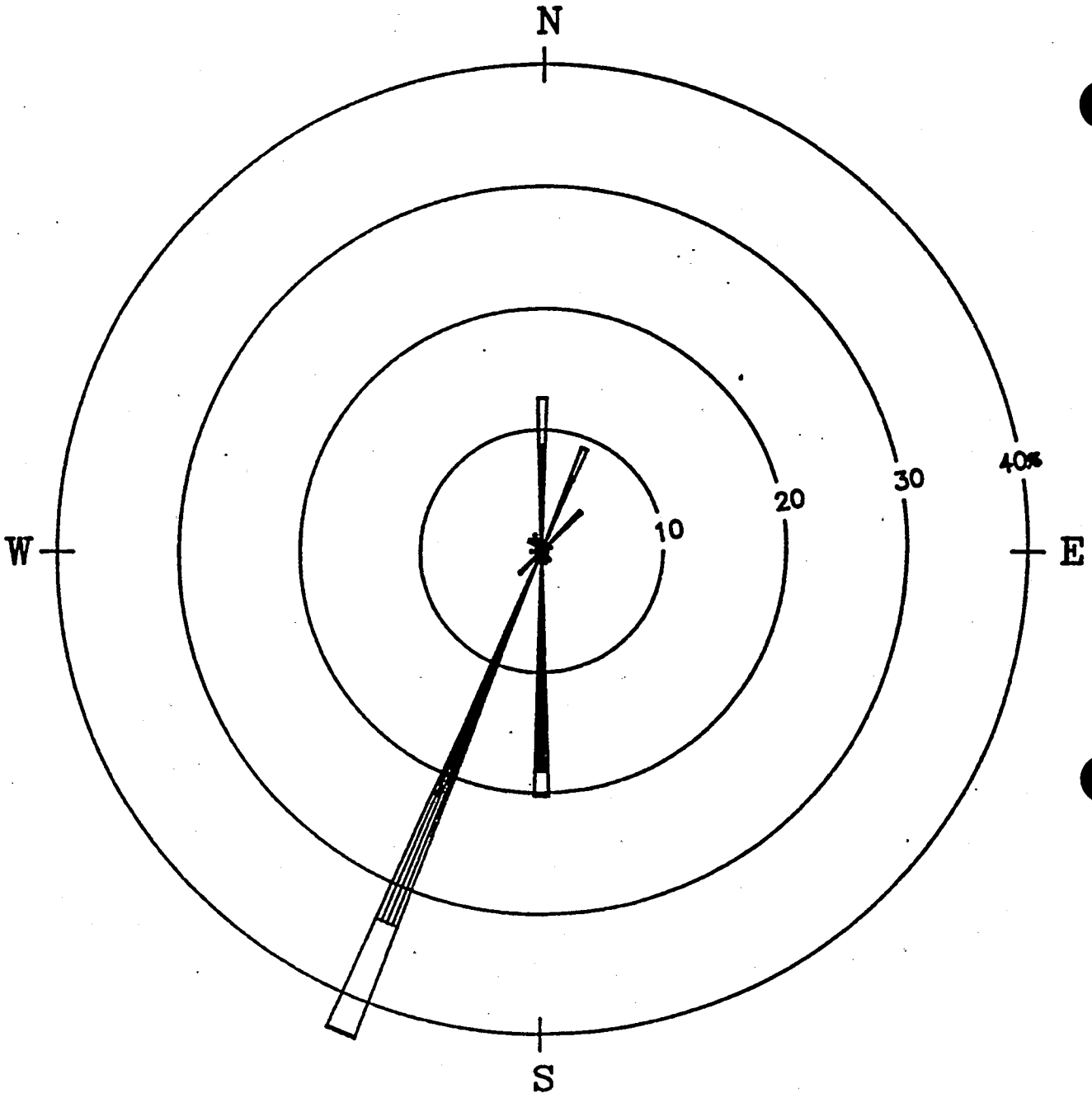
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3	5	7	6	6	4	6	5	7	8	6	10	8	6	8	5	4	5	6	5	6	5	4	6	5	10	10	5.96
4	6	7	5	4	6	7	5	4	5	4	6	7	6	4	10	8	7	8	6	4	6	4	5	4	10	14	5.75
5	5	4	6	5	8	4	5	4	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	4	5.20
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
7	-	-	-	-	-	-	-	-	-	7	6	5	8	10	10	14	8	6	5	7	6	5	6	7	14	15	7.33
8	5	6	7	5	6	5	7	6	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-	8	10	6.00
9	-	-	-	-	-	-	-	-	-	-	-	-	-	8	8	8	6	7	6	3	6	6	6	6	8	13	6.36
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11	11	11	11	11	10	14	11	13	10	10	10	10	10	10	10	10	8	8	8	8	10	10	10	11	14	5	10.21
12	10	10	9	8	8	8	8	8	8	8	7	7	6	5	7	6	6	5	3	3	2	2	3	3	10	0	6.25
13	14	2	2	2	2	3	3	4	4	6	8	8	6	8	10	10	10	10	4	6	8	6	8	8	14	0	6.33
14	6	6	8	6	6	6	8	10	10	8	10	10	10	10	10	8	12	10	8	6	6	5	4	4	12	16	7.79
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18	4	4	4	8	8	6	4	6	6	4	8	8	8	8	6	8	8	8	8	4	4	6	6	6	8	3	6.25
19	8	8	6	6	6	6	6	8	8	6	8	8	10	9	10	10	10	10	8	8	6	4	4	4	10	12	7.38
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21	8	8	8	6	8	8	8	8	8	8	8	8	6	8	8	9	6	9	8	8	8	8	8	8	9	15	7.83
22	8	6	8	8	6	6	8	8	8	10	9	8	8	14	13	14	14	14	14	14	14	14	15	10	15	22	10.46
23	8	10	10	10	10	8	8	8	10	8	8	8	8	8	8	6	8	8	8	8	8	8	8	8	10	1	8.33
24	8	8	8	8	9	8	8	1	9	10	10	9	8	8	8	10	8	8	8	8	8	10	10	8	10	9	8.25
25	10	10	10	10	8	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	0	9.71
26	-	-	-	-	-	-	-	9	9	9	9	9	4	9	9	8	9	9	6	8	8	8	8	10	10	23	8.29
27	8	8	10	8	8	8	8	8	8	8	9	8	8	8	8	7	8	8	8	8	7	8	8	8	10	2	8.04
28	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	7	8	8	7	8	9	9	23	7.96
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30	7	8	7	8	6	6	6	7	8	8	8	7	8	8	8	7	8	8	7	7	4	8	8	7	8	1	7.25
31	8	8	8	7	6	8	7	8	4	6	8	6	6	7	6	6	6	4	5	4	10	9	8	6	10	20	6.71
AV	7	7	7	7	6	7	6	7	7	7	8	8	8	8	9	9	9	8	7	7	7	7	7	7			7.36
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

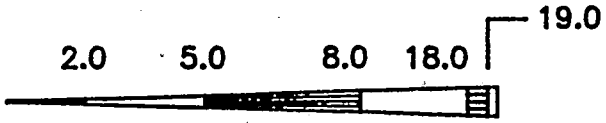
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: MAR 01, 1992 - MAR 31, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.3	1.2	5.6	3.2	0.0	77.0	10.35	7.55
1	0.5	0.7	4.0	2.2	0.0	56.0	7.53	7.55
2	0.0	1.0	1.4	1.3	0.0	29.0	3.90	7.34
3	0.0	0.0	0.7	0.0	0.0	5.0	0.67	7.60
4	0.0	0.1	0.3	0.0	0.0	3.0	0.40	6.00
5	0.0	0.0	0.4	0.0	0.0	3.0	0.40	7.33
6	0.0	0.3	0.4	0.1	0.0	6.0	0.81	7.00
7	0.0	0.5	0.1	0.1	0.0	6.0	0.81	6.00
8	0.5	4.3	10.0	1.7	0.0	129.0	17.34	6.67
9	0.8	3.3	23.0	8.0	0.1	267.0	35.89	7.85
10	0.0	0.4	1.2	0.4	0.0	15.0	2.02	7.13
11	0.0	0.0	0.1	0.0	0.0	1.0	0.13	8.00
12	0.0	0.4	0.0	0.3	0.0	5.0	0.67	8.40
13	0.0	0.1	0.1	0.0	0.0	2.0	0.27	5.00
14	0.1	0.7	0.3	0.0	0.0	8.0	1.08	5.13
15	0.0	0.1	0.8	0.3	0.0	9.0	1.21	7.78
MSG	16.0	0.0	0.0	0.0	0.0	123.0	16.53	0.00
TOT	18.0	13.0	49.0	17.0	0.1	744.0	100.00	7.02





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 12.6 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: MAR 1992

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: APR, 1992

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	16	16	16	16	16	16	16	16	16	1	16	16	16	16	1	8	9	16	1	1	16	1	1	1
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30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: APR, 1992

Clock Time

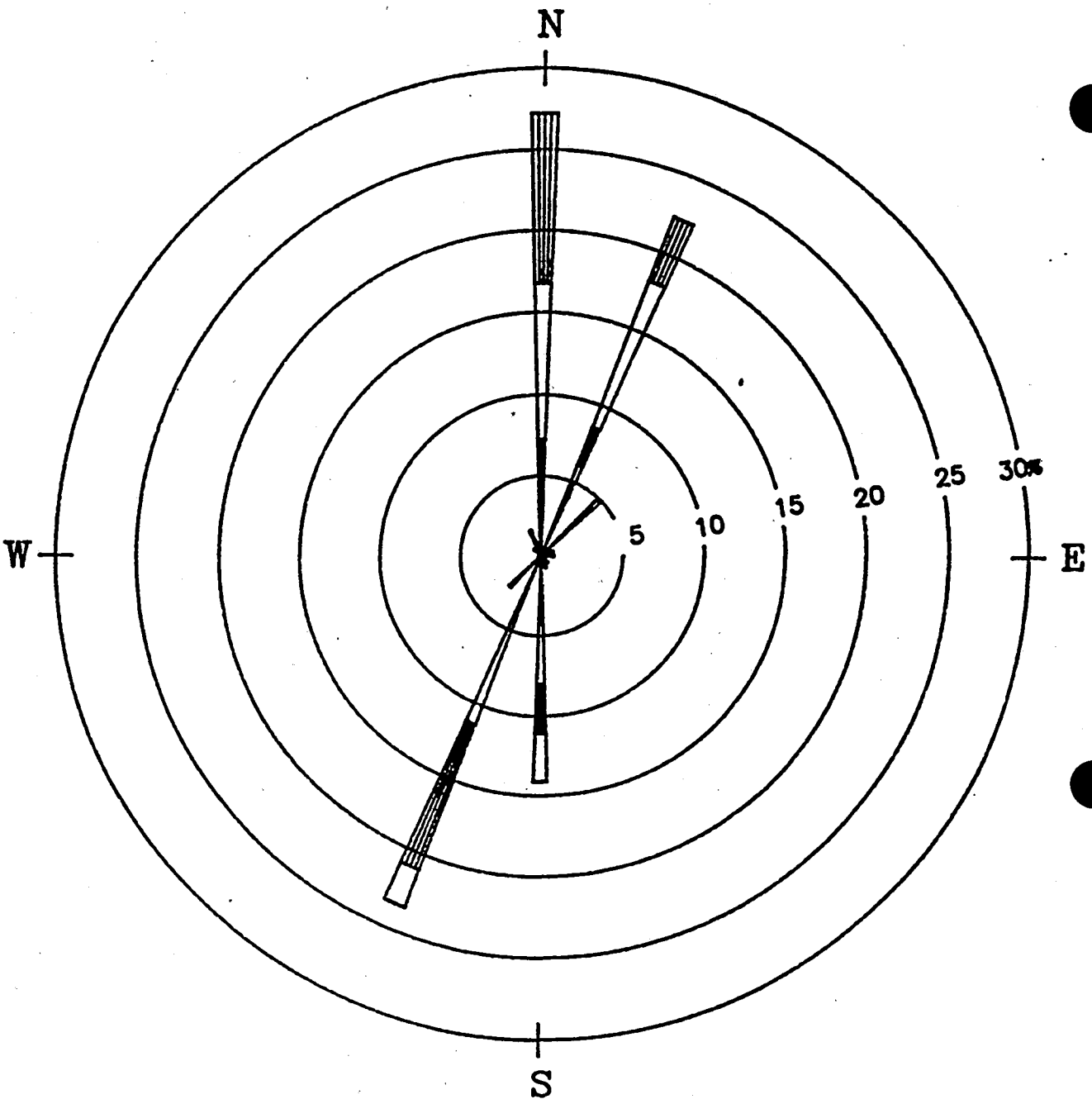
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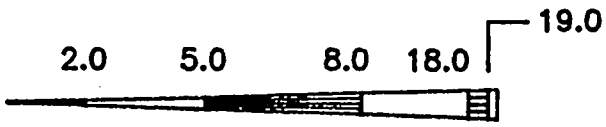
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: APR 01, 1992 - APR 30, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.0	1.8	2.0	5.0	5.5	104.0	14.44	15.98
1	0.1	3.1	1.3	5.0	2.2	86.0	11.94	12.40
2	0.3	1.3	0.6	0.4	0.0	19.0	2.64	5.32
3	0.0	0.4	0.0	0.0	0.0	3.0	0.42	3.33
4	0.0	0.1	0.3	0.0	0.0	3.0	0.42	6.67
5	0.0	0.0	0.0	0.1	0.0	1.0	0.14	9.00
6	0.1	0.1	0.1	0.0	0.0	3.0	0.42	4.33
7	0.0	0.3	0.1	0.0	0.0	3.0	0.42	5.00
8	0.1	4.1	1.6	1.6	0.0	55.0	7.64	5.89
9	0.1	5.8	5.1	1.3	0.0	90.0	12.50	6.20
10	0.0	1.1	0.3	0.0	0.0	10.0	1.39	4.70
11	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
12	0.0	0.1	0.0	0.0	0.0	1.0	0.14	3.00
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.0	0.3	0.0	0.0	0.0	2.0	0.28	3.50
15	0.0	0.1	0.4	0.3	0.1	7.0	0.97	9.57
MSG	46.0	0.0	0.0	0.0	0.0	333.0	46.25	0.00
TOT	47.0	19.0	12.0	13.0	7.9	720.0	100.00	5.93





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 27.2 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: APR 1992

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: MAY, 1992

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	-	-	-	-	-	-	-	15	16	8	9	9	9	9	8	8	9	16	16	16	16	16	16	1
2	-	-	-	-	-	-	-	1	1	9	8	8	8	9	9	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	2	2	9	9	9	8	8	9	9	9	9	9	8	8	8	9
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31	9	8	10	1	16	1	1	2	2	2	8	9	9	8	8	10	9	9	9	8	9	9	9	9

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: MAY, 1992

Clock Time

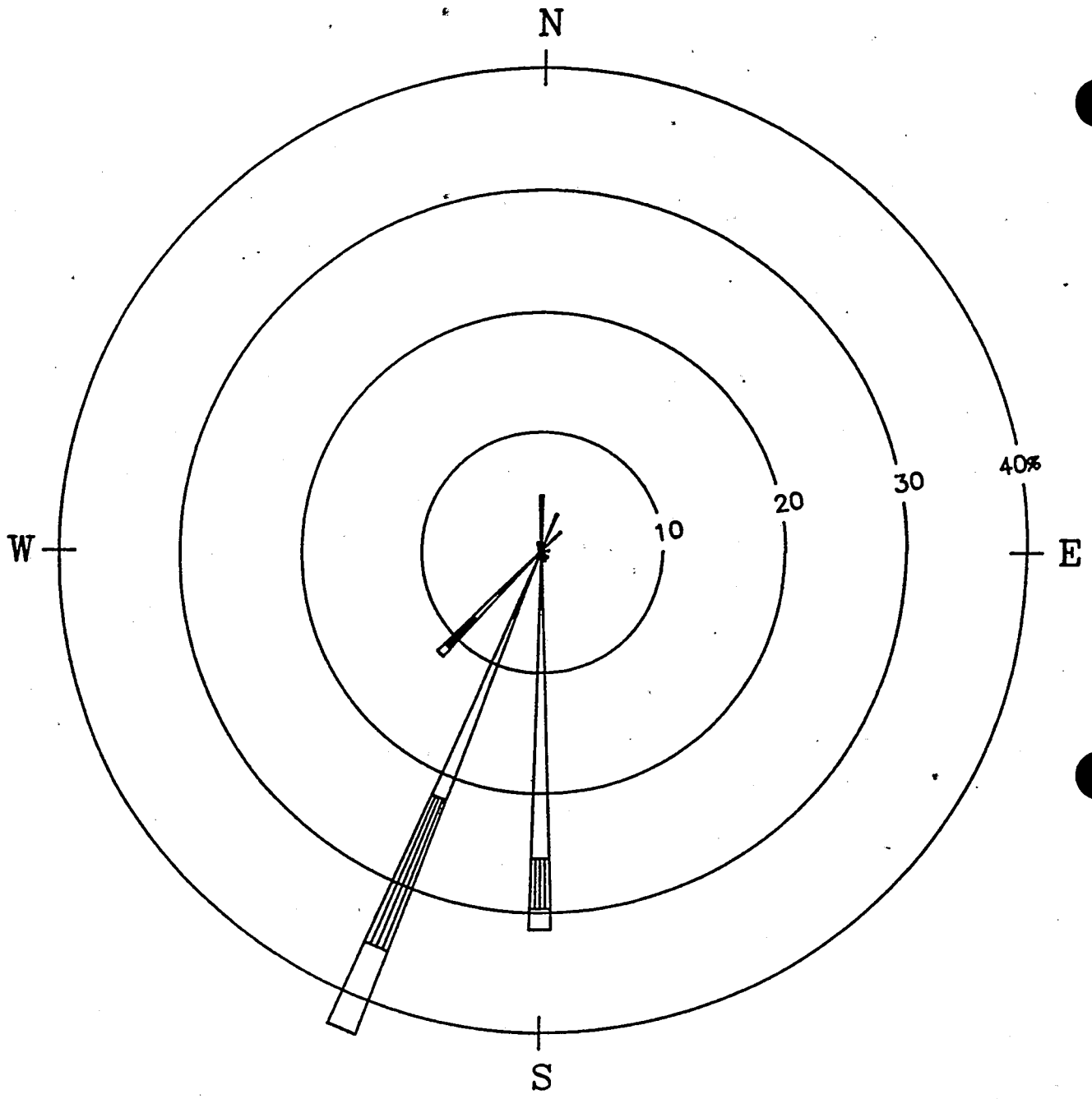
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27	8	9	6	5	5	4	5	4	3	5	4	6	6	8	7	8	7	8	8	10	8	4	8	5	10	19	6.29
28	5	4	4	4	4	4	4	5	5	4	5	4	4	4	4	5	6	5	6	8	8	4	2	5	8	19	4.71
29	3	4	4	4	2	4	4	2	2	4	5	5	5	6	5	5	8	8	8	5	5	4	4	2	8	16	4.50
30	2	2	4	4	4	3	2	3	10	4	5	5	5	8	6	10	8	8	5	5	4	2	4	4	10	8	4.88
31	4	3	4	4	5	5	9	10	10	4	5	5	5	5	5	8	8	8	8	4	5	4	3	2	10	7	5.54
AV	4	4	4	4	4	4	4	6	6	5	5	6	6	7	8	8	8	8	8	7	6	5	5	5			5.77
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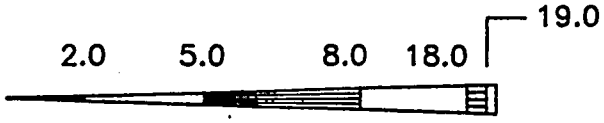
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: MAY 01, 1992 - MAY 31, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.1	1.7	0.3	1.4	0.3	29.0	3.90	8.07
1	0.0	1.6	0.3	0.8	0.0	20.0	2.69	6.60
2	0.0	1.3	0.0	0.5	0.0	14.0	1.88	5.36
3	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
4	0.1	0.4	0.0	0.0	0.0	4.0	0.54	2.75
5	0.1	0.0	0.0	0.0	0.0	1.0	0.13	2.00
6	0.3	0.3	0.0	0.0	0.0	4.0	0.54	3.50
7	0.4	0.3	0.0	0.0	0.0	5.0	0.67	2.40
8	1.6	19.0	3.4	1.4	0.0	192.0	25.81	4.75
9	0.8	17.0	11.0	6.0	0.0	266.0	35.75	6.30
10	1.0	5.3	2.6	0.7	0.0	73.0	9.81	5.34
11	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
12	0.1	0.0	0.0	0.0	0.0	1.0	0.13	2.00
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.1	0.1	0.0	0.0	0.0	2.0	0.27	3.00
15	0.1	0.1	0.3	0.1	0.0	5.0	0.67	6.20
MSG	17.0	0.0	0.0	0.0	0.1	128.0	17.20	0.00
TOT	22.0	47.0	18.0	11.0	0.4	744.0	100.00	3.64





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 4.7 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: MAY 1992

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: JUN, 1992

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	9	9	9	8	8	8	8	9	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	9	9	8	9	9	9	9	9	9	9	9	8	9	9	9	9	8
3	9	8	1	8	1	8	8	9	12	9	9	9	8	8	8	9	9	8	8	8	8	9	9	9
4	8	9	9	8	9	9	8	10	9	9	8	9	9	9	9	8	11	9	9	8	8	9	8	9
5	8	8	9	10	8	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
6	9	9	9	9	9	9	9	9	9	9	9	9	8	8	9	9	8	9	9	9	9	8	8	8
7	8	8	9	8	8	8	16	10	10	9	9	8	8	8	8	9	10	9	9	9	10	7	6	5
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9	8	8	8	10	10	16	1	1	2	2	9	10	10	9	8	9	9	9	9	8	8	9	9	9
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12	1	16	2	16	1	1	1	16	16	16	16	1	16	16	16	16	10	16	16	1	16	16	16	16
13	16	16	16	16	1	16	16	16	16	16	16	1	9	9	9	9	8	9	9	10	9	8	8	8
14	8	2	8	16	16	16	15	16	1	16	12	9	9	9	9	10	9	9	10	16	16	14	16	16
15	16	16	9	14	8	9	9	2	8	10	9	9	9	9	9	8	9	10	9	9	8	9	16	16
16	16	16	16	16	16	16	16	2	2	1	15	16	8	9	9	8	9	9	9	8	9	6	16	16
17	2	2	8	9	8	15	2	2	2	2	8	8	9	8	8	9	9	8	9	8	8	8	2	9
18	8	8	8	8	9	10	9	8	9	9	9	9	8	9	9	9	8	8	9	9	8	6	6	16
19	1	1	2	2	2	10	10	9	9	9	9	8	9	8	8	9	8	9	9	9	8	7	7	16
20	10	9	8	9	10	6	8	8	9	10	10	9	8	9	9	9	9	8	8	9	9	9	9	9
21	8	9	9	9	1	1	10	10	10	10	9	8	9	9	9	8	10	9	8	9	8	10	10	1
22	2	1	1	2	2	2	1	2	1	2	16	9	9	9	10	9	10	10	9	9	9	10	10	2
23	2	16	1	2	1	1	2	1	1	2	9	8	9	9	9	9	9	9	9	12	1	1	1	16
24	16	16	16	1	1	1	2	2	2	2	9	10	9	10	10	10	9	9	10	8	8	9	4	16
25	3	9	16	9	14	1	2	8	9	10	8	9	8	8	8	8	9	9	8	9	8	9	9	2
26	6	16	16	8	14	1	10	10	9	9	8	8	9	8	8	8	10	9	8	8	8	9	8	10
27	8	8	15	1	16	8	1	9	9	8	8	10	8	9	8	8	9	9	9	8	9	8	10	9
28	6	9	7	8	9	8	2	8	9	9	9	10	10	9	9	9	8	9	9	8	8	8	9	6
29	9	8	8	8	9	8	8	9	9	9	9	9	10	8	9	8	9	9	8	8	9	8	6	8
30	8	8	9	8	8	9	8	9	9	9	11	11	11	11	11	11	11	11	11	11	11	4	7	9

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: JUN, 1992

Clock Time

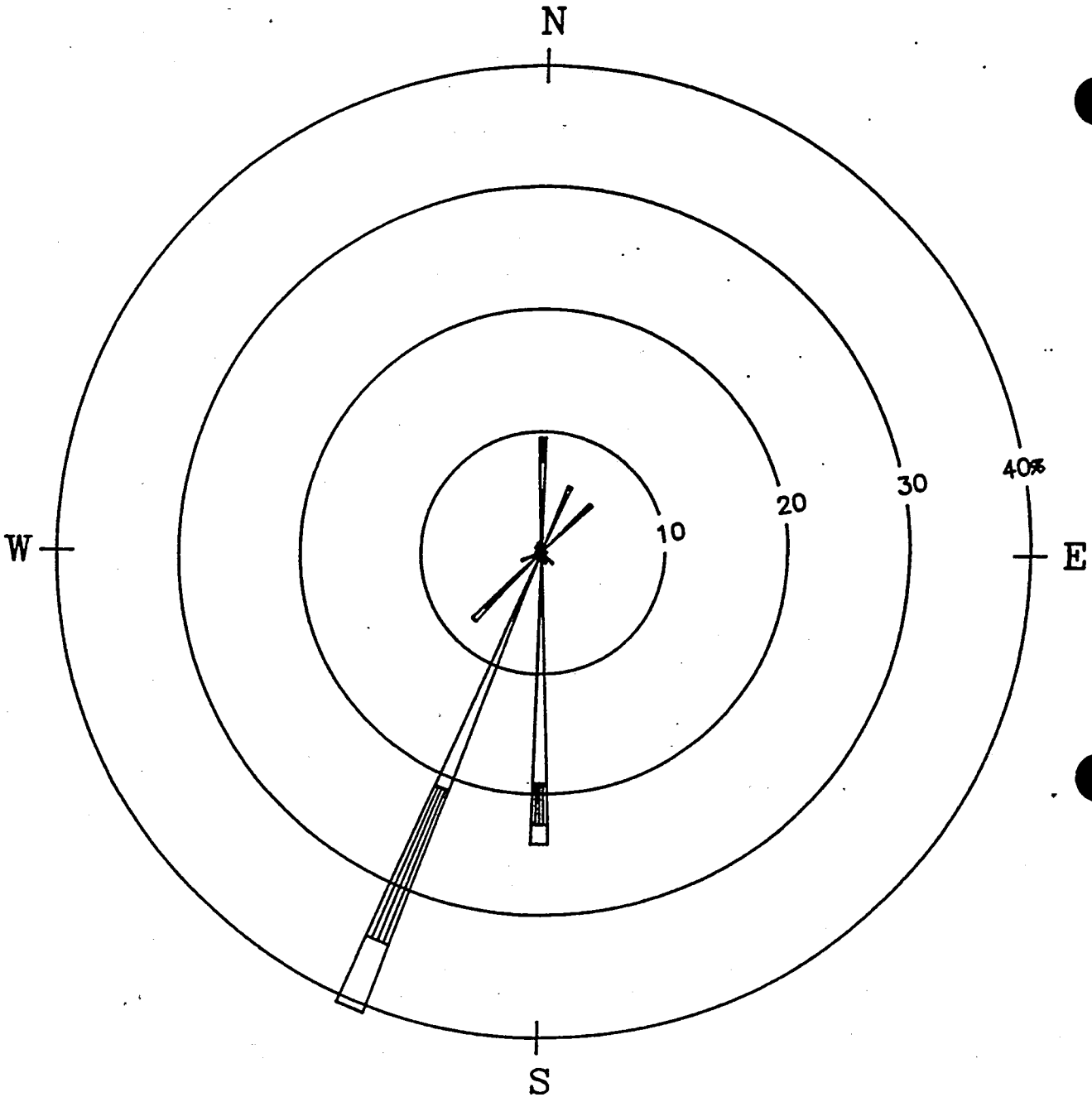
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2	-	-	-	-	-	-	-	2	5	7	8	8	8	8	8	8	8	8	4	-	4	4	4	3	8	10	6.06
3	4	4	4	3	4	3	3	4	4	4	4	5	5	6	7	7	8	5	5	5	5	4	4	5	8	16	4.67
4	3	4	2	5	2	3	2	2	2	4	5	7	8	10	10	9	9	8	8	6	5	8	4	5	10	13	5.46
5	4	7	8	3	5	5	5	5	5	5	4	5	7	7	8	8	6	9	8	8	12	12	10	10	12	20	6.92
6	10	8	10	5	6	5	8	12	8	8	8	8	9	8	8	8	5	5	5	8	8	8	7	4	12	7	7.46
7	4	3	3	3	2	1	2	2	4	5	6	5	5	7	5	9	10	10	8	4	3	3	4	4	10	16	4.67
8	3	2	4	3	4	5	4	5	6	3	5	5	5	5	5	7	8	7	5	5	5	3	3	2	8	16	4.54
9	3	4	2	4	2	5	6	5	7	4	4	5	7	5	7	8	9	9	8	7	5	4	5	8	9	16	5.54
10	3	2	3	3	8	4	4	4	3	5	5	6	7	8	5	5	5	8	8	8	7	5	5	3	8	4	5.17
11	3	3	3	5	4	3	2	4	4	4	4	4	4	5	5	7	8	5	7	3	4	2	3	2	8	16	4.08
12	4	4	2	4	5	7	10	14	15	13	9	6	7	5	5	3	5	7	8	10	21	20	17	22	22	23	9.29
13	22	27	30	30	30	25	21	25	23	17	10	5	8	7	8	10	7	8	8	5	3	3	4	3	30	2	14.13
14	3	4	2	13	14	15	14	13	9	5	4	5	7	5	6	12	10	8	6	8	8	5	10	12	15	5	8.25
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19	5	10	4	2	3	4	4	2	4	4	9	4	5	5	7	6	5	10	8	5	4	3	2	2	10	1	4.88
20	2	4	4	2	2	2	4	3	4	5	5	5	6	6	8	8	8	5	7	5	5	5	2	4	8	14	4.63
21	2	5	3	2	4	4	4	4	4	4	4	5	5	6	8	8	8	10	8	9	5	3	2	4	10	17	5.04
22	5	5	8	5	5	8	8	9	10	8	8	5	8	14	15	15	15	12	9	8	8	4	3	4	15	14	8.29
23	3	4	5	5	6	5	6	5	3	5	4	5	5	10	8	10	10	8	5	5	3	4	3	2	10	13	5.38
24	3	7	7	7	5	4	5	5	3	6	5	7	8	9	10	10	8	6	5	3	3	3	2	3	10	14	5.58
25	3	2	1	1	1	2	3	4	4	5	5	8	5	7	5	8	10	10	5	7	5	2	3	5	10	16	4.63
26	4	7	5	3	2	2	2	5	5	7	5	5	5	5	5	-	8	5	4	5	4	5	2	3	8	16	4.48
27	4	3	2	4	3	3	4	4	4	3	4	5	5	5	5	6	8	8	10	5	6	3	3	4	10	18	4.63
28	2	3	3	4	4	4	3	2	9	5	5	8	9	8	9	10	10	8	8	5	5	3	3	2	10	15	5.50
29	4	2	2	4	4	3	4	5	5	8	10	10	12	10	10	10	10	10	5	8	6	4	4	5	12	12	6.46
30	3	5	4	2	2	2	4	5	5	8	6	8	9	10	12	12	12	8	8	6	8	5	4	3	12	14	6.29
AV	5	6	5	5	6	5	5	6	6	6	6	6	7	7	8	9	8	8	7	6	6	5	5	6			6.07
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

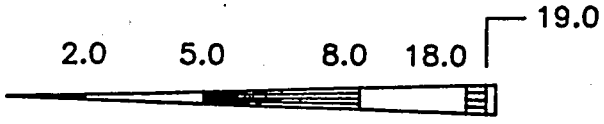
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: JUN 01, 1992 - JUN 30, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.7	1.8	1.6	3.1	1.8	66.0	9.17	11.79
1	0.3	3.4	1.1	0.7	0.1	41.0	5.69	5.98
2	0.4	3.4	1.2	0.3	0.0	39.0	5.42	4.85
3	0.1	0.1	0.0	0.0	0.0	2.0	0.28	2.50
4	0.1	0.3	0.0	0.0	0.0	3.0	0.42	3.33
5	0.0	0.1	0.0	0.0	0.0	1.0	0.14	4.00
6	0.8	0.4	0.0	0.0	0.0	9.0	1.25	2.67
7	0.3	0.6	0.0	0.0	0.0	6.0	0.83	2.83
8	3.1	15.0	3.3	1.5	0.0	169.0	23.47	4.63
9	2.0	18.0	13.0	5.6	0.0	281.0	39.03	6.16
10	1.0	4.0	1.1	1.3	0.0	54.0	7.50	5.70
11	0.0	0.0	0.8	0.8	0.0	12.0	1.67	9.00
12	0.0	0.4	0.0	0.0	0.0	3.0	0.42	4.33
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.3	0.3	0.0	0.0	0.0	4.0	0.56	2.75
15	0.3	0.0	0.1	0.3	0.0	5.0	0.69	7.20
VSG	2.9	0.3	0.0	0.0	0.3	25.0	3.47	0.32
TOT	12.0	48.0	22.0	13.0	2.2	720.0	100.00	4.88





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 9.5 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: JUNE 1992

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: JUL, 1992

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	9	8	9	9	9	8	9	9	9	10	10	9	9	9	9	8	9	9	9	8	9	8	8	8
2	9	9	8	10	16	1	1	2	1	9	9	9	9	9	10	9	8	9	8	8	9	8	9	10
3	10	9	8	3	8	10	16	10	9	10	9	10	10	8	8	10	9	9	9	10	8	9	8	2
4	8	9	8	9	2	8	16	10	7	10	9	9	9	9	10	9	9	8	8	9	8	8	1	16
5	1	16	16	16	16	1	2	2	16	1	9	10	9	9	9	9	10	9	9	10	8	1	16	16
6	1	8	2	1	16	2	2	2	10	1	2	10	10	9	9	8	9	10	9	9	9	9	7	7
7	9	9	14	1	1	1	16	16	9	10	9	9	9	9	9	10	9	9	10	9	9	10	13	16
8	16	16	16	16	15	15	2	14	3	2	10	9	9	1	1	1	1	16	1	16	16	15	16	16
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11	8	8	10	9	9	9	9	9	9	9	8	9	9	9	10	9	9	9	10	9	8	11	8	8
12	9	9	9	9	9	9	10	10	9	10	9	9	9	9	9	9	9	9	9	8	9	9	8	8
13	16	1	1	9	10	9	9	9	9	9	9	10	8	8	9	10	10	10	10	9	9	16	2	2
14	16	1	1	1	10	1	1	1	8	9	9	8	8	9	8	8	9	9	9	9	6	4	16	9
15	15	1	16	1	10	1	1	1	1	3	9	9	9	9	9	9	9	9	9	9	8	8	9	8
16	1	9	41	9	1	2	1	2	10	10	10	9	9	9	9	9	10	9	10	9	9	7	8	8
17	9	8	8	1	9	10	8	8	1	2	10	9	9	9	9	9	8	9	9	10	8	9	9	8
18	16	8	9	9	16	16	1	1	2	16	1	9	9	8	8	9	9	10	16	16	1	16	16	16
19	15	8	16	16	16	16	16	16	16	16	16	7	1	16	16	2	16	2	16	8	10	16	1	16
20	16	16	16	16	1	1	1	16	16	16	16	8	8	8	8	8	8	8	8	8	8	9	9	8
21	8	10	9	8	8	8	8	10	8	10	8	9	10	9	8	9	8	9	9	8	8	9	9	9
22	9	9	8	8	9	9	10	9	8	8	10	10	9	9	10	9	8	9	9	9	9	9	9	9
23	10	8	8	9	9	9	9	9	8	10	8	10	9	9	9	8	9	9	9	9	9	9	9	9
24	9	9	9	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-	-	9	9	9	9	10	10	8	8	9	16	9
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30	16	1	1	1	10	10	2	2	2	8	9	8	9	9	9	9	9	9	8	9	9	8	9	9
31	16	16	1	16	1	8	16	16	12	2	2	9	9	9	9	9	9	9	9	9	9	9	9	12

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: JUL, 1992

Clock Time

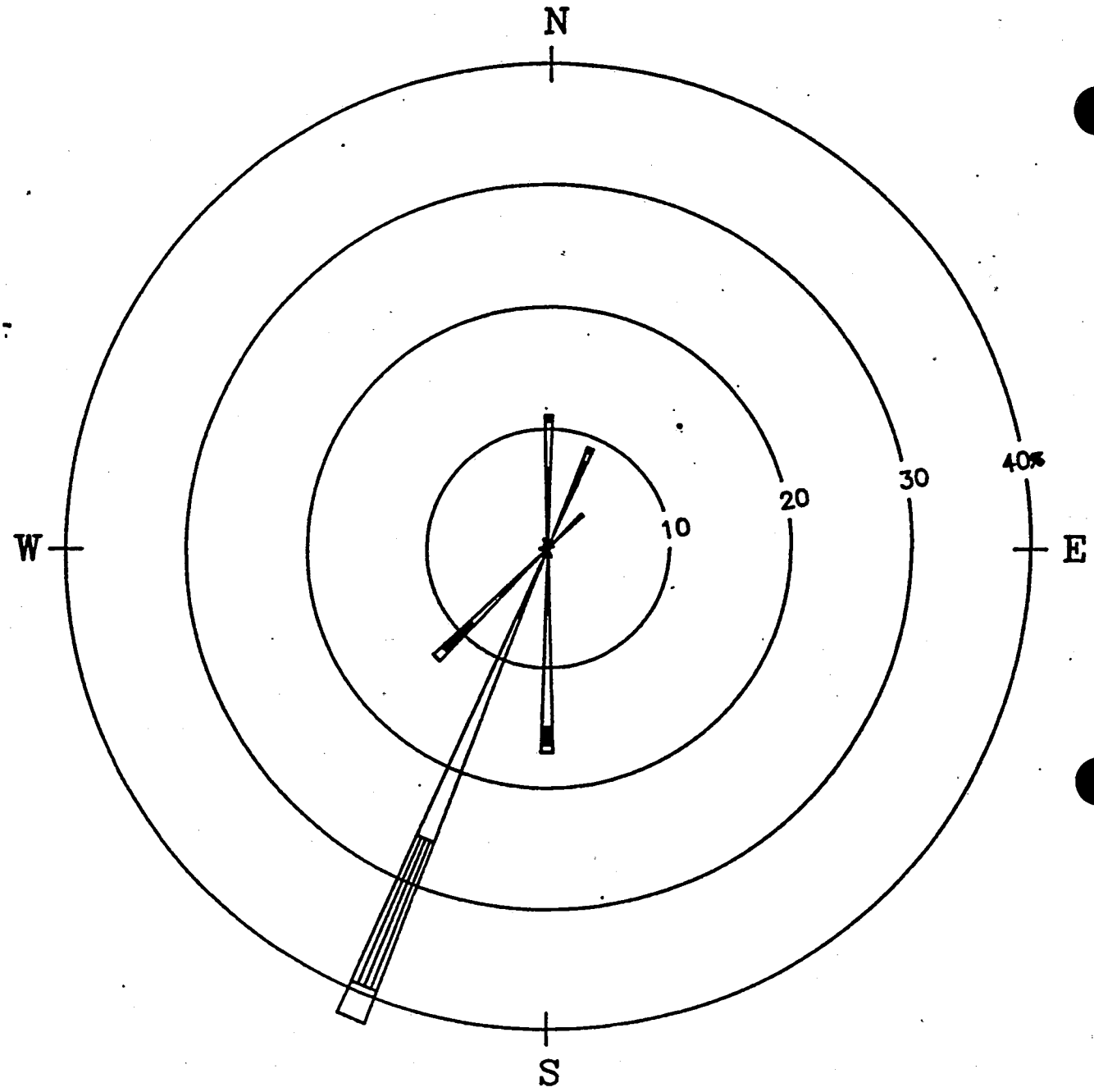
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2	3	4	3	2	5	4	4	3	4	5	5	4	5	6	8	10	8	8	5	5	5	4	2	3	10	15	4.79
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6	4	3	5	5	8	4	5	5	3	8	3	5	8	8	10	10	12	12	8	8	8	7	5	5	12	16	6.63
7	3	3	3	5	5	5	4	2	5	8	7	4	5	6	7	9	8	7	11	8	8	5	4	5	11	18	5.71
8	12	13	15	10	14	13	5	4	4	3	4	3	2	5	5	5	8	5	8	8	5	7	5	6	15	2	7.04
9	5	5	3	5	4	2	2	3	4	3	5	5	4	8	5	10	10	8	8	4	4	4	3	2	10	15	4.83
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11	4	5	5	5	5	5	8	8	7	8	5	8	5	6	5	5	4	3	5	5	3	4	5	5	8	6	5.33
12	6	7	5	5	5	5	7	8	8	5	8	8	8	8	8	10	10	9	5	3	6	4	4	3	10	15	6.46
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14	5	5	7	8	8	7	3	3	3	4	4	5	5	5	5	5	8	8	5	3	3	3	4	4	8	3	5.00
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23	4	3	2	3	4	4	4	3	4	3	2	4	5	5	5	5	5	8	8	8	8	5	5	5	8	17	4.67
24	5	3	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	0	4.00
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
28	-	-	-	-	-	-	-	-	-	-	-	-	-	7	8	6	5	4	3	2	1	1	2	1	8	14	3.64
29	1	4	2	5	6	2	1	2	4	3	3	4	5	9	8	7	6	7	8	6	5	4	2	4	9	13	4.50
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AV	5	5	5	5	6	5	5	5	5	6	5	5	6	6	7	7	8	7	7	6	5	5	4	4			5.51
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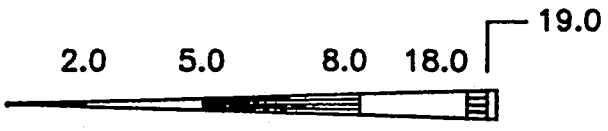
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: JUL 01, 1992 - JUL 31, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.9	2.6	2.1	3.2	0.4	70.0	9.41	8.71
1	0.4	4.4	1.7	0.7	0.3	56.0	7.53	6.39
2	0.1	2.5	0.7	0.0	0.0	25.0	3.36	4.56
3	0.0	0.4	0.0	0.0	0.0	3.0	0.40	4.00
4	0.0	0.1	0.0	0.0	0.0	1.0	0.13	3.00
5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
6	0.0	0.1	0.0	0.0	0.0	1.0	0.13	3.00
7	0.0	0.5	0.0	0.1	0.0	5.0	0.67	5.80
8	2.4	10.0	1.2	0.5	0.0	110.0	14.78	4.11
9	1.6	20.0	11.0	2.4	0.0	275.0	36.96	5.48
10	1.2	6.1	2.6	0.8	0.0	81.0	10.89	5.26
11	0.0	0.1	0.0	0.0	0.0	1.0	0.13	4.00
12	0.4	0.1	0.0	0.0	0.0	4.0	0.54	1.75
13	0.0	0.1	0.0	0.0	0.0	1.0	0.13	4.00
14	0.0	0.3	0.0	0.0	0.0	2.0	0.27	3.50
15	0.0	0.1	0.3	0.3	0.0	5.0	0.67	9.20
VSG	13.0	0.0	0.0	0.0	0.0	104.0	13.98	0.00
TOT	21.0	49.0	20.0	8.0	0.7	744.0	100.00	4.55





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 11.1 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: JUL 1992

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: SEP, 1992

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
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3	14	6	6	6	12	12	12	12	12	4	4	3	4	4	4	4	12	4	4	6	6	13	12	12
4	14	13	13	13	13	14	14	14	13	12	14	13	4	4	4	4	4	5	4	6	12	14	14	14
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6	12	8	12	8	6	12	12	13	13	3	4	4	4	4	4	4	4	4	5	6	6	8	12	14
7	10	12	12	13	12	6	12	12	16	1	4	4	4	4	4	4	5	6	6	6	6	10	13	14
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12	8	9	9	10	8	9	16	10	10	9	10	8	8	8	8	8	9	9	9	8	16	16	1	8
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[illegible]	7	9	9	8	1	16	2	2	2	2	9	9	9	9	9	9	10	9	9	8	9	10	9	9
[illegible]	15	1	16	16	15	1	2	2	2	10	9	9	9	10	9	9	9	10	9	10	1	16	16	1
[illegible]	2	16	1	1	16	16	1	1	2	2	9	8	9	10	9	10	9	9	8	16	10	2	16	16
18	1	1	1	1	8	2	8	9	9	10	10	9	9	9	10	10	9	9	9	9	8	8	8	16
19	16	15	1	1	2	16	1	16	16	16	1	1	16	16	10	10	9	10	10	9	8	9	9	6
20	15	2	16	1	9	8	9	9	9	10	8	1	2	2	2	8	10	9	9	10	9	10	9	10
21	9	4	16	16	16	2	2	2	2	1	9	9	9	9	9	9	10	9	9	9	8	6	12	12
22	10	9	16	1	16	2	2	2	2	2	10	9	8	9	8	10	8	10	9	9	1	16	16	16
23	16	2	16	16	2	1	1	1	1	1	1	2	2	10	9	14	9	16	16	12	16	16	16	16
24	16	15	15	15	16	16	16	16	15	16	16	9	9	9	10	9	9	9	9	9	14	1	1	16
25	16	16	16	16	1	16	16	1	1	2	9	10	10	9	9	9	9	9	9	9	9	8	16	16
26	12	9	16	1	2	1	16	2	2	9	10	10	9	10	9	10	9	8	9	8	16	1	16	1
27	1	2	16	16	16	16	16	1	1	2	9	10	9	9	9	10	9	9	16	15	15	16	15	15
28	16	16	16	16	1	16	16	16	1	2	10	10	9	9	9	9	9	11	16	14	15	16	1	1
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30	2	16	16	2	16	16	2	1	1	2	10	9	9	8	8	8	9	10	16	15	15	15	16	15

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: SEP, 1992

Clock Time

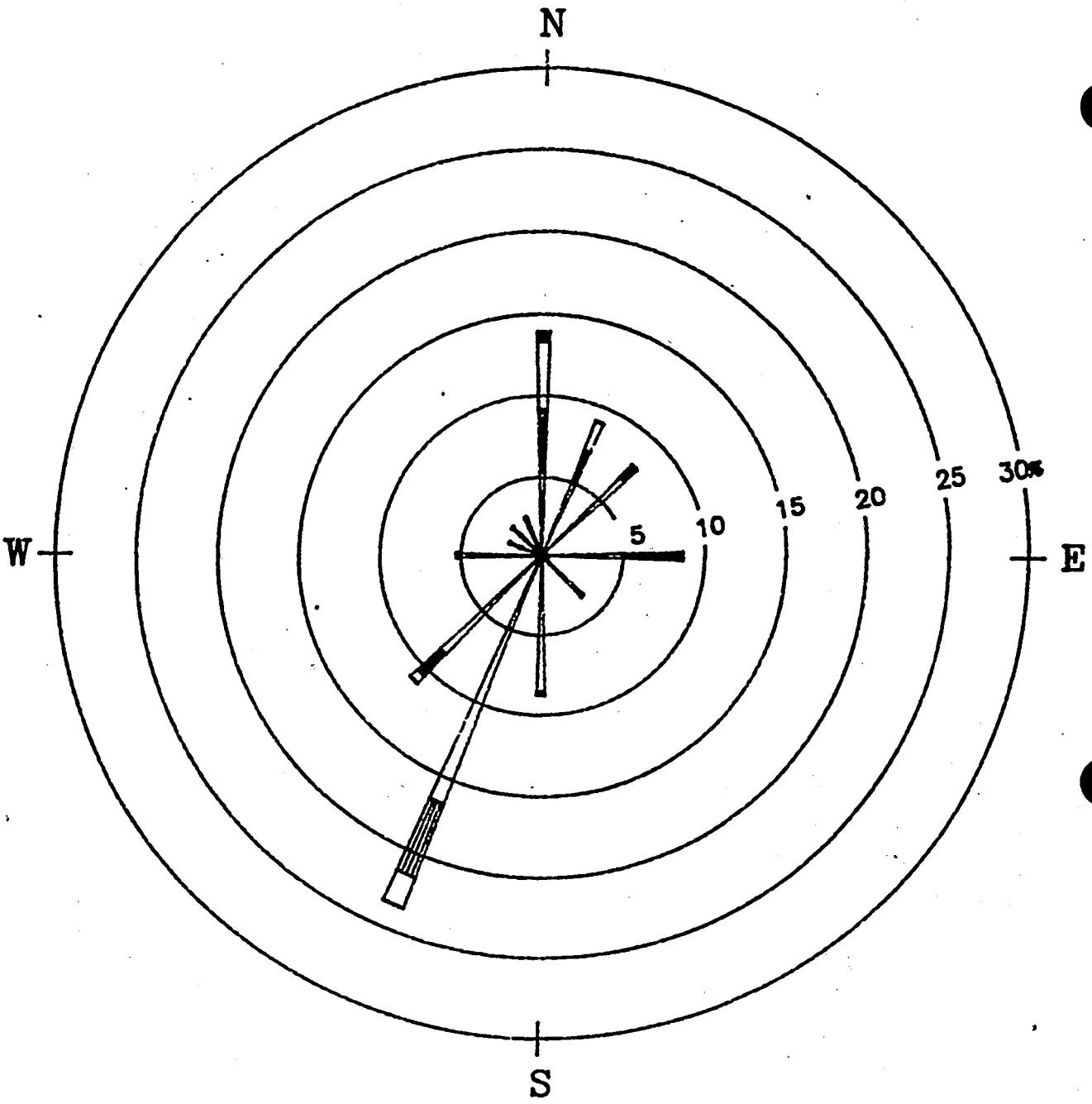
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3	5	2	2	3	3	3	4	3	2	5	6	5	7	6	8	9	5	6	5	7	5	4	3	4	9	15	4.67
4	10	15	12	13	12	8	10	8	10	12	14	8	6	7	8	9	5	5	7	4	3	3	12	12	15	1	8.88
5	7	4	5	5	5	4	5	3	4	5	5	5	5	8	5	5	5	5	5	5	3	2	3	4	8	13	4.67
6	3	1	2	5	5	3	4	3	4	5	5	4	8	8	5	5	8	5	6	5	3	5	3	3	8	12	4.50
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9	2	2	2	3	3	2	3	1	4	4	5	5	5	6	6	6	5	5	5	5	2	4	9	10	10	23	4.33
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11	3	3	3	2	5	4	2	3	3	4	4	5	5	5	4	5	9	3	5	2	2	2	3	3	9	16	3.71
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19	8	8	9	4	6	7	8	12	8	5	10	10	10	7	5	4	3	4	6	4	2	8	3	3	12	7	6.42
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21	2	3	8	10	10	5	5	3	5	5	4	5	3	8	10	10	8	8	7	2	3	2	2	2	10	3	5.42
22	2	2	5	5	7	4	5	5	5	4	3	4	5	5	5	5	4	7	4	2	5	7	7	10	10	23	4.88
23	5	5	5	8	5	8	5	8	8	5	5	4	3	5	4	3	4	8	4	4	12	7	8	8	12	20	5.88
24	12	12	13	15	15	15	8	17	21	22	10	8	12	5	9	8	5	2	3	2	7	18	18	15	22	9	11.33
25	22	22	18	20	10	9	9	11	8	6	3	5	5	5	5	6	8	6	5	3	2	2	3	8	22	0	8.38
26	2	3	3	3	4	4	7	3	4	3	3	3	3	4	4	6	5	3	3	2	5	8	8	9	9	23	4.25
27	8	5	5	10	9	8	9	10	9	3	3	3	3	7	10	5	5	3	4	8	7	10	10	8	10	3	6.75
28	8	12	12	11	12	10	12	13	12	5	3	3	3	4	5	5	3	3	7	3	8	7	3	3	13	7	6.96
29	2	3	5	5	9	8	3	3	5	3	3	4	6	8	10	10	10	8	3	4	5	7	3	4	10	14	5.46
30	5	5	5	6	8	7	8	10	5	4	3	3	5	3	4	5	3	3	3	5	7	7	5	8	10	7	5.29
AV	5	5	5	6	6	5	6	5	6	5	5	5	6	6	6	7	6	5	5	4	4	5	5	5			5.33
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

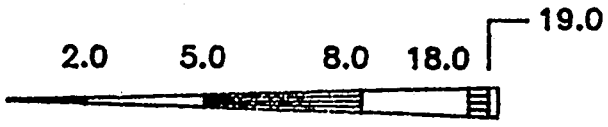
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: SEP 01, 1992 - SEP 30, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.4	4.8	3.8	4.1	0.6	100.0	13.89	7.86
1	0.3	4.8	1.9	1.9	0.0	65.0	9.03	6.31
2	0.0	6.8	1.0	0.0	0.0	56.0	7.78	4.29
3	0.0	0.3	0.0	0.0	0.0	2.0	0.28	5.00
4	0.1	4.8	3.3	0.3	0.0	62.0	8.61	5.76
5	0.0	0.1	0.3	0.0	0.0	3.0	0.42	6.00
6	0.7	2.5	0.3	0.0	0.0	25.0	3.47	3.80
7	0.3	0.0	0.0	0.0	0.0	2.0	0.28	2.00
8	3.0	5.4	0.1	0.1	0.0	63.0	8.75	3.40
9	2.3	14.0	4.8	2.0	0.0	168.0	23.33	4.95
10	1.5	6.9	1.9	0.6	0.0	79.0	10.97	4.51
11	0.0	0.1	0.0	0.0	0.0	1.0	0.14	3.00
12	2.0	3.0	0.1	0.1	0.0	39.0	5.42	3.21
13	0.0	1.3	0.1	0.7	0.0	16.0	2.22	6.88
14	0.3	1.1	0.4	0.7	0.0	18.0	2.50	6.33
15	0.3	0.3	1.3	0.6	0.1	19.0	2.64	8.37
MSG	0.0	0.0	0.0	0.0	0.3	2.0	0.28	0.00
TOT	11.0	56.0	19.0	11.0	1.0	720.0	100.00	5.10





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 13.9 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: SEPT 1992

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: OCT, 1992

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	2	1	15	16	1	16	1	1	2	10	10	9	9	9	9	10	10	12	1	4	8	5	8	8
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SUNSHINE CANYON LANDFILL
SITE 1

Date: Wind Speed (MPH)
Station: SUNSHINE 1
Period: OCT, 1992

Clock Time

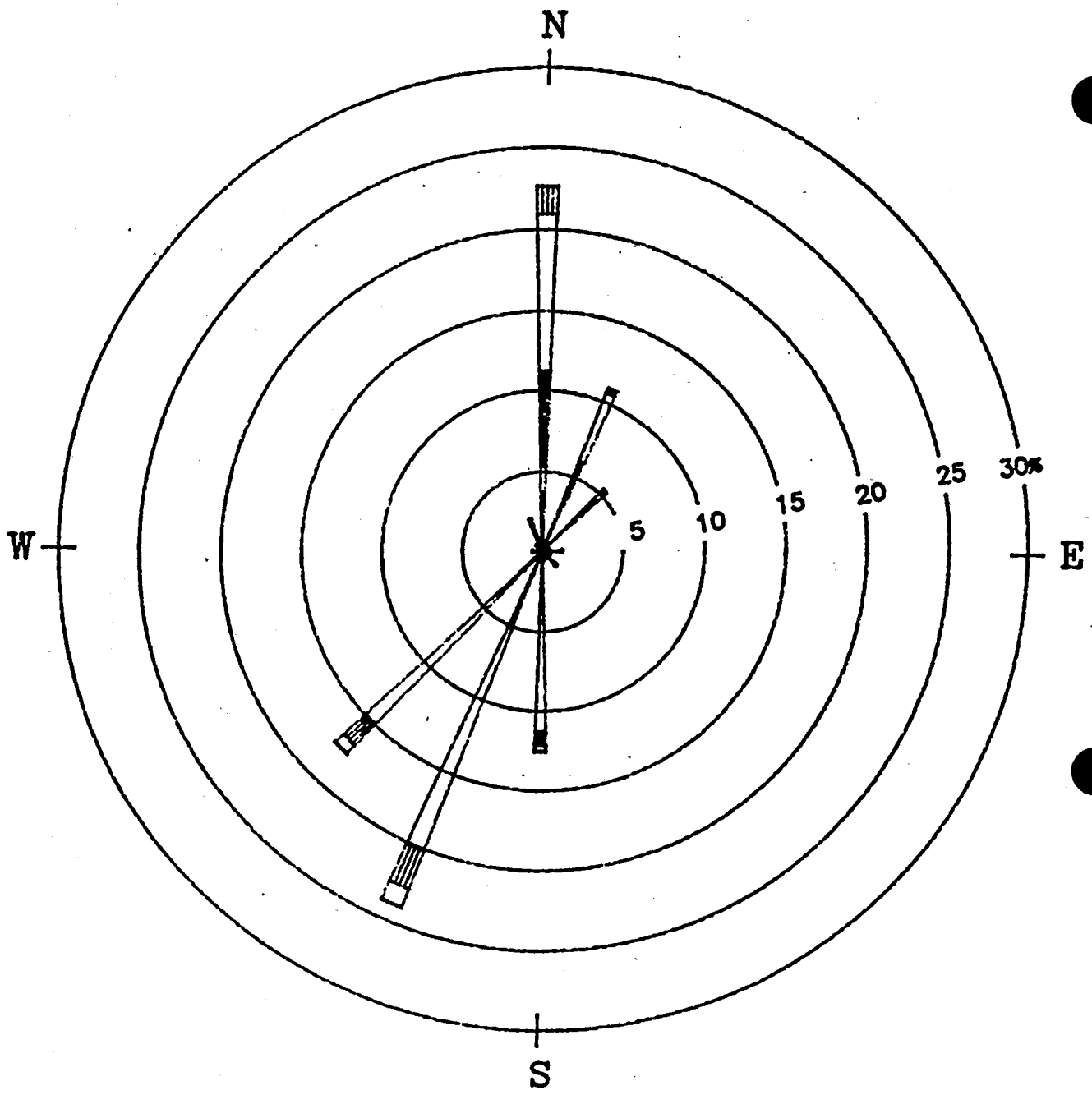
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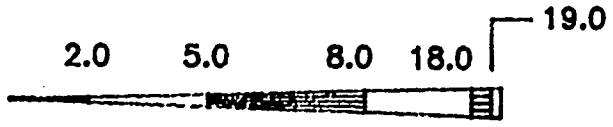
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: OCT 01, 1992 - OCT 31, 1
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.3	4.9	5.7	9.5	1.6	165.0	22.18	9.85
1	0.0	3.7	2.2	4.4	0.3	80.0	10.75	8.13
2	0.0	3.2	1.2	0.8	0.0	39.0	5.24	6.10
3	0.1	0.1	0.1	0.1	0.0	4.0	0.54	7.00
4	0.5	0.7	0.0	0.0	0.0	9.0	1.21	2.33
5	0.1	0.0	0.0	0.4	0.0	4.0	0.54	9.25
6	0.4	0.7	0.0	0.1	0.0	9.0	1.21	3.89
7	0.0	0.5	0.0	0.0	0.0	4.0	0.54	3.75
8	2.4	8.6	0.8	0.4	0.0	91.0	12.23	3.59
9	1.6	18.0	2.5	1.2	0.0	181.0	24.33	4.38
10	1.6	13.0	1.8	0.7	0.0	132.0	17.74	4.20
11	0.0	0.1	0.0	0.0	0.0	1.0	0.13	3.00
12	0.3	0.3	0.0	0.0	0.0	4.0	0.54	2.50
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.0	0.5	0.0	0.0	0.0	4.0	0.54	3.00
15	0.0	0.8	0.5	0.4	0.4	16.0	2.15	10.00
VSG	0.0	0.1	0.0	0.0	0.0	1.0	0.13	4.00
TOT	7.3	56.0	15.0	18.0	2.2	744.0	100.00	5.31





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

WINDROSE

SUNSHINE CANYON 1
PERIOD: OCT 1992

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 22.6 PERCENT OF THE TIME.

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: NOV, 1992

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
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SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: NOV, 1992

Clock Time

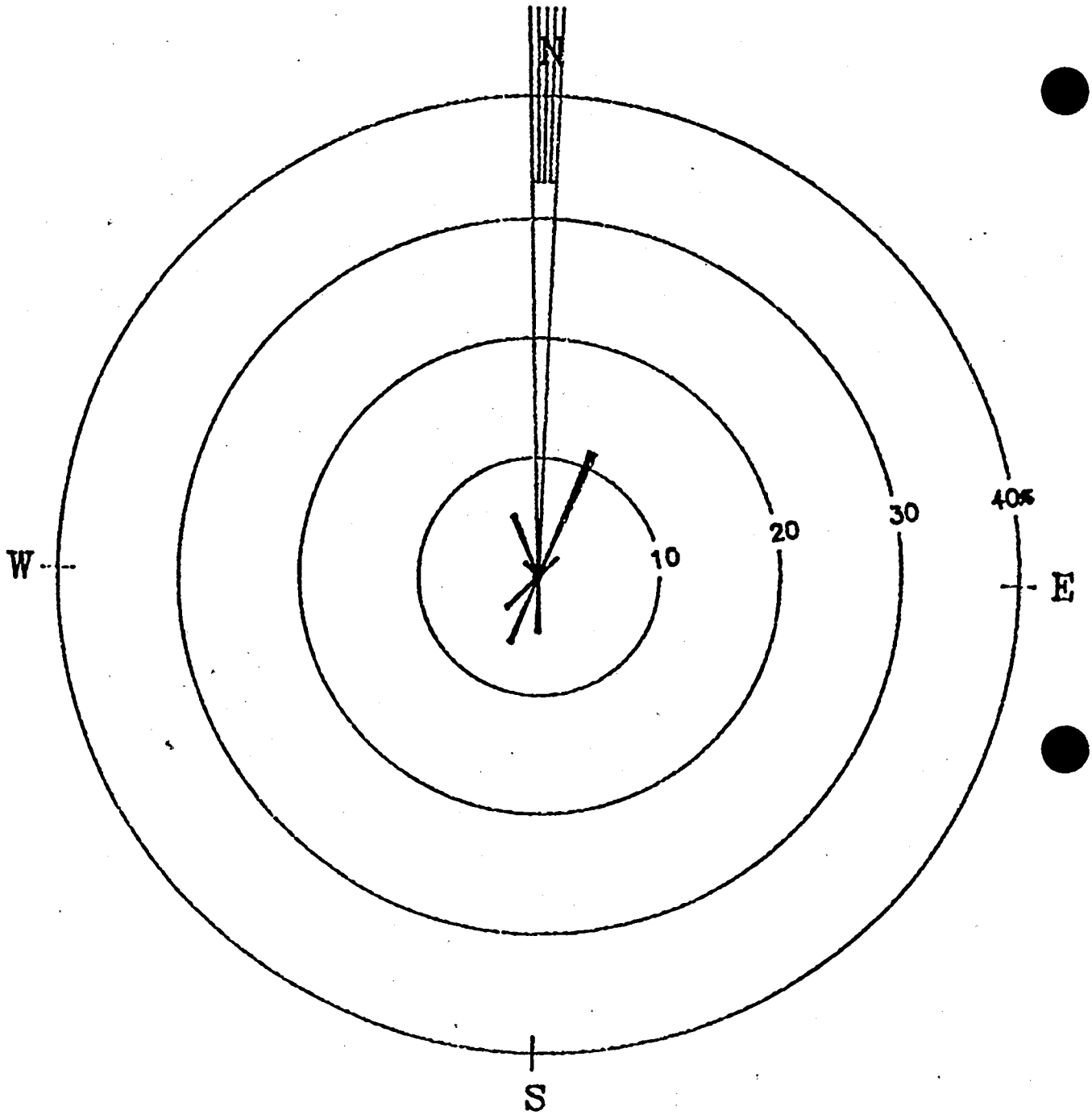
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26	30	32	32	29	32	30	32	32	26	32	30	34	30	32	30	30	30	30	30	24	22	22	24	24	34	11	29.13
27	20	20	22	22	22	20	21	18	20	12	14	18	18	14	10	14	20	20	18	21	20	22	24	20	24	22	18.75
28	24	20	24	20	24	22	14	20	14	19	21	28	20	14	18	18	8	10	14	14	18	24	20	30	30	23	19.08
29	24	24	20	2	28	26	32	30	32	20	14	12	20	20	18	14	12	10	14	14	10	18	19	20	32	6	18.88
30	22	26	30	30	30	30	30	32	24	24	30	30	32	32	24	30	20	22	28	22	22	20	20	20	32	7	26.25
AV	17	17	17	16	17	17	18	18	17	17	15	16	16	15	15	15	14	14	15	15	15	15	15	16			15.84
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

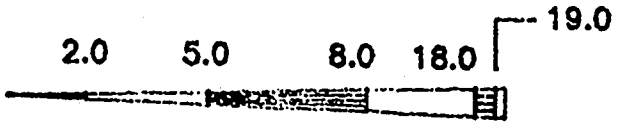
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: NOV 01, 1992 - NOV 30,
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.0	1.3	2.9	28.0	31.0	468.0	65.00	18.16
1	0.1	0.8	1.0	4.3	4.8	80.0	11.11	17.44
2	0.0	0.1	0.7	0.7	0.6	15.0	2.08	14.13
3	0.0	0.0	0.0	0.0	0.1	1.0	0.14	28.00
4	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
6	0.0	0.0	0.1	0.0	0.0	1.0	0.14	6.00
7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
8	0.1	3.0	1.3	0.0	0.0	33.0	4.58	4.79
9	0.1	3.1	2.5	0.1	0.0	43.0	5.97	5.40
10	0.0	1.2	2.2	0.1	0.1	27.0	3.75	6.78
11	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
12	0.0	0.3	0.0	0.0	0.0	2.0	0.28	4.00
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.0	0.8	0.4	0.3	0.0	11.0	1.53	6.27
15	0.0	0.0	0.3	3.6	1.5	39.0	5.42	15.79
[illegible]	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
TOT	0.4	10.0	11.0	38.0	39.0	720.0	100.00	7.92





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

WINDROSE

SUNSHINE CANYON 1
PERIOD: NOV 1992

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 64.8 PERCENT OF THE TIME.

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 point scale)
Station: SUNSHINE CANYON 1
Period: JAN, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	16	16	16	16	16	16	16	16	16	16	16	1	1	1	16	16	16	16	16	16	16	1	16	16
2	16	16	16	1	16	1	16	16	1	16	16	16	16	16	16	16	16	16	16	16	16	1	1	1
3	1	1	16	16	16	16	16	16	16	16	16	16	16	1	16	1	16	16	16	16	16	16	16	16
4	16	16	16	16	16	1	16	1	1	2	3	3	4	10	9	9	10	9	9	10	9	9	1	16
5	16	16	16	16	16	16	16	16	1	16	1	1	1	1	16	16	16	1	1	1	1	1	16	16
6	1	1	16	16	16	1	2	1	1	1	1	1	2	10	10	10	9	9	9	9	9	9	9	8
7	10	2	16	16	16	16	2	10	16	16	16	16	1	16	10	10	10	10	10	1	16	16	16	1
8	16	1	14	1	1	2	1	16	16	16	16	1	10	10	8	16	1	10	10	16	16	1	16	2
9	8	10	10	10	9	10	10	10	10	10	10	10	9	9	9	9	10	16	1	1	16	16	1	1
10	16	1	16	16	16	1	2	2	1	2	2	2	2	2	10	10	10	10	10	16	16	2	1	1
11	1	1	1	1	1	1	1	1	1	2	1	1	16	16	16	16	10	10	1	2	1	1	1	1
12	1	2	1	1	1	1	1	1	1	1	1	1	2	1	2	2	2	2	2	1	1	11	1	1
13	1	1	16	1	1	1	1	1	1	1	1	1	1	16	1	16	1	16	16	16	16	16	16	1
14	1	16	1	1	1	1	16	1	16	16	16	16	16	16	16	16	16	1	16	16	16	16	1	16
15	16	16	16	16	16	16	16	16	1	1	1	1	1	2	1	16	11	16	1	1	1	1	1	1
16	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	16
17	1	1	16	1	2	16	1	1	1	2	1	1	2	16	1	2	16	2	16	16	16	16	16	16
18	1	16	1	16	1	1	16	16	16	16	16	16	1	8	8	8	10	9	10	10	10	10	10	10
19	10	9	10	10	10	10	10	10	10	4	2	10	8	8	10	10	10	10	10	10	4	16	16	16
20	16	16	1	16	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
21	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	2	1	16	16	16	16	16	16	16
22	16	16	16	16	16	16	1	16	16	16	16	16	16	1	2	2	2	1	16	16	16	16	16	1
23	1	16	16	16	1	16	16	2	1	2	2	9	10	8	8	9	9	9	9	9	9	9	8	8
24	9	10	10	10	2	16	16	2	1	2	10	9	10	10	10	10	8	8	8	8	9	8	10	10
25	15	16	16	2	1	16	16	16	16	16	16	2	10	8	8	10	10	9	10	14	15	16	16	1
26	16	16	4	2	1	16	16	16	16	16	1	10	9	9	10	9	9	10	12	16	16	16	16	16
27	2	10	8	8	10	16	16	1	16	16	8	8	8	8	8	8	8	9	9	8	16	16	1	4
28	10	10	8	16	10	10	8	8	8	10	8	8	10	8	10	10	10	9	9	10	12	2	4	16
29	1	1	16	16	1	16	16	16	16	16	16	1	16	1	1	1	16	1	16	16	1	16	1	2
30	2	16	1	16	16	1	16	1	1	16	16	16	16	16	1	10	10	10	9	16	16	16	16	16
31	16	16	16	1	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16

SUNSHINE CANYON
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE CANYON 1
Period: JAN, 1991

Clock Time

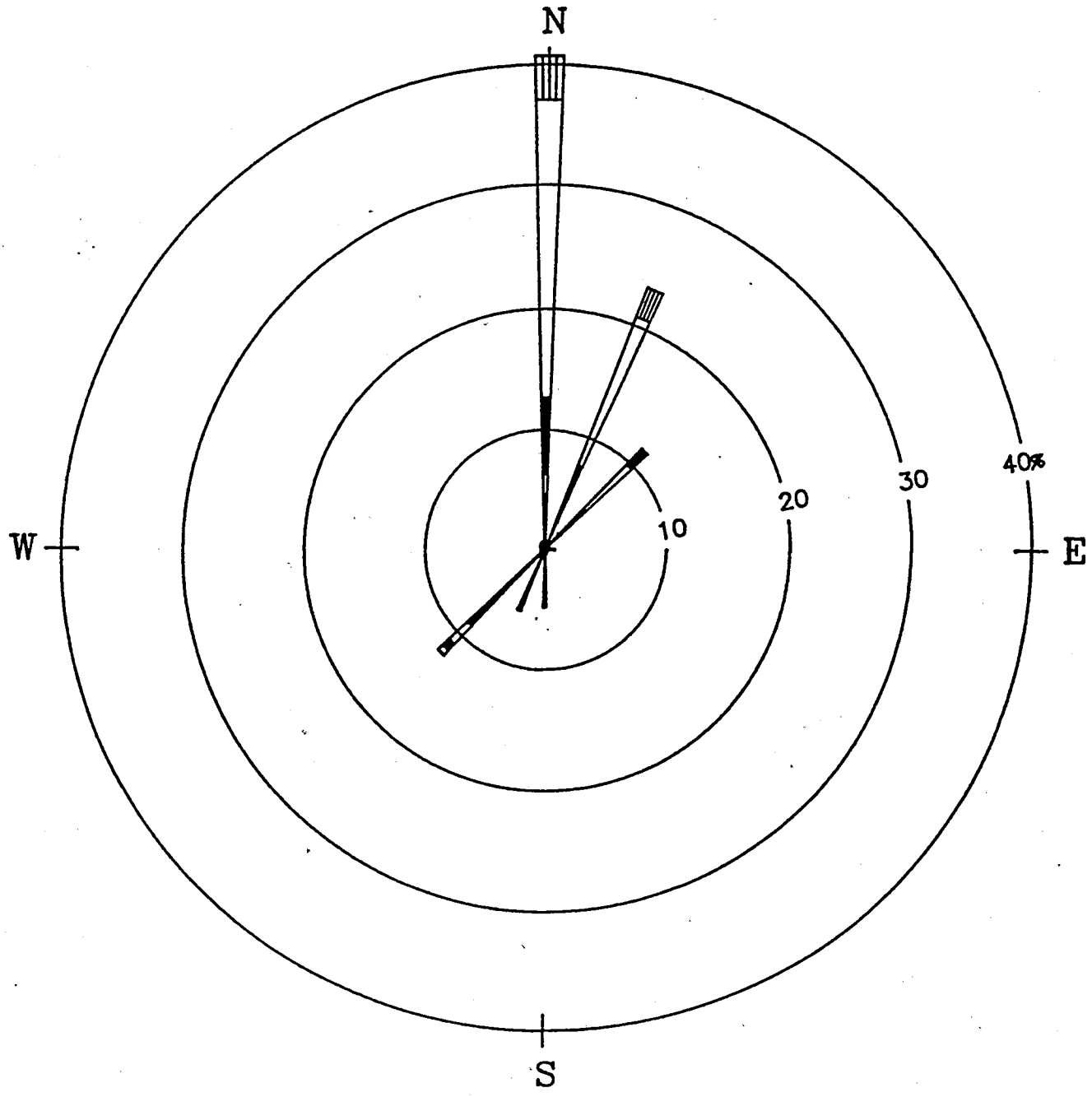
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2	12	12	12	18	20	12	18	18	12	12	18	18	10	10	10	10	10	10	10	10	10	10	10	8	20	4	12.50
3	10	10	10	10	10	10	10	12	18	18	18	18	10	12	15	12	12	15	15	15	18	12	18	18	18	8	13.58
4	12	10	15	10	12	10	8	8	2	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	15	2	4.96
5	2	8	10	10	12	15	10	10	10	10	12	10	12	10	10	10	10	10	10	10	10	10	8	8	15	5	9.88
6	10	10	10	8	8	10	8	8	8	8	8	8	2	8	8	5	8	8	8	2	2	2	2	2	10	0	6.71
7	2	2	2	2	2	2	2	2	8	8	8	8	8	3	4	2	2	2	2	8	2	2	2	8	8	8	3.88
8	8	8	2	3	10	8	8	10	18	10	10	10	2	2	2	5	3	2	2	2	3	3	2	2	18	8	5.63
9	2	2	2	2	2	2	2	2	10	10	10	10	8	4	4	2	2	3	10	10	10	15	8	8	15	21	5.83
10	5	5	5	5	4	8	5	5	8	8	10	8	4	4	2	2	2	2	2	2	4	8	8	8	10	10	5.17
11	8	8	8	8	10	10	10	10	10	10	10	10	8	8	4	2	2	2	5	8	8	8	8	8	10	4	7.63
12	8	5	8	8	8	10	10	12	10	10	12	15	15	18	20	18	18	20	20	18	18	20	20	18	20	14	14.13
13	18	18	18	18	18	18	18	18	20	18	12	20	20	20	15	20	22	18	18	18	20	25	20	20	25	21	18.75
14	20	20	20	20	20	15	15	20	15	15	10	10	12	15	15	18	10	10	12	10	10	15	8	10	20	0	14.38
15	8	8	10	12	12	10	12	12	15	12	12	12	12	12	12	12	18	20	20	30	30	30	20	20	30	19	15.46
16	10	12	20	18	12	18	20	20	20	25	30	22	20	25	20	20	15	10	12	15	12	15	10	10	30	10	17.13
17	8	10	12	12	10	18	12	18	18	12	18	18	18	15	12	15	18	10	10	10	10	12	10	10	18	5	13.17
18	15	10	10	10	10	10	18	18	18	12	12	8	8	2	2	2	3	2	2	2	2	2	2	2	18	6	7.58
19	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	7	2.04
20	2	8	10	10	10	10	10	8	10	10	10	10	10	12	12	15	10	10	10	10	12	10	10	8	15	15	9.88
21	10	18	18	20	18	20	18	20	12	18	18	20	20	18	15	12	10	5	8	10	10	8	8	10	20	3	14.33
22	10	20	20	20	18	20	20	20	10	18	18	20	18	20	15	10	10	8	10	10	10	8	10	10	20	1	14.71
23	10	10	10	10	12	12	10	8	8	8	2	2	2	2	2	2	3	3	3	2	2	2	2	2	12	4	5.38
24	2	2	2	2	2	8	8	2	3	3	2	3	3	3	3	3	3	3	3	2	2	2	2	2	8	5	2.92
25	5	5	5	3	3	8	8	8	8	12	8	2	2	3	3	3	3	2	3	2	3	3	3	3	12	9	4.50
26	8	8	2	3	3	8	8	8	8	8	8	4	4	5	5	5	8	4	5	3	3	4	8	7	8	0	5.71
27	2	2	2	2	2	3	3	3	3	3	2	3	3	4	4	4	3	3	3	2	3	3	3	2	4	13	2.79
28	2	2	2	2	2	2	2	2	2	2	3	3	8	5	5	8	8	5	3	5	2	2	2	2	8	12	3.38
29	2	5	4	4	3	8	8	8	8	10	10	10	18	18	18	12	10	10	10	8	4	4	2	2	18	12	8.17
30	2	10	10	8	8	10	10	10	10	10	10	10	8	8	2	2	2	2	2	2	8	10	10	10	10	1	7.25
31	10	10	10	10	10	12	14	15	18	18	18	10	12	10	10	10	10	12	18	12	12	12	12	12	18	8	12.38
AV	8	9	9	9	10	11	11	11	11	11	11	10	10	9	9	8	8	8	8	8	8	9	8	8			9.23
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

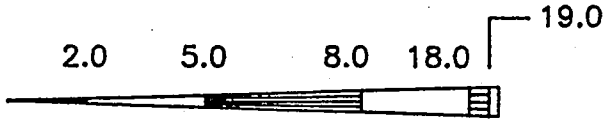
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE CANYON 1
Period: JAN 01, 1991 - JAN 31, 1991
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	2.6	3.6	6.3	24.0	3.6	302.0	40.59	11.19
1	0.7	1.8	4.9	13.0	2.5	173.0	23.25	11.51
2	1.7	1.2	1.2	5.5	1.8	86.0	11.56	10.83
3	0.3	0.0	0.0	0.0	0.0	2.0	0.27	2.00
4	0.8	0.0	0.0	0.0	0.0	6.0	0.81	2.00
5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
8	2.9	1.8	0.0	0.0	0.0	36.0	4.84	2.53
9	3.0	1.7	0.7	0.0	0.0	41.0	5.51	3.27
10	8.7	2.1	0.7	0.5	0.0	90.0	12.10	2.99
11	0.0	0.0	0.0	0.1	0.0	1.0	0.13	18.00
12	0.1	0.1	0.0	0.0	0.0	2.0	0.27	3.50
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.3	0.0	0.0	0.0	0.0	2.0	0.27	2.00
15	0.0	0.3	0.0	0.0	0.0	2.0	0.27	4.00
MSG	0.0	0.0	0.0	0.0	0.1	1.0	0.13	20.00
TOT	21.0	12.0	13.0	43.0	8.1	744.0	100.00	5.86





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 40.7 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: JAN 1991

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 point scale)
Station: SUNSHINE CANYON 1
Period: FEB, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	4	4	16	16	16	16
2	16	1	1	16	16	2	1	2	2	16	10	10	8	10	8	15	10	16	16	16	16	16	15	16
3	16	16	1	15	16	2	1	1	16	16	1	8	8	10	10	8	8	9	9	14	15	16	16	1
4	16	1	16	16	16	16	1	16	1	16	16	15	15	15	14	16	16	8	10	16	16	16	16	16
5	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
6	16	1	16	16	1	16	16	1	16	16	16	1	1	1	1	1	1	2	1	16	16	16	16	16
7	16	16	16	1	1	16	16	16	16	16	1	1	1	1	2	2	2	8	8	16	14	16	16	16
8	16	1	16	16	16	16	16	16	16	1	16	8	8	9	9	10	8	9	8	8	8	16	1	16
9	16	16	16	16	16	16	16	16	1	16	16	16	14	9	10	9	9	9	16	16	16	16	16	16
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11	16	16	16	16	16	16	16	16	16	16	16	16	16	16	14	16	16	16	16	16	16	16	16	16
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13	14	16	16	16	2	1	1	16	2	2	10	10	10	8	10	10	10	8	8	16	16	2	16	16
14	16	16	16	16	16	16	16	15	15	15	15	14	16	16	16	16	1	16	16	14	16	1	16	9
15	9	8	1	16	16	16	16	16	1	1	16	9	8	9	8	8	16	10	8	8	8	9	9	8
16	9	9	10	9	9	9	9	9	9	9	9	8	8	9	9	9	9	9	10	14	16	6	6	10
17	8	10	1	16	16	16	10	16	16	16	16	16	16	1	16	16	16	16	16	16	16	16	16	16
18	16	16	16	16	16	16	16	16	16	1	1	1	2	1	1	1	1	1	16	1	16	16	14	1
19	16	16	16	16	1	16	1	16	16	16	16	16	1	1	1	1	16	8	10	8	8	1	1	2
20	1	16	16	1	1	16	16	16	1	16	15	16	16	1	14	16	16	5	5	16	16	16	16	16
21	1	16	16	16	16	16	16	16	1	1	2	9	8	8	8	8	9	8	8	10	6	16	1	2
22	2	16	1	14	16	2	1	16	1	2	9	10	10	10	9	9	8	10	8	9	9	9	8	9
23	8	16	16	16	1	1	1	1	12	14	10	9	10	10	9	10	10	9	10	10	9	9	9	9
24	9	8	1	14	10	10	2	2	2	8	9	10	9	8	9	10	8	9	9	10	10	10	10	11
25	14	1	1	1	16	16	16	16	16	1	9	10	10	9	10	10	10	10	10	16	:9	9	9	9
26	1	1	1	16	16	1	2	8	2	9	10	10	10	10	10	10	9	9	9	9	9	9	9	10
27	10	10	10	10	10	10	10	10	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10
28	10	9	9	9	10	10	10	10	10	10	10	10	10	9	10	10	9	9	9	8	10	9	9	9

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE CANYON 1
Period: FEB, 1991

Clock Time

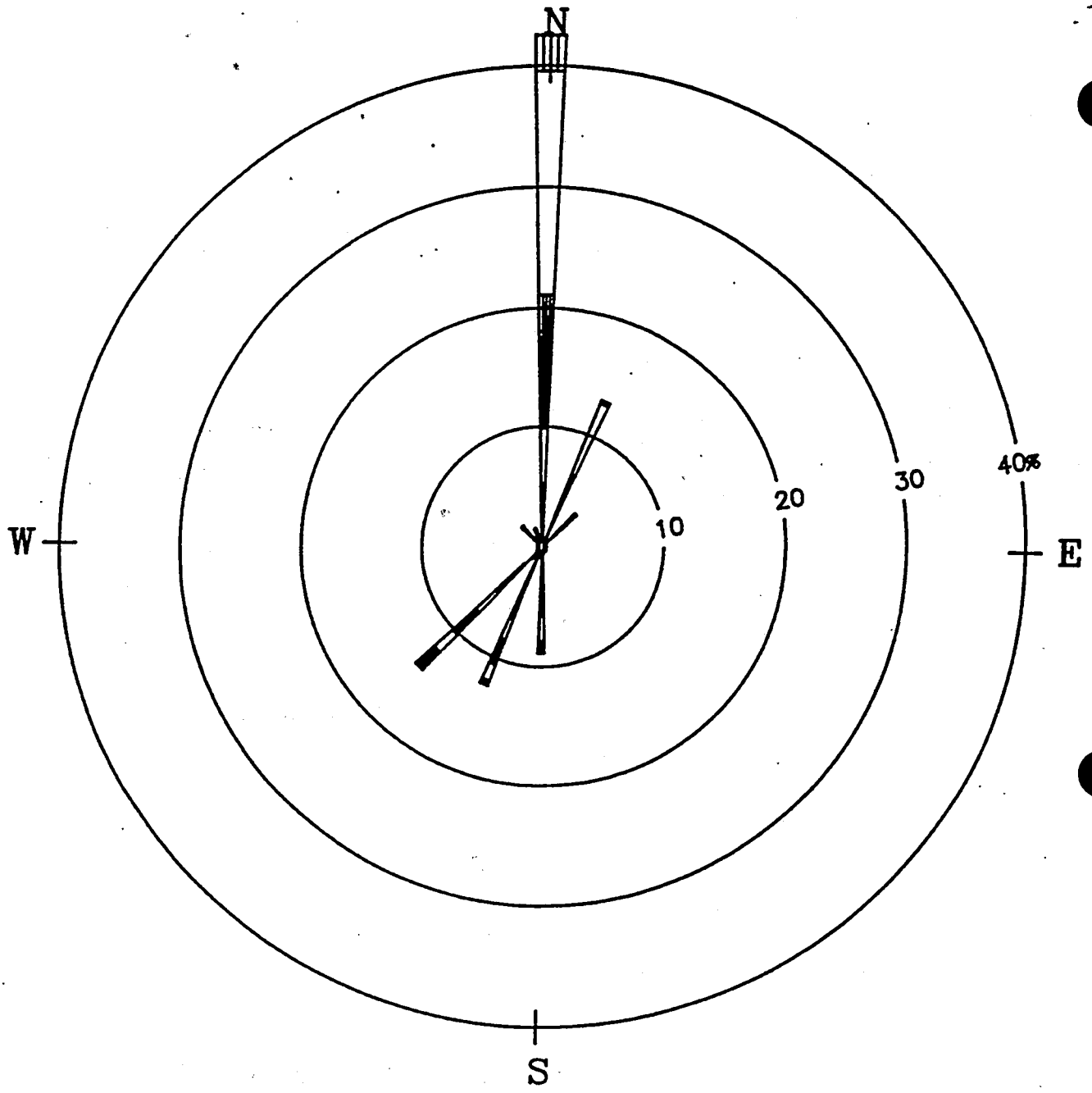
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1	12	12	18	18	18	18	12	10	10	10	10	8	8	8	4	2	2	2	2	2	4	5	8	5	18	2	8.67
2	8	4	2	4	4	4	2	2	2	2	2	2	2	2	2	8	2	2	4	4	4	4	8	4	8	0	3.50
3	4	4	8	8	8	8	8	8	8	8	8	2	2	2	2	2	2	2	2	2	2	4	4	8	8	2	4.83
4	8	8	8	8	8	10	10	8	8	8	8	8	4	8	8	4	2	2	2	2	10	10	10	10	10	5	7.17
5	18	18	18	12	12	18	18	18	18	18	18	10	10	10	10	15	20	30	24	20	20	20	15	18	30	17	17.00
6	18	20	30	24	20	20	18	5	10	12	12	15	8	10	12	12	14	18	10	4	4	10	10	8	30	2	13.50
7	10	8	12	18	15	18	18	12	14	10	10	18	14	10	10	10	8	2	2	4	4	8	8	8	18	3	10.46
8	8	8	10	10	10	8	8	8	8	8	8	5	8	4	5	5	4	5	5	5	6	5	4	10	10	2	6.88
9	10	10	10	10	10	10	8	8	10	10	10	5	2	8	8	8	8	4	4	8	8	8	8	8	10	0	8.04
10	10	10	10	10	8	10	10	10	10	10	10	3	2	2	5	5	5	5	2	2	8	8	8	8	10	0	7.13
11	10	10	10	10	10	8	10	10	10	10	10	10	8	5	3	5	8	8	8	5	5	5	5	8	10	0	7.96
12	10	10	8	8	8	8	8	10	10	4	3	4	4	5	5	5	4	3	2	2	4	2	2	2	10	0	5.46
13	2	2	5	5	2	4	8	8	5	5	5	4	8	5	8	8	5	4	2	8	10	8	10	10	10	20	5.88
14	10	10	10	10	12	12	15	8	10	10	8	8	8	8	4	8	8	8	4	4	4	4	4	4	15	6	7.96
15	4	2	5	8	8	10	8	8	10	8	2	8	5	4	5	5	4	5	4	4	5	5	4	4	10	5	5.63
16	2	2	5	4	5	5	5	5	8	10	10	8	8	8	8	5	4	4	4	4	4	4	4	5	10	9	5.46
17	2	2	8	8	10	18	20	18	10	10	10	10	8	8	8	12	10	18	20	30	25	25	24	15	30	19	13.71
18	20	20	20	20	20	14	10	10	10	12	15	18	18	10	15	10	10	10	8	10	8	10	10	10	20	0	13.25
19	10	10	10	10	8	8	10	10	10	15	15	20	18	18	18	12	5	2	2	2	2	10	10	10	20	11	10.21
20	10	5	8	15	10	10	10	10	10	10	8	8	8	4	5	5	5	8	2	2	5	8	8	10	15	3	7.67
21	8	5	5	4	8	8	8	8	8	5	5	4	5	5	5	5	5	4	2	2	2	4	2	4	8	0	5.04
22	2	2	2	2	2	2	4	2	4	4	4	5	8	8	8	8	8	9	2	2	2	2	2	2	9	17	4.00
23	2	2	4	8	2	5	8	4	5	5	6	6	6	6	6	6	6	3	3	2	2	2	2	2	8	3	4.29
24	2	2	3	2	2	2	4	3	6	2	3	4	4	3	3	2	2	2	2	2	2	2	2	3	6	8	2.67
25	2	2	7	9	10	15	10	10	10	8	3	4	5	4	6	6	5	2	3	2	2	2	2	2	15	5	5.46
26	8	9	9	8	2	2	4	2	4	4	4	5	6	7	9	9	7	8	8	6	2	2	2	2	9	1	5.38
27	4	2	4	2	4	3	4	3	5	5	9	10	8	10	13	20	10	28	20	10	20	20	27	10	28	17	10.46
28	20	19	20	18	8	10	10	10	17	23	30	20	30	26	20	20	17	10	10	6	9	9	10	9	30	10	15.88
AV	8	8	10	10	9	10	10	8	9	9	9	8	8	7	8	8	7	7	6	6	7	7	8	7			7.98
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

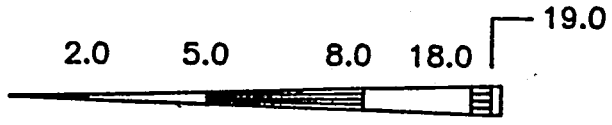
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE CANYON 1
Period: FEB 01, 1991 - FEB 28, 1991
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	2.8	6.8	11.0	18.0	2.9	285.0	42.41	9.75
1	1.0	1.9	3.4	6.2	0.3	87.0	12.95	9.17
2	0.7	1.4	0.7	0.9	0.0	26.0	3.87	6.38
3	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
4	0.3	0.0	0.0	0.0	0.0	2.0	0.30	2.00
5	0.1	0.0	0.1	0.0	0.0	2.0	0.30	5.00
6	0.1	0.3	0.0	0.0	0.0	3.0	0.45	3.33
7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
8	4.0	3.7	0.9	0.0	0.0	58.0	8.63	3.64
9	3.2	4.9	2.2	1.4	0.4	83.0	12.35	5.71
10	3.4	4.0	2.5	2.0	2.0	95.0	14.14	7.84
11	0.0	0.1	0.0	0.0	0.0	1.0	0.15	3.00
12	0.0	0.1	0.0	0.0	0.0	1.0	0.15	5.00
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.9	1.0	0.3	0.1	0.0	16.0	2.38	4.13
15	0.1	0.1	1.1	0.3	0.0	12.0	1.79	7.50
MSG	0.1	0.0	0.0	0.0	0.0	1.0	0.15	2.00
TOT	17.0	24.0	22.0	29.0	5.8	672.0	100.00	4.65





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 42.5 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: FEB 1991

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 point scale)
Station: SUNSHINE CANYON 1
Period: MAR, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	10	10	10	10	10	10	10	11	12	10	12	12	10	11	11	12	12	12	14	2	10	16	2	10
2	16	16	1	1	1	2	10	10	10	10	10	10	10	10	10	12	12	5	1	1	1	1	1	1
3	2	2	2	2	2	2	2	10	10	10	10	10	10	9	10	10	10	10	1	2	2	10	11	8
4	9	10	8	10	10	10	10	3	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	9	10	10	10	10	10	10	10	10	10	1	1	1	1	1	1	1	1	1
6	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1
7	1	1	2	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1
8	1	1	1	1	1	1	1	1	1	1	1	9	10	10	10	10	10	9	9	2	2	1	2	10
9	1	1	1	16	16	1	1	1	2	9	9	9	9	10	10	10	10	10	10	9	9	10	10	10
10	10	1	1	16	16	9	9	9	9	9	10	10	10	10	10	10	10	10	10	9	9	9	9	10
11	10	10	10	4	16	1	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1
12	1	1	1	2	2	2	2	2	2	1	1	9	10	10	10	10	10	10	10	10	6	9	10	9
13	10	9	10	9	9	9	10	9	9	10	10	10	10	10	12	10	10	10	10	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16	10	10	10	10	10	10	10	10	10
15	10	10	10	1	1	1	1	1	1	10	10	10	10	10	11	11	2	2	1	1	1	1	2	2
16	1	1	2	1	1	1	2	3	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
17	10	10	10	10	10	10	10	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
18	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
19	10	10	10	10	10	10	10	16	1	3	12	10	10	10	10	10	10	10	10	10	10	10	10	10
20	10	10	10	10	10	10	10	10	2	16	10	4	10	10	10	10	10	10	10	10	10	10	1	12
21	2	8	8	16	1	16	16	16	10	2	2	2	9	12	1	1	16	16	16	1	16	16	16	16
22	16	16	16	1	10	14	12	9	10	9	9	9	10	9	9	9	10	10	9	9	13	4	16	16
23	16	10	1	16	9	10	10	10	9	9	9	9	9	9	9	10	10	10	10	9	4	13	3	10
24	9	9	11	12	1	2	2	16	9	10	9	9	9	9	9	9	10	10	10	10	10	10	10	10
25	10	10	9	10	10	9	9	9	9	9	10	10	10	10	10	10	10	10	9	9	9	9	9	10
26	9	10	1	1	1	1	1	1	10	10	10	10	10	10	10	10	10	10	10	10	10	9	9	10
27	10	10	16	2	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
28	1	1	1	1	1	1	1	2	2	3	3	10	10	10	10	10	9	9	9	9	8	16	1	1
29	16	1	14	10	10	8	11	10	10	10	10	9	10	10	9	10	10	9	9	9	10	1	2	2
30	2	2	2	1	1	1	2	2	2	1	2	8	9	10	10	10	10	10	10	12	1	1	1	1
31	2	10	10	10	2	2	1	2	3	10	10	10	10	10	10	10	10	10	10	9	10	10	10	10

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE CANYON 1
Period: MAR, 1991

Clock Time

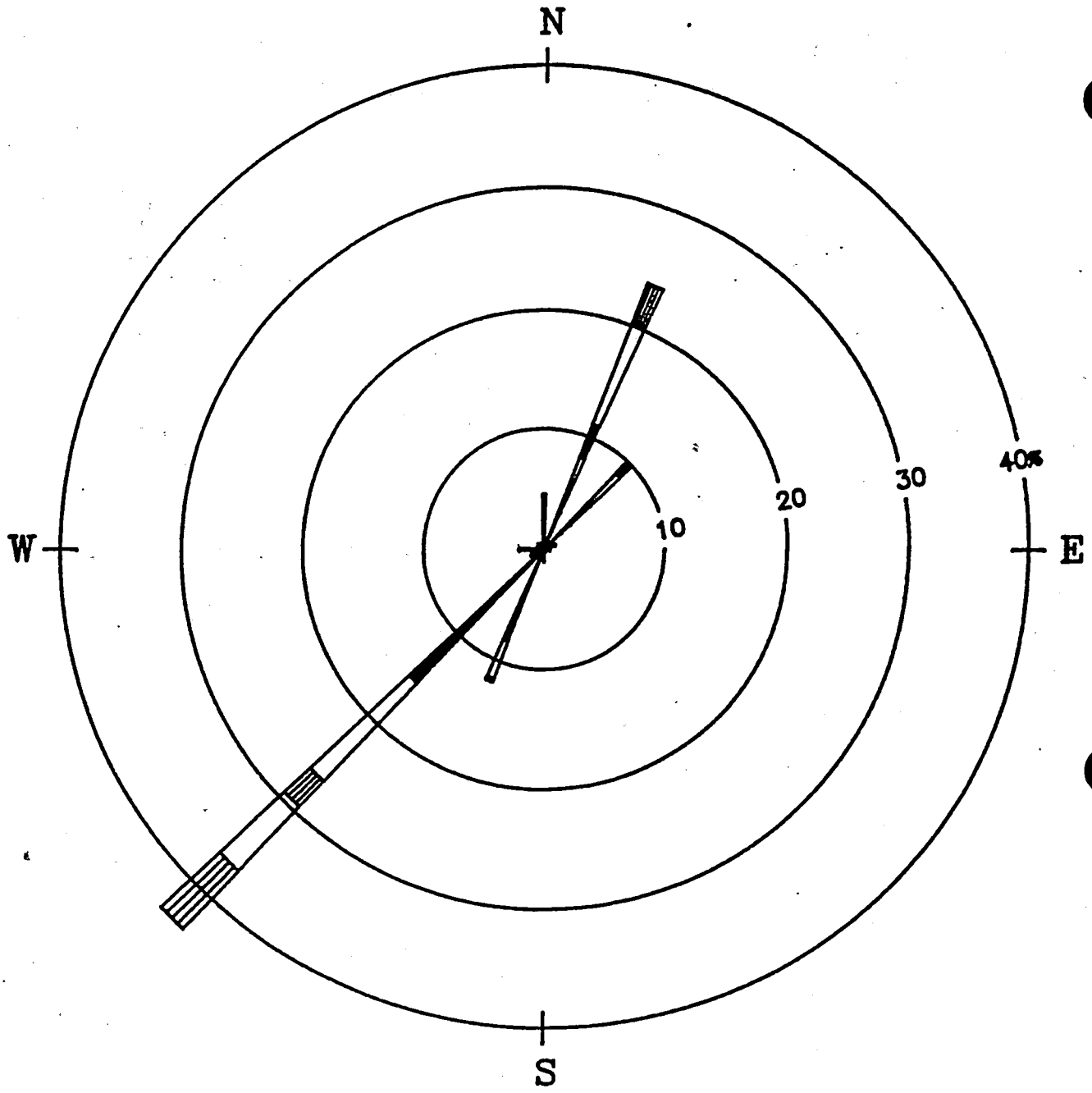
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2	6	8	9	10	8	8	6	7	6	8	6	7	8	10	2	5	4	6	6	8	8	9	8	10	10	3	7.21
3	9	8	10	7	9	8	8	2	2	3	5	6	3	2	2	2	2	2	7	4	6	3	2	5	10	2	4.88
4	2	5	6	5	6	4	3	2	1	4	4	5	5	6	7	7	6	5	3	2	4	1	1	2	7	14	4.00
5	2	1	4	2	1	4	1	1	2	2	2	3	3	2	1	8	10	9	10	10	8	11	12	12	12	22	5.04
6	14	20	20	20	20	22	24	25	27	23	20	15	10	10	10	9	10	10	10	13	15	20	20	20	27	8	16.96
7	25	20	20	26	10	20	30	30	20	18	22	20	20	20	22	22	19	17	12	9	10	10	10	10	30	6	18.42
8	9	9	10	10	10	10	12	12	10	5	5	1	4	4	2	2	4	2	1	3	4	3	6	2	12	6	5.83
9	7	2	3	6	2	7	5	3	2	1	2	5	5	10	19	18	17	17	16	10	3	1	1	1	19	14	6.79
10	2	4	5	4	2	2	1	1	1	2	5	5	5	4	4	10	5	4	3	4	3	3	2	3	10	15	3.50
11	5	5	3	4	6	4	2	2	3	9	10	12	10	11	10	10	12	15	10	5	8	9	10	10	15	17	7.71
12	10	11	18	12	8	8	9	9	7	4	3	2	4	4	4	4	5	2	1	1	1	1	1	1	18	2	5.42
13	1	1	1	2	1	1	1	2	2	2	2	3	4	4	3	2	3	3	2	3	2	2	2	3	4	12	2.17
14	4	2	2	5	4	6	10	20	20	28	28	25	13	7	5	3	5	5	4	1	2	2	1	2	28	9	8.50
15	3	4	3	6	5	4	4	2	3	3	10	5	9	14	12	7	10	10	8	10	12	12	10	10	14	13	7.33
16	7	4	4	5	2	3	2	2	1	1	1	2	4	10	9	10	8	8	10	10	2	2	3	3	10	13	4.71
17	2	2	2	4	1	1	2	1	3	4	10	20	20	20	25	28	28	25	2	15	15	20	20	20	28	15	12.08
18	20	20	19	15	20	15	9	10	10	10	10	19	20	20	28	27	20	10	19	20	22	25	30	25	30	22	18.46
19	20	20	18	5	20	4	10	5	2	5	4	5	10	12	10	11	10	10	10	10	5	5	4	8	20	0	9.29
20	18	20	10	20	20	20	15	5	10	8	1	1	8	10	10	10	10	5	4	2	2	2	1	1	20	1	8.88
21	2	2	1	2	2	4	8	5	2	3	7	7	2	2	9	10	10	10	10	12	9	9	9	8	12	19	6.04
22	8	8	8	3	2	1	1	1	1	1	2	2	4	4	4	4	4	4	4	1	1	1	1	1	8	0	2.96
23	1	1	1	1	1	1	1	1	1	1	2	2	4	4	4	4	2	1	1	1	2	1	2	1	4	12	1.71
24	1	1	1	1	2	1	1	1	1	2	2	3	4	5	5	6	8	5	7	4	10	12	22	22	22	22	5.29
25	22	20	2	2	1	2	5	1	2	3	2	4	12	5	3	3	2	2	4	2	1	1	1	1	22	0	4.29
26	4	1	1	7	10	3	2	2	1	2	4	9	10	20	20	22	20	25	25	4	2	3	2	1	25	17	8.33
27	1	1	2	2	2	1	2	12	8	7	5	5	2	5	12	10	18	20	30	28	12	12	10	10	30	18	9.04
28	8	2	8	9	7	10	10	10	9	3	2	2	2	2	3	4	2	1	1	1	1	1	4	4	10	5	4.42
29	8	5	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1	1	2	8	2	8	0	2.17
30	4	2	2	5	10	10	8	5	8	10	8	2	2	2	2	2	1	2	1	1	2	5	2	3	10	4	4.13
31	2	1	1	1	1	1	2	1	1	1	1	2	3	5	10	10	11	5	2	2	1	1	2	1	11	16	2.83
AV	8	8	7	7	7	7	7	6	6	6	6	7	7	8	8	9	9	8	7	7	6	6	7	7			7.10
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

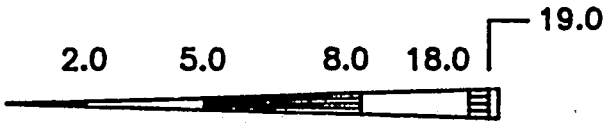
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE CANYON 1
Period: MAR 01, 1991 - MAR 31, 1991
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	1.4	0.7	1.6	0.8	0.0	34.0	4.57	5.41
1	3.3	4.7	2.9	9.0	3.4	175.0	23.52	9.60
2	2.0	1.0	2.2	3.3	1.3	75.0	10.08	8.81
3	0.7	0.3	0.0	0.0	0.0	7.0	0.94	2.43
4	0.4	0.1	0.0	0.0	0.0	4.0	0.54	2.00
5	0.0	0.0	0.1	0.0	0.0	1.0	0.13	6.00
6	0.1	0.0	0.0	0.0	0.0	1.0	0.13	1.00
7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
8	0.7	0.1	0.1	0.0	0.0	7.0	0.94	2.57
9	8.0	3.3	0.1	0.1	0.0	87.0	11.69	2.32
10	15.0	11.0	2.9	7.2	6.5	325.0	43.68	7.31
11	0.4	0.1	0.3	0.3	0.0	8.0	1.08	5.38
12	0.7	0.5	0.3	0.5	0.0	15.0	2.02	4.93
13	0.3	0.0	0.0	0.0	0.0	2.0	0.27	1.00
14	0.3	0.0	0.1	0.0	0.0	3.0	0.40	3.33
15	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
MSG	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
TOT	34.0	22.0	10.0	21.0	11.0	744.0	100.00	3.88





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 4.6 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: MAR 1991

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 point scale)
Station: SUNSHINE CANYON 1
Period: APR, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	8	10	10	10	10	9	8	9	9	10	10	10	10	10	10	10	10	14	1	1	1	5	6	8
2	8	10	16	2	1	3	9	9	8	9	2	1	10	10	10	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	9	3	16	16	16	16	1
5	1	1	1	1	1	2	2	2	2	9	9	9	9	9	9	9	9	9	10	9	12	2	1	1
6	1	2	1	1	1	1	16	1	1	1	8	9	10	9	9	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	10	11	10	13	16	16	16	16	16	16	16
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SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE CANYON 1
Period: APR, 1991

Clock Time

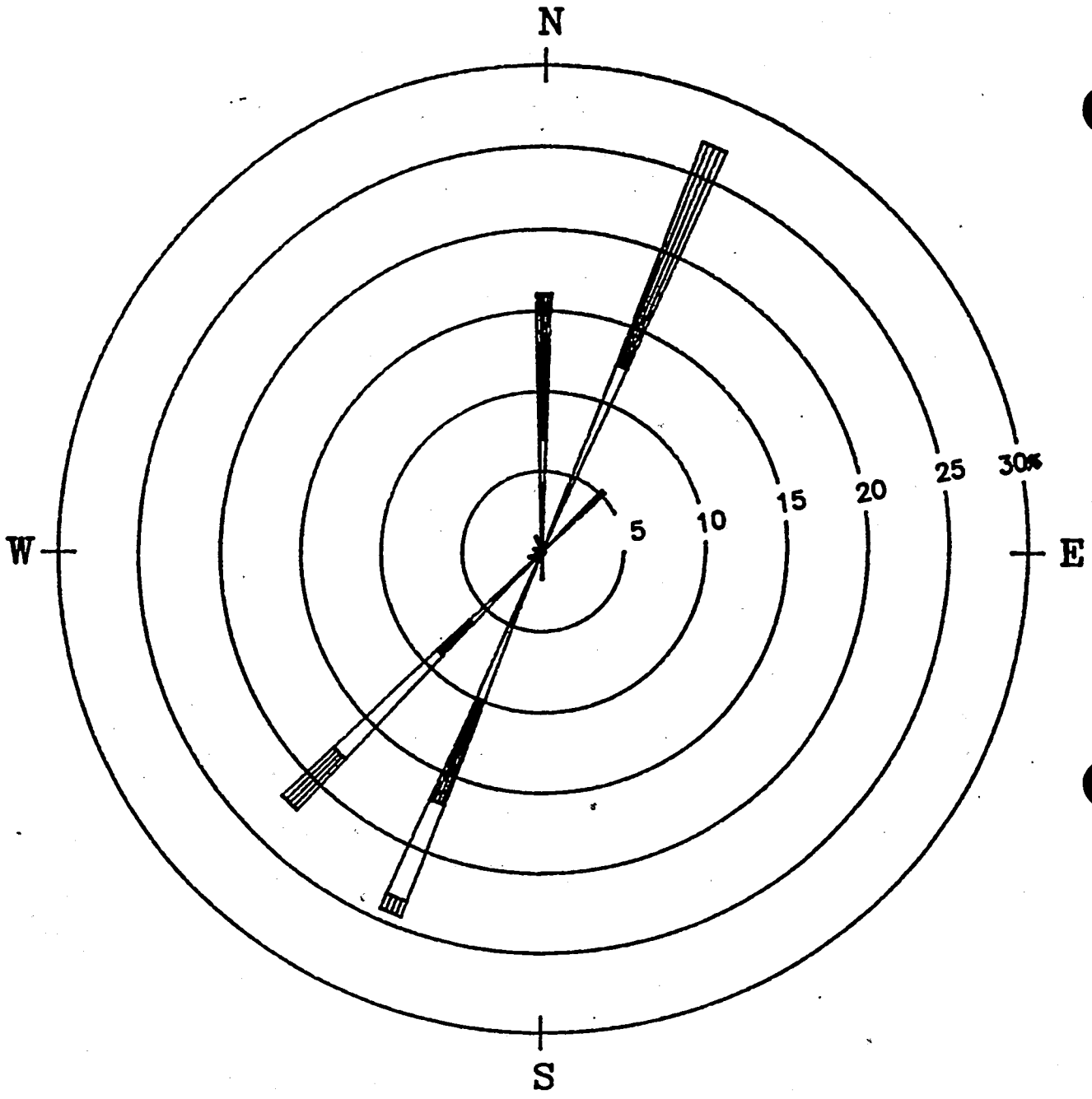
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28	20	35	35	30	30	28	25	30	20	20	20	20	18	15	11	10	10	15	15	13	16	15	25	22	35	1	20.75
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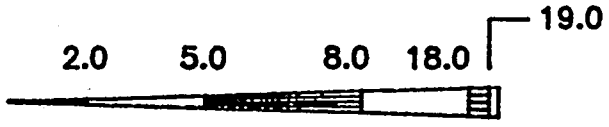
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE CANYON 1
Period: APR 01, 1991 - APR 30, 1991
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.1	0.3	0.7	3.0	5.4	69.0	9.58	18.77
1	0.0	0.7	1.6	5.1	8.6	116.0	16.11	18.72
2	0.3	0.7	0.3	1.2	0.6	22.0	3.06	12.36
3	0.0	0.1	0.0	0.0	0.0	1.0	0.14	4.00
4	0.1	0.0	0.0	0.0	0.0	1.0	0.14	2.00
5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
6	0.0	0.1	0.0	0.0	0.0	1.0	0.14	4.00
7	0.1	0.0	0.0	0.0	0.0	1.0	0.14	2.00
8	0.6	0.4	0.0	0.0	0.0	7.0	0.97	3.14
9	2.2	3.7	4.1	3.8	0.6	105.0	14.58	7.49
10	1.1	2.6	1.6	5.2	2.6	96.0	13.33	10.90
11	0.1	0.1	0.0	0.3	0.0	4.0	0.56	6.50
12	0.1	0.1	0.0	0.0	0.0	2.0	0.28	2.50
13	0.0	0.0	0.0	0.3	0.0	2.0	0.28	12.50
14	0.1	0.0	0.0	0.0	0.0	1.0	0.14	2.00
15	0.1	0.0	0.0	0.4	0.1	5.0	0.69	13.80
MSG	36.0	0.0	0.0	0.0	3.4	287.0	39.86	0.00
TOT	41.0	9.0	8.4	19.0	21.0	720.0	100.00	7.54





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 16.0 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: APR 1991

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 point scale)
Station: SUNSHINE 1
Period: MAY, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
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SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: MAY, 1991

Clock Time

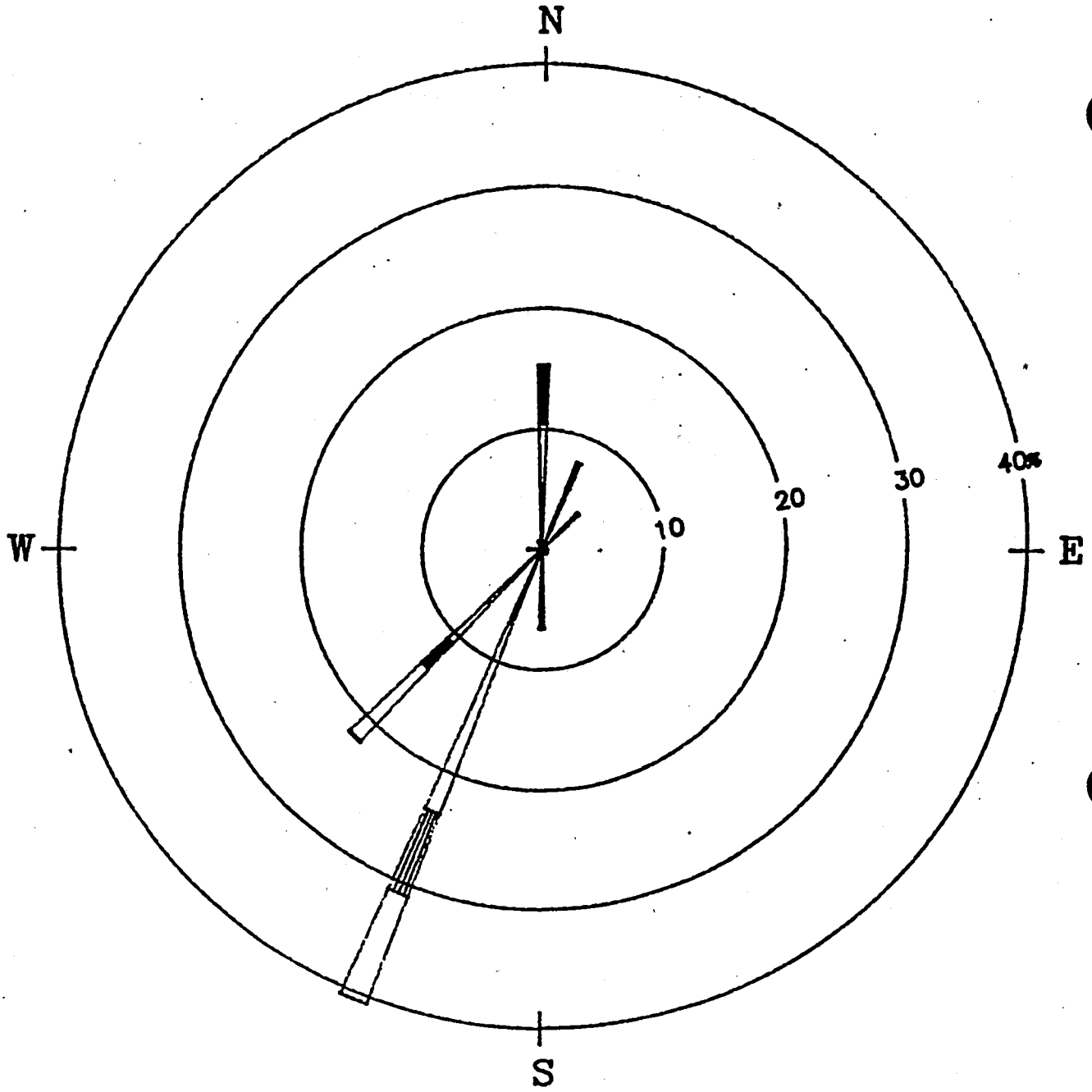
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AV	7	6	6	7	7	7	7	7	9	9	9	9	9	9	10	10	11	10	8	7	6	5	6	6			7.84
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

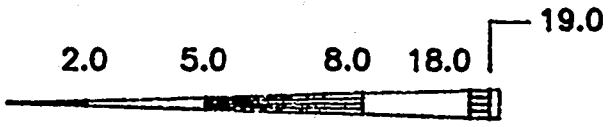
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: MAY 00, 1991 - MAY 31, 1991
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.7	2.9	0.9	5.7	4.7	112.0	15.05	13.76
1	0.5	1.3	0.5	3.0	2.2	58.0	7.80	13.45
2	0.0	2.1	0.7	1.2	0.0	30.0	4.03	6.83
3	0.0	0.1	0.0	0.0	0.0	1.0	0.13	3.00
4	0.1	0.3	0.0	0.0	0.0	3.0	0.40	2.67
5	0.1	0.3	0.0	0.0	0.0	3.0	0.40	2.67
6	0.0	0.5	0.0	0.0	0.0	4.0	0.54	3.00
7	0.0	0.1	0.0	0.0	0.0	1.0	0.13	3.00
8	0.5	4.9	1.0	0.0	0.0	49.0	6.59	4.43
9	4.9	18.0	7.2	9.4	0.0	299.0	40.19	5.85
10	0.5	10.0	2.8	8.0	0.1	167.0	22.45	7.14
11	0.0	0.1	0.0	0.0	0.0	1.0	0.13	5.00
12	0.1	1.0	0.0	0.0	0.0	9.0	1.21	3.00
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.1	0.0	0.0	0.0	0.0	1.0	0.13	1.00
15	0.0	0.1	0.0	0.3	0.3	5.0	0.67	15.40
MSG	0.1	0.0	0.0	0.0	0.0	1.0	0.13	2.00
TOT	7.9	43.0	13.0	27.0	7.3	744.0	100.00	5.76





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 15.3 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: MAY 1991

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 point scale)
Station: SUNSHINE 1
Period: JUN, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
2	12	1	1	16	16	1	2	2	9	9	9	9	9	9	9	9	8	9	9	9	9	9	16	16
3	16	1	1	1	1	16	2	1	1	9	9	9	9	9	9	9	9	9	9	9	9	1	9	9
4	9	16	9	16	9	9	9	2	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
5	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	8	8	8	9	9	9	9
6	16	9	9	8	14	9	12	9	9	9	9	9	9	9	9	9	9	9	9	9	9	16	16	16
7	16	1	1	1	10	1	1	9	9	9	9	9	9	9	9	9	9	9	9	9	8	16	1	1
8	9	9	9	8	8	9	9	9	9	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9
9	9	9	9	9	9	8	9	8	8	8	9	9	9	8	9	9	9	9	8	8	9	9	9	9
10	9	9	9	8	1	1	1	9	9	9	9	9	9	9	9	9	9	8	8	9	9	9	9	9
11	9	9	9	9	9	9	16	16	9	9	9	9	9	9	9	9	9	9	9	9	9	8	12	1
12	16	1	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
13	9	9	9	9	9	9	16	16	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
14	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	8	8	9
15	9	8	16	16	1	1	1	8	8	8	8	9	9	9	9	9	9	9	9	9	9	9	16	9
16	1	1	1	6	14	9	2	9	9	9	9	9	9	9	9	8	8	9	9	9	9	16	16	1
17	2	16	1	9	9	16	16	10	9	8	9	9	9	9	9	9	9	9	9	9	9	8	9	9
18	9	9	16	16	9	1	2	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
19	9	16	14	2	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
20	9	9	9	9	11	9	9	10	10	9	9	9	9	9	9	9	9	9	9	9	9	9	10	6
21	8	9	9	9	8	10	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
22	9	9	10	10	10	9	10	9	9	10	10	9	9	9	10	9	9	9	9	9	9	9	9	9
23	9	9	9	9	9	8	9	9	10	10	9	9	9	9	9	9	9	9	8	9	8	9	9	9
24	9	9	9	9	9	9	9	9	9	9	9	9	9	10	10	9	9	9	10	10	9	8	8	9
25	6	8	9	9	10	10	9	10	10	9	9	9	9	10	10	10	10	10	10	10	9	5	8	8
26	9	9	9	10	9	16	9	9	9	9	8	10	8	9	9	9	9	9	8	9	9	9	9	9
27	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	6
28	10	8	9	9	9	9	9	9	9	9	9	10	10	9	9	10	10	10	10	9	8	9	9	
29	9	9	10	10	8	1	1	9	9	9	10	9	9	9	9	9	9	9	9	9	8	16	16	16
30	1	1	1	1	16	1	1	1	16	8	9	9	9	9	9	9	9	10	9	8	8	14	9	9

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: JUN 01, 1991 - JUN 30, 1991
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

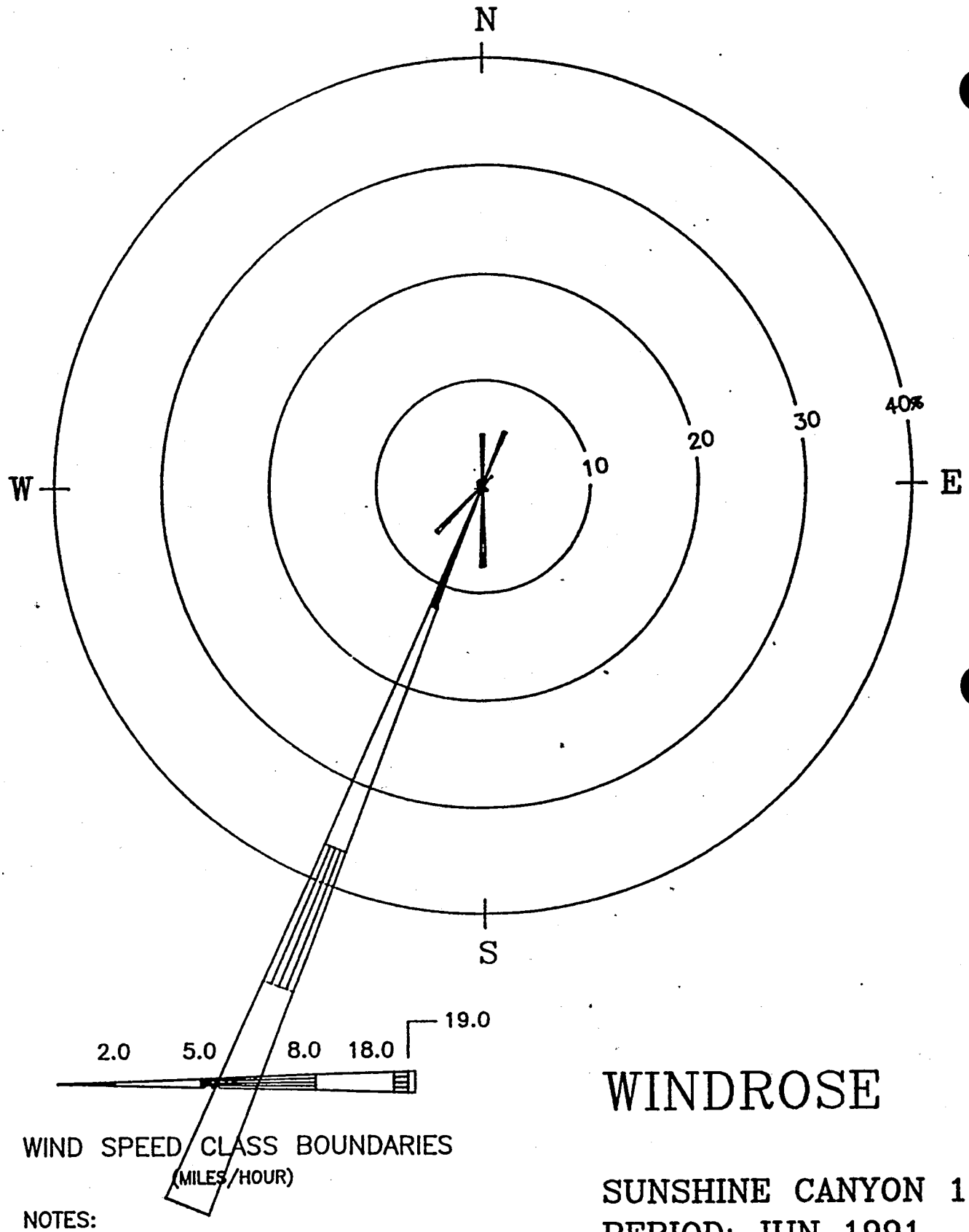
Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	1.9	1.7	0.8	0.8	0.1	36.0	5.00	5.19
1	1.5	2.7	0.3	0.8	0.1	40.0	5.56	5.38
2	0.6	0.6	0.0	0.0	0.0	8.0	1.11	2.88
3	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
4	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
5	0.0	0.1	0.0	0.0	0.0	1.0	0.14	3.00
6	0.6	0.0	0.0	0.0	0.0	4.0	0.56	1.00
7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
8	3.0	3.4	0.6	0.4	0.0	54.0	7.50	3.57
9	12.0	24.0	14.0	22.0	0.0	525.0	72.92	6.20
10	1.6	1.9	1.0	1.5	0.0	44.0	6.11	5.59
11	0.1	0.0	0.0	0.0	0.0	1.0	0.14	1.00
12	0.4	0.0	0.0	0.0	0.0	3.0	0.42	1.33
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.4	0.1	0.0	0.0	0.0	4.0	0.56	1.50
15	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
MSG	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
TOT	22.0	34.0	17.0	25.0	0.3	720.0	100.00	2.29

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: JUN, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	MAX	HR.	AVE.
1	3	3	5	5	4	4	5	5	5	7	7	7	8	8	9	8	10	10	10	9	6	5	1	1	10	16	6.04
2	2	5	3	10	10	8	5	3	5	5	8	10	10	10	10	11	10	10	8	7	4	1	1	5	11	15	6.71
3	1	2	3	5	3	1	4	7	5	7	7	8	9	8	8	8	9	8	5	4	2	2	2	1	9	12	4.96
4	1	2	2	2	1	2	2	2	3	5	8	9	9	10	10	10	10	9	9	8	5	5	4	4	10	13	5.50
5	3	4	5	7	5	3	4	3	3	5	5	8	8	8	9	8	8	7	5	5	5	2	1	1	9	14	5.08
6	1	1	1	1	1	1	1	2	5	6	7	7	7	7	9	9	10	8	8	5	2	3	7	9	10	16	4.92
7	8	5	5	5	2	1	1	1	5	7	10	10	10	7	8	9	10	10	5	4	1	5	2	2	10	10	5.54
8	1	1	1	2	2	3	3	2	3	5	7	8	10	10	9	10	8	5	7	5	4	3	3	3	10	12	4.79
9	1	2	1	1	1	1	4	2	4	4	5	7	5	5	7	9	9	10	5	2	2	2	3	1	10	17	3.88
10	1	2	1	1	4	5	3	1	2	4	6	7	7	7	8	9	8	5	5	5	5	3	1	1	9	15	4.21
11	1	1	1	4	6	4	7	1	4	4	7	10	10	13	12	12	11	10	10	9	5	2	1	2	13	13	6.13
12	5	3	2	2	3	3	1	3	4	5	7	10	10	10	11	12	11	10	10	10	11	6	3	4	12	15	6.50
13	5	6	5	5	4	3	8	5	5	5	10	10	11	10	11	11	10	12	10	10	12	10	9	5	12	17	8.00
14	6	5	5	5	5	5	5	5	5	7	5	6	7	7	9	8	9	9	10	9	3	3	3	1	10	18	5.92
15	1	1	3	4	4	3	4	3	4	4	5	7	6	8	10	11	10	8	5	4	4	3	2	1	11	15	4.79
16	1	1	1	1	1	1	1	3	5	5	5	7	7	7	9	9	8	8	5	5	3	2	1	4	9	14	4.17
17	5	10	4	1	1	1	1	2	3	5	5	10	9	10	10	10	10	9	5	5	1	1	1	1	10	1	5.00
18	4	1	1	2	3	3	2	3	5	5	9	10	12	15	11	15	15	8	8	5	5	5	3	2	15	13	6.33
19	1	4	1	1	1	3	3	3	5	9	10	11	12	11	10	10	10	8	8	6	5	3	1	1	12	12	5.71
20	1	1	1	1	1	1	2	4	5	7	8	10	10	10	10	11	10	14	10	5	3	3	1	1	14	17	5.42
21	1	2	1	1	1	1	2	4	4	5	9	11	11	10	10	10	11	12	10	6	5	5	4	4	12	17	5.83
22	3	4	4	2	1	2	1	3	7	8	9	9	10	10	10	12	10	12	10	7	5	1	1	3	12	15	6.00
23	1	1	3	2	1	2	3	3	3	5	8	8	10	10	10	10	10	10	8	8	5	3	2	3	10	12	5.38
24	2	3	5	8	8	8	6	5	7	8	8	8	5	5	8	10	10	11	8	7	5	3	1	1	11	17	6.25
25	1	3	2	3	3	5	3	4	5	5	7	10	9	10	11	11	10	10	8	5	2	3	2	1	11	14	5.54
26	1	1	3	2	3	7	5	5	10	10	5	5	4	8	10	15	13	10	9	8	7	5	4	5	15	15	6.46
27	5	5	8	5	5	8	5	5	8	8	10	10	10	10	10	10	10	8	10	7	5	1	1	1	10	10	6.88
28	1	1	2	4	8	8	7	5	4	4	4	5	8	9	10	10	10	10	8	5	5	4	4	3	10	14	5.79
29	1	1	2	1	1	2	3	2	3	5	5	8	10	10	10	10	10	8	5	4	1	3	8	12	12	23	5.21
30	14	15	15	20	20	10	15	15	15	3	4	5	7	8	8	10	11	10	5	5	1	3	3	3	20	3	9.38
AV	3	3	3	4	4	4	4	4	5	6	7	8	9	9	10	10	10	9	8	6	4	3	3	3			5.74
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			



WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 4.9 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: JUN 1991

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE CANYON 1
Period: JUL, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	9	9	9	9	16	1	16	9	9	9	8	8	9	9	9	8	8	9	8	8	8	9	9	9
2	9	9	9	1	1	1	1	10	10	9	9	9	10	9	9	9	9	9	9	9	8	9	9	9
3	9	9	9	9	9	10	10	10	10	9	9	9	9	9	9	9	9	8	8	8	9	9	9	9
4	1	11	1	1	1	1	1	9	9	9	9	9	9	9	9	9	10	10	9	9	9	9	9	9
5	10	10	9	9	9	4	16	16	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	1
6	1	9	16	16	16	14	9	9	9	9	9	9	9	9	9	9	8	9	9	9	9	8	9	9
7	9	16	16	8	8	9	9	16	9	9	9	9	10	9	9	9	9	8	8	8	9	9	16	16
8	10	8	16	9	9	8	9	10	16	16	16	9	9	9	9	9	9	9	9	8	9	9	10	16
9	10	16	1	9	10	9	10	9	9	9	9	9	9	10	10	9	9	9	9	9	9	9	9	9
10	9	9	9	10	9	10	10	10	9	9	9	9	10	10	9	9	9	9	9	9	9	9	9	9
11	8	9	6	10	15	8	10	10	9	9	9	9	9	10	9	9	9	9	9	9	9	9	9	9
12	9	1	9	16	10	10	10	9	9	9	9	9	9	9	9	9	8	9	8	8	9	16	9	9
13	9	9	9	9	10	9	9	10	10	10	9	9	9	9	9	9	9	9	9	9	9	9	8	9
14	9	9	9	9	10	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
15	9	10	10	10	9	7	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
[illegible]	9	9	9	16	16	9	1	2	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8
[illegible]	9	9	9	9	10	10	10	10	8	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9
18	9	9	9	9	9	9	9	9	10	9	10	10	9	9	9	9	9	9	9	9	9	9	9	9
19	9	10	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	9	9	8
20	8	9	10	1	8	9	10	10	10	10	10	10	10	10	10	10	10	9	9	10	10	9	5	5
21	1	1	1	16	1	8	9	9	10	10	10	10	9	9	9	10	10	10	8	9	9	9	10	9
22	9	10	10	1	10	10	10	10	10	10	10	10	10	10	9	9	9	9	9	9	9	8	9	10
23	10	10	16	10	10	9	9	8	9	10	10	10	9	9	9	9	8	9	9	9	10	9	9	10
24	9	9	10	10	10	10	10	10	10	10	10	9	10	10	10	10	9	8	9	9	9	9	9	10
25	10	10	10	10	10	9	8	8	10	10	10	10	10	10	10	10	10	9	9	10	10	10	9	10
26	10	10	10	10	10	8	10	8	10	10	10	10	10	10	10	10	10	10	9	8	9	9	10	9
27	1	1	2	1	9	1	1	2	10	10	10	10	10	10	10	10	10	9	9	8	8	8	16	16
28	1	2	1	2	16	16	1	2	10	10	10	9	9	9	10	9	9	10	9	10	4	16	1	2
29	2	1	16	16	14	9	10	10	10	10	10	10	10	8	8	9	9	8	9	9	10	9	9	9
30	9	9	9	1	16	16	16	10	10	10	10	10	10	9	9	9	9	10	9	10	10	10	9	8
31	10	10	16	1	16	9	10	10	10	10	10	10	10	10	10	10	9	10	9	10	10	9	10	9

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE CANYON 1
Period: JUL, 1991

Clock Time

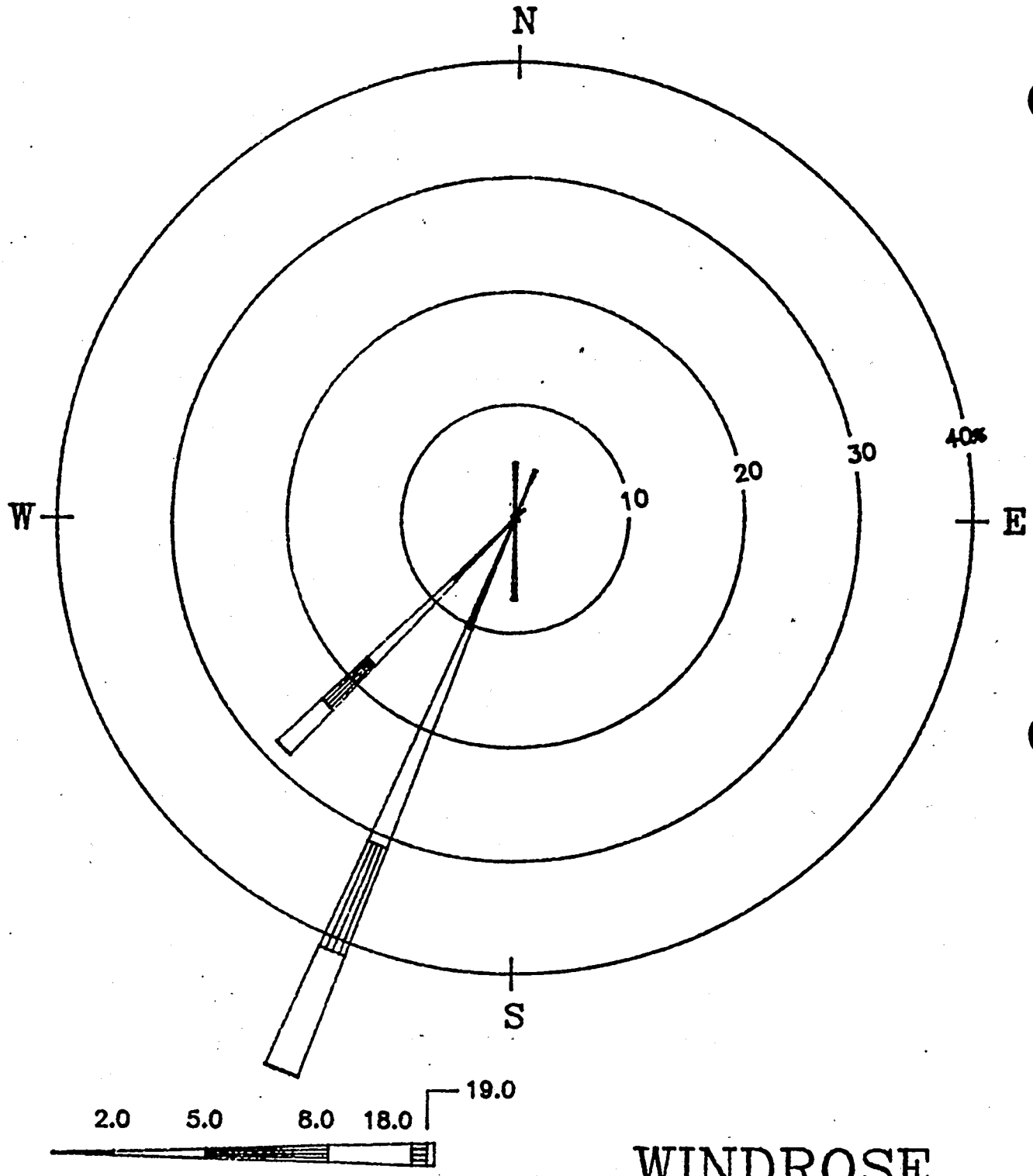
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	MAX	HR.	AVE.
1	3	3	1	2	3	5	5	4	5	5	5	6	8	9	8	8	8	5	4	5	5	2	3	4	9	13	4.83
2	3	1	2	4	5	4	4	2	3	5	8	8	10	8	8	10	8	8	5	3	2	3	1	1	10	12	4.83
3	2	1	1	1	1	3	1	1	3	5	8	9	9	8	10	10	10	8	7	5	4	4	3	4	10	14	4.92
4	2	1	9	5	10	14	10	4	4	5	8	8	10	10	9	9	9	8	7	5	2	1	5	1	14	5	6.50
5	1	1	2	3	3	2	10	10	5	3	4	7	10	16	15	15	15	10	12	11	10	7	2	3	16	13	7.38
6	3	3	7	10	8	1	3	3	5	5	8	10	9	7	10	10	8	10	5	5	4	4	5	3	10	3	6.08
7	3	3	8	1	1	1	3	5	2	8	8	8	8	5	9	10	10	7	4	5	5	4	5	5	10	15	5.33
8	3	3	1	1	2	1	3	1	4	3	5	3	3	5	8	5	5	5	5	5	3	4	3	1	8	14	3.42
9	1	1	3	1	1	2	2	3	5	6	8	10	11	13	15	15	14	10	6	7	5	2	2	2	15	14	6.04
10	2	1	1	1	1	1	1	2	3	5	9	10	10	9	9	10	10	8	5	5	4	3	3	2	10	11	4.79
11	1	1	1	1	1	1	1	3	4	5	8	8	5	8	8	10	8	5	5	5	3	3	1	1	10	15	4.04
12	1	2	2	3	1	1	1	2	3	5	7	8	8	8	8	8	8	8	5	4	2	1	1	2	8	11	4.13
13	2	2	1	1	1	2	1	1	2	4	8	8	7	8	10	10	10	9	8	3	2	1	2	3	10	14	4.42
14	2	2	1	1	1	2	1	1	4	5	7	7	8	10	12	15	11	10	8	5	5	5	3	4	15	15	5.42
15	3	3	3	2	1	1	1	1	4	5	7	10	15	15	20	18	15	12	10	5	4	4	2	2	20	14	6.7
16	3	1	1	1	1	1	4	2	3	5	8	10	10	10	12	11	10	10	8	7	5	4	3	1	12	14	5.
17	2	2	2	1	1	1	1	2	3	7	8	8	9	8	8	9	10	8	7	5	5	5	4	3	10	16	4.5
18	4	3	2	2	3	5	5	5	8	8	6	5	7	7	8	8	8	10	9	8	5	3	4	4	10	17	5.71
19	3	5	6	8	5	4	3	4	5	5	8	8	10	9	8	7	7	7	7	4	3	1	1	1	10	12	5.38
20	1	1	1	1	1	3	3	4	3	5	8	10	9	10	8	8	10	10	7	5	4	3	1	1	10	11	4.88
21	1	5	2	1	1	1	1	2	2	5	7	8	8	8	8	10	10	5	5	5	3	3	1	1	10	15	4.29
22	1	5	5	1	1	1	1	1	4	8	8	9	8	10	9	10	9	8	5	5	4	3	5	3	10	13	5.17
23	1	1	3	1	2	2	5	3	4	5	6	6	9	10	8	10	7	6	5	4	4	3	3	3	10	13	4.63
24	5	4	3	3	2	1	1	1	5	7	8	8	10	10	10	10	7	7	8	5	4	4	3	3	10	12	5.38
25	4	3	3	3	5	4	2	2	3	3	5	6	10	9	10	9	10	8	8	5	5	5	4	3	10	12	5.38
26	5	4	3	2	1	1	3	3	3	5	6	8	10	10	11	10	9	8	5	3	3	3	2	1	11	14	4.96
27	3	3	4	1	1	1	2	3	3	4	5	5	5	10	8	10	10	7	5	4	1	1	9	4	10	13	4.54
28	5	2	5	2	5	10	5	4	3	3	5	5	5	10	8	10	10	10	4	2	1	1	3	4	10	5	5.08
29	4	2	5	5	1	3	1	1	3	4	5	5	6	5	5	5	10	5	4	5	2	3	5	4	10	16	4.08
30	4	5	3	8	10	11	1	1	2	4	5	8	9	10	11	14	10	10	8	5	4	3	3	3	14	15	6.33
31	3	2	17	5	3	4	1	3	3	5	6	8	9	10	8	6	5	6	6	5	4	3	2	2	17	2	5.25
AV	3	2	3	3	3	3	3	3	4	5	7	8	9	9	10	10	9	8	6	5	4	3	3	3			5.17
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE CANYON 1
Period: JUL 01, 1991 - JUL 31, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	1.2	2.1	0.4	1.0	0.0	36.0	4.84	5.14
1	1.4	2.4	0.1	0.5	0.0	34.0	4.57	4.15
2	0.4	0.7	0.0	0.0	0.0	8.0	1.08	3.13
3	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
4	0.3	0.0	0.0	0.0	0.0	2.0	0.27	1.50
5	0.3	0.0	0.0	0.0	0.0	2.0	0.27	1.00
6	0.1	0.0	0.0	0.0	0.0	1.0	0.13	1.00
7	0.1	0.0	0.0	0.0	0.0	1.0	0.13	1.00
8	2.5	3.0	1.3	0.0	0.0	52.0	6.99	3.71
9	10.0	20.0	10.0	11.0	0.1	395.0	53.09	5.71
10	7.2	10.0	5.1	5.1	0.0	209.0	28.09	4.98
11	0.1	0.0	0.0	0.0	0.0	1.0	0.13	1.00
12	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.3	0.0	0.0	0.0	0.0	2.0	0.27	1.00
15	0.1	0.0	0.0	0.0	0.0	1.0	0.13	1.00
MSG	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
TOT	24.0	39.0	17.0	17.0	0.1	744.0	100.00	2.14



WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 4.8 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: JUL 1991

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: AUG, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	9	9	9	9	16	9	9	10	10	10	10	10	10	10	10	9	9	8	10	9	9	9	8	10
2	10	10	9	1	1	2	10	10	10	10	8	10	9	10	9	8	9	10	9	9	9	10	10	9
3	9	9	9	8	9	9	10	10	10	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9
4	9	9	10	10	10	10	10	10	10	10	10	10	10	9	9	9	9	9	9	9	9	8	8	8
5	9	9	10	9	9	9	8	8	10	10	10	10	10	10	10	9	9	9	9	9	9	9	8	10
6	9	9	9	9	10	10	10	10	10	10	10	10	9	10	10	10	9	9	9	8	9	11	1	10
7	16	16	10	10	1	2	1	1	10	10	10	10	10	9	10	9	9	9	9	10	8	1	1	2
8	10	16	1	2	2	1	1	1	1	10	10	9	8	9	10	9	9	9	9	9	10	10	1	8
9	14	10	16	16	1	1	1	1	8	10	10	9	9	9	9	9	9	8	8	9	8	16	10	10
10	9	9	9	16	9	10	9	1	1	10	9	9	9	9	9	9	9	9	9	9	9	9	10	10
11	10	10	10	2	9	10	1	2	2	2	10	10	9	10	9	9	9	9	8	9	9	9	9	9
12	9	9	10	10	9	9	9	9	9	9	9	9	10	16	16	16	16	16	1	1	16	1	1	9
13	9	9	9	9	16	16	16	2	10	10	10	9	9	9	9	9	9	9	9	9	9	9	9	9
14	9	9	9	9	9	9	9	9	9	9	9	9	10	10	9	9	10	10	9	9	9	9	9	10
15	10	8	9	10	10	10	9	10	10	10	10	10	10	10	10	10	10	9	9	10	8	10	2	1
	2	2	2	9	10	9	1	16	10	10	10	10	10	10	10	9	9	9	9	8	9	9	9	9
	9	16	9	9	8	10	16	1	10	10	9	10	9	10	10	10	10	9	9	9	9	9	10	9
18	9	10	10	9	9	1	10	10	10	10	10	10	9	10	10	9	9	9	9	9	9	9	9	9
19	16	10	10	16	9	1	1	10	10	8	10	10	9	10	10	10	9	9	8	10	9	10	1	16
20	16	1	9	10	16	10	1	1	10	10	9	9	8	8	10	10	9	9	9	8	1	9	16	2
21	10	10	2	2	1	16	1	1	16	16	10	9	10	10	9	9	9	8	8	10	10	10	9	9
22	9	10	8	1	2	1	1	10	10	10	10	8	10	10	9	9	10	8	9	8	9	16	1	10
23	10	10	10	9	16	2	2	2	2	10	10	9	10	9	10	9	10	9	9	7	9	9	9	9
24	9	10	11	10	1	2	1	2	9	10	9	9	9	9	9	9	9	10	9	9	9	9	9	9
25	9	1	9	1	1	16	16	2	9	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9
26	9	9	9	9	8	9	15	8	10	9	9	9	10	9	9	9	9	9	9	9	9	9	9	9
27	9	9	9	9	9	10	10	9	10	9	10	9	9	9	9	9	10	9	9	9	8	10	16	9
28	10	9	16	10	2	2	5	10	10	10	10	10	10	9	9	9	9	9	9	9	9	9	11	9
29	9	9	16	2	2	1	2	1	2	10	10	9	9	9	9	9	9	9	9	8	9	9	16	1
30	16	1	1	1	1	16	16	2	2	10	9	9	9	9	9	9	8	9	9	5	15	10	9	10
31	9	9	16	9	9	16	16	9	10	10	9	8	8	9	9	9	9	9	9	9	16	16	9	9

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: AUG, 1991

Clock Time

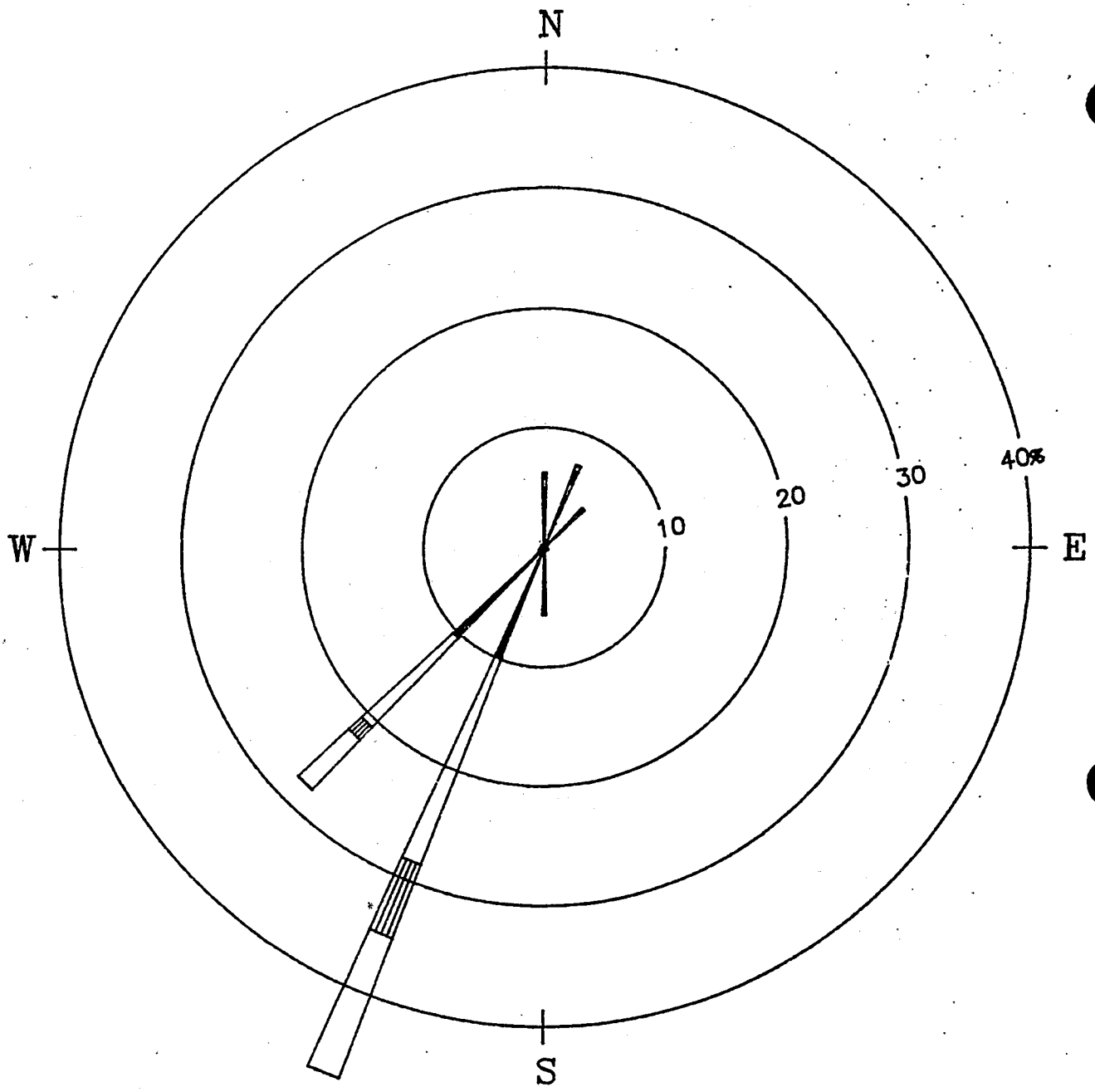
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1	3	3	4	3	1	1	1	2	2	5	9	10	10	10	10	10	9	6	5	4	3	3	1	1	10	11	4.83
2	1	1	1	1	3	4	1	1	1	5	5	7	7	10	9	9	8	8	5	4	3	3	1	3	10	13	4.21
3	3	3	1	1	1	1	1	1	3	5	8	10	10	10	11	10	10	10	5	6	6	5	6	4	11	14	5.46
4	4	5	3	4	2	2	1	3	3	5	5	9	10	10	10	10	10	10	9	8	5	2	1	1	10	12	5.50
5	1	2	5	3	3	1	1	1	2	4	5	8	9	10	10	10	10	10	5	4	4	3	1	1	10	13	4.71
6	2	3	3	1	2	1	1	5	5	4	5	8	10	5	5	10	10	8	8	5	2	1	1	1	10	12	4.42
7	1	1	1	1	3	2	3	1	1	4	5	5	6	5	10	10	8	6	5	2	1	5	4	3	10	14	3.88
8	1	1	5	5	3	5	6	9	9	1	5	5	5	5	7	10	10	9	5	2	1	1	1	1	10	15	4.67
9	1	1	1	1	1	5	5	8	2	4	5	5	5	5	6	10	10	5	2	1	1	1	1	1	10	15	3.63
10	4	3	1	1	5	3	1	8	8	4	5	5	10	10	10	10	10	15	15	10	5	1	1	1	15	17	6.08
11	1	1	1	1	1	1	1	3	1	3	5	6	8	10	10	10	10	10	5	8	5	4	3	5	10	13	4.71
12	3	3	1	1	1	5	4	5	5	5	5	4	2	4	25	25	21	15	9	7	7	6	3	5	25	14	7.13
13	3	3	1	1	1	8	5	5	5	4	4	6	10	10	15	10	15	15	10	10	10	5	5	5	15	14	6.92
14	5	5	9	9	9	10	10	10	10	10	10	10	10	10	10	10	9	5	5	3	4	4	3	3	10	5	7.63
15	4	3	2	1	2	2	2	3	3	5	5	5	5	10	10	10	9	10	5	4	2	1	1	1	10	13	4
16	2	2	1	2	2	1	1	3	3	5	5	5	5	10	10	10	10	5	5	3	3	2	1	1	10	13	[illegible]
17	1	1	2	2	2	1	1	3	5	5	6	10	10	9	10	10	10	6	5	5	2	1	1	1	10	11	[illegible]
18	2	1	1	1	1	5	1	5	4	5	5	10	10	10	10	10	10	10	5	5	3	4	3	3	10	11	5.17
19	1	1	1	1	1	1	3	2	3	4	5	10	10	10	10	10	10	5	5	4	1	1	1	1	10	11	4.21
20	1	1	1	1	1	1	1	1	2	3	4	5	5	5	10	10	10	5	5	2	3	1	1	4	10	14	3.46
21	1	1	4	5	15	10	4	5	14	6	5	5	5	5	6	9	9	5	4	5	1	2	1	1	15	4	5.33
22	1	1	1	5	5	5	5	2	2	5	5	5	5	5	5	6	6	5	4	2	1	8	3	1	8	21	3.88
23	1	1	2	1	1	1	4	3	6	3	5	5	6	6	5	5	9	6	6	4	3	3	4	3	9	16	3.88
24	3	2	2	2	2	5	2	2	3	4	6	8	6	10	6	4	5	4	4	4	5	4	4	2	10	13	4.13
25	2	6	3	2	4	10	9	3	4	5	6	8	10	10	10	10	9	9	6	5	4	4	4	4	10	5	6.13
26	3	4	4	2	1	1	1	-	3	5	7	9	10	10	10	9	8	6	5	5	3	2	2	2	10	12	4.87
27	3	3	3	3	2	2	2	4	5	5	9	7	10	10	10	10	10	8	3	3	2	2	4	2	10	12	5.08
28	2	2	1	1	3	2	2	2	2	3	6	5	6	7	6	8	9	7	5	3	2	1	1	1	9	16	3.63
29	2	1	2	2	2	6	5	5	6	3	5	6	5	6	6	7	6	6	5	2	2	2	2	4	7	15	4.08
30	5	5	3	2	5	7	9	4	2	3	5	5	5	9	10	10	5	5	4	2	3	2	2	1	10	14	4.71
31	2	3	2	2	2	1	1	2	2	4	5	5	6	6	8	7	5	5	4	2	2	2	1	1	8	14	3.33
AV	2	2	2	2	3	4	3	4	4	4	6	7	7	8	9	10	9	8	6	4	3	3	2	2			4.79
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

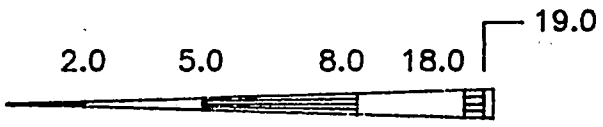
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE CANYON 1
Period: AUG 01, 1991 - AUG 31, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	3.4	0.7	0.7	0.8	0.4	45.0	6.05	5.02
1	2.2	3.4	1.0	0.5	0.0	55.0	7.39	4.11
2	1.7	2.4	0.3	0.0	0.0	33.0	4.44	3.15
3	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
4	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
5	0.3	0.0	0.0	0.0	0.0	2.0	0.27	2.00
6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
7	0.0	0.1	0.0	0.0	0.0	1.0	0.13	4.00
8	2.8	2.2	0.3	0.1	0.0	41.0	5.51	3.17
9	9.5	18.0	6.3	12.0	0.0	348.0	46.77	5.53
10	10.0	10.0	1.4	5.5	0.0	212.0	28.49	4.41
11	0.4	0.0	0.0	0.0	0.0	3.0	0.40	1.33
12	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.1	0.0	0.0	0.0	0.0	1.0	0.13	1.00
15	0.1	0.1	0.0	0.0	0.0	2.0	0.27	2.00
MSG	0.0	0.0	0.0	0.0	0.1	1.0	0.13	0.00
TOT	31.0	38.0	10.0	19.0	0.5	744.0	100.00	2.23





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 6.2 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: AUG 1991

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE CANYON 1
Period: SEP, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	9	1	1	1	1	1	1	2	10	10	9	9	9	9	9	9	9	9	9	9	10	9	9	9
2	9	1	1	1	1	1	16	1	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
3	16	1	1	2	1	16	1	2	2	10	10	9	9	9	9	9	9	9	9	8	9	16	1	1
4	1	9	9	9	16	1	1	9	10	10	10	10	9	9	9	9	9	9	9	9	9	9	9	9
5	9	1	1	1	1	1	1	1	10	10	10	8	9	10	10	9	9	9	9	9	9	9	9	9
6	1	9	9	16	1	10	10	10	10	10	10	10	10	9	9	9	9	9	9	9	9	9	1	1
7	9	10	8	9	1	9	1	1	9	10	9	10	9	9	9	9	-	8	8	9	9	1	1	15
8	1	1	1	1	1	1	10	9	9	9	10	9	9	9	9	9	9	9	9	9	9	9	9	9
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
10	9	9	9	9	9	9	15	1	9	9	9	9	9	9	9	9	9	9	9	9	9	8	9	16
11	16	16	16	16	1	2	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
12	9	1	1	9	5	15	9	9	10	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9
13	9	9	9	9	15	9	9	9	10	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9
14	9	9	9	9	9	9	9	1	9	9	9	9	9	9	9	9	9	9	9	9	9	9	10	10
15	2	10	9	9	9	16	1	1	1	10	9	9	9	9	9	9	8	9	9	9	16	10	1	9
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30	1	16	16	1	1	1	1	1	2	3	8	9	9	10	10	9	10	10	10	16	16	16	16	1

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE CANYON 1
Period: SEP, 1991

Clock Time

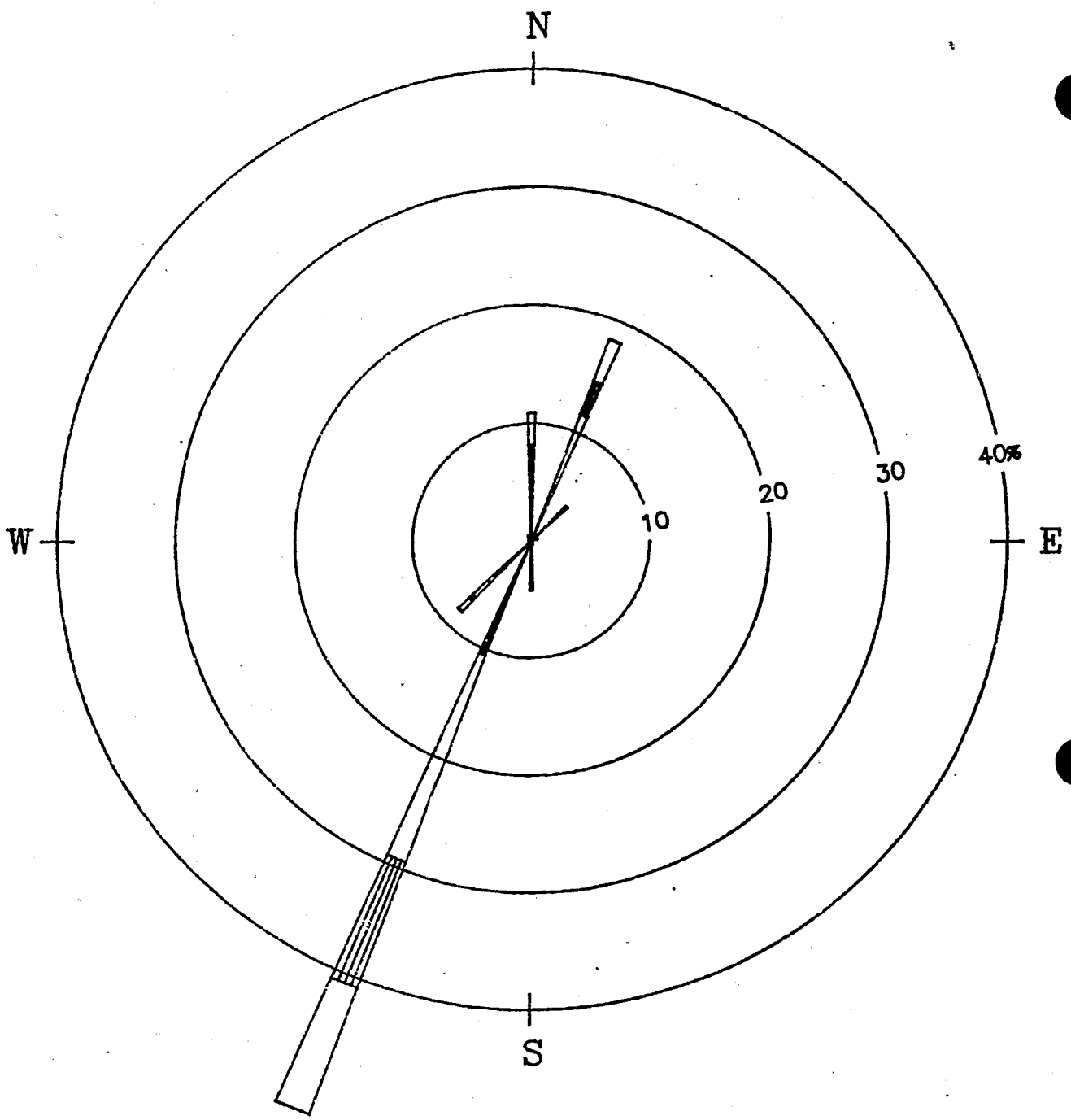
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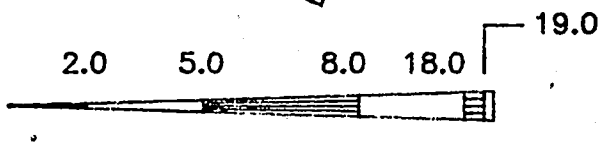
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE CANYON 1
Period: SEP 01, 1991 - SEP 30, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.8	4.1	2.9	2.6	0.0	76.0	10.56	6.37
1	2.7	8.3	2.9	3.6	0.0	127.0	17.64	5.59
2	0.7	2.5	0.4	0.4	0.0	29.0	4.03	4.86
3	0.1	0.4	0.0	0.0	0.0	4.0	0.56	3.75
4	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
5	0.1	0.0	0.0	0.0	0.0	1.0	0.14	1.00
6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
7	0.1	0.1	0.0	0.0	0.0	2.0	0.28	2.50
8	1.5	2.0	0.1	0.4	0.0	30.0	4.17	3.73
9	10.0	18.0	11.0	11.0	0.0	384.0	53.33	5.55
10	3.0	3.4	0.4	1.2	0.0	59.0	8.19	4.20
11	0.0	0.1	0.0	0.0	0.0	1.0	0.14	5.00
12	0.1	0.0	0.0	0.0	0.0	1.0	0.14	2.00
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.1	0.0	0.0	0.0	0.0	1.0	0.14	2.00
15	0.4	0.0	0.0	0.1	0.0	4.0	0.56	3.25
MSG	0.0	0.0	0.1	0.0	0.0	1.0	0.14	8.00
.OT	20.0	40.0	18.0	20.0	0.0	720.0	100.00	3.61





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 10.9 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: SEP 1991

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE CANYON 1
Period: OCT, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
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2	16	16	16	1	1	1	1	1	1	1	1	1	1	1	1	10	9	12	6	5	16	16	16	16
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4	16	1	1	9	1	2	1	2	2	10	9	9	9	9	9	9	9	8	9	9	9	16	16	1
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31	1	16	16	1	16	16	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16	16

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE CANYON 1
Period: OCT, 1991

Clock Time

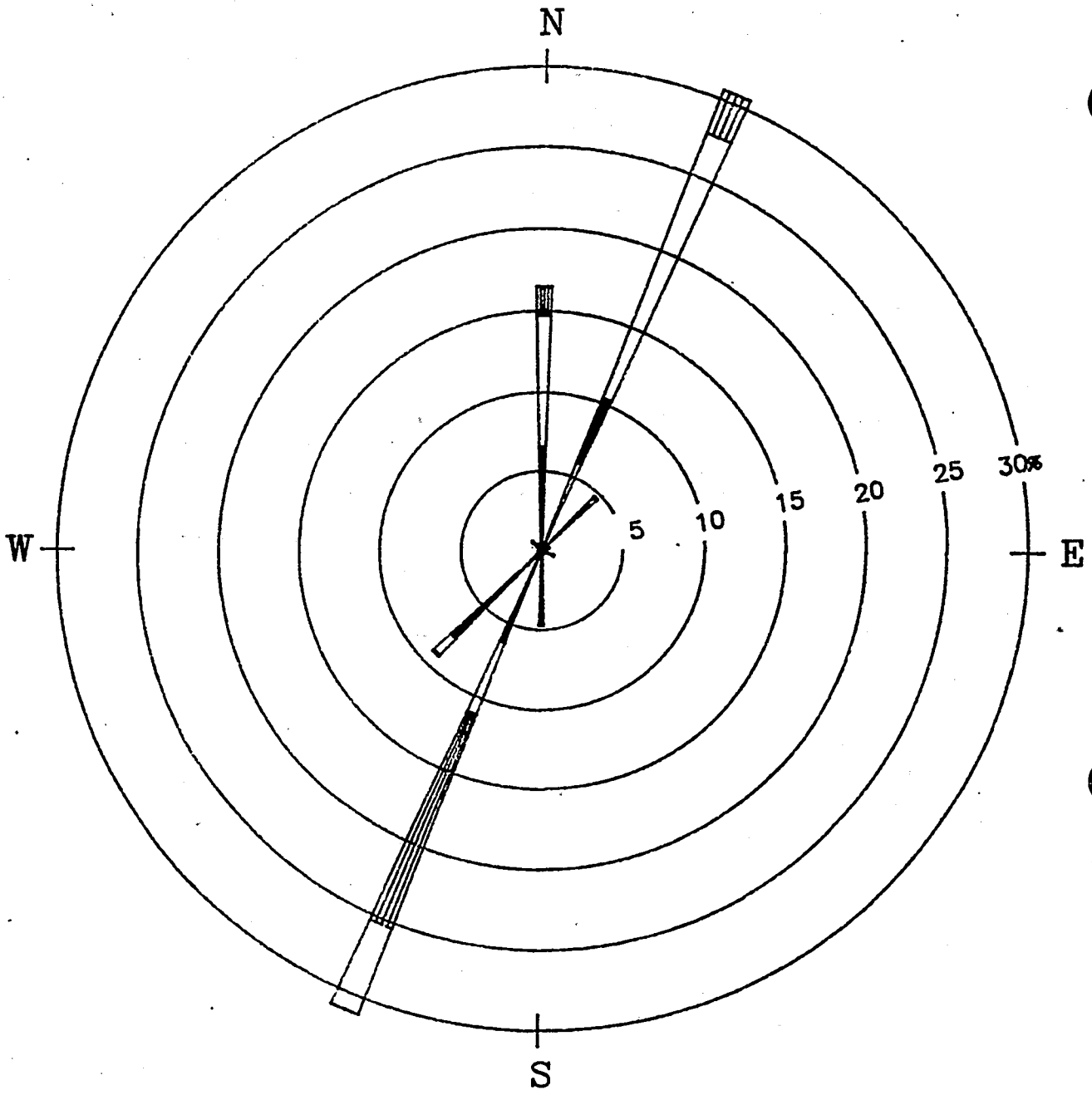
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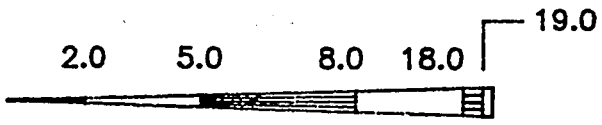
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE CANYON 1
Period: OCT 01, 1991 - OCT 31, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	2.1	1.4	2.9	8.0	1.7	122.0	16.40	10.01
1	1.8	4.0	4.3	17.0	2.8	226.0	30.38	10.81
2	1.6	1.6	0.8	0.5	0.1	35.0	4.70	5.00
3	0.4	0.0	0.1	0.0	0.0	4.0	0.54	3.50
4	0.0	0.0	0.3	0.0	0.0	2.0	0.27	8.00
5	0.0	0.3	0.5	0.0	0.0	6.0	0.81	5.50
6	0.1	0.1	0.0	0.0	0.0	2.0	0.27	3.00
7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
8	0.9	0.7	2.9	0.1	0.0	35.0	4.70	5.46
9	6.1	4.7	14.0	5.6	0.0	232.0	31.18	6.29
10	1.2	1.0	5.3	1.4	0.1	69.0	9.27	6.67
11	0.0	0.1	0.0	0.0	0.0	1.0	0.13	4.00
12	0.0	0.0	0.1	0.0	0.0	1.0	0.13	8.00
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.5	0.3	0.0	0.0	0.0	6.0	0.81	2.67
15	0.1	0.3	0.0	0.0	0.0	3.0	0.40	3.00
MSG	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
TOT	15.0	14.0	32.0	33.0	4.8	744.0	100.00	5.12





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 16.5 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: OCT 1991

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE CANYON 1
Period: NOV, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
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2	16	16	16	2	1	1	1	16	2	2	10	9	10	9	9	10	9	9	16	16	16	1	2	1
3	1	1	1	2	1	1	1	1	16	16	16	16	2	16	1	16	16	1	16	16	16	16	16	16
4	1	1	1	1	16	16	16	16	16	16	16	16	16	15	14	16	16	16	16	16	1	1	16	1
5	16	16	16	16	16	16	16	16	1	1	16	1	1	1	1	1	1	16	16	16	1	1	1	16
6	16	16	4	16	16	16	1	1	1	1	16	10	10	10	9	9	9	8	16	4	16	16	16	16
7	16	1	1	1	1	1	1	1	1	16	16	10	10	9	9	8	9	10	16	16	14	9	9	10
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12	16	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	16	16	16	16
13	16	16	1	1	16	1	1	1	16	16	10	10	10	1	16	16	16	16	16	16	16	16	16	16
14	16	16	16	16	16	16	16	16	16	16	16	1	1	1	1	1	1	1	1	1	1	1	1	1
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17	9	9	9	9	9	16	9	9	9	9	9	9	9	-	9	9	9	9	9	9	9	9	9	9
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21	16	16	16	16	16	16	16	16	16	16	16	16	12	8	8	8	8	8	16	16	16	16	16	16
22	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	15
23	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
24	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
25	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
26	16	16	16	16	16	16	16	16	16	16	16	16	8	8	8	8	8	6	8	8	16	16	16	16
27	16	16	4	16	16	16	8	8	8	8	8	8	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	8	8	8	8	10	8	16	16	16	16	16	16	16	16	16	16
30	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE CANYON 1
Period: NOV, 1991

Clock Time

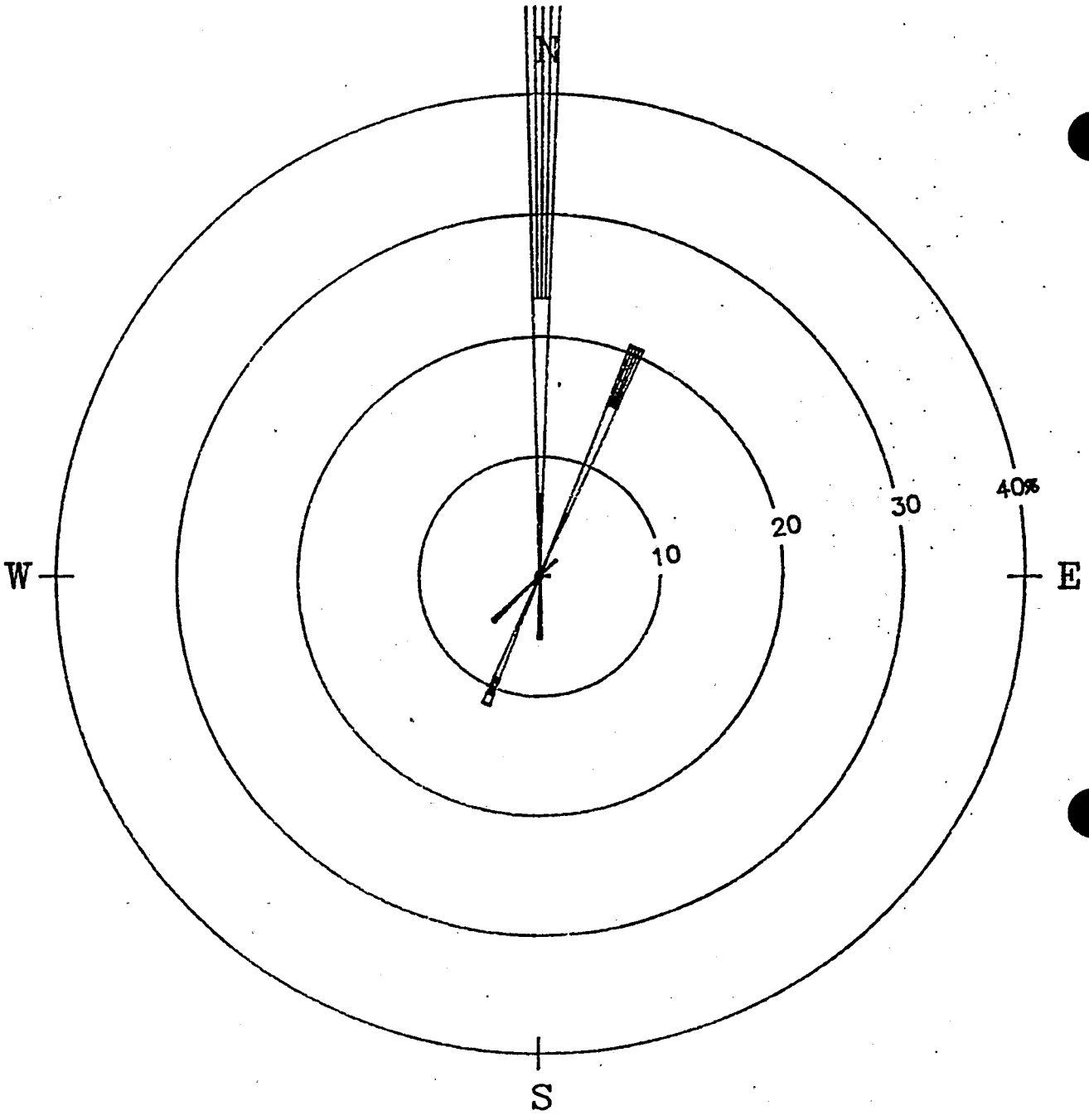
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2	10	10	15	8	8	8	10	10	7	5	5	6	5	5	5	6	5	5	5	5	7	6	6	10	15	2	7.17
3	7	10	9	7	8	10	9	13	15	13	13	10	10	9	7	7	7	6	7	10	15	20	20	17	20	21	10.79
4	17	17	15	15	15	20	20	20	18	15	12	12	10	9	7	5	8	10	11	15	10	14	20	18	20	5	13.88
5	20	15	12	15	10	20	20	28	25	18	15	20	18	18	15	12	11	7	9	15	15	18	18	20	28	7	16.42
6	17	15	15	15	15	10	10	10	10	7	4	6	6	5	5	3	3	2	2	5	5	10	12	10	17	0	8.42
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12	20	25	25	25	20	20	20	25	25	25	24	22	25	20	20	25	10	12	15	15	10	15	12	15	25	1	19.58
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14	20	20	20	25	25	25	20	20	15	15	25	23	25	25	25	30	30	25	25	30	30	35	30	25	35	21	24.50
15	20	16	17	17	15	15	9	12	12	10	9	5	3	2	5	5	5	2	2	1	1	5	5	8	20	0	8.38
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23	35	35	35	35	35	35	35	35	40	30	35	35	40	40	40	40	40	45	40	35	45	40	40	40	45	17	37.71
24	40	40	35	40	40	35	40	35	30	35	30	30	25	20	20	10	10	20	20	20	15	20	20	25	40	0	27.29
25	25	30	30	30	25	25	25	25	25	20	20	10	20	20	15	20	10	10	20	25	25	20	20	20	30	1	21.46
26	20	20	15	20	20	20	20	12	15	15	10	10	10	10	10	10	10	9	9	8	8	8	10	10	20	0	12.88
27	10	5	8	8	8	8	8	10	8	10	10	10	-	-	-	-	-	-	-	-	-	-	-	-	10	0	8.58
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
29	-	-	-	-	-	-	-	-	10	10	20	20	20	10	30	35	40	40	30	25	25	20	20	10	40	16	22.81
30	20	20	20	20	25	25	30	30	30	40	30	35	35	25	30	30	30	30	25	25	30	35	35	30	40	9	28.54
AV	15	15	15	16	15	15	15	16	16	16	16	16	17	15	16	15	14	14	13	15	15	15	16	16			15.18
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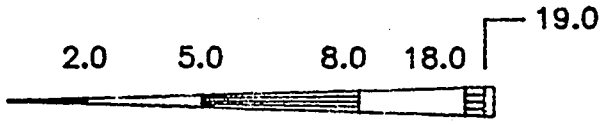
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE CANYON 1
Period: NOV 01, 1991 - NOV 31, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.6	3.6	2.0	15.0	28.0	363.0	50.42	20.42
1	1.0	2.2	1.9	9.0	4.8	137.0	19.03	13.66
2	0.0	0.6	0.6	0.4	0.1	12.0	1.67	8.17
3	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
4	0.1	0.4	0.1	0.1	0.0	6.0	0.83	6.17
5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
6	0.1	0.0	0.0	0.1	0.0	2.0	0.28	5.00
7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
8	0.7	1.6	0.4	1.8	0.3	35.0	4.86	7.31
9	2.3	6.1	1.3	0.8	0.0	77.0	10.69	4.48
10	0.8	2.9	0.8	0.3	0.1	36.0	5.00	5.17
11	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
12	0.0	0.3	0.0	0.0	0.0	2.0	0.28	4.50
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.1	0.1	0.1	0.0	0.0	3.0	0.42	4.33
15	0.0	0.0	0.0	0.1	0.1	2.0	0.28	14.50
MSG	6.1	0.0	0.0	0.1	0.0	45.0	6.25	0.27
TOT	11.0	17.0	7.5	28.0	34.0	720.0	100.00	5.87





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE -- WIND IS BLOWING FROM THE NORTH 53.7 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: NOV 1991

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Direction (16 points)
Station: SUNSHINE 1
Period: DEC, 1991

Clock Time

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
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2	16	16	16	4	8	8	4	8	16	8	9	10	9	9	9	9	9	9	8	8	16	16	16	2
3	2	2	2	16	16	1	16	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	1	16	16	1	16	16	16	16	16	16	16	16	16	16	16	16	1	1	1	16	16	16	16	16
5	16	16	16	1	16	1	1	1	1	16	16	1	1	10	10	8	1	9	10	15	1	1	1	1
6	1	1	1	1	1	1	1	2	2	10	10	10	9	10	10	9	9	10	10	15	10	10	9	9
7	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	10	9	10	9	6	4	16
8	16	1	1	1	1	1	1	1	1	1	2	2	2	1	2	2	2	2	2	1	1	2	2	2
9	2	2	2	2	9	8	10	8	16	16	1	1	1	1	1	1	1	1	1	1	1	16	15	15
10	15	16	16	16	1	16	1	1	1	1	1	1	1	1	16	16	16	1	16	16	16	1	1	16
11	2	1	16	1	16	16	1	1	1	1	1	1	2	2	2	9	9	9	9	9	9	10	10	16
12	10	10	16	1	1	1	1	1	1	2	16	10	9	10	9	9	9	8	16	16	16	16	1	2
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14	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	15	15	16
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16	16	1	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	1	1	1	1	1	1	1
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18	6	9	16	16	14	1	16	15	16	1	9	9	9	9	9	9	9	9	8	9	9	9	9	9
19	8	1	16	1	16	16	1	16	1	1	16	1	1	16	16	16	16	1	16	1	1	16	16	1
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21	16	16	16	16	16	16	16	16	16	16	16	16	16	15	15	15	9	8	8	9	8	6	8	2
22	9	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	15	1	16	1
23	1	1	1	1	16	16	15	16	16	16	1	16	16	16	1	16	16	16	16	1	16	16	16	16
24	16	16	16	16	1	1	16	1	16	1	1	1	1	1	1	2	1	1	1	1	16	16	16	1
25	1	16	16	1	16	16	1	1	14	16	1	8	9	8	8	8	9	9	9	10	2	1	2	1
26	-	-	-	-	-	-	-	-	2	2	2	2	10	10	10	9	9	9	9	16	15	2	1	2
27	2	2	15	1	1	1	2	1	1	9	9	-	-	-	-	-	-	-	-	-	-	-	-	-
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30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Speed (MPH)
Station: SUNSHINE 1
Period: DEC, 1991

Clock Time

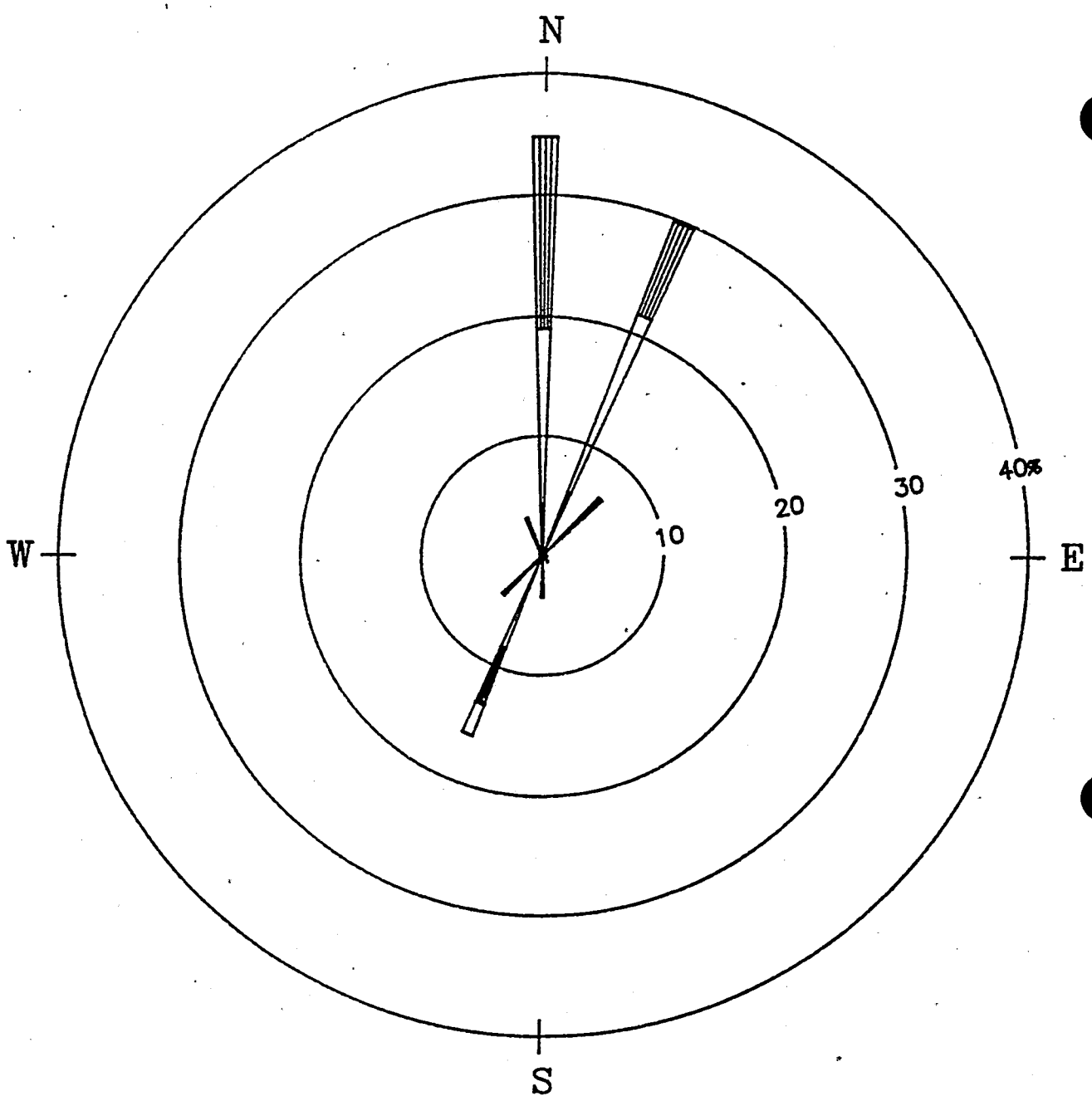
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3	3	3	4	8	10	15	13	10	7	10	13	13	10	10	9	10	12	12	15	15	12	12	15	17	17	23	10.75
4	16	15	15	17	16	17	16	15	17	17	17	15	15	15	10	13	7	5	6	8	10	10	10	10	17	3	13.00
5	20	20	14	16	16	14	14	14	16	14	14	15	6	4	4	4	2	4	4	2	6	8	12	8	20	0	10.46
6	10	12	14	14	14	12	14	10	6	4	6	6	3	6	8	6	6	2	2	3	2	2	3	2	14	2	6.96
7	4	4	4	4	4	4	4	8	6	6	10	10	10	10	8	10	3	4	4	4	3	4	4	6	10	10	5.75
8	8	8	8	10	20	16	24	20	20	24	24	24	22	20	26	24	24	24	30	24	20	20	30	24	30	18	20.58
9	20	16	12	6	4	4	2	4	8	12	12	14	16	12	16	18	22	26	28	27	22	20	26	20	28	18	15.29
10	20	20	37	38	37	29	29	30	20	21	21	29	30	31	27	20	19	12	13	13	14	9	9	10	38	3	22.42
11	9	18	19	10	19	18	10	12	13	19	19	18	17	10	8	7	6	4	4	6	6	6	6	6	19	2	11.25
12	6	7	8	10	10	10	10	13	10	5	4	4	5	4	3	3	4	3	2	8	8	8	5	5	13	7	6.46
13	6	7	6	10	9	10	10	9	7	10	11	13	11	7	10	11	12	12	13	13	19	20	20	20	20	21	11.50
14	20	20	20	21	24	28	30	29	28	28	29	30	29	24	25	25	26	20	21	22	21	20	21	20	30	6	24.21
15	24	21	21	22	23	23	29	28	27	27	24	24	23	20	20	19	19	18	19	19	18	15	15	15	29	6	21.38
16	13	12	12	13	13	13	12	14	19	13	10	10	8	8	9	10	10	10	10	10	10	7	5	5	19	8	1
17	5	7	10	9	9	7	8	8	6	4	5	4	8	9	10	11	9	4	4	2	4	4	3	4	11	15	6.
18	4	4	4	4	4	4	8	8	8	6	6	6	7	8	8	10	6	8	4	4	4	8	8	4	10	15	6.04
19	4	14	16	18	22	32	24	38	30	18	34	18	50	52	42	30	24	20	18	18	22	20	28	22	52	13	25.58
20	28	22	28	32	30	30	32	30	32	25	30	20	24	22	32	20	32	20	30	32	30	18	19	18	32	3	26.50
21	20	22	24	23	23	28	26	28	24	16	14	10	10	18	4	6	18	9	4	6	6	5	4	4	28	5	14.67
22	4	5	4	6	5	4	4	5	4	5	8	10	8	8	9	9	8	8	4	5	4	5	8	8	10	11	6.17
23	10	8	16	18	20	20	21	18	18	19	18	20	12	8	10	20	10	16	16	18	18	14	16	16	21	6	15.83
24	15	21	19	18	16	16	18	16	10	24	18	18	18	18	18	10	14	12	10	10	10	16	10	18	24	9	15.54
25	10	10	10	10	18	22	18	18	18	6	8	4	4	4	5	8	8	8	5	4	4	6	8	6	22	5	9.25
26	-	-	-	-	-	-	-	-	9	9	5	5	6	9	10	18	9	8	4	4	5	4	9	5	18	15	7.44
27	5	4	6	9	5	9	6	6	6	8	10	-	-	-	-	-	-	-	-	-	-	-	-	-	10	10	6.73
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
AV	12	13	14	15	16	16	16	17	15	14	15	14	15	14	14	13	13	11	11	11	11	11	12	11			13.27
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

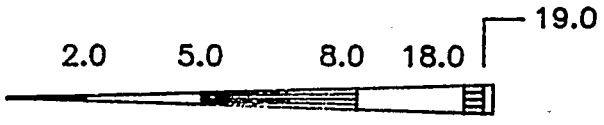
SUNSHINE CANYON LANDFILL
SITE 1

Data: Wind Rose
Station: SUNSHINE 1
Period: DEC 01, 1991 - DEC 31, 19
Hours: 00 - 23

Wind Speed and Direction
Frequency Distribution

Direction	Wind Speed (MPH) Group 0-2	3-5	6-8	9-18	19+	TOT	%TOT	AVE SPEED
16	0.1	0.9	2.5	12.0	13.0	220.0	29.57	17.72
1	0.1	1.2	3.4	13.0	6.7	186.0	25.00	15.26
2	0.1	1.7	0.7	1.4	1.6	42.0	5.65	12.05
3	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
4	0.0	0.1	0.1	0.1	0.0	3.0	0.40	7.33
5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
6	0.0	0.5	0.0	0.0	0.0	4.0	0.54	4.00
7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
8	0.3	1.6	0.8	0.1	0.0	21.0	2.82	5.14
9	0.1	6.7	4.1	2.2	0.0	99.0	13.31	6.09
10	0.8	1.4	1.2	0.3	0.0	28.0	3.76	4.68
11	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
12	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
13	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
14	0.0	0.1	0.0	0.1	0.0	2.0	0.27	11.00
15	0.1	0.5	0.5	0.4	1.3	22.0	2.96	14.09
MSG	15.0	0.0	0.0	0.0	0.0	117.0	15.73	0.00
TOT	17.0	15.0	13.0	30.0	23.0	744.0	100.00	6.09





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 34.8 PERCENT OF THE TIME.

WINDROSE

SUNSHINE CANYON 1
PERIOD: DEC 1991

APPENDIX D5

BFI Award Information

EXHIBIT 1
BFI Awards
Marketplace Level Awards

Year	Award/Recognition	By	Landfill
1988	Meritorious Achievement	GRCDA	Woodlake (Minneapolis, MN)
1990	Outstanding Solid Waste Management	Governors Conference on Environment	Benson Valley (Frankfort, KY)
1991	Environmental Excellence - Gas Control System	USEPA	McCardy Road (Houston, TX)
1989	Governors Treescape Award	Governors Office	St Louis County (LA)
1990/ 1991	Good Neighbor Award	City of Millington	North Shelby (Memphis, TN)
1990	Wetlands Award		North Shelby (Memphis, TN)
1991	Certified Wildlife Habitat Preserve	Wildlife Habitat Council	North Shelby (Memphis, TN)
1987	Protection of Environment through training	Louisiana DEQ	Louisiana Landfills
1993	Engineering Excellence Award	American Consulting Engineers Council (ACEC)	Keller Canyon (Oakland, CA)
1997	Outstanding Achievement in Environmental Enhancement	Boy Scouts of America	Keller Canyon (Oakland, CA)
1997	Governor's Environmental Excellence Award	Virginia Governor and Secretary of Natural Resources	Old Dominion (Richmond, VA)
1995	Engineering Excellence Honor Award	Virginia Consulting Engineers Council	Old Dominion (Richmond, VA)
1995	Engineering Excellence	American Consulting Engineers Council	Old Dominion (Richmond, VA)
1995	Outstanding Civil Engineering Achievement	American Society of Civil Engineers (ASCE)	Old Dominion (Richmond, VA)
1995	Good Corporate Citizen Award	Henrico County	Old Dominion (Richmond, VA)
1996	Certified Wildlife Habitat Preserve	Wildlife Habitat Council	Old Dominion (Richmond, VA)
1996	Certified Wildlife Habitat Preserve	Wildlife Habitat Council	King and Queen
1996	Certificate of Recognition - Gas Control System	Los Angeles County	Azusa

Year	Award/Recognition	By	Landfill
1995/ 1996/ 1997	Governor's Award	Alabama Governors Office/People Against a Littered State	Pineview (Birmingham)
1996	Engeria for Environmental Excellence - Gas Control System	Association Quebecoise Poor La Matrise de L'Energie	Lachenaie (Montreal)
1996	Merit Award - Wetlands Migration	Indiana Consulting Engineers Council	Laubscher Meadows (Evansville)
1998	Innovative Pretreatment Technology	Evansville Water and Sewer Utility District	Laubscher Meadows
1994	Environmental Excellence	Pureto Rico EQB Estudo Libre Asociado De DePuerto Rico/Officina Del Gobernador Environmental Quality Board	Ponce
1993	Environmental Award	Missoula Chamber of Commerce	Missoula (MT)
1996	Outstanding Landfill	APWA	Missoula (MT)
1992	Wildlife Habitat Preserve	Wildlife Habitat Council	Aber Road (Cincinnati)
1995	Wildlife Habitat Preserve	Wildlife Habitat Council	Bridge City (TX)
1991	Wildlife Habitat Preserve	Wildlife Habitat Council	Charlotte Motor Speedway
1995	Wildlife Habitat Preserve	Wildlife Habitat Council	Corslogo (Philadelphia)
1997	Wildlife Habitat Preserve	Wildlife Habitat Council	East Baton Rouge
1997	Wildlife Habitat Preserve	Wildlife Habitat Council	Niagara Falls
1997	Wildlife Habitat Preserve	Wildlife Habitat Council	Norris Farm (Baltimore)
1996	Wildlife Habitat Preserve	Wildlife Habitat Council	Ox Mountain (San Francisco)

EXHIBIT 2
BFI Awards
Marketplace Level Awards

Year	Organization	Award Type	Comments
1997	Alberta Labor and Workers Compensation	Safety Award	BFI Alberta (4 districts in Alberta Canada)
1997	Mt. Diablo Silverado Council - Boy Scouts of America	Outstanding Achievement in Environmental Enhancement	BFI Keller Canyon Landfill (Contra Costa County, CA)
1994	Capital Regional District	Contribution to Solid Waste Reduction	BFI Victoria, British Columbia District Canada
1997	Infinite Power of Texas	Actively supporting Renewable energy in Texas	BFI Sunset Farms Power Plant
1998	Family Care Connections	Top 25 Family Friendly Companies in Jacksonville	BFI Jacksonville
1997	Keep Houston Beautiful	1997 Corporation of the BFI Year	BFI Houston - for environmental practices and community activities
1997	North Forest ISD	Business Partnership Award	BFI Houston - for BFI's True Blue Business Promise Program that addresses environmental and community activities for a low socioeconomic area.
1997	Texas Natural Resource Conservation Commission	Governor's Award	BFI Houston - for environmental education and community outreach.
1994	BFI	Pacesetter Award	BFI Charlotte - for outstanding commitment to environmental excellence
1996	CMA	Crystal Award Finalist	Mobius Curriculum
1996	CMA	Crystal Award Finalist	Mobius Teaching on Recycling
1995	International Association of Business Communicators	Excellence Award	BNN - Europe
1994	Solid Waste Association of North America	Education Award	Mobius Program
1994	Society For Technical Communities	Award of Achievement	3 R's Poster
1994	Society For Technical Communities	Award Of Achievement	District Guide to Mobius
1994	Women in Communication	Matrix Awards Competition 3rd Place	Mobius District Guide - Writing/Employee Information Piece

Year	Organization	Award Type	Comments
1994	Women in Communication	Matrix Awards Competition 3rd Place	Mobius 3 R's Poster - Design, Poster/Calendar
1994	Women in Communication	Matrix Awards Competition 1st Place	Mobius Info File - Press Kit
1993	Clean TX 2000	Environmental Pollution Prevention & Environmental Protection Award	
1993	Harvey Communication	Measurement Award	Advertisement
1992	Keep America Beautiful	Corporate Award	Educational Materials
1992	Ad. Q	Outstanding Advertisement Award	
1992	National Environmental Awards Council	Environmental Achievement - Renew America 1992 Environmental Success Index	
1992	Varco-Pruden Buildings	Corporate Customer of the Year	
1992	Telly Awards	Telly Award	The Living Landfill
1991	National Recycling Coalition	NRC Partnership for Recycling	
1991	Minnesota PRESA Classic	Best of the Show Award	Mobius
1991	Minnesota PRESA Classic	Community Relations Award	Mobius
1990	BPAA	Lantern Award	Business Communications
1990	Art Directors Club of Houston	Annual Report Design Award	
1990	Telly Awards	Telly Award	The BFI Story
1989	Keep America Beautiful	Corporate Award	Educational Materials
1989	Health Facilities Management	Waste Handling Products & Service Award	
1989	Telly Awards	Telly Award	The Bottom Line
1988	Keep America Beautiful	Corporate Award	Educational Materials
1988	Public Relations Society of America	Excalibur Award	Publications, Annual Reports - Public Companies
1988	Public Relations Society of America	Excalibur Award	Writing, News Releases, CECOS International
1988	Public Relations Society of America	Excalibur Award	Design & Graphics
1986	Keep America Beautiful	Corporate Award	Educational Materials
1986	Plant Services Magazine	Top Readership Award - Fosdick Study	
1985	The Financial World	Bronze Award	Environmental Control

BFI Awards
Wildlife Habitat Council Certifications

1992 - Aber Road - Closed site
- Individual Species Management
- Habitat Management

1995 - Bridge City - Closed site
- Individual Species Management
- Habitat Management

1991 - Charlotte Motor Speedway
- Individual Species Management
- Habitat Management

1995 - Conestoga
- Individual Species Management
- Habitat Management
- Environmental Education

1997 - East Baton Rouge Parish
- Habitat Management

1995 - Katy Wildlife Habitat
- Individual Species Management
- Habitat Management
- Environmental Education

1996 - King & Queen
- Individual Species Management
- Habitat Management

1997 - Niagara Falls
- Individual Species Management
- Habitat Management

1997 - Norris Farms - Closed site
- Individual Species Management
- Habitat Management

1990 - North Shelby
- Individual Species Management
- Habitat Management

1996 - Old Dominion
- Individual Species Management
- Habitat Management

1996 - Ox Mountain

- Individual Species Management
- Habitat Management

1996 - Woodlake - Closed site

- Individual Species Management

APPENDIX D6

Solid Waste Facility Inspection Reports:
Inclement Weather Conditions

SUNSHINE CANYON LANDFILL (19-AA-0853)
INCLEMENT WEATHER OPERATION INSPECTION REPORT

INSPECTION DATE: 2/3/98

INSPECTOR: Richard Lange, R.E.H.S. III

VIOLATIONS: None observed at the time of inspection

AREAS OF CONCERN: None observed at the time of inspection.

Title 27 California Code of Regulations (CCR)

COMMENTS:

1. **20540-Roads** - Roads were kept in a safe condition and maintained such that vehicle access and unloading could be safely conducted during inclement weather. Tracking of material onto adjacent public roads was minimized.

2. **20580-Lighting** - Adequate lighting was provided.

3. **20590-Personal Health and Safety** - Operating and maintenance personnel were wearing health and safety equipment appropriate for the inclement weather.

4. **20615-Supervision** - Adequate supervision of a sufficient number of qualified personnel were on site to insure proper operations.

5. **20630-Confined Unloading** - Unloading was adequately confined.

6. **20640-Spreading/Compacting** - Spreading and compacting were accomplished as rapidly as practicable in layers with repeated passages of the landfill equipment.

7. **20650- Grading of Fill Surfaces** - Covered surfaces of the disposal area were graded to promote lateral runoff of precipitation and to prevent ponding.

8. **20740-Equipment** - Equipment was adequate in type capacity and number.

9. **20750**-Site Maintenance - Deteriorated or defective conditions were monitored and promptly repaired.

10 **20820-Drainage/Erosion Control** - The drainage system functioned satisfactorily maintaining the integrity of roads, structures, gas monitoring and control systems. No safety hazard or exposure of waste was observed at the time of inspection.

COUNTY OF LOS ANGELES DEPARTMENT OF HEALTH SERVICES
PUBLIC HEALTH PROGRAMS & SERVICES - ENVIRONMENTAL HEALTH
SOLID WASTE MANAGEMENT PROGRAM

OFFICIAL SOLID WASTE FACILITY INSPECTION REPORT

No. 18735

S.W.F.P. NO. 19-AA-0853

H.W.F.P. NO. _____

NAME OF SITE: SUNSHINE CANYON L.F. EXT

ADDRESS: 14747 SAN FERNANDO RD

SYLMAR, CAL 91342

TELEPHONE NO. 818 362-1567

EMERGENCY TELEPHONE NO. 818 362-3071

MAILING ADDRESS: SAME AS ABOVE

" " "

OPERATOR: BFI OF CALIF

MANAGER: DAN TEMPELIS

VIOLATION: NONE

CORRECTION DATE: N/A

TYPE OF S.W.F.: LANDFILL | PUBLIC: YES

CLASS: III | LIQUIDS: No

AMOUNTS RECEIVED: 4000 TPD

COMPLETION DATE: 2004

HOURS OPEN TO PUBLIC: 6-6 M-F; SAT 8-2

DAYS CLOSED: SUN - HOL

RATES: REFUSE $35/TON

MINIMUM $25

HARD TO HANDLE $45/TON

YOU ARE HEREBY DIRECTED TO INCLEMENT WEATHER OPERATION

INSPECTION REPORT - SEE ATTACHED.

SATISFACTORY COMPLIANCE

IN ACCORDANCE WITH APPLICABLE STATE, COUNTY OF CITY LAWS, REGULATIONS, ORDINANCES, REQUIREMENTS AND ENACTMENTS OR PERMIT CONDITIONS.

REMARKS: _____

DATE 2-3-98

RECEIVED BY: _____

LOS ANGELES COUNTY HEALTH OFFICER

Richard Lange

By RICHARD LANGE, R.S.

Authorized Representative

760203 H-978 (Rev. 11/92)

STATE OF CALIFORNIA
CIWMB-52 (REV. 9/97)

Disposal Site Inspection Report

CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD

Enforcement Agency: LA COUNTY LEA

Page of

FACILITY FILE NUMBER	PROGRAM CODE (LOCAL = L, STATE = S)	INSPECTION DATE (MM DD YY)	TIME IN / TIME OUT	INSPECTION TIME
[redacted]-AA-0053	L	2-3-98		3.0

FACILITY NAME: SUNSHINE CANYON L.F. EXT	RECEIVED BY (OPERATOR)
FACILITY LOCATION: 14747 SAN FERNANDO RD SYLMAR	OWNER: BFI OF CALIF
INSPECTOR: K. LANGE	INSPECTOR SIGNATURE: [signature] / ALSO PRESENT

THE ABOVE FACILITY WAS INSPECTED FOR COMPLIANCE WITH APPLICABLE SECTIONS OF DIVISION 30 OF THE PUBLIC RESOURCES CODE (PRC) AND TITLE 27 CALIFORNIA CODE OF REGULATION (CCR).

THE STANDARDS BELOW ARE CONSIDERED IN COMPLIANCE UNLESS OTHERWISE MARKED WITH ONE OF THE FOLLOWING: V = VIOLATION A = AREA OF CONCERN NA = NOT APPLICABLE

PERMITS	V	A	NA
PRC 44004 - SIGNIFICANT CHANGE			
PRC 44014(b) - OPERATOR COMPLIES with TERMS & CONDITIONS OF PERMIT			
21640 - REVIEW OF PERMITS			
21600 - REPORT OF DISP SITE INFORMATION			
LOCATION RESTRICTIONS			
20270 - AIRPORT SAFETY			
OPERATING CRITERIA			
20510 - DISPOSAL SITE RECORDS			
20515 - MSWLF UNIT RECORDS			
20517 - DOCUMENT APPROVALS/REQUIREMENTS			
20520 - SIGNS			
20530 - SITE SECURITY			
20540 - ROADS			
20550 - SANITARY FACILITIES			
20560 - DRINKING WATER SUPPLY			
20570 - COMMUNICATIONS FACILITIES			
20580 - LIGHTING			
PERSONNEL			
20590 - PERSONNEL HEALTH & SAFETY			
20610 - TRAINING			
20615 - SUPERVISION			
20620 - SITE ATTENDANT			
CONFINED UNLOADING			
20630 - CONFINED UNLOADING			

SPREADING/COMPACTING	V	A	NA
20640 - SPREADING/COMPACTING			
20650 - GRADING OF FILL SURFACES			
20660 - STOCKPILING			
DAILY & INTERMEDIATE COVER			
20670 - AVAILABILITY COVER MATERIAL			
20680 - DAILY COVER			
20685 - PERFORMANCE STANDARDS			
20690 - (RESERVED)			
20700 - INTERMEDIATE COVER			
20701 - (RESERVED)			
HANDLING, EQUIPMENT & MAINTENANCE			
20710 - SCAVENGING/SALVAGING/STORAGE			
20720 - NON-SALVAGEABLE ITEMS			
20730 - VOLUME REDUCTION/ENERGY RECOVERY			
20740 - EQUIPMENT			
20750 - SITE MAINTENANCE			
CONTROLS			
20760 - NUISANCE CONTROL			
20770 - ANIMAL FEEDING			
20780 - OPEN BURNING/BURNING WASTES			
20790 - LEACHATE CONTROL			
20800 - DUST CONTROL			
20810 - VECTOR AND BIRD CONTROL			
20820 - DRAINAGE/EROSION CONTROL			
20830 - LITTER CONTROL			

CONTROLS	V	A	NA
20840 - NOISE CONTROL			
20860 - TRAFFIC CONTROL			
20870 - HAZARDOUS WASTES			
20880 - MEDICAL WASTES			
20890 - DEAD ANIMALS			
20900 - AIR CRITERIA			
GAS MONITORING & CONTROL			
20918 - EXEMPTIONS			
20919 - GAS CONTROL			
20919.5 - EXPLOSIVE GAS CONTROL			
CLOSURE			
21780 - SUBMITTAL CLOSURE PLANS			
TIRES			
17351 - FIRE PREVENTION			
17352 - FACILITY ACCESS SECURITY			
17353 - VECTOR CONTROL			
17354 - STORAGE			
17355 - DISPOSAL			
17356 - INDOOR STORAGE			
OTHER			

COMMENTS (USE SWIS-63 FOR ADDITIONAL SPACE)

INCLEMENT WEATHER OPERATION INSPECTION REPORT

SEE OIR # 18735

SATISFACTORY COMPLIANCE

DISTRIBUTION: TOP - CIWMB MIDDLE - EA BOTTOM - OPERATOR

SUNSHINE CANYON LANDFILL (19-AA-0853)
INCLEMENT WEATHER OPERATION INSPECTION REPORT

INSPECTION DATE: 2/9/98

INSPECTOR: Richard Lange, R.E.H.S. III

VIOLATIONS: None observed at the time of inspection

AREAS OF CONCERN: None observed at the time of inspection.

Title 27 California Code of Regulations (CCR)

COMMENTS:

1. **20540-Roads** - Roads were kept in a safe condition and maintained such that vehicle access and unloading could be safely conducted during inclement weather. Some mud was observed at entrance on San Fernando Rd which appeared to have come from the washout of a freeway slope at the Balboa exit. Work was in progress by BFI personnel to remove the mud from in front of the landfill entrance.Tracking of material onto adjacent public roads was minimized.

2. **20590-Personal Health and Safety** - Operating and maintenance personnel were wearing health and safety equipment appropriate for the inclement weather.

3. **20615-Supervision** - Adequate supervision of a sufficient number of qualified personnel were on site to insure proper operations.

4. **20630-Confined Unloading** - Unloading was adequately confined.

5. **20640-Spreading/Compacting** - Spreading and compacting were accomplished as rapidly as practicable in layers with repeated passages of the landfill equipment.

6. **20650- Grading of Fill Surfaces** - Covered surfaces of the disposal area were graded to promote lateral runoff of precipitation and to prevent ponding.

7. **20740-Equipment** - Equipment was adequate in type capacity and number.

8. **20750**-Site Maintenance - Deteriorated or defective conditions were monitored and promptly repaired.

9. **20820-Drainage/Erosion Control** - The drainage system functioned satisfactorily maintaining the integrity of roads, structures, gas monitoring and control systems. No safety hazard or exposure of waste was observed at the time of inspection. Some minor cosmetic erosion was observed.

COUNTY OF LOS ANGELES DEPARTMENT OF HEALTH SERVICES
PUBLIC HEALTH PROGRAMS & SERVICES - ENVIRONMENTAL HEALTH
SOLID WASTE MANAGEMENT PROGRAM

OFFICIAL SOLID WASTE FACILITY INSPECTION REPORT

No. 18736

S.W.F.P. NO. 19-AA-0853

H.W.F.P. NO.

NAME OF SITE: SUNSHINE CANYON L.F EXT

ADDRESS: 14747 SAN FERNANDO RD.
SYLMAR, CAL 91342

TELEPHONE NO.: 818 362-1567

EMERGENCY TELEPHONE NO.: 818 362-3071

MAILING ADDRESS: SAME AS ABOVE
" " "

OPERATOR: BFI OF CALIF

MANAGER: DAN TEMPELIS

VIOLATION: NONE

CORRECTION DATE: N/A

TYPE OF S.W.F.: LANDFILL

PUBLIC: YES

CLASS: III

LIQUIDS: NO

AMOUNTS RECEIVED: 4000 T/D

COMPLETION DATE: 2004

HOURS OPEN TO PUBLIC: 6-6 M-F, 6-2 SAT

DAYS CLOSED: SUN - HOL

RATES:
REFUSE $35 / TON
MINIMUM $25
HARD TO HANDLE $45/TON

YOU ARE HEREBY DIRECTED TO IMPLEMENT WEATHER OPERATION
INSPECTION REPORT - SEE ATTACHED

SATISFACTORY COMPLIANCE

IN ACCORDANCE WITH APPLICABLE STATE, COUNTY OF CITY LAWS, REGULATIONS, ORDINANCES, REQUIREMENTS AND ENACTMENTS OR PERMIT CONDITIONS.

REMARKS:

DATE: 2-9-98

RECEIVED BY:

LOS ANGELES COUNTY HEALTH OFFICER

By RICHARD LANCE, R.S.
Authorized Representative

760203 H-978 (Rev. 11/92)

STATE OF CALIFORNIA
CIWMB-52 (REV. 9/97)

Disposal Site Inspection Report

CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD

Enforcement Agency: LA COUNTY LEA

Page of

FACILITY FILE NUMBER	PROGRAM CODE (LOCAL = L, STATE = S)	INSPECTION DATE (MM DD YY)	TIME IN / TIME OUT	INSPECTION TIME
19-AA-0853	L	2-9-98		3.0

FACILITY NAME: SUNSHINE CANYON L.F. EXT	RECEIVED BY (OPERATOR):
FACILITY LOCATION: 14747 SAN FERNANDO RD. SYLMAR	OWNER: BFI OF CALIF
INSPECTOR: R. LANGE	INSPECTOR SIGNATURE:
	ALSO PRESENT: DAN TEMPELIS

THE ABOVE FACILITY WAS INSPECTED FOR COMPLIANCE WITH APPLICABLE SECTIONS OF DIVISION 30 OF THE PUBLIC RESOURCES CODE (PRC) AND TITLE 27 CALIFORNIA CODE OF REGULATION (CCR).

THE STANDARDS BELOW ARE CONSIDERED IN COMPLIANCE UNLESS OTHERWISE MARKED WITH ONE OF THE FOLLOWING: V = VIOLATION A = AREA OF CONCERN NA = NOT APPLICABLE

PERMITS	V	A	NA
PRC 44004 - SIGNIFICANT CHANGE			
PRC 44014(b) - OPERATOR COMPLIES with TERMS & CONDITIONS OF PERMIT			
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OPERATING CRITERIA			
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20515 - MSWLF UNIT RECORDS			
20517 - DOCUMENT APPROVALS/REQUIREMENTS			
20520 - SIGNS			
20530 - SITE SECURITY			
20540 - ROADS			
20550 - SANITARY FACILITIES			
20560 - DRINKING WATER SUPPLY			
20570 - COMMUNICATIONS FACILITIES			
20580 - LIGHTING			
PERSONNEL			
20590 - PERSONNEL HEALTH & SAFETY			
20610 - TRAINING			
20615 - SUPERVISION			
20620 - SITE ATTENDANT			
CONFINED UNLOADING			
20630 - CONFINED UNLOADING			

SPREADING/COMPACTING	V	A	NA
20640 - SPREADING/COMPACTING			
20650 - GRADING OF FILL SURFACES			
20660 - STOCKPILING			
DAILY & INTERMEDIATE COVER			
20670 - AVAILABILITY COVER MATERIAL			
20680 - DAILY COVER			
20685 - PERFORMANCE STANDARDS			
20690 - (RESERVED)			
20700 - INTERMEDIATE COVER			
20701 - (RESERVED)			
HANDLING, EQUIPMENT & MAINTENANCE			
20710 - SCAVENGING/SALVAGING/STORAGE			
20720 - NON-SALVAGEABLE ITEMS			
20730 - VOLUME REDUCTION/ENERGY RECOVERY			
20740 - EQUIPMENT			
20750 - SITE MAINTENANCE			
CONTROLS			
20760 - NUISANCE CONTROL			
20770 - ANIMAL FEEDING			
20780 - OPEN BURNING/BURNING WASTES			
20790 - LEACHATE CONTROL			
20800 - DUST CONTROL			
20810 - VECTOR AND BIRD CONTROL			
20820 - DRAINAGE/EROSION CONTROL			
20830 - LITTER CONTROL			

CONTROLS	V	A	NA
20840 - NOISE CONTROL			
20860 - TRAFFIC CONTROL			
20870 - HAZARDOUS WASTES			
20880 - MEDICAL WASTES			
20890 - DEAD ANIMALS			
20900 - AIR CRITERIA			
GAS MONITORING & CONTROL			
20918 - EXEMPTIONS			
20919 - GAS CONTROL			
20919.5 - EXPLOSIVE GAS CONTROL			
CLOSURE			
21780 - SUBMITTAL CLOSURE PLANS			
TIRES			
17351 - FIRE PREVENTION			
17352 - FACILITY ACCESS SECURITY			
17353 - VECTOR CONTROL			
17354 - STORAGE			
17355 - DISPOSAL			
17356 - INDOOR STORAGE			
OTHER			

COMMENTS (USE SWIS-03 FOR ADDITIONAL SPACE)

ALSO PRESENT KEN MURRAY - LEA

INCLEMENT WEATHER OPERATION INSPECTION REPORT

SEE OIR # 18736

SATISFACTORY COMPLIANCE

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APPENDIX D7

USEPA Letter to Dr. G. Fred Lee (February 9, 1998)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 9 1998

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

Dr. G. Fred Lee
G. Fred Lee & Associates
27298 E. El Macero Dr.
El Macero, California 95618-1005

Dear Dr. Lee:

Thank you for sharing your thoughts on the Municipal Solid Waste Landfill Criteria issued by the Environmental Protection Agency (EPA) in October 1991. After spending considerable time reviewing and discussing your letters and reference materials, we believe that we have fundamentally different approaches to landfill performance. Such philosophical differences make comparisons between our approaches impractical.

While you contend that landfills will always be a threat if they release any constituent, we believe that controlled releases of certain constituents from landfills may be acceptable provided the releases do not exceed regulatory levels that have been established to protect human health and the environment. Our risk assessment supports our position. It concludes that disposal of municipal waste in properly located, designed, operated, closed, and monitored landfills poses very low risks to human health and the environment. For a complete discussion of our risk findings, please see 56 FR 50984-8, October 11, 1991.

We believe that our regulations satisfy the statutory intent to protect human health and the environment. However, we want to stay abreast of any new developments in landfill technology that may help us further explain our position and allay any lingering doubts about municipal solid waste landfill safety. To do this, we plan to publish a series of fact sheets in the near future on such topics as liner longevity, leachate recirculation, consequences of liner leakage, and landfill management beyond the regulatory 30 year post-closure care period. Given your interest in these issues, we are hoping that you would be able to share relevant data on these topics. You may send any pertinent information to Allen J. Geswein, P.E. of my staff at U.S. EPA, Office of Solid Waste (5306W), 401 M St., S.W., Washington, DC 20460.

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Again, thank yc ,l for your thoughtful analysis of our approach to regulating municipal solid waste ndfills. Please feel free to contact Mr. Geswein at 703-308-7261 if you w int to discuss this issue further.

Sincerely yours,

Robert W. Dellinger, Director
Municipal and Industrial Waste Division

APPENDIX D8

City of Los Angeles Correspondences (March 3, 1998 and May 8, 1998)

BOARD OF RECREATION AND PARK COMMISSIONERS

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(818) 756-8404
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DAVID R. GONZALEZ
ASSISTANT GENERAL MANAGER

March 3, 1998

Mr. Joe Maturino, REHS
Environmental Affairs Department
201 North Figueroa Street
Los Angeles, California 90012

Dear Mr. Maturino:

On Wednesday, February 4, 1998, I accompanied Mr. Tseng, yourself and a member of the City Council office on a helicopter ride to inspect the area surrounding Sunshine Canyon, Porter Ridge and O'Melveny Park to determine if it is possible to design a mountain bike trail, hiking/horse trail, on Browning-Ferris Industries owned property (known as Sunshine Canyon Landfill). Our findings are as follows:

1. Unsafe due to severe slopes.
2. Additional staff needed.
3. Fire clearance maintenance.
4. Maintenance of trails.
5. Material costs, soil, erosion due to heavy rain.
6. Trails, dead-end, trails would not serve a purpose to the community.

On Tuesday, February 10, 1998, I met with you, David Thompson, and Eugene Tseng, in my office at the Valley Region Headquarters to discuss all the possibilities to construct a recreational trail. Our Department concluded, that the recreational trail would not be practical at this time. If you have any questions regarding this matter, please call me at 818/756-8190.

Very truly yours,

JAMES N. WARD
Principal Grounds Maintenance Supervisor
Valley Region

RON BERKOWITZ
Senior Park Maintenance Supervisor

RB:jlb8.008

CITY OF LOS ANGELES
CALIFORNIA

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LOS ANGELES, CA 90012-2601
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FAX: (213) 580-5569

RECEIVED
MAY 14 1998
Paul, Hastings, Janofsky & Walker

May 8, 1998

Joe Maturino
Environmental Affairs Department
201 North Figueroa Street, #200
Los Angeles, CA 90012

CASE NOS. ZA 17804 (ZV)
and ZA 89-1129 (ZV)
COMMUNICATION
14747 San Fernando Road
Granada Hills Planning Area
Zone : A1-1-0
D. M. : 228B133
C. D. : 12

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ULTRASYSTEMS
ENVIRONMENTAL

I am in receipt of a facsimile of a letter dated March 3, 1998 from Department of Recreation and Parks Senior Park Maintenance Supervisor Ron Berkowitz to your Office. This letter addresses findings of Recreation and Parks regarding the potential for recreational use of the Sunshine Canyon landfill site. In this letter Mr. Berkowitz notes that after inspecting the property from the air, and after discussing the potential of the property for use as a bike trail, hiking/horse trail, the Department of Recreation and Parks has concluded that a recreational trail would not be practical at this time. The reasons for said conclusion are delineated in that letter.

I understand the reason for these findings at the present time, and concur that a recreational trail that is unsafe would not be appropriate. Implicit in any recreational use of the property is the understanding that it be undertaken only if it is safe to do so. I believe, however, that the long held concept of developing some recreational use of this area should not be abandoned prematurely. The Planning Department will reserve the option to reevaluate the use of the property for recreational purposes at a later time after completion of the closure activities (during the post-closure maintenance period) of the County portion and/or after the closure of the City portion of Sunshine Canyon Landfill if any proposed expansion is permitted.

We take this position now because of the reasons listed in the Department of Recreation and Parks letter and because of the following:

1. The need to complete closure of the current City portion of the Sunshine Canyon Landfill;

2. The future recreational needs and the potential for the availability in the future of resources for trail development, operations and maintenance, and;

3. The impact of current operations and/or potential future operations.

For the purposes of the current closure of the City portion of the Sunshine Canyon Landfill, Condition no. 14 of ZA Case No. 17804 may be considered conditionally satisfied at this time but only until such time as a reevaluation of the site for the provision of recreational opportunities is conducted during the post closure maintenance period.

LEONARD S. LEVINE
Associate Zoning Administrator

LSL:lmc

cc: Councilmember Hal Bernson
Twelfth District
Michael Woodward
Paul, Hastings, Janofsky & Walker
Ron Berkowitz
Recreation and Parks