

**MARINA DEL REY BOAT LAUNCH RAMP REPLACEMENT PROJECT
SPECS. 7663; C.P. NO. 8A078**

APPENDIX A

California Coastal Commission
Coastal Development Permit No. 5-23-0914
Dated March 25, 2025

CALIFORNIA COASTAL COMMISSION

SOUTH COAST DISTRICT OFFICE
301 E. OCEAN BLVD., SUITE 300
LONG BEACH, CALIFORNIA 90802-4830
PH (562) 590-5071
WWW.COASTAL.CA.GOV



Page 1

March 25, 2025

Permit Application Number: **5-23-0914****COASTAL DEVELOPMENT PERMIT**

On February 06, 2025, the California Coastal Commission granted to **County Of Los Angeles / Department Of Beaches And Harbors** this permit subject to the attached Standard and Special conditions, for development consisting of **Waterside improvements to support a new landward stormwater biofiltration system that will include the installation of a new 12-inch diameter outfall with two new check valves on the existing and new outfall pipe within the existing seawall along the northeast side of the public launch ramp to treat stormwater runoff from a public parking lot in Marina del Rey harbor.,** more specifically described in the application filed in the Commission offices.

The development is within the coastal zone at: **13477 Fiji Way, Marina Del Rey (Los Angeles County) (APN: 4224010901)**

Issued on behalf of the California Coastal Commission by

Sincerely,

Kate Huckelbridge, PhD
Executive Director

Elishabah Tate-Pulliam
E. Tate-Pulliam
Coastal Program Analyst

cc: Commissioners/File

ACKNOWLEDGMENT:

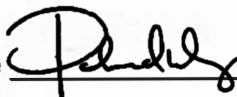
The undersigned permittee acknowledges receipt of this permit and agrees to abide by all terms and conditions thereof.

The undersigned permittee acknowledges that Government Code Section 818.4 which states in pertinent part of that: "A Public entity is not liable for injury caused by the issuance... of any permit..." applies to the issuance of this permit.

Coastal Development Permit
5-23-0914

IMPORTANT: THIS PERMIT IS NOT VALID UNLESS AND UNTIL A COPY OF THE PERMIT WITH THE SIGNED ACKNOWLEDGEMENT HAS BEEN RETURNED TO THE COMMISSION OFFICE. 14 Cal. Admin. Code Section 13158(a).

Date: 4/1/2025

Signature 
On behalf of County of Los Angeles
Department of Beaches and Harbors

STANDARD CONDITIONS:

1. **Notice of Receipt and Acknowledgment.** The permit is not valid and development shall not commence until a copy of the permit, signed by the permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.
2. **Expiration.** If development has not commenced, the permit will expire two years from the date on which the Commission voted on the application. Development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made prior to the expiration date.
3. **Interpretation.** Any questions of intent or interpretation of any condition will be resolved by the Executive Director or the Commission.
4. **Assignment.** The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.
5. **Terms and Conditions Run with the Land.** These terms and conditions shall be perpetual, and it is the intention of the Commission and the permittee to bind all future owners and possessors of the subject property to the terms and conditions.

SPECIAL CONDITIONS:

1. **Storage of Construction Materials, Mechanized Equipment and Removal of Construction Debris.** The permittee shall comply with the following construction-related requirements:
 - A. No demolition or construction materials, debris, or waste shall be placed or stored where it may enter sensitive habitat, receiving waters or a storm drain, or be subject to wave, wind, rain, or tidal erosion and dispersion;

Coastal Development Permit
5-23-0914

- B. No demolition or construction equipment, materials, or activity shall be placed in or occur in any location that would result in impacts to environmentally sensitive habitat areas, streams, wetlands or their buffers;
- C. Any and all debris resulting from demolition or construction activities shall be removed from the project site within 24 hours of completion of the project;
- D. Demolition or construction debris and sediment shall be removed from work areas each day that demolition or construction occurs to prevent the accumulation of sediment and other debris that may be discharged into coastal waters;
- E. All trash and debris shall be disposed in the proper trash and recycling receptacles at the end of every construction day;
- F. The applicants shall provide adequate disposal facilities for solid waste, including excess concrete, produced during demolition or construction;
- G. Debris shall be disposed of at a legal disposal site or recycled at a recycling facility. If the disposal site is located in the Coastal Zone, a coastal development permit or an amendment to this permit shall be required before disposal can take place unless the Executive Director determines that no amendment or new permit is legally required;
- H. All stock piles and construction materials shall be covered, enclosed on all sides, shall be located as far away as possible from drain inlets and any waterway, and shall not be stored in contact with the soil;
- I. Machinery and equipment shall be maintained and washed in confined areas specifically designed to control runoff. Thinners or solvents shall not be discharged into sanitary or storm sewer systems;
- J. The discharge of any hazardous materials into any receiving waters is prohibited;
- K. Spill prevention and control measures shall be implemented to ensure the proper handling and storage of petroleum products and other construction materials. Measures shall include a designated fueling and vehicle maintenance area with appropriate berms and protection to prevent any spillage of gasoline or related petroleum products or contact with runoff. The area shall be located as far away from the receiving waters and storm drain inlets as possible;
- L. Best Management Practices (BMPs) and Good Housekeeping Practices (GHPs) designed to prevent spillage and/or runoff of demolition or construction-related materials, and to contain sediment or contaminants associated with demolition or construction activity, shall be implemented prior to the on-set of such activity; and

Coastal Development Permit
5-23-0914

M. All BMPs shall be maintained in a functional condition throughout the duration of construction activity.

N. During construction of the project, no runoff, site drainage or dewatering shall be directed from the site into any street, alley or storm drain, unless specifically authorized by the California Regional Water Quality Control Board

2. **Nesting Bird Monitoring and Avoidance Plan.** PRIOR TO CONSTRUCTION, the applicant shall submit to the Executive Director for review and written approval, a Nesting Bird Monitoring and Avoidance Plan that shall include but not be limited to the following provisions:

- i. If project activities must occur during bird nesting season (February 1 through August 31), a qualified biologist, with experience conducting bird surveys, shall survey for active nests within 7 days prior to commencement of project activities, and once a week thereafter during construction, to detect any such activity within 500 feet of the project area.
- ii. If an active songbird nest(s) is located within 300 feet of construction activities (500 feet for raptors), the qualified biologist shall halt construction activities to enable the applicant to employ best management practices (BMPs) to ensure that construction activities do not disturb or disrupt nesting activities.
- iii. Noise levels at active nest sites must not exceed 65 dB unless a noise study has determined that ambient noise in the immediate area exceeds that level. If this is the case, noise levels at the nest site must not exceed the ambient noise level measured. Noise reducing BMPs may include using alternative equipment, equipment noise buffering, sound blankets, etc. Alternatively, construction activities and schedules may be adjusted to avoid active nest areas until the respective young birds have fledged. Unrestricted construction activities may resume when no active nests remain in the construction area. Results of nesting bird surveys, ambient noise surveys, and any follow-up construction avoidance measures shall be documented in monthly reports by the qualified biologist and submitted to the Coastal Commission Executive Director throughout the bird breeding season.

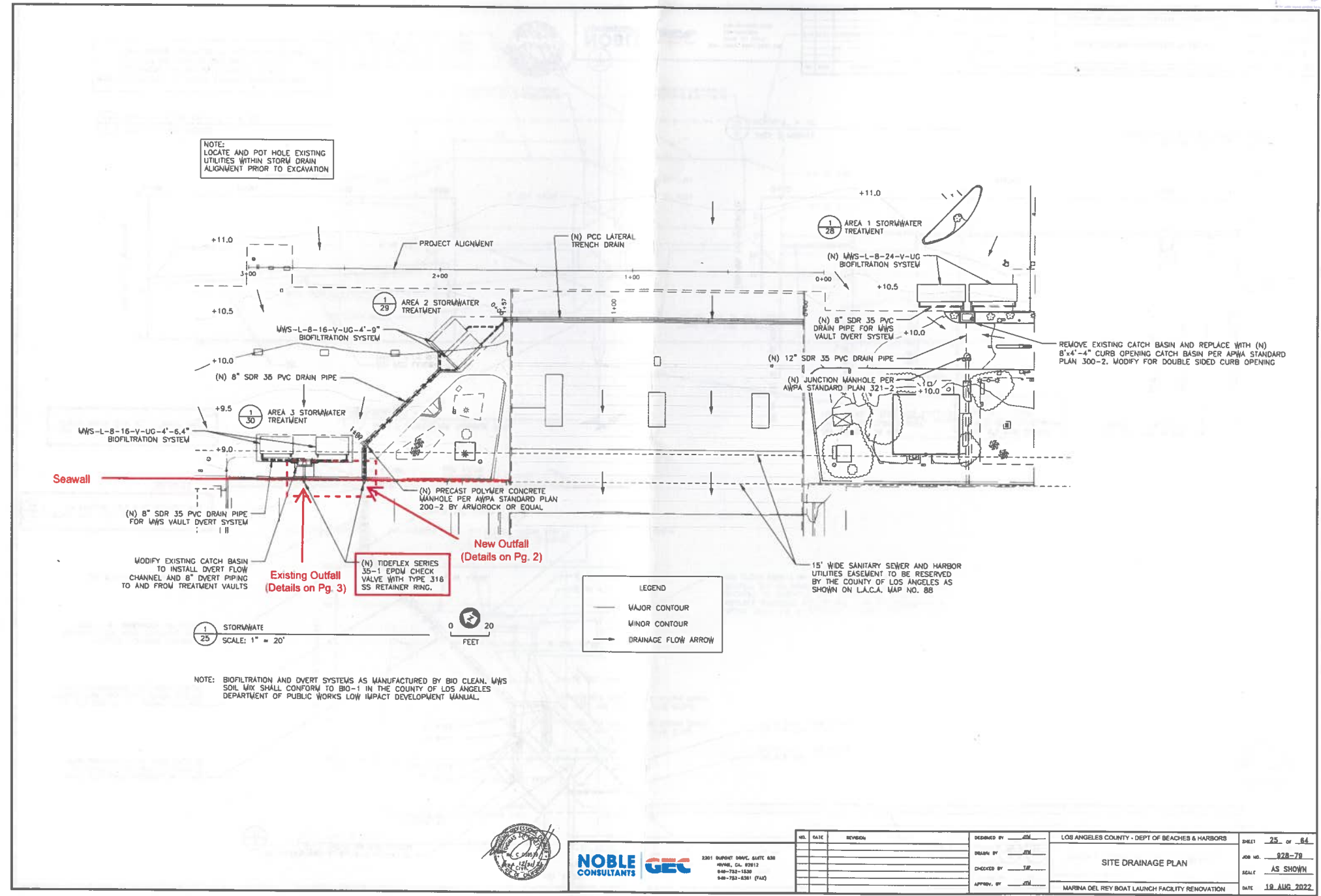
3. **Other Agency Approvals.** PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT, the applicant shall provide to the Executive Director a copy of a permit issued by U.S. Army Corps of Engineers, Regional Water Quality Control Board, Los Angeles County Department of Regional Planning, or letter of permission, or evidence that no permit or permission is required. The applicant shall inform the Executive Director of any changes to the project required by the U.S. Army Corps of Engineers, Regional Water Quality Control Board, Los Angeles County Department of Regional Planning. Such changes

Coastal Development Permit
5-23-0914

shall not be incorporated into the project until the applicant obtains a Commission amendment to this coastal development permit, unless the Executive Director issues a written determination that no amendment is legally required.

4. **Assumption of Risk, Waiver of Liability, and Indemnity.** By acceptance of this permit, the applicants acknowledge and agree (i) that the site may be subject to hazards, including but not limited to, waves, storms, flooding, and erosion, many of which will worsen with future sea level rise; (ii) to assume the risks to the permittee and the property that is the subject of this permit of injury and damage from such hazards in connection with this permitted development; (iii) to unconditionally waive any claim of damage or liability against the Commission, its officers, agents, and employees for injury or damage from such hazards; and (iv) to indemnify and hold harmless the Commission, its officers, agents, and employees with respect to the Commission's approval of the project against any and all liability, claims, demands, damages, costs (including costs and fees incurred in defense of such claims), expenses, and amounts paid in settlement arising from any injury or damage due to such hazards.

ENGINEER: [Signature]
 BY: [Signature]
 PERMIT NO: 5-23-0914
APPROVED
 South Coast District Office
 California Coastal Commission



NOBLE CONSULTANTS **GEC** 2301 BURBANK DRIVE, SUITE 800, IRVINE, CA 92612, 949-721-1239, 949-721-8361 (FAX)

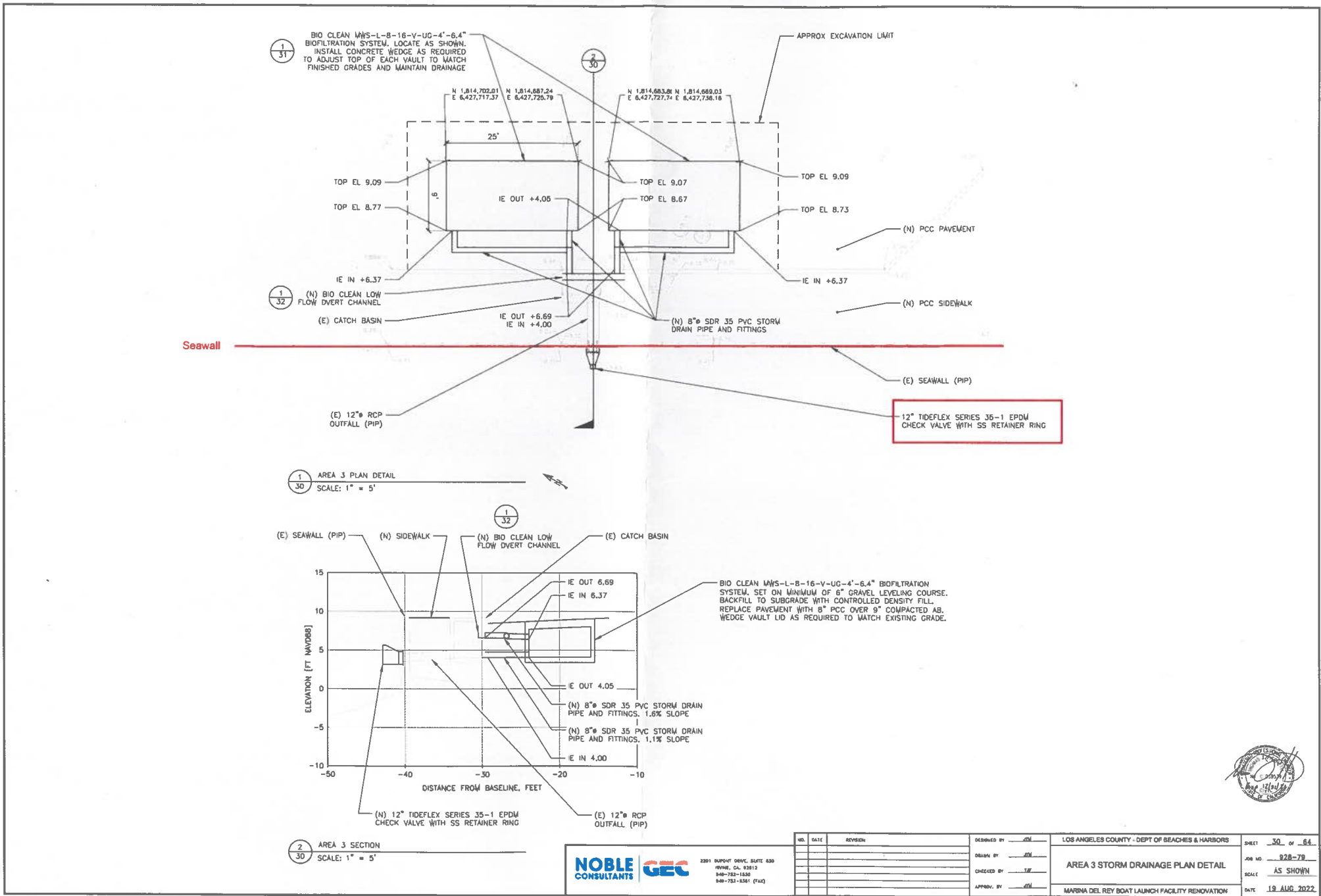
NO.	DATE	REVISION

DESIGNED BY: [Signature]
 DRAWN BY: [Signature]
 CHECKED BY: [Signature]
 APPROVED BY: [Signature]

LOS ANGELES COUNTY - DEPT OF BEACHES & HARBORS
 SITE DRAINAGE PLAN
 MARINA DEL REY BOAT LAUNCH FACILITY RENOVATION

SHEET 25 OF 84
 JOB NO. 928-78
 SCALE AS SHOWN
 DATE 18 AUG 2022

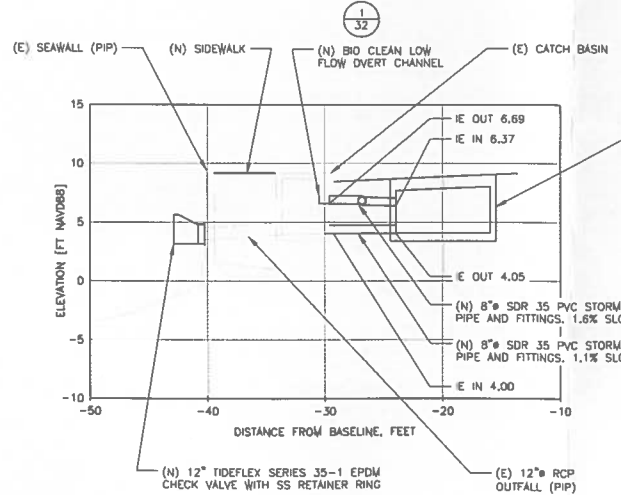
California Coastal Commission
 South Coast District Office
APPROVED
 Permit No. 5-23-0914
 By: [Signature]
 Effective Date: 2/6/25



1/31 BIO CLEAN MWS-L-8-16-V-UG-4'-6.4" BIOFILTRATION SYSTEM, LOCATE AS SHOWN. INSTALL CONCRETE WEDGE AS REQUIRED TO ADJUST TOP OF EACH VAULT TO MATCH FINISHED GRADES AND MAINTAIN DRAINAGE

1/32 (N) BIO CLEAN LOW FLOW DIVERT CHANNEL (E) CATCH BASIN

1/30 AREA 3 PLAN DETAIL SCALE: 1" = 5'



2/30 AREA 3 SECTION SCALE: 1" = 5'

NOBLE CONSULTANTS **GEC**
 2291 DUPONT DRIVE, SUITE 830
 IRVINE, CA 92613
 949-753-1836
 949-753-8361 (FAX)

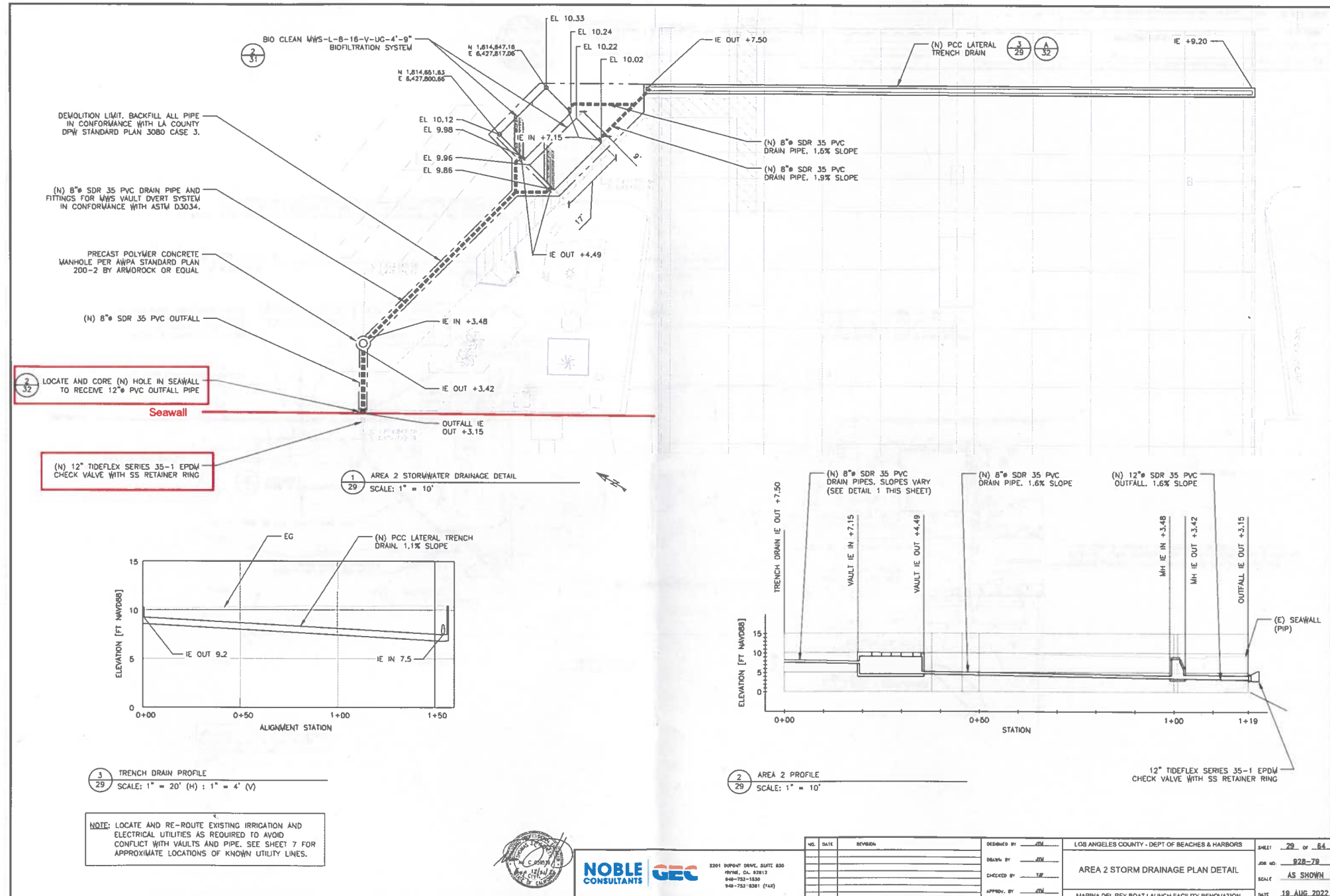
NO.	DATE	REVISION

DESIGNED BY: JEM
 DRAWN BY: JEM
 CHECKED BY: JEM
 APPROV. BY: JEM
 LOS ANGELES COUNTY - DEPT OF BEACHES & HARBORS
 AREA 3 STORM DRAINAGE PLAN DETAIL
 MARINA DEL REY BOAT LAUNCH FACILITY RENOVATION
 SHEET 30 OF 64
 JOB NO. 928-79
 SCALE AS SHOWN
 DATE 19 AUG 2022



California Coastal Commission
 South Coast District Office
 APPROVED
 Permit No. 5-23-0914
 By: *[Signature]*

EFFECTIVE DATE: _____
 BY: _____
 PERMIT NO. 5-23-1914
APPROVED
 SOUTH COAST DISTRICT OFFICE
 CALIFORNIA COASTAL COMMISSION



NOBLE CONSULTANTS
 2301 SUPPLY DRIVE, SUITE 830
 IRVINE, CA 92612
 949-752-1530
 949-752-1531 (FAX)

NO.	DATE	REVISION

DESIGNED BY: JTM
 DRAWN BY: JTM
 CHECKED BY: TJP
 APPROVED BY: JTM

LOS ANGELES COUNTY - DEPT OF BEACHES & HARBORS
 AREA 2 STORM DRAINAGE PLAN DETAIL
 MARINA DEL REY BOAT LAUNCH FACILITY RENOVATION

SHEET: 29 OF 84
 JOB NO: 928-78
 SCALE: AS SHOWN
 DATE: 19 AUG 2022

California Coastal Commission
 South Coast District Office
APPROVED
 Permit No. 5-23-1914
 By: *[Signature]*
 Effective Date: 2/6/25

**MARINA DEL REY BOAT LAUNCH RAMP REPLACEMENT PROJECT
SPECS. 7663; C.P. NO. 8A078**

APPENDIX B

Department of the Army Permit, Los Angeles District
Nationwide Permit (NWP) Verification
Permit No. SPL-2011-01173-GS
Dated May 27, 2025



**DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT
915 WILSHIRE BOULEVARD, SUITE 930
LOS ANGELES, CALIFORNIA 90017**

May 27, 2025

SUBJECT: Nationwide Permit (NWP) Verification

Warren Ontiveros
Chief of Planning
Los Angeles County Department of Beaches and Harbors
13837 Fiji Way
Marina del Rey, California 90292

Dear Mr. Ontiveros:

I am responding to your request dated October 26, 2022 for a Department of the Army (DA) permit for your proposed project, Chace Park Boat Dock Replacement (File No. SPL-2011-01173-GS). The proposed project is located in Marina del Rey, an unincorporated community within Los Angeles County, California (Latitude 33.977905°, Longitude -118.44399°).

Because construction of this project would result in a discharge of dredged and/or fill material into waters of the U.S. and would place structures or consist of work in or affecting navigable waters of the U.S., a Department of the Army permit is required pursuant to Section 404 of the Clean Water Act (33 USC 1344; 33 CFR parts 323 and 330) and Section 10 of the Rivers and Harbors Act (33 USC 403). I have determined your proposed project, if constructed as described in your application, would comply with NWP 13 Bank Stabilization and MWP 3 Maintenance. Specifically, and as shown in the enclosed figure(s), you are authorized to:

1. Temporarily impact 0.27 acres to replace a ramp
2. Temporarily impact 0.06 acre to replace ramp slope protection
3. Temporarily impact 0.03 acre for temporary installation of cofferdam and turbidity curtain

For this NWP verification letter to be valid, you must comply with all of the terms and conditions in Enclosure 1. Furthermore, you must comply with the non-discretionary Special Conditions listed below:

1. Within 45 calendar days of completion of authorized work in waters of the U.S., the Permittee shall submit to the Corps Regulatory Division a post-project implementation memorandum including the following information:
 - A) Date(s) work within waters of the U.S. was initiated and completed;

- B) Summary of compliance status with each special condition of this permit (including any noncompliance that previously occurred or is currently occurring and corrective actions taken or proposed to achieve compliance);
- C) Color photographs (including map of photopoints) taken at the project site before and after construction for those aspects directly associated with permanent impacts to waters of the U.S. such that the extent of authorized fills can be verified;
- D) One copy of "as built" drawings for the entire project. Electronic submittal (Adobe PDF format) is preferred. All sheets must be signed, dated, and to-scale. If submitting paper copies, sheets must be no larger than 11 x 17 inches; and
- E) Signed Certification of Compliance (attached as part of this permit package).

2. The Permittee shall comply with the terms and conditions of the Clean Water Act Section 401 Water Quality Certification (WQC) 20-061, amended May 16, 2025.

3. INTERFERENCE WITH NAVIGATION: The permitted activity shall not interfere with the right of the public to free navigation on all navigable waters of the United States as defined by 33 C.F.R. Part 329.

4. PILES: Creosote treated pilings shall not be placed in navigable waters unless all of the following conditions are met:

- A) The project involves the repair of existing structures that were originally constructed using wood products;
- B) The creosote treated pilings are wrapped in plastic;
- C) Measures are taken to prevent damage to plastic wrapping from boat use. Such measures may include installation of rub strips or bumpers;
- D) The plastic wrapping is sealed at all joints to prevent leakage; and
- E) The plastic material is expected to maintain its integrity for at least ten years, and plastic wrappings that develop holes or leaks must be repaired or replaced in a timely manner by the Permittee.

5. LIMITATIONS: No other modifications or work shall occur to the structure permitted herein.

6. CLEAN CONSTRUCTION PRACTICES: The Permittee shall discharge only clean construction materials suitable for use in the oceanic environment. The Permittee shall ensure no debris, soil, silt, sand, sawdust, rubbish, cement or concrete washings thereof, oil or petroleum products, hazardous/toxic/radioactive/munitions from construction or dredging or disposal shall be allowed to enter into or placed where it may be washed by rainfall or runoff into waters of the United States. Upon completion of the project authorized herein, any and all excess material or debris shall be completely removed from the work area and disposed of in an appropriate upland site.

7. OBSTRUCTIONS: The Permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the Permittee will be required, upon due notice from the Corps of Engineers Regulatory Division, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

8. U.S. COAST GUARD NOTIFICATION: To ensure navigational safety, the Permittee shall provide appropriate notifications to the U.S. Coast Guard as described below:

Local Notice to Mariners, 11th Coast Guard District

TEL: (510) 437-2980

Email: d11LNM@uscg.mil

Website: <https://www.pacificarea.uscg.mil/Our-Organization/District-11/Prevention-Division/LnmRequest/>

U.S. Coast Guard, District 11, LA-LB Sector

Captain of the Port (COTP)

Email: d11-SMB-SectorLALB-WWM@uscg.mil

A) The Permittee shall notify the U.S. Coast Guard, Commander, 11th Coast Guard District (dpw) and the U.S. Coast Guard, Sector LA-LB (COTP) (contact information shown above), not less than 14 calendar days prior to commencing work and as project information changes. The notification shall be provided by email with at least the following information, transmitted as an attached Word or PDF file:

- 1) Project description including the type of operation (i.e. dredging, diving, construction, etc).
- 2) Location of operation, including Latitude / Longitude (NAD 83).
- 3) Work start and completion dates and the expected duration of operations. The U.S. Coast Guard needs to be notified if these dates change.
- 4) Vessels involved in the operation (name, size and type).
- 5) VHF-FM radio frequencies monitored by vessels on scene.
- 6) Point of contact and 24 -hour phone number.
- 7) Potential hazards to navigation.
- 8) Chart number for the area of operation.
- 9) Recommend the following language be used in the Local Notice to Mariners:
"Mariners are urged to transit at their slowest safe speed to minimize wake, and proceed with caution after passing arrangements have been made."

B) The Permittee and its contractor(s) shall not remove, relocate, obstruct, willfully damage, make fast to, or interfere with any aids to navigation defined at 33 C.F.R. chapter I, subchapter C, part 66. Not less than 30 calendar days in advance of operating any equipment adjacent to any aids to navigation that require relocation or removal, the Permittee shall notify, in writing, the Eleventh U.S. Coast Guard District and the Corps Regulatory Division. The Permittee and its contractor(s) are prohibited from relocating or removing any aids to navigation until authorized to do so by the Corps Regulatory Division and the U.S. Coast Guard.

C) The Permittee is prohibited from establishing private aids to navigation in navigable waters of the United States until authorized to do so by the Corps Regulatory Division and the U.S. Coast Guard. Should the Permittee determine the work requires the temporary placement and use of private aids to navigation in navigable waters of the United States, the Permittee shall submit a request in writing to the Corps Regulatory Division and the U.S. Coast Guard.

D) The COTP may modify the deployment of marine construction equipment or mooring systems to safeguard navigation during project construction. The Permittee shall direct questions concerning lighting, equipment placement, and mooring to the appropriate COTP.

9. COMMENCEMENT AND COMPLETION NOTIFICATION: The Permittee shall notify the Corps Regulatory Division of the date of commencement of work in navigable waters of the United States (within 10 calendar days prior to the start of construction) and completion of the activity (within 10 calendar days following the end of construction) using the enclosed forms.

10. POST-CONSTRUCTION AS-BUILT SURVEY(S): Within 30 calendar days of completion of the project authorized by this permit, the Permittee shall conduct a post-project as-built survey indicating the location of all new structures and their features, or the modification of structures and their features, or post-dredge hydrographic surveys, within navigable waters. Within 45 calendar days of completion of the project, the Permittee shall forward a copy of the survey, as well as a copy of this permit, to the Corps Regulatory Division (via email at: Vanessa.Navarro@usace.army.mil), and to the National Oceanic and Atmospheric Administration, Marine Charting Division for updating nautical charts (via email at: ocs.ndb@noaa.gov) Post-project surveys/as-built plans should be provided electronically in two formats: .pts (xyz) and one of, .pdf or GIS. Include the following header metadata: project name, surveyor's name and company, area surveyed (acres), type of survey method, date of survey, geographic control points (for example: latitude/longitude, plane coordinates), geographic coordinate system (use NAD83), geographic projection, units (use US Survey Feet), and tide gage location. For

all subsurface structures and dredge projects include elevation (z coordinate) datum indicated as a negative below MLLW, and also indicate the survey system and bin sizes as appropriate.

11. CAULERPA PRE-CONSTRUCTION SURVEY: A pre-construction survey of the project area for all *Caulerpa* sp. (*Caulerpa*) shall be conducted by a certified *Caulerpa* surveyor in accordance with the *Caulerpa* Control Protocol (see https://media.fisheries.noaa.gov/dam-migration/caulerpa_control_protocol_4_updatedpoc.pdf) not earlier than 90 calendar days prior to planned construction and not later than 30 calendar days prior to construction. The results of this survey shall be furnished to the Corps Regulatory Division, NOAA Fisheries, and the California Department of Fish and Wildlife (CDFW) at least 15 calendar days prior to initiation of work in navigable waters. In the event that *Caulerpa* is detected within the project area, the Permittee shall not commence work until such time as the infestation has been isolated, treated, and the risk of spread is eliminated as confirmed in writing by the Corps Regulatory Division, in consultation with NOAA Fisheries and CDFW.

12. EELGRASS SURVEYS: Prior to construction, a pre-project eelgrass survey should be conducted in accordance with the California Eelgrass Mitigation Policy (CEMP) (https://media.fisheries.noaa.gov/dam-migration/cemp_oct_2014_final.pdf). The results of the survey must be submitted to the Corps at least 15 calendar days prior to the scheduled start date for work in waters of the United States. If the pre-project survey demonstrates eelgrass presence within 25 feet of the project footprint, the Permittee shall conduct two years of post-construction eelgrass monitoring surveys per the mapping guidelines in NOAA Fisheries' California Eelgrass Mitigation Policy (Policy) (https://media.fisheries.noaa.gov/dam-migration/cemp_oct_2014_final.pdf). All required post-construction monitoring surveys shall be submitted by the Permittee to the Corps and NOAA Fisheries within 30 calendar days of each survey completion date. Based upon the post-construction monitoring survey results and in accordance with the Policy, the Corps will determine the need and/or amount of Essential Fish Habitat (EFH) mitigation required to offset adverse impacts to such habitat. The Corps will transmit its determination to the Permittee in writing. Within 60 calendar days of receiving the Corps' determination specifying the need and amount of mitigation, the Permittee shall submit a draft EFH mitigation plan to the Corps for review and approval. The EFH mitigation plan shall be prepared in accordance with the Policy and the Corps' South Pacific Division Regional Compensatory Mitigation Guidelines and Monitoring Requirements, dated January 12, 2015. The Permittee shall fully implement the final EFH mitigation plan as approved by the Corps.

This verification is valid through March 14, 2026. If on March 14, 2026 you have commenced or are under contract to commence the permitted activity you will have an

additional twelve (12) months to complete the activity under the present NWP terms and conditions. However, if I discover noncompliance or unauthorized activities associated with the permitted activity I may request the use of discretionary authority in accordance with procedures in 33 CFR part 330.4(e) and 33 CFR part 330.5(c) or (d) to modify, suspend, or revoke this specific verification at an earlier date. Additionally, at the national level the Chief of Engineers, any time prior to March 14, 2026, may choose to modify, suspend, or revoke the nationwide use of a NWP after following procedures set forth in 33 CFR part 330.5. It is incumbent upon you to comply with all of the terms and conditions of this NWP verification and to remain informed of any change to the NWPs.

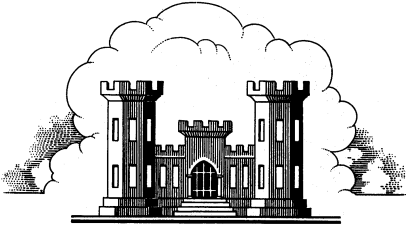
A NWP does not grant any property rights or exclusive privileges. Additionally, it does not authorize any injury to the property, rights of others, nor does it authorize interference with any existing or proposed Federal project. Furthermore, it does not obviate the need to obtain other Federal, state, or local authorizations required by law.

Thank you for participating in our regulatory program. If you have any questions, please contact Vanessa Navarro at (213) 452-3414 or via email at Vanessa.Navarro@usace.army.mil. Please help me to evaluate and improve the regulatory experience for others by completing the [customer survey](https://regulatory.ops.usace.army.mil/customer-service-survey/) form at <https://regulatory.ops.usace.army.mil/customer-service-survey/>.

Sincerely,

Deanna L. Cummings
Senior Project Manager
North Coast Branch
Regulatory Division

Enclosures



**LOS ANGELES DISTRICT
U.S. ARMY CORPS OF ENGINEERS**

**CERTIFICATE OF COMPLIANCE WITH
DEPARTMENT OF THE ARMY NATIONWIDE PERMIT**

Permit Number: *SPL-2011-01173-GS*

Name of Permittee: *Warren Ontiveros, Los Angeles County Department of Beaches and Harbors*

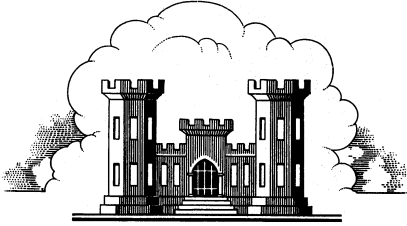
Date of Issuance: *May 27, 2025*

Upon completion of the activity authorized by this permit and the mitigation required by this permit, sign this certificate, and email it to Vanessa.Navarro@usace.army.mil or splreglasb@usace.army.mil.

I hereby certify that the authorized work and any required compensatory mitigation has been completed in accordance with the NWP authorization, including all general, regional, or activity-specific conditions. Furthermore, if credits from a mitigation bank or in-lieu fee program were used to satisfy compensatory mitigation requirements I have attached the documentation required by 33 CFR 332.3(l)(3) to confirm that the appropriate number and resource type of credits have been secured.

Signature of Permittee

Date



**LOS ANGELES DISTRICT
U.S. ARMY CORPS OF ENGINEERS**

**COMPLIANCE DELIVERABLES CHECKLIST FOR
DEPARTMENT OF ARMY PERMIT**

Permit Number: *SPL-2011-01173-GS*

Name of Permittee: *Warren Ontiveros, Los Angeles County Department of Beaches and Harbors*

Date of Issuance: *May 27, 2025*

Please submit this checklist along with all required compliance deliverables (listed in the table below) to the Corps via email to Vanessa.Navarro@usace.army.mil or splreglasb@usace.army.mil. Upon receipt, the Corps will review proffered deliverables for sufficiency and, if approved, return an electronically-signed/dated copy of this checklist to you. The Corps Project Manager will provide e-signature upon receipt/approval of each compliance deliverable and will return the signed checklist to the applicant/agent in a progressive manner.

Condition #	Compliance deliverable	Corps approval
N/A	Notification of Commencement of Work	
Special Condition #1	Post Project Implementation Report	
Special Condition #9	Commencement notice	
Special Condition #10	Post Project As-built drawings	
Special Condition #11 and 12	Eelgrass and Caulerpa survey requirements	
General Condition #30	Certificate of Compliance with Department of the Army Nationwide Permit	

Upon receipt and approval of all items listed in the table above, the Corps will consider you in full compliance with compliance deliverable requirements in your permit authorization. Note, however, that any ongoing reporting obligations associated with the permit may remain unaffected by this compliance deliverables determination.

**MARINA DEL REY BOAT LAUNCH RAMP REPLACEMENT PROJECT
SPECS. 7663; C.P. NO. 8A078**

APPENDIX B

Department of the Army Permit, Los Angeles District
Letter of Permission
Permit No. SPL-2011-01173-GS
Dated May 27, 2025



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT
915 WILSHIRE BOULEVARD, SUITE 930
LOS ANGELES, CALIFORNIA 90017

May 27, 2025

SUBJECT: Letter of Permission

Warren Ontiveros
Chief of Planning
Los Angeles County Department of Beaches and Harbors
13837 Fiji Way
Marina del Rey, California 90292

Dear Mr. Ontiveros:

I am responding to your application dated October 26, 2022, for a Department of Army permit for your proposed project, Chace Park Boat Dock Replacement (File No. SPL-2011-01173-GS). The proposed project is located in Marina del Rey, an unincorporated community within Los Angeles County, California (Latitude 33.977905°, Longitude -118.44399°).

Pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403) and Section 404 of the Clean Water Act (33 U.S.C. § 1344), you are hereby authorized through this Letter of Permission (LOP) to conduct the work described in your application. Specifically, and as shown on the enclosed drawings, you are authorized to permanently impact 0.04 acre and temporarily impact 0.51 acre by:

1. Install a new accessible boarding float, new accessible gangway, and new accessible concrete gangway platform
2. Install 4 submerged guide piles
3. Install 3 new piles for gangway platform
4. Install 9 new piles for existing boarding float replacement
5. Replace existing boarding floats
6. Replace existing 12 piles
7. Temporarily install a turbidity curtain and cofferdam
8. Install a new outlet to connect to upland stormwater treatment facilities in the wall adjacent to the boat ramp

Please notify this office as to the dates of commencement (within 10 days prior to the start of construction) and completion of the activity (within 10 days following the end of construction) using the enclosed forms.

Furthermore, you are hereby advised that the U.S. Army Corps of Engineers (Corps) has established an administrative appeal process which is fully described in 33 CFR part 331 and summarized in the enclosed Notification of Administrative Appeal Options and Process (NAP) and Request for Appeal (RFA) form. Please review the enclosed documents carefully, in particular, the conditions of the initial proffered LOP. If you accept the permit terms and conditions as offered, then your work is authorized. Your acceptance of this LOP means that you accept the permit in its

entirety and waive all rights to appeal the permit under our administrative appeal process at 33 CFR Part 331.

However, if you object to the LOP because of certain terms and conditions, you may request that the permit be modified. To request a modification, you must complete Section II of the RFA form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this letter, or you will forfeit your right to appeal the permit in the future. Your request must be submitted to:

Colonel Andrew J. Baker, District Engineer
Los Angeles District, U.S. Army Corps of Engineers
915 Wilshire Boulevard, Suite 930
Los Angeles, California 90017
Telephone (213) 452-3961
Email: Andrew.J.Baker@usace.army.mil

The district engineer would then evaluate your objections and determine whether it is appropriate to change some, all, or none of the terms and special conditions of the permit. The permit would then be provided to you a second time for your reconsideration, at which point you could accept the permit, appeal the permit conditions to the Corps' South Pacific Division office, or withdraw your permit request. It is not necessary to submit an RFA form unless you object to the conditions of the permit.

Thank you for participating in our regulatory program. If you have any questions, please contact me via email at Deanna.L.Cummings@usace.army.mil. Please help me to evaluate and improve the regulatory experience for others by completing the [customer survey](https://regulatory.ops.usace.army.mil/customer-service-survey/) form at <https://regulatory.ops.usace.army.mil/customer-service-survey/>.

For and on the behalf of Colonel Andrew J. Baker, District Engineer:

Sincerely,

Deanna L. Cummings
Senior Project Manager
North Coast Branch
Regulatory Division

Enclosures

LETTER OF PERMISSION CONDITIONS

Permittee: Los Angeles County Beaches and Harbors, Attn. Warren Ontiveros

Permit No. SPL-2011-001173-GS

Issuing Office: U.S. Army Corps of Engineers, Los Angeles District

NOTE: The term "you" and its derivatives, as used in this permit, means the Permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

General Conditions:

1. The time limit for completing the authorized activity ends on May 27, 2027. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.
4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
5. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished with the terms and conditions of your permit.
6. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

7. If a conditioned coastal zone management act consistency concurrence has been issued for your project, you must comply with the conditions specified in the concurrence as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

Furthermore, you must comply with the following non-discretionary Special Conditions:

Special Conditions:

1. Within 45 calendar days of completion of authorized work in waters of the U.S., the Permittee shall submit to the Corps Regulatory Division a post-project implementation memorandum including the following information:

- A) Date(s) work within waters of the U.S. was initiated and completed;
- B) Summary of compliance status with each special condition of this permit (including any noncompliance that previously occurred or is currently occurring and corrective actions taken or proposed to achieve compliance);
- C) Color photographs (including map of photopoints) taken at the project site before and after construction for those aspects directly associated with permanent impacts to waters of the U.S. such that the extent of authorized fills can be verified;
- D) One copy of "as built" drawings for the entire project. Electronic submittal (Adobe PDF format) is preferred. All sheets must be signed, dated, and to-scale. If submitting paper copies, sheets must be no larger than 11 x 17 inches; and
- E) Signed Certification of Compliance (attached as part of this permit package).

2. The Permittee shall comply with the terms and conditions of the Clean Water Act Section 401 Water Quality Certification (WQC) 20-061 dated December 3, 2021, and amended May 16, 2025.

3. INTERFERENCE WITH NAVIGATION: The permitted activity shall not interfere with the right of the public to free navigation on all navigable waters of the United States as defined by 33 C.F.R. Part 329.

4. PILES: Creosote treated pilings shall not be placed in navigable waters unless all of the following conditions are met:

- A) The project involves the repair of existing structures that were originally constructed using wood products;
- B) The creosote treated pilings are wrapped in plastic;
- C) Measures are taken to prevent damage to plastic wrapping from boat use. Such measures may include installation of rub strips or bumpers;
- D) The plastic wrapping is sealed at all joints to prevent leakage; and
- E) The plastic material is expected to maintain its integrity for at least ten years, and plastic wrappings that develop holes or leaks must be repaired or replaced in a timely manner by the Permittee.

5. LIMITATIONS: No other modifications or work shall occur to the structure permitted herein.

6. CLEAN CONSTRUCTION PRACTICES: The Permittee shall discharge only clean construction materials suitable for use in the oceanic environment. The Permittee shall ensure no debris, soil, silt, sand, sawdust, rubbish, cement or concrete washings thereof, oil or petroleum products, hazardous/toxic/radioactive/munitions from construction or dredging or disposal shall be allowed to enter into or placed where it may be washed by rainfall or runoff into waters of the United States. Upon completion of the project authorized herein, any and all excess material or debris shall be completely removed from the work area and disposed of in an appropriate upland site.

7. OBSTRUCTIONS: The Permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the Permittee will be required, upon due notice from the Corps of Engineers Regulatory Division, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

8. U.S. COAST GUARD NOTIFICATION: To ensure navigational safety, the Permittee shall provide appropriate notifications to the U.S. Coast Guard as described below:

Local Notice to Mariners, 11th Coast Guard District

TEL: (510) 437-2980

Email: d11LNM@uscg.mil

Website: <https://www.pacificarea.uscg.mil/Our-Organization/District-11/Prevention-Division/LnmRequest/>

U.S. Coast Guard, District 11, LA-LB Sector

Captain of the Port (COTP)

Email: d11-SMB-SectorLALB-WWM@uscg.mil

A) The Permittee shall notify the U.S. Coast Guard, Commander, 11th Coast Guard District (dpw) and the U.S. Coast Guard, Sector LA-LB (COTP) (contact information shown above), not less than 14 calendar days prior to commencing work and as project information changes. The notification shall be provided by email with at least the following information, transmitted as an attached Word or PDF file:

- 1) Project description including the type of operation (i.e. dredging, diving, construction, etc).
- 2) Location of operation, including Latitude / Longitude (NAD 83).
- 3) Work start and completion dates and the expected duration of operations. The U.S. Coast Guard needs to be notified if these dates change.
- 4) Vessels involved in the operation (name, size and type).

- 5) VHF-FM radio frequencies monitored by vessels on scene.
- 6) Point of contact and 24 -hour phone number.
- 7) Potential hazards to navigation.
- 8) Chart number for the area of operation.
- 9) Recommend the following language be used in the Local Notice to Mariners:
"Mariners are urged to transit at their slowest safe speed to minimize wake, and proceed with caution after passing arrangements have been made."

B) The Permittee and its contractor(s) shall not remove, relocate, obstruct, willfully damage, make fast to, or interfere with any aids to navigation defined at 33 C.F.R. chapter I, subchapter C, part 66. Not less than 30 calendar days in advance of operating any equipment adjacent to any aids to navigation that require relocation or removal, the Permittee shall notify, in writing, the Eleventh U.S. Coast Guard District and the Corps Regulatory Division. The Permittee and its contractor(s) are prohibited from relocating or removing any aids to navigation until authorized to do so by the Corps Regulatory Division and the U.S. Coast Guard.

C) The Permittee is prohibited from establishing private aids to navigation in navigable waters of the United States until authorized to do so by the Corps Regulatory Division and the U.S. Coast Guard. Should the Permittee determine the work requires the temporary placement and use of private aids to navigation in navigable waters of the United States, the Permittee shall submit a request in writing to the Corps Regulatory Division and the U.S. Coast Guard.

D) The COTP may modify the deployment of marine construction equipment or mooring systems to safeguard navigation during project construction. The Permittee shall direct questions concerning lighting, equipment placement, and mooring to the appropriate COTP.

9. COMMENCEMENT AND COMPLETION NOTIFICATION: The Permittee shall notify the Corps Regulatory Division of the date of commencement of work in navigable waters of the United States (within 10 calendar days prior to the start of construction) and completion of the activity (within 10 calendar days following the end of construction) using the enclosed forms.

10. POST-CONSTRUCTION AS-BUILT SURVEY(S): Within 30 calendar days of completion of the project authorized by this permit, the Permittee shall conduct a post-project as-built survey indicating the location of all new structures and their features, or the modification of structures and their features, or post-dredge hydrographic surveys, within navigable waters. Within 45 calendar days of completion of the project, the Permittee shall forward a copy of the survey, as well as a copy of this permit, to the Corps Regulatory Division (via email at: [Vanessa.Navarro@usace.army.mil]), and to the National Oceanic and Atmospheric Administration, Marine Charting Division for updating nautical charts (via email at: ocs.ndb@noaa.gov) Post-project surveys/as-built plans should be provided electronically in two formats: .pts (xyz) and one of, .pdf or GIS. Include the following header metadata: project name, surveyor's name and company, area surveyed (acres),

type of survey method, date of survey, geographic control points (for example: latitude/longitude, plane coordinates), geographic coordinate system (use NAD83), geographic projection, units (use US Survey Feet), and tide gage location. For all subsurface structures and dredge projects include elevation (z coordinate) datum indicated as a negative below MLLW, and also indicate the survey system and bin sizes as appropriate.

11. CAULERPA PRE-CONSTRUCTION SURVEY: A pre-construction survey of the project area for all *Caulerpa* sp. (*Caulerpa*) shall be conducted by a certified *Caulerpa* surveyor in accordance with the *Caulerpa* Control Protocol (see https://media.fisheries.noaa.gov/dam-migration/caulerpa_control_protocol_4_updatedpoc.pdf) not earlier than 90 calendar days prior to planned construction and not later than 30 calendar days prior to construction. The results of this survey shall be furnished to the Corps Regulatory Division, NOAA Fisheries, and the California Department of Fish and Wildlife (CDFW) at least 15 calendar days prior to initiation of work in navigable waters. In the event that *Caulerpa* is detected within the project area, the Permittee shall not commence work until such time as the infestation has been isolated, treated, and the risk of spread is eliminated as confirmed in writing by the Corps Regulatory Division, in consultation with NOAA Fisheries and CDFW.

12. EELGRASS SURVEYS: Prior to construction, a pre-project eelgrass survey should be conducted in accordance with the California Eelgrass Mitigation Policy (CEMP) (https://media.fisheries.noaa.gov/dam-migration/cemp_oct_2014_final.pdf). The results of the survey must be submitted to the Corps at least 15 calendar days prior to the scheduled start date for work in waters of the United States. If the pre-project survey demonstrates eelgrass presence within 25 feet of the project footprint, the Permittee shall conduct two years of post-construction eelgrass monitoring surveys per the mapping guidelines in NOAA Fisheries' California Eelgrass Mitigation Policy (Policy) (https://media.fisheries.noaa.gov/dam-migration/cemp_oct_2014_final.pdf). All required post-construction monitoring surveys shall be submitted by the Permittee to the Corps and NOAA Fisheries within 30 calendar days of each survey completion date. Based upon the post-construction monitoring survey results and in accordance with the Policy, the Corps will determine the need and/or amount of Essential Fish Habitat (EFH) mitigation required to offset adverse impacts to such habitat. The Corps will transmit its determination to the Permittee in writing. Within 60 calendar days of receiving the Corps' determination specifying the need and amount of mitigation, the Permittee shall submit a draft EFH mitigation plan to the Corps for review and approval. The EFH mitigation plan shall be prepared in accordance with the Policy and the Corps' South Pacific Division Regional Compensatory Mitigation Guidelines and Monitoring Requirements, dated January 12, 2015. The Permittee shall fully implement the final EFH mitigation plan as approved by the Corps

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 10 of the Rivers and Harbors Act of 1899

(X) Section 404 of the Clean Water Act

2. Limits of this authorization.

- a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.
- b. This permit does not grant any property rights or exclusive privileges.
- c. This permit does not authorize any injury to the property or rights of others.
- d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

- a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
- b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.
- c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.
- d. Design or construction deficiencies associated with the permitted work.
- e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

- a. You fail to comply with the terms and conditions of this permit.
- b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

- c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measure ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give you favorable consideration to a request for an extension of this time limit.

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this LOP will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

TRANSFeree

DATE

**NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND
REQUEST FOR APPEAL**

Applicant: Los Angeles County Department of Beaches and Harbors	File Number: SPL-2011-01173-GS	Date: MAY 27, 2025
---	--------------------------------	--------------------

Attached is:	See Section below
--------------	-------------------

X	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/cecw/pages/reg_materials.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **OBJECT:** If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **APPEAL:** If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- **ACCEPT:** You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- **APPEAL:** If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also, you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

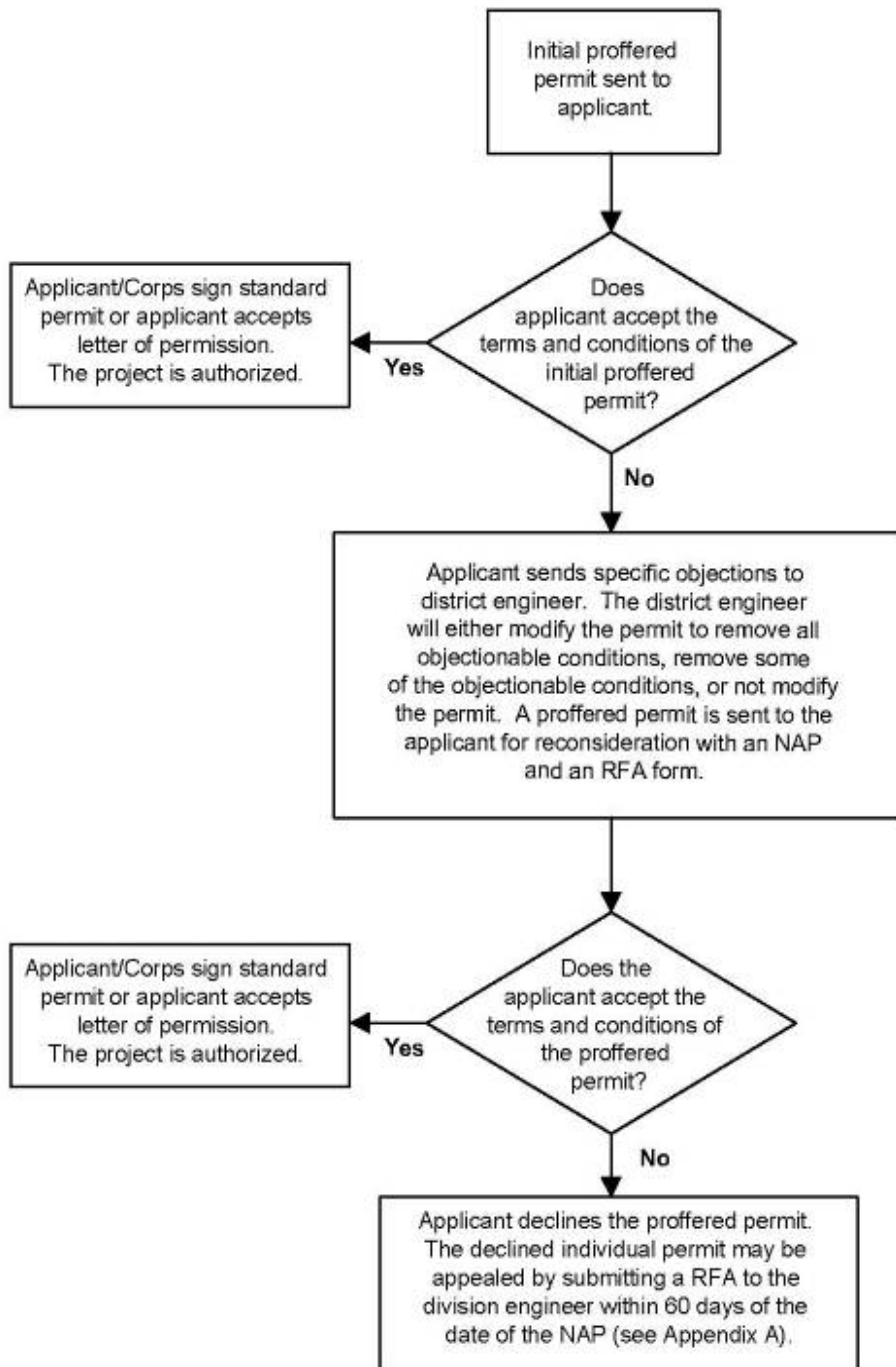
POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

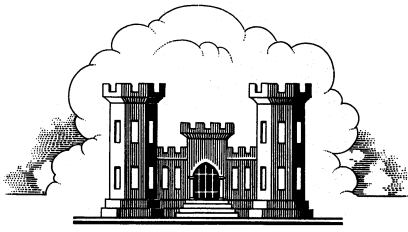
<p>If you have questions regarding this decision and/or the appeal process you may contact:</p> <p>Deanna Cummings U.S. Army Corps of Engineers Los Angeles District 915 WILSHIRE BOULEVARD, SUITE 1109 LOS ANGELES, CA 90017-3409 Phone: (213) 452-3002 Email: Deanna.L.Cummings@usace.army.mil</p>	<p>If you only have questions regarding the appeal process you may also contact:</p> <p>Travis Morse Administrative Appeal Review Officer U.S. Army Corps of Engineers South Pacific Division 450 Golden Gate Ave. San Francisco, California 94102 Phone: (213) 452-3146 Email: w.travis.morse@usace.army.mil</p>
--	--

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15-day notice of any site investigation, and will have the opportunity to participate in all site investigations.

<p>_____ Signature of appellant or agent.</p>	<p>Date:</p>	<p>Telephone number:</p>
--	--------------	--------------------------

Applicant Options with Initial Proffered Permit





LOS ANGELES DISTRICT
U.S. ARMY CORPS OF ENGINEERS

**NOTIFICATION OF COMMENCEMENT OF WORK
FOR
DEPARTMENT OF THE ARMY PERMIT**

Permit Number: *SPL-2011-01173-GS*

Name of Permittee: *Los Angeles County Department of Beaches and Harbors;
Ismael Lopez*

Date of Issuance: *May 27, 2025*

Date work in waters of the U.S. will commence: _____

Estimated construction period (in weeks): _____

Name & phone of contractor (if any): _____

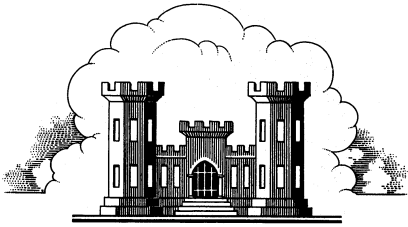
Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit you may be subject to permit suspension, modification, or revocation.

I hereby certify that I, and the contractor (if applicable), have read and agree to comply with the terms and conditions of the above referenced permit.

Signature of Permittee

Date

At least ten (10) calendar days prior to the commencement of the activity authorized by this permit, sign this certification and email it to Vanessa.Navarro@usace.army.mil or splreglasb@usace.army.mil.



LOS ANGELES DISTRICT
U.S. ARMY CORPS OF ENGINEERS

**NOTIFICATION OF COMPLETION OF WORK AND
CERTIFICATION OF COMPLIANCE WITH
DEPARTMENT OF THE ARMY PERMIT**

Permit Number: *SPL-2011-01173-GS*

Name of Permittee: *Los Angeles County Department of Beaches and Harbors;
Ismael Lopez*

Date of Issuance: *May 27, 2025*

Date work in waters of the U.S. completed: _____

Construction period (in weeks): _____

Name & phone of contractor (if any): _____

Please note that your permitted activity is subject to a compliance inspection by an Army Corps of Engineers representative. If you fail to comply with this permit you may be subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and conditions of said permit.

Signature of Permittee

Date

Upon completion of the activity authorized by this permit, sign this certification and email it to Vanessa.Navarro@usace.army.mil or splreglasb@usace.army.mil.

**MARINA DEL REY BOAT LAUNCH RAMP REPLACEMENT PROJECT
SPECS. 7663; C.P. NO. 8A078**

APPENDIX C

Los Angeles Regional Water Quality Control Board
Amendment Section 401 Water Quality Certification
File No. 20-061
Dated May 16, 2025



Los Angeles Regional Water Quality Control Board

May 16, 2025

Warren Ontiveros
Chief of Planning
County of Los Angeles Department of Beaches and Harbors
13837 Fiji Way
Marina del Rey, CA 90292

Dear Mr. Oliveros:

**AMENDMENT TO CLEAN WATER ACT SECTION 401 WATER QUALITY CERTIFICATION
AND ORDER FOR THE MARINA DEL REY BOAT LAUNCH PROJECT (File No. 20-061)
(4WQC40110061)**

The Los Angeles Regional Water Quality Control Board (Los Angeles Water Board) is in receipt of your letter dated December 9, 2024, requesting an amendment of your Clean Water Act section 401 Water Quality Certification for the Marina Del Rey Boat Launch Project issued on December 3, 2021 (File No. 20-061). As we understand, the County of Los Angeles (Permittee) has requested that the Los Angeles Water Board adopt several revisions. The county would like to add language to the project description and extend the deadline. The county is requesting to add a new 12" diameter outfall with a check valve into the existing seawall. Additionally, the county will add a check valve to an existing outfall at the site. Finally, the county is requesting a 3-year deadline extension because the project has been delayed due to jurisdictional approvals.

Los Angeles Water Board staff have reviewed the Certification and determined that the conditions of the Certification continue to be appropriate. In response to your request, the Certification is modified as shown below. The revisions are in section XIII, *Findings*, and in section XIV, *Conditions*, E, *Standard Conditions*. The revised Certification will now read as follows, new text is shown in double underline, and deleted text is shown in ~~strike-out~~:

Applicant Contact:
~~Amy Caves~~
~~Deputy Director~~
~~County of Los Angeles Department of Beaches and Harbors~~
~~13837 Fiji Way~~
~~Marina Del Rey, CA 90292~~
~~acaves@bh.lacounty.gov~~

Warren Ontiveros
Chief of Planning
County of Los Angeles Department of Beaches and Harbors
13837 Fiji Way
Marina Del Rey, CA 90292
Email: wontiveros@bh.lacounty.gov

DAVID NAHAI, CHAIR | SUSANA ARREDONDO, EXECUTIVE OFFICER

Applicant Agent:
Ismael Lopez
County of Los Angeles Department of Beaches and Harbors
13837 Fiji Way
Marina del Rey, CA 90292
Email: ilopez@bh.lacounty.gov

Chantal Alatorre
Department Facilities Planner II
13837 Fiji Way
Marina del Rey, CA 90292
Phone: 424-526-7754
Email: CAlatorre@bh.lacounty.gov

IV. Project Description

[Paragraphs 1-5 remained unmodified]

Construction activity

The remaining Project phases will continue the work to rehabilitate the Marina del Rey Public Boat Launch at Parcels 49R and 77. To complete the reconstruction of the docks, all old dock components including the floats and piling will be removed. Disposal of removed materials will be offsite. The new dock components, including the new guide piles, will be fabricated in a land-based manufacturing facility and transported to the Marina. New guide piles will be hammered in.

Once all the piles are in place, the prefabricated floating dock components will be floated in, attached to the pilings and assembled to create new docks.

Parcel 77 occupies 7,585 square feet and the replacement dock will cover 19,400 square feet. This results in a net increase of 11,815 square feet (0.27 acre) of dock coverage. The increase is necessary to convert the existing 14-slip motorboat anchorage to a solid dock storage.

Parcel 49R currently occupies 4,860 square feet of existing floats and the replacement will cover 6,360 square feet, an increase of 1,500 square feet (0.03 acre). The increase is the result of adding one 10-foot by 150-foot boarding float to the existing launch ramp.

The total size of the Project is approximately seven acres. The Project, including all 5 Parcels, results in a net decrease of 542 square feet of over water coverage.

Additional Project activities include resurfacing the public parking lot, replacing the concrete launch ramp, replacing launch ramp docks, adding new ADA compliant queue dock and gangway, replacing perimeter fencing, replacing existing stormwater filtration unit, and adding a new filtration unit to capture runoff that concurrently sheet flows into marina waters. The project will include coring a new 12-inch diameter outfall into the existing seawall. New check valves will be installed in the new outfall and in one existing outfall at the site. The new stormwater filtration unit will capture and treat all surface water flowing into the ramp area and marina harbor.

This Project will create 0.48 acres of temporary impact.

Parcel 49R construction is expected to take 24 months to complete. Parcel 77 is expected to take 12 months to complete.

XII. Conditions

F. Administrative

6. This Order shall expire ~~five (5) years from date of this Order~~ December 31, 2028. The Applicant shall submit a complete application at least 90 days prior to termination of this Order if renewal is requested.

I have determined that the above proposed modifications do not constitute a significant change in the nature or scope of the original Certification and its intent or mitigation required for the project. Therefore, the proposed modifications are hereby incorporated into 401 Certification No. 20-061 and no additional action by this agency pursuant to Section 401 of the Clean Water Act is necessary. This determination is limited to the proposed amendment contained in your notification to this Regional Board dated December 9, 2024, and described herein and does not eliminate the Applicant's responsibility to comply with any other applicable laws, requirements, or permits.

Sincerely,

for Susanna Arredondo
Executive Officer
Los Angeles Water Quality Control Board

cc:

Chantal Altatorre
Department Facilities Planner II
County of Los Angeles Department of Beaches and Harbors

Elizabeth Payne
CWA Section 401 Program
Division of Water Quality
State Water Resources Control Board

Deanna Cummings
Senior Project Manager
US Army Corps of Engineers
Regulatory Division, Los Angeles District

Brock Warmuth
California Department of Fish and Wildlife
Streambed Alteration Team

Los Alamitos Field Office

Office of Water
US EPA, Region 9

Jonathan Snyder
U.S. Fish and Wildlife Service

Shannon Vaughn
Coastal Program Manager
California Coastal Commission

**MARINA DEL REY BOAT LAUNCH RAMP REPLACEMENT PROJECT
SPECS. 7663; C.P. NO. 8A078**

APPENDIX D

Geotechnical Evaluation
Boat Launch Facility Renovation, Marina del Rey, California
Work Order No. 3047-0-0-101 by Gorian & Associates, Inc.
Dated April 17,2019.

**GEOTECHNICAL EVALUATION,
BOAT LAUNCH FACILITY RENOVATION,
MARINA DEL REY, CALIFORNIA**

prepared for:

Noble Consultants, Inc.
2201 Dupont Drive, Suite 830
Irvine, California 92612

Work Order: 3047-0-0-101
April 17, 2019



TABLE OF CONTENTS

1.0 PROPOSED DEVELOPMENT 1

2.0 GEOTECHNICAL SCOPE OF WORK..... 1

3.0 SITE CONDITIONS..... 2

 3.1 SURFACE CONDITIONS 2

 3.2 SUBSURFACE CONDITIONS – PARKING LOT 3

 3.3 WATER..... 3

 3.4 SUBSURFACE CONDITIONS – BOARDING FLOATS AND GANGWAY LANDING 3

 3.4.1 Summary of Data Available..... 3

 3.4.2 Summary of Data on Boring Logs 3

 3.4.3 Profile Used in Lateral Pile Analysis for Guide Piles 3

 3.4.4 Profile Used in Abutment Pile Analysis 4

4.0 CONCLUSIONS AND RECOMMENDATIONS – BOARDING FLOATS 4

 4.1 GENERAL 4

 4.2 GUIDE PILES 4

 4.2.1 Design Data..... 4

 4.2.2 Lateral Pile Capacity - Guide Piles..... 4

 4.3 ABUTMENT FOUNDATIONS 5

 4.3.1 Design Data..... 5

 4.3.2 Axial Pile Capacity - Abutment Piles 5

 4.3.3 Vertical Settlement..... 5

 4.3.4 Lateral Pile Capacity - Abutment Piles 5

 4.4 PILE INSTALLATION..... 6

 4.5 LAUNCH RAMP 6

 4.5.1 Excavations 6

 4.5.2 Cofferdam and Dewatering 6

 4.6 SITE PREPARATION AND GRADING 6

 4.6.1 Demolition..... 6

 4.6.2 Stripping 6

 4.6.3 Soil Removals..... 6

 4.6.4 In-Place Soil Processing 7

 4.6.5 Fill Placement 7

 4.7 RAMP SLABS-ON-GRADE..... 7

5.0 CONCLUSIONS AND RECOMMENDATIONS – PARKING LOT 8

 5.1 PARKING LOT..... 8

 5.2 RECOMMENDATIONS FOR NEW PAVEMENT SECTION 8

 5.2.1 Subgrade Preparation..... 8

 5.2.2 Aggregate Base Preparation..... 8

 5.3 RECOMMENDATIONS FOR PAVEMENT REHABILITATION..... 8

6.0 SITE DRAINAGE..... 9

7.0 PLAN REVIEW..... 9

8.0 CLOSURE..... 9

- Attachments: Plates 1A & 1B Boring Location Map
 Appendix A Logs of Subsurface Data
 Appendix B Laboratory Test Results
 Appendix C Pile Design Analyses



Applied Earth Sciences
Geotechnical Engineers
Engineering Geologists
Special Inspection and Materials Testing

3595 Old Conejo Road
Thousand Oaks
California 91320-2122
805 375-9262
805 375-9263 fax

April 17, 2019

Noble Consultants, Inc.
2201 Dupont Drive, Suite 830
Irvine, California 92612

Work Order: 3047-0-0-101

Attention: Jon Moore, P.E.

Subject: **Geotechnical Evaluation, Boat Launch Facility Renovation, Marina Del Rey, California**

Presented herein is our geotechnical evaluation for the renovation of the public boat launch facility in Marina Del Rey. The renovation includes rehabilitation of the pavement in the parking lot, replacement of the launch ramp pavement, new guide piles for the boarding floats, and bearing piles for the accessible gangway landing platform. The existing parking lot and launch ramp are west of Admiralty Way between Fiji Way and Mindanao Way, leading into Basin H.

1.0 PROPOSED DEVELOPMENT

The proposed renovation consists of demolition of the existing boat launching ramp, construction of a new ramp and replacement of three boarding floats. In addition, an accessible gangway and boarding float is proposed. The new ramp is proposed to be at approximately 7(horizontal):1 (vertical) slope and 156 feet long and 153 feet wide. We understand the new ramp will be built in the dry using a temporary sheet pile coffer dam. The proposed new boarding floats are approximately 9 feet wide and 200 feet long. The abutment for the 80 foot ADA gangway will be pile supported. At the end of the gangway the accessible boarding float is approximately 87 feet long and 16 feet wide.

Within Basin H, near the area of the proposed renovation, the mudline elevation varies from approximately -2 to -10 feet MLLW.

2.0 GEOTECHNICAL SCOPE OF WORK

The scope of services described below was performed to provide geotechnical engineering recommendations for the proposed improvements. This evaluation was conducted by or under the direct supervision of a State licensed geotechnical engineer. Our evaluation included the following:

Archival Review

Pertinent geologic/geotechnical data in our files was reviewed including regional geologic maps and reports. Additionally, available geotechnical data in the vicinity of the proposed launch ramp, and boarding floats provided by you was reviewed.

Field Exploration

To evaluate the soil conditions in the parking lot five borings were excavated to depths of approximately 5 feet below the existing ground surface (bgs) at the approximate locations shown on the attached Boring Location Map, Plate 1A. A subcontractor supplied and operated hollow-stem auger drill rig was used to advance the borings. An engineer from this office logged the underlying materials and obtained bulk and relatively undisturbed drive soil samples for laboratory analyses. The drive samples were obtained using an automatic hammer weighing 140 pounds with a 30-inch drop.

Prior to starting subsurface exploratory operations, the exploration locations were marked in the field and Underground Service Alert (USA) was contacted to locate utilities per state mandated protocols.

Upon completion of logging and sampling, the borings were backfilled with the spoils and topped with asphalt cold patch. However, boring backfill may settle over time and the property owner or designated representative should periodically observe the boring locations and fill any depressions should they develop.

Laboratory Testing

A limited program of geotechnical laboratory testing was performed to evaluate geotechnical properties of selected earth material samples obtained during the subsurface exploration. Testing performed included in-situ moisture content and dry density as well as R-value testing by a subcontracted laboratory.

Engineering Analyses and Report Preparation

The results of our laboratory testing, in conjunction with our field findings and archival review, were the basis for our geotechnical analysis of the proposed parking lot rehabilitation and boarding floats and gangway landing. This report has been prepared to present our discussions and preliminary geotechnical recommendations and includes:

- a) A description of soil and groundwater conditions, as encountered during the subsurface exploration, including logs of the exploratory borings and a Boring Location Map, Plate 1A;
- b) A summary description of soil conditions as obtained from available geotechnical information and reports, including the available boring logs from prior explorations by others and a Boring Location Map, Plate 1B showing the location of the relevant borings;
- c) A description of the current and reviewed laboratory testing programs, including tests results.
- d) Discussion and additional geotechnical recommendations regarding:
 - Geotechnical recommendations regarding site preparation and grading;
 - Preliminary recommendations for construction of the proposed parking lot improvements;
 - Geotechnical data for use in sheet pile coffer dam design;
 - Geotechnical recommendations for the concrete ramp; and
 - Geotechnical recommendations for gangway landing platform piles and boarding float guide piles including lateral and vertical pile capacities, and installation recommendations.

3.0 SITE CONDITIONS

3.1 SURFACE CONDITIONS

The site presently contains the launch ramp, three boarding floats and the paved parking lot to the east. Alligator cracking and some linear cracking were observed in the pavement.

3.2 SUBSURFACE CONDITIONS – PARKING LOT

Asphaltic concrete, 3 to 5 inches thick, overlying no aggregate base, was encountered in the borings. The pavement section was underlain by fill soils to the maximum depth explored of 5 feet. As encountered in our exploratory borings the fill soils (probably hydraulic) consisted of silty and sandy clays, silty to poorly graded sands and some silt. The materials were in a damp to wet condition and loose to medium dense and medium stiff. Descriptions of the encountered earth materials are presented on the attached boring logs (Appendix A).

3.3 WATER

Groundwater in the prior borings was encountered at approximate depths of 4 to 10 feet or approximate elevation of 0 to +2 MLLW. Water in the recent parking lot borings was not encountered to the maximum depth explored of 5 feet. Water in the area of the proposed launch ramps is expected to vary with the tide. The mudline in the area of the toe of the ramp is at an average elevation of -10 feet MLLW.

3.4 SUBSURFACE CONDITIONS – BOARDING FLOATS AND GANGWAY LANDING

3.4.1 Summary of Data Available

Geotechnical data was obtained from the above referenced data and reports. Data obtained from each source is summarized below.

Reference 1

Reference 1 contained plan sheets of boring logs that were drilled for the original Marina Del Rey development. Five borings were previously drilled in the vicinity of the subject docks and three borings were drilled in the parking lot. Borings drilled near the proposed Basin H improvements varied in depth from 21 feet to 53 feet and were generally drilled from elevations of +6 to +7. This data contained soil descriptions only, no blow counts or laboratory data were presented.

The borings were deep enough to provide descriptions of soils at elevation -10 feet mudlines and up to approximately 5 to 35 feet below -10 feet mudlines. The boring data at the mudline and in the upper soils below the mudline provided information for evaluating lateral pile capacities.

Reference 2

Reference 2 contains borings and geotechnical data from 1996 pertaining to the Marina Del Rey Seawall Refurbishment Project. Two borings are in the vicinity of the subject docks and were drilled to depths of 45.5 feet and 60.5 feet below ground surface elevation of approximately +10 feet. Blow counts to drive the soil sampler and laboratory test data are available for these borings. All borings penetrated the expected mudline depths.

3.4.2 Summary of Data on Boring Logs

The borings indicate that generally there is 1½ to 3 feet of silt overlying clay on the north side of the basin and sand on the south side overlying a layer of silty clay to clayey silt and then sand. The sand is present at approximate elevations of -10 to -17½ and becomes denser and coarser with depth. The sands and sand and gravel layers with varying degrees of coarseness are medium dense to dense, occasionally with some silt and cobbles.

3.4.3 Profile Used in Lateral Pile Analysis for Guide Piles

The above soil data was generalized into a single profile for the purpose of evaluating lateral pile capacities. From the mudline down, the following profile was used:

DEPTH BELOW MUDLINE (in feet)	SOIL DESCRIPTION	COHESION (psf) or FRICTION (degrees)	BUOYANT SOIL DENSITY (lbs./cu. ft.)
0 to 5	soft to medium stiff Clay	365 psf	41
5 to 20	medium dense Sand	31°	51
Greater than 20	med dense to dense Sands	33°	68

3.4.4 Profile Used in Abutment Pile Analysis

The soil profile used for analyses of the areas of the proposed ADA gangway ramp is presented in the table below.

DEPTH BELOW ABUTMENT (in feet)	SOIL DESCRIPTION	COHESION (psf) or FRICTION (degrees)	BUOYANT SOIL DENSITY (lbs./cu. ft.)
0 to 9	soft to medium stiff Clay	365 psf	41
9 to 26	medium dense Sand	31°	51
Greater than 26	med dense to dense Sands	33°	68

4.0 CONCLUSIONS AND RECOMMENDATIONS – BOARDING FLOATS

4.1 GENERAL

From a geotechnical standpoint, the proposed boarding floats and launch ramp may be developed; geotechnical recommendations presented in the following sections of this report should be incorporated into the design and construction of the project. Geotechnical recommendations concerning guide piles and the ADA gangway pile supported abutment are provided herein.

4.2 GUIDE PILES

4.2.1 Design Data

Driven friction piles may be used for support of the float guide piles. Lateral loads are the primary load associated with the guide piles. A discussion of lateral pile capacities, pile installation, and other design and construction issues are provided in the following sections.

4.2.2 Lateral Pile Capacity - Guide Piles

The lateral capacity of piles and the response of piles to lateral loading were analyzed using the computer program LPILE by Ensoft. The program uses p-y curves to model the pile-soil reaction to applied moments and lateral loading. Fourteen- and sixteen-inch square piles and 16-inch round piles were evaluated for a mudline elevation of approximately -10 MLLW and lateral loads of 1 and 2 kips being applied at high tide plus dock thickness (elev. +10 MLLW). The lateral load, mudline moment and deflection at the mudline for each case, is presented in the table below. The results of the analyses are presented in Appendix C. The depth on the graphs in Appendix C is measured from the application of the load. Minimum pile embedment for 14-inch and 16-inch diameter piles is 16 feet below mudline.

LATERALLY LOADED GUIDE PILES Load Applied at +10 Feet				
PILE	Mudline Elevation (feet)	Applied Load (kips)	Mudline Moment (kip feet)	Approximate Mudline Deflection (inches)
14" square	-10	1	20.1	1/8
		2	40.2	1/3
16" square	-10	1	20.0	1/10
		2	40.1	1/4
16" round	-10	1	20.1	1/8
		2	40.2	1/3

4.3 ABUTMENT FOUNDATIONS

4.3.1 Design Data

Driven friction piles may be used for support of the ADA gangway abutment. Downward loads are the primary loads for the ADA gangway abutment. A discussion of shallow foundations, vertical and lateral pile capacities, pile installation, and other design and construction issues are provided in the following sections.

4.3.2 Axial Pile Capacity - Abutment Piles

The axial load capacity of driven concrete piles is based on the frictional resistance developed between the pile shaft and the surrounding soils. The axial capacity curve for 14-inch square piles are presented in Appendix C. The embedment length should be measured from two feet below the bottom of the rock revetment at the location of the abutment piles.

The capacities given are allowable and include a factor of safety of two for downward loads. The capacities may be increased by one-third for short term wind or seismic loads. Uplift capacities may be taken as one-half the downward capacity. The weight of the pile may be added to the uplift capacities and should be neglected in determining downward foundation loads.

4.3.3 Vertical Settlement

The estimated settlement of properly designed and constructed friction piles is expected to be on the order of ½ inch, or less. The differential settlement between similarly loaded piles is not expected to exceed ¼ inch.

4.3.4 Lateral Pile Capacity - Abutment Piles

The lateral capacity of piles and the response of piles to lateral loading were analyzed using the computer program LPILE by Ensoft. The program uses p-y curves to model the pile-soil reaction to applied moments and lateral loading. The lateral pile capacity of the abutment piles was evaluated for 14-inch square piles, a minimum of 40 feet long. The deflection due to loading of 2.35 kips is presented for piles in a free head condition. The results of the analyses are presented in Appendix C.

4.4 PILE INSTALLATION

Based upon the reviewed boring logs and the anticipated pile length on the order of 40 feet, the piles will generally be driven through clay materials into medium dense to dense sands, some with gravel.

4.5 LAUNCH RAMP

We understand the new ramp will be constructed in the dry by use of a coffer dam, designed by others.

4.5.1 Excavations

Excavations should be sloped due to the sandy nature of the soils. Temporary excavations may be sloped at 1½ (horizontal): 1 (vertical) and permanent slopes should be sloped at 2:1.

4.5.2 Cofferdam and Dewatering

We understand that the ramp improvements are to be constructed in the dry. This will require installation of a sheet pile cofferdam around the area of construction and dewatering within the cofferdam. The cofferdam is to be designed by others. The following data may be used in the design of the sheet piles for the cofferdam.

The soils encountered in the reviewed borings and tested for shear strength were predominately sandy clay and medium dense to dense sandy soils. A composite of the samples tested for the seawall, indicate the underlying soils have a shear strength of 350 psf cohesion and a friction angle of 31 degrees. The wet density of the underlying soils is 105 to 125 pcf and the buoyant unit weight is 41 to 61 pcf.

Corresponding active and passive soil pressures in a submerged condition are 15 pcf and 200 pcf respectively. These values do not contain a factor of safety.

4.6 SITE PREPARATION AND GRADING

The following site preparation and grading recommendations are for the preparation of the development area for construction of the proposed structures and other site improvements. All aspects of grading including site preparation, grading, and fill placement should be per the applicable Building Code.

4.6.1 Demolition

The existing ramp and guide piles should be demolished and removed from the site.

4.6.2 Stripping

Any vegetation and/or debris in the area of construction should be removed prior to construction.

4.6.3 Soil Removals

Within the footprint of the proposed launch ramp and to a distance of five feet beyond all loose soils and soils disturbed by the removal of the existing facilities should be removed to firm native ground. We estimate the depth of removals to be on the order of one to two feet depending upon soils disturbed during demolition.

After these removals are completed as addressed above, the exposed ground surface should be observed by a field representative of this office to confirm that it is suitable for placement of certified fill. No fill soils may be placed until completion of the geotechnical observation. If soils exposed in the approved bottom are too wet to properly place and

compact fill upon, the approved bottom soils may require improvement through the use of geotextile fabric, placement of gravel/rock or other approved alternative.

4.6.4 In-Place Soil Processing

Following removals, the underlying 8 to 12 inches should be scarified; moisture conditioned to near the optimum moisture content and recompact to at least 90% of the maximum dry density as determined by ASTM D 1557. If the soils are wet and pumping, improvement as describe above may be required.

4.6.5 Fill Placement

On-site soils may be reused as fill soils providing the soils are free of major vegetation, trash and debris. Per the applicable building code, rocks greater than 12 inches in diameter should be excluded from all fills placed. Suitable fill soils should be placed in thin (8 to 12 inch maximum) lifts, brought to above optimum moisture content, and compacted to at least 90% of the maximum dry density as determined by ASTM D 1557. If any import soils are needed, the soils should be approved by the project geotechnical consultant prior to transport to the site.

4.7 RAMP SLABS-ON-GRADE

Ramp slabs may be 8 inches thick and reinforced with #3 bars at 24 inches on center each way or per the structural engineer's recommendations. Slabs should be underlain by 6 inches of aggregate base or gravel. A filter fabric should be placed on the slab subgrade prior to placing aggregate base or gravel to prevent migration of subgrade soils into the base or gravel. The presence of the filter fabric will reduce the ultimate coefficient of friction between the ramp slab and the underlying subgrade soils to approximately 0.45. Without the filter fabric the coefficient of friction between the ramp slab and the underlying soils would be approximately 0.6. As an alternative to placing filter fabric, a two layer soil filter system could be used consisting of a 6 inch thick fine layer placed on the subgrade soils overlain by a 6 inch coarse layer.

Weep holes are necessary to reduce the potential for differential uplift pressure on the slab when tide levels are ebbing. Weep holes, 3 inches in diameter should be placed through the slab on a grid layout a maximum spacing of 5 to 6 feet center to center. We recommend that keying and doweling be provided at all cold joints between adjacent slab pours to reduce the potential for differential movement between adjacent slab sections.

The perimeter edges of the ramp slab should have deepened edges/footings to improve edge bearing capacity and to provide containment for the sand/ gravel underlayment. The toe of the ramp should also have a deepened edge to resist the forces imparted to the ramp from vehicles braking as boats are launched and from vehicles accelerating as boats are pulled out of the water. The perimeter edge depth should be at least two feet.

Concrete slabs on grade should be provided with tooled crack control joints at 10 to 15 foot centers or as specified by the slab designer. We suggest scoring (tooled crack control joints) the sidewalks into square panels (a 5-foot wide sidewalk should be scored every 5 feet). Crack control joints should be tooled during construction where saw cut access is not possible.

Shrinkage cracking can become excessive if water is added to the concrete above the allowable limit and proper finishing and curing practices are not followed. Concrete mixing, placement, finishing and curing should be performed per the Portland Cement Association guidelines.

5.0 CONCLUSIONS AND RECOMMENDATIONS – PARKING LOT

5.1 PARKING LOT

The existing pavement section, where explored, consisted of 3 to 5 inches of asphaltic concrete. It appears that the section was installed at two different times. There is no base underlying the pavement. The asphalt pavement exhibits alligator cracking and some linear cracking.

The soils underlying the pavement were varied and consisted of both clays and sands. A sample of the clay soil was sent to a laboratory for R-Value testing. The resulting R-Value was an 8. This indicates the pavement section should consist of asphalt overlying aggregate base.

Presented below are recommendations for either removal and replacement of the pavement section or rehabilitation of the pavement section.

5.2 RECOMMENDATIONS FOR NEW PAVEMENT SECTION

Presented below are preliminary structural section recommendations for the parking and drive areas at the site. The structural sections are based on a range of traffic indices and an “R” value of 8. Actual traffic indices should be confirmed.

PAVEMENT SECTIONS		
Traffic Index	Asphaltic Concrete Sections “R” Value = 8	
		FULL DEPTH AC
4.5	3” AC / 8” AB	6½” AC / NO AB
5.0	3” AC / 10” AB or 4” AC / 7” AB	7¼” AC / NO AB
5.5	3” AC / 12” AB or 4” AC / 9” AB	8½” AC / NO AB
AC = Asphaltic Concrete AB = Aggregate Base		

5.2.1 Subgrade Preparation

The subgrade soils within areas of proposed paving should be moistened to slightly above the optimum moisture content and compacted to at least 90% of the laboratory standard prior to placing aggregate base.

5.2.2 Aggregate Base Preparation

The aggregate base materials should be placed in thin (6 inch maximum) lifts, moistened to slightly above the optimum moisture content and compacted to at least 95% of the laboratory standard.

5.3 RECOMMENDATIONS FOR PAVEMENT REHABILITATION

As an alternate to complete removal and replacement of the existing pavement section, it may be possible to provide a paving mat and a minimum thickness of asphaltic concrete to create a suitable pavement surface. If the grade cannot be raised the existing surface would need to be milled or ground down.

A preliminary section for the rehabilitated pavement section would be utilizing GlasPav25, a Tensar product, overlain by two inches of new asphaltic concrete.

6.0 SITE DRAINAGE

Positive drainage should be provided to approved drainage devices. Water should not be allowed to gather or pond. In addition, planters near the pavement should be constructed so that irrigation water will not saturate pavement subgrade soils.

7.0 PLAN REVIEW

The final plans should be reviewed by the project geotechnical consultant as they become available. Revised and/or additional geotechnical recommendations will be provided as required.

8.0 CLOSURE

This report was prepared under the direction of a licensed geotechnical engineer. No warranty, express or implied, is made as to conclusions and professional advice included in this report. Gorian and Associates, Inc. disclaim any and all responsibility and liability for problems that may occur if the recommendations presented in this report are not followed.

This report was prepared for Noble Consultants, Inc. and their design consultants solely for the design and construction of the development described herein. This report may not contain sufficient information for other uses or the purposes of other parties. These recommendations should not be extrapolated to other areas or used for other facilities without consulting Gorian and Associates, Inc.

The conclusions and recommendations contained herein are based on interpretations of the subsurface conditions concluded from information gained from subsurface explorations and a surficial site reconnaissance as well as available subsurface exploratory work performed by others. The interpretations may differ from the actual subsurface conditions, which can vary horizontally and vertically across the site. Due to the possible subsurface variations, this office should observe all aspects of field construction addressed in this report.

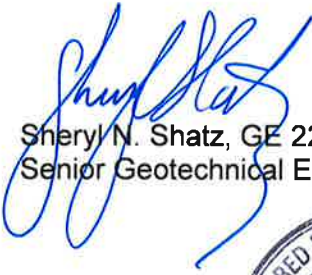
Any person using this report for bidding or construction purposes should perform such independent investigations as they deem necessary.

We recommended all earthwork be observed and tested by the project geotechnical consultant including site stripping, removals and placement of compacted fill. The work should be performed per the current applicable Building Code. However, the services of the geotechnical consultant should not be construed to relieve the owner or contractors of their responsibilities or liabilities.

-oOo-

We appreciate the opportunity to submit this geotechnical report and look forward to continuing our service on the project design and construction team. Please call if you have any questions concerning this report, or require any additional information.

Respectfully submitted,
GORIAN AND ASSOCIATES, INC.



Sheryl N. Shatz, GE 2288
Senior Geotechnical Engineer



Distribution: Addressee via e-mail

REFERENCES

George F. Nicholson, Consulting Engineer and Associates, October 9, 1959, Marina Del Rey Bulkheads Plan Sheets 2, Test Hole Location Map, and Sheets 4, Test Hole Logs – Basin A & H, and 5, Test Hole Logs – Basin B & H, Marina Del Rey, California.

Geo-Environmental, Inc. (GEI), March 31, 1996, Additional Geotechnical Investigation Report (Project Report No. 06-95093-4), Marina Del Rey Seawall Refurbishment Project, Marina Del Rey, California.

EXPLANATION

B-5 Approximate Location of Exploratory Boring (Gorian, 2015)

TH 612 Approximate Location of Exploratory Boring (Maurseth & Howe, 1956-59)

Lot #2 Capacity

Cars: 466

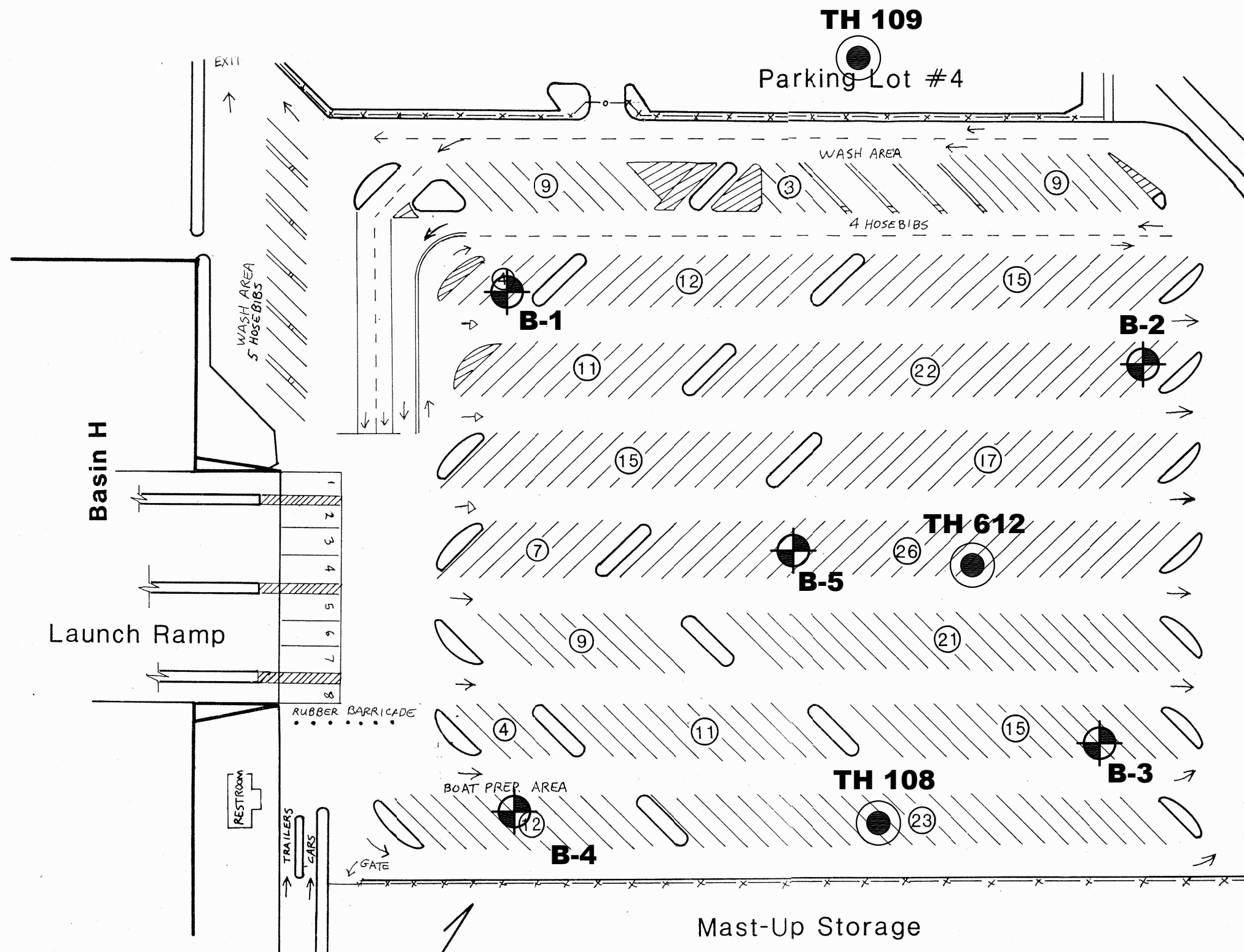
or

Cars & Trailers: 233

Boat Prep: 12

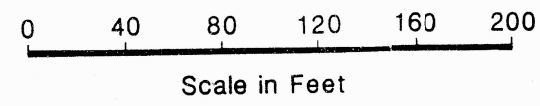
Wash Area: 13

Circled figures show number of spaces for vehicles with trailers. Double these numbers for amount of single car spaces.



Mast-Up Storage

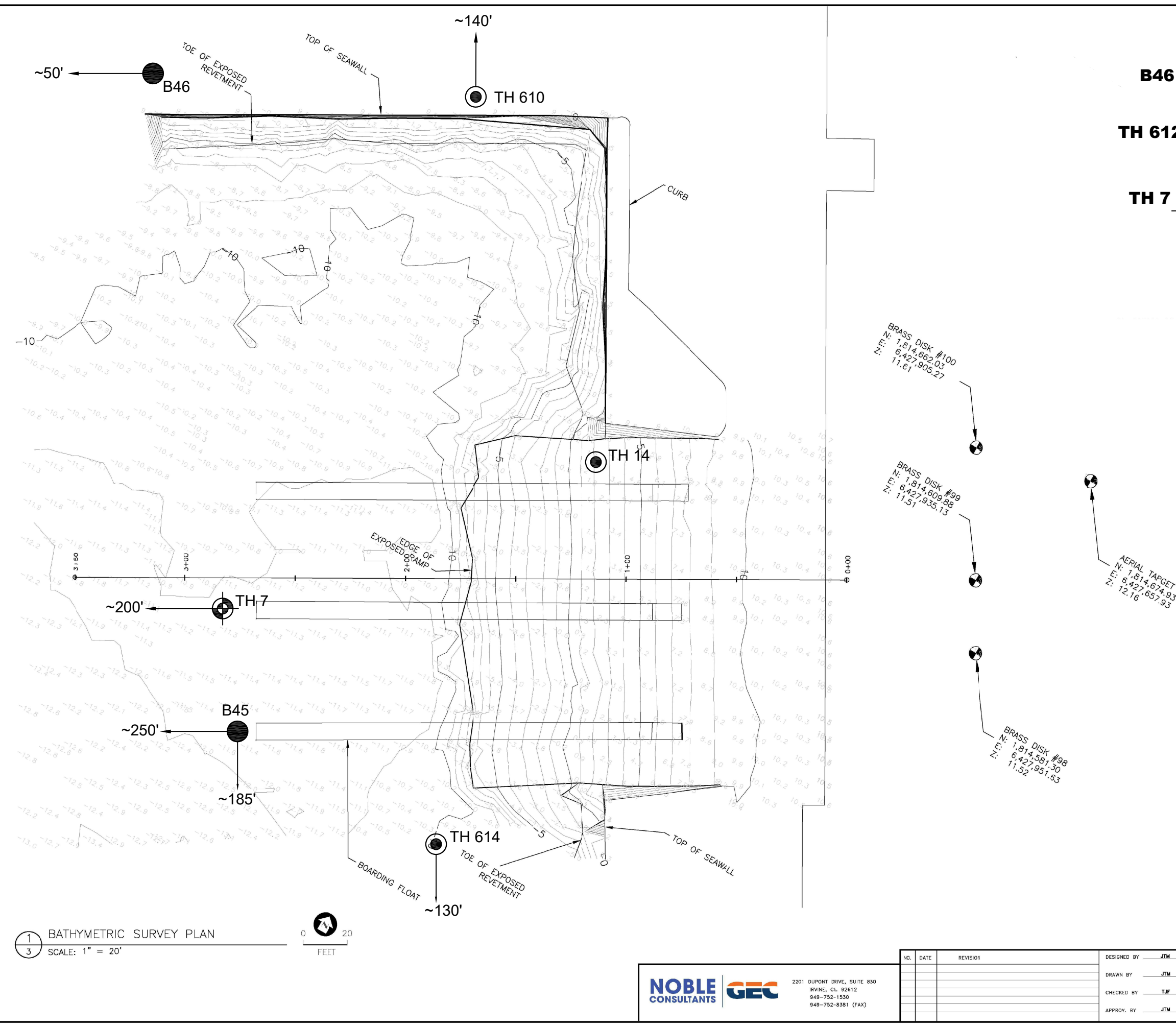
Parking Lot # 2 (Parcel 49R)
Marina del Rey
 L.A. County Dept. of Beaches & Harbors
 5/87



011127

BORING LOCATION MAP

Gorlan & Associates, Inc. <i>Applied Earth Sciences</i>	
Job No: 3047-0-0-101	Date: April 2019
Scale: 1" = 80'	Drawn by:
	Approved by:
PLATE 1A	



EXPLANATION

- B46** ● Approximate Location of Exploratory Boring (GEI, 1996)
- TH 612** ⊙ Approximate Location of Exploratory Boring (Maurseth & Howe 1956-59)
- TH 7** ⊕ Approximate Location of Exploratory Boring (Corps of Engineers, 1945)

ELEVATION INFORMATION FOR SANTA MONICA, CA TIDE GAGE
STA ID 9410840

HIGHEST OBSERVED (1983) — 8.497
MHHW — 5.423
MHW — 4.685
MSL — 2.785
NGVD 29 — 2.649
MLW — 0.928
NAVD 88 — 0.187
MLLW — 0.0
LOWEST OBSERVED (1933) — -2.844

- BRASS DISK #100
N: 1,814,662.03
E: 6,427,905.27
Z: 11.61
- BRASS DISK #99
N: 1,814,609.88
E: 6,427,935.13
Z: 11.51
- AERIAL TARGET POINT #5
N: 1,814,674.93
E: 6,427,657.93
Z: 12.16
- BRASS DISK #98
N: 1,814,581.30
E: 6,427,951.63
Z: 11.52

BORING LOCATION MAP

G Gorian & Associates, Inc.
Applied Earth Sciences

Job No: 3047-0-0-101	Date: April 2019
Scale: N.T.S.	Drawn by: _____
	Approved by: _____
PLATE 1B	

90% COMPLETE: PRELIMINARY - NOT FOR CONSTRUCTION

1 BATHYMETRIC SURVEY PLAN
3 SCALE: 1" = 20'
0 20 FEET

NOBLE CONSULTANTS | **GEC**

2201 DUPONT DRIVE, SUITE 830
IRVINE, CA 92612
949-752-1530
949-752-8381 (FAX)

NO.	DATE	REVISION

DESIGNED BY: **JTM**
DRAWN BY: **JTM**
CHECKED BY: **TJF**
APPROV. BY: **JTM**

LOS ANGELES COUNTY - DEPT OF BEACHES & HARBORS

BATHYMETRIC SURVEY

MARINA DEL REY BOAT LAUNCH FACILITY RENOVATION

SHEET **3** OF **50**

JOB NO. **928-79**

SCALE **AS SHOWN**

DATE **2 JAN 2019**

APPENDIX A
LOGS OF SUBSURFACE DATA

T.H.110

0.0	El. +5.6
3	ML SILT-gray
5	CL CLAY-light gray
7	W SAND fine, brown
10	SP
13	SC SAND-clayey, gray
20	ML SILT-blue gray numerous sea shells
23	SM SAND-silty
32	GP SAND & GRAVEL

T.H.611

0.0	El. +5.0
1.0	ML SILT-clayey
4.0	W CLAY green-brown CLAY light green
9.5	CH
13.0	ML CLAY-brown silty slightly sandy sea shells SILT-gray clayey sea shells
19.0	CL CLAY dark gray silty slightly sandy
21.0	GP SAND, GRAVEL and large PEBBLES gray, silty

T.H.610

0.0	El. +6.0
2.0	ML SILT-dark brown sandy
5.5	OL CLAY-brown silty slightly sandy organic matter
6.0	W
12.0	SM SAND-fine gray-brown (mottled) silty sandy SILT lenses, pebbles
16.0	CL CLAY dark gray silty slightly sandy
21.0	SM SAND gray silty
	GP SAND and GRAVEL

T.H.14

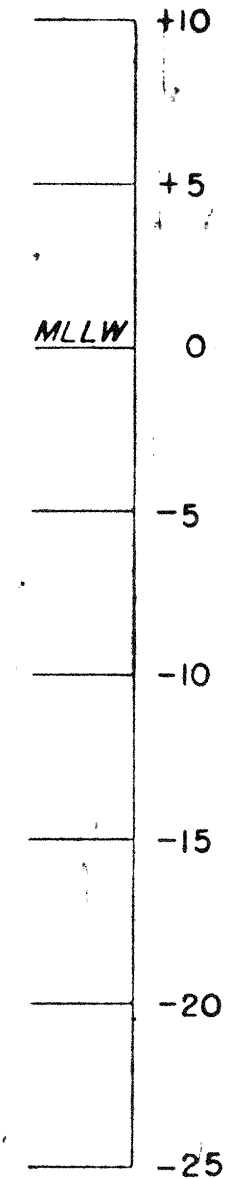
0.0	El. +6.0
2	ML SILT-gray
6	CL CLAY-gray
13	SP SAND-fine, gray & brown
22	ML SILT-blue gray, sea shells

T.H.109

0.0	El. +6.3
3	ML SILT-gray
5	CL CLAY-light gray
7	SP SAND-fine
17	ML SILT-blue gray, sand layers, sea shells
25	GP SAND & GRAVEL-gray SAND & GRAVEL-some cobbles

T.H.612

0.0	El. +6.3
1.5	ML SILT-gray brown, sandy
4.0	CL CLAY-brown silty
6.5	W SAND-fine gray-brown (mottled) silty sea shells
8.5	SM
13.5	ML SILT dark gray sandy sea shells SAND-fine dark gray silty thin silty CLAY lenses
21.0	SC



Log of Boring No. B-45

Date Drilled: 3/4/96 Logged by: JSW Project Manager: FHS
 Equipment: Mobile B61 Driving Weight and Drop: 140 lb / 30 in
 Surface Elevation(ft): 10 ± 0.5 Tide Elevation [ft(MLLW)]: +5.4

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	LABORATORY TESTS
			DRIVE	BULK				
		ASPHALT CONCRETE						
		<u>Artificial Fill</u> SILTY SAND (SM) , brown, medium dense, moist, fine to coarse grained, some gravel, isolated clayey silt pockets			17	12.7	118.7	
5		<u>Native Soil</u> CLAYEY SILT (ML) , gray, very loose, very moist to wet, micaceous			1	39.4	72.2	
		SILTY SAND (SM) , gray, loose, very moist to wet, micaceous						
10	▽				5	35.6	75.1	
		very loose, wet, fine grained, some clay			1	34.2	74.7	
20		large pieces of wood, no sample recovered						
		CLAYEY SAND (SC) , gray, loose, very moist, fine grained, piece of wood @ 25.5			5	30.7	96.2	
30		POORLY GRADED SAND (SP) , gray, medium dense, wet, fine grained						
		lense silty sand			22	24.6	95.5	SA
		medium dense, wet, fine grained			15			

GEO. MDREY 3/22/96



GEO-ENVIRONMENTAL, INC.






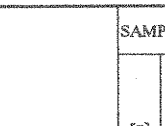
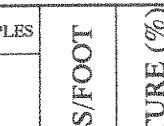
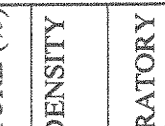
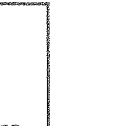
Project Name: **Seawall Refurbishment Project**
 Marina Del Rey, California

Project No. **051-1**

Plate **A-6a**

Log of Boring No. B-45

Date Drilled: 3/4/96 Logged by: JSW Project Manager: FHS
 Equipment: Mobile B61 Driving Weight and Drop: 140 lb / 30 in
 Surface Elevation(ft): 10 ± 0.5 Tide Elevation [ft(MLLW)]: +5.4

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	LABORATORY TESTS
			DRIVE	BULK				
		SANDY CLAY (CL) , gray, stiff, wet, micaceous, fine grained sand	■			31.2	116.2	
		POORLY GRADED SAND (SP) , gray, medium dense, wet, fine grained						
40		PEAT (PT) , brown, stiff, moist, fibrous	■		13	138.1	52.9	
								
45		POORLY GRADED SAND (SP) , gray, medium dense, wet, fine grained	■		20	244.8	24.5	
								
50								
								
55		dense, wet, fine to coarse grained	■		31	22.7	103.2	
60		dense, wet, fine grained	■		> 50	18.3	104.4	
65		Boring terminated at 60.5 feet below ground surface. Groundwater encountered at approximately 10 feet below ground surface during drilling. Boring backfilled with soil cuttings and patched with concrete on 3/4/96.						

GEO. MDREY, 3/29/96



GEO-ENVIRONMENTAL, INC.

Project Name:
 Seawall Refurbishment Project
 Marina Del Rey, California

Project No.
 051-1

Plate
 A-6b

Log of Boring No. B-46

Date Drilled: 3/4/96 Logged by: JSW Project Manager: FHS
 Equipment: Mobile B61 Driving Weight and Drop: 140 lb / 30 in
 Surface Elevation(ft): 10 ± 0.5 Tide Elevation [ft(MLLW)]: +1.0

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	LABORATORY TESTS
			DRIVE	BULK				
	[Diagonal Hatching]	ASPHALT CONCRETE						
	[Dotted Pattern]	Artificial Fill SANDY CLAY (CL) , gray, firm, moist, mottled						
5	[Vertical Lines]	Native Soil SILTY SAND (SM) , gray brown, loose, very moist, fine grained, iron oxide stains	█		6	37.5	75.9	
10	[Vertical Lines]	∇ wet, iron oxide stains	█		8	32.0	82.7	
15	[Diagonal Hatching]	FAT CLAY (CH) , gray, soft, very moist to wet, micaceous	█		3	46.0	70.6	
	[Diagonal Hatching]	CLAYEY SAND (SC) , gray, loose, wet, fine grained	█					
20	[Diagonal Hatching]	SANDY CLAY (CL) , gray brown, stiff, very moist	█		10			
	[Diagonal Hatching]	lense Clayey Sand	█					
25	[Diagonal Hatching]	blue gray, stiff, very moist	█		23	27.8	89.9	
	[Diagonal Hatching]	CLAYEY SAND (SC) , gray, medium dense, wet, fine grained	█					
	[Diagonal Hatching]	SILTY SAND (SM) , blue gray, dense, wet, fine to coarse grained	█					
30	[Diagonal Hatching]	dense, wet, fine to medium grained	█		39	18.8	111.2	SA
	[Diagonal Hatching]	dense to very dense, wet, fine to coarse grained, gravel to 2"	█		> 50			

GEO. MDREY 3/29/96



GEO-ENVIRONMENTAL, INC.


Project Name:
 Seawall Refurbishment Project
 Marina Del Rey, California

Project No.
 051-1

Plate
 A-7a

Log of Boring No. B-46

Date Drilled: 3/4/96 Logged by: JSW Project Manager: FHS
 Equipment: Mobile B61 Driving Weight and Drop: 140 lb / 30 in
 Surface Elevation(ft): 10 ± 0.5 Tide Elevation [ft(MLLW)]: +1.0

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	LABORATORY TESTS
			DRIVE	BULK				
40		<p>POORLY GRADED SAND (SP), gray, dense, wet, fine grained, trace gravel</p>	■		34	14.0	112.2	
45		<p>very dense, wet, fine to medium grained</p>	■		> 50	15.3	105.0	
50		<p>Boring terminated at 45.5 feet below ground surface. Groundwater encountered at approximately 9 feet below ground surface during drilling. Boring backfilled with soil cuttings and patched with concrete on 3/4/96.</p>						
55								
60								
65								

GEO. MDREY_3/29/96



GEO-ENVIRONMENTAL, INC.

Project Name:
 Seawall Refurbishment Project
 Marina Del Rey, California

Project No.
 051-1

Plate
 A-7b

APPENDIX B LABORATORY TESTING

General

Laboratory test results on selected bulk soil samples are presented below. Tests were performed to evaluate the physical and engineering properties of the encountered earth materials.

Field Density and Moisture Tests

In situ dry density and moisture content were evaluated from the relatively undisturbed drive samples obtained during exploratory operations. The test results and a detailed description of the earth materials encountered are shown on the attached Logs of Subsurface Data, Appendix A.

Optimum Moisture-Maximum Density Curve

Maximum density/optimum moisture tests (compaction characteristics) were performed on a selected bulk sample of the encountered materials. The results are as follows:

Sample	Visual Soil Classification	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-2 @ 1-3'	Dark gray sand and clay	127.4	8.3

"R" Value Determination

An "R" Value determination was conducted by a subcontractor on the typical soil type encountered in the proposed pavement area. The test was performed in general accordance with the California State Test Method No. 301-F. An "R" Value of 8 is indicated. The test results are attached.



November 6, 2015
Lab No. 35110-3
File No. 15-7492-3

Gorian & Associates, Inc.
3595 Old Conejo Road
Thousand Oaks, CA 91320

**SUBJECT: R-Value Testing
Samples Delivered to Laboratory**

Gentlemen:

Pursuant to your request, R-Value testing was performed on soil sample delivered to our laboratory. R-Value testing was performed in accordance with California Test 301-F criteria. The test results follow:

R-VALUE RESULTS

PROJECT: Noble - MDR Parking Lot 49, Marina Del Rey, #3047-0-0-100
LOCATION: B-4 @ 0 - 2'

Soil Description: Black brown fine sandy clay

<u>ITEM</u>	<u>1</u>	<u>2</u>	<u>3</u>
Compaction Pressure – psi	100/125	125/175	150/200
Initial Moisture - %	16.9	16.9	16.9
Moisture at Compaction - %	18.4	17.4	16.9
Density – pcf	108.9	108.1	111.8
R-Value	7	9	12
Exudation Pressure	237	307	388
Expansion Pressure thickness ft.	0.33	0.00	0.13

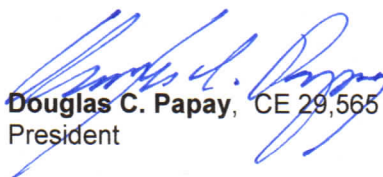
Assigned R-Value: 8*

Footnote:

* Please verify R-value is correct based upon expansion thickness requirement (see California Test 301-F procedures)

Thank you for allowing *Pacific Materials Laboratory, Inc.* to be of service. If we may be of further service regarding this or other geotechnical issues, please do not hesitate to call (805) 482-9801, fax (805) 445-6551, email at pacificmaterialslab@msn.com or write.

Respectfully Submitted,
PACIFIC MATERIALS LABORATORY, INC.

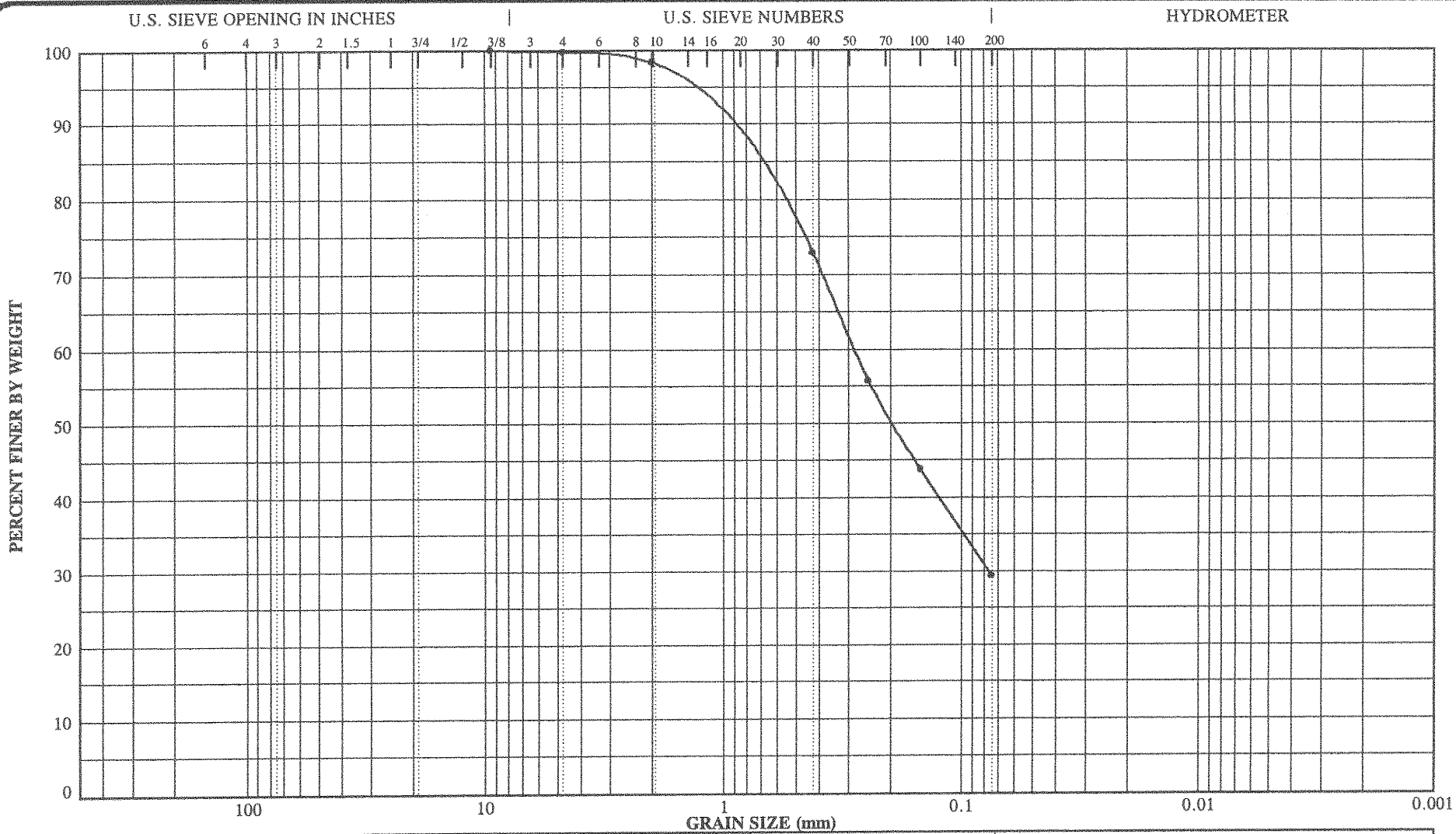

Douglas C. Papay, CE 29,565
President



DCP:dkp
cc: Addressee – Email

Table B1. Summary of Moisture Density, Sieve Analysis and Atterberg Limits Test Results

Boring	Depth (feet)	Soil Classification	Moisture Content (%)	Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Silt & Clay	LL (%)	PL (%)	PI (%)
B-43	59.5-60.0	Poorly Graded Sand (SP)	19.1	106.2						
B-44	3.0-3.5	Lean Clay (CL)	35.6	75						
B-44	14.5-15.0	Poorly Graded Sand (SP)	34.2	85.8						
B-44	19.5-20.0	Fat Clay (CH)	80.2	53.5						
B-44	25.0-25.5	Fat Clay (CH)	52.5	69.9				59	28	31
B-44	29.5-30.0	Fat Clay (CH)	41.4	78.5						
B-44	36.5-37.0	Lean Clay (CL)	34.7	88.9						
B-44	39.5-40.0	Silt (ML)	50.4	64.4						
B-44	44.5-45.0	Peat (Pt)	274.8	24.8						
B-44	49.5-50.0	Silty Sand (SM)	19.5	106.9	0.02	82.84	17.14			
B-45	3.0-3.5	Silty Sand (SM)	12.7	118.7						
B-45	5.0-5.5	Clayey Silt (ML)	39.4	72.2						
B-45	10.0-10.5	Silty Sand (SM)	35.6	75.4						
B-45	14.5-15.0	Silty Sand (SM)	34.2	74.7						
B-45	25.0-25.5	Clayey Sand (SC)	30.7	96.2						
B-45	29.5-30.0	Poorly Graded Sand (SP)	24.6	95.5						
B-45	34.5-35.0	Poorly Graded Sand (SP)	31.2	116.2						
B-45	40.0-40.5	Peat (Pt)	138.1	52.9						
B-45	45.0-45.5	Poorly Graded Sand (SP)	244.8	24.5						
B-45	55.0-55.5	Poorly Graded Sand (SP)	22.7	103.2						
B-45	60.0-60.5	Poorly Graded Sand (SP)	18.3	104.4						
B-46	5.0-5.5	Silty Sand (SM)	37.5	75.9						
B-46	9.5-10.0	Silty Sand (SM)	32	82.7						
B-46	14.5-15.0	Fat Clay (CH)	46	70.6						
B-46	25.0-25.5	Clayey Sand (SC)	27.8	89.9						
B-46	29.5-30.0	Silty Sand (SM)	18.8	111.2	0.17	70.43	29.4			
B-46	40.0-40.5	Poorly Graded Sand (SP)	14	112.2						
B-46	45.0-45.5	Poorly Graded Sand (SP)	15.3	105						
B-47	5.0-5.5	Lean Clay (CL)	37	74.2						
B-47	14.5-15.0	Poorly Graded Sand with Silt (SP-SM)	32.9	83.9						
B-47	19.5-20.0	Poorly Graded Sand with Silt (SP-SM)	30.8	88.9	0.26	89.78	9.96			
B-47	25.0-25.5	Fat Clay (CH)	54.4	66.6						
B-47	30.0-30.5	Lean Clay (CL)	35.1	86.5						



COBBLES	GRAVEL		SAND			SILT or CLAY
	coarse	fine	coarse	medium	fine	

Sample ID: 03076Y/97	Description	%Gravel	%Sand	%Fines	MC%	LL	PL	PI	USCS
B46, 29.5 to 30 ft.	Grey to white, micaceous Silty to Clayey, fine to medium SAND	0.2	70.4	29.4	N/A	N/A	N/A	N/A	SM/SC

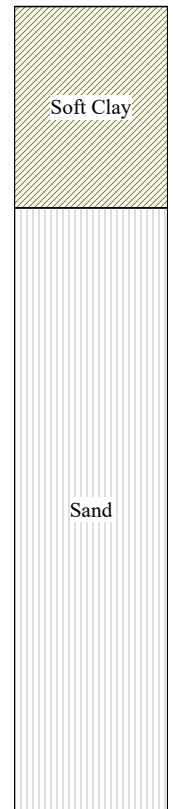
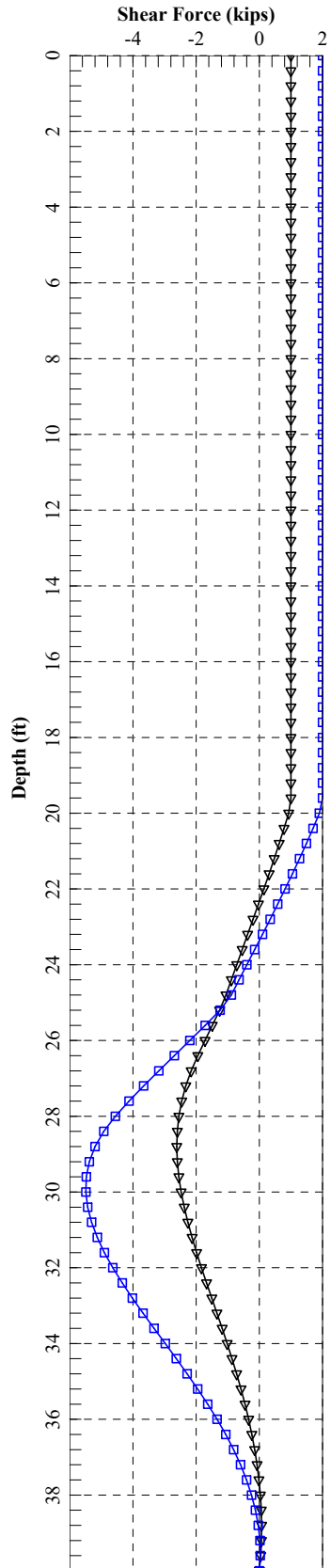
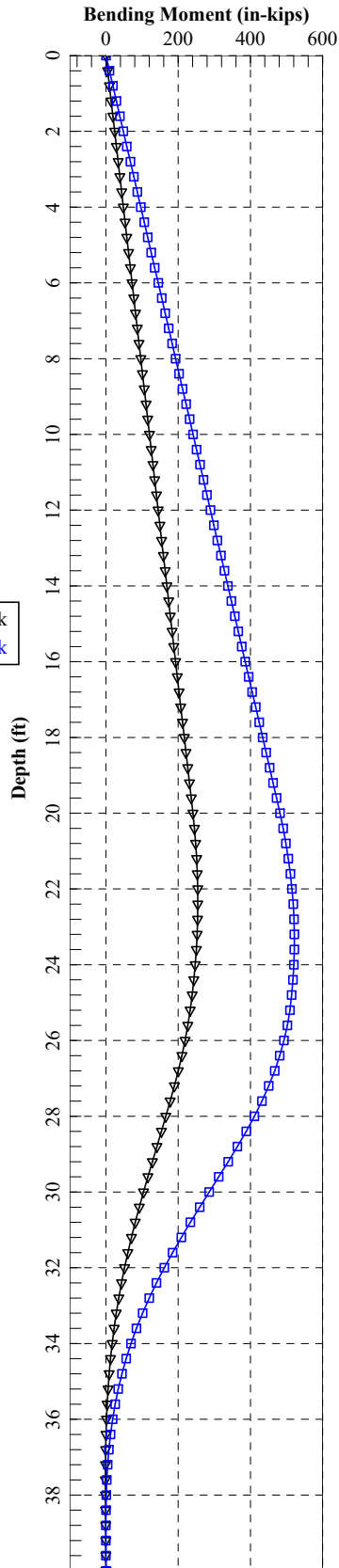
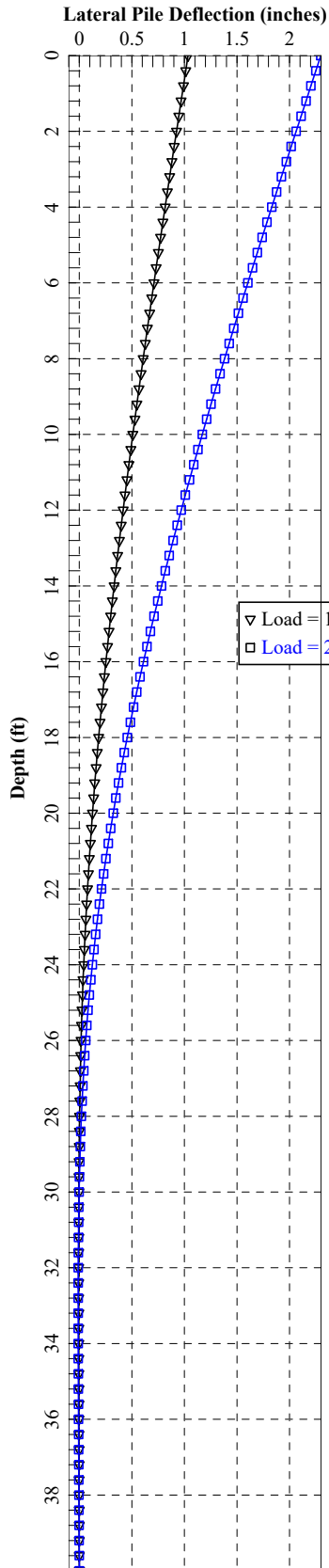
WHITLOCK DALRYMPLE POSTON & Assoc.
 8832 Rixlew Lane
 Manassas, Virginia 22110
 (703) 257-9280

Marina Del Rey Seawall
 Los Angeles, California
 WDP Project No.: 06-95093

REVISION 95093 97 0.00 3/25/96

APPENDIX C
PILE DESIGN ANALYSES

14" square boarding floats



3047-0-0-101 boarding floats 14 inch sq.lp11o

=====
LPile for Windows, Version 2019-11.001

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
© 1985-2019 by Ensoft, Inc.
All Rights Reserved

=====
This copy of LPile is being used by:

GAI
Gorian and Associates, INC.

Serial Number of Security Device: 139304473

This copy of LPile is licensed for exclusive use by:

Gorian & Associates, Inc., Thous

Use of this program by any entity other than Gorian & Associates, Inc., Thous
is a violation of the software license agreement.

Files Used for Analysis

Path to file locations:

\\SERVER\Server\gorian\GORIAN MASTER FILES\3047-0-0 Noble MDR Pavement\Pile Calcs\

Name of input data file:

3047-0-0-101 boarding floats 14 inch sq.lp11

Name of output report file:

3047-0-0-101 boarding floats 14 inch sq.lp11

Name of plot output file:

3047-0-0-101 boarding floats 14 inch sq.lp11

Name of runtime message file:

3047-0-0-101 boarding floats 14 inch sq.lp11

Date and Time of Analysis

3047-0-0-101 boarding floats 14 inch sq.lp110

Date: April 16, 2019

Time: 10:53:38

Problem Title

Project Name: MDR Boat Launch Renovation

Work Order: 3047-0-0-101

Client: Noble GEC

Engineer: GAI

Description: Boarding Floats 14" sq

Program Options and Settings

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

3047-0-0-101 boarding floats 14 inch sq.lp110

Loading Type and Number of Cycles of Loading:

- Static loading specified
- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1
Total length of pile = 40.000 ft
Depth of ground surface below top of pile = 20.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	14.0000
2	40.000	14.0000

Input Structural Properties for Pile Sections:

3047-0-0-101 boarding floats 14 inch sq.lp110

Pile Section No. 1:

Section 1 is a square prestressed concrete pile

Length of section	=	40.000000 ft
Pile Width	=	14.000000 in
Corner Chamfer	=	0.500000 in
Shear capacity of section	=	100.000000 lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	20.000000 ft
Distance from top of pile to bottom of layer	=	25.000000 ft
Effective unit weight at top of layer	=	41.000000 pcf
Effective unit weight at bottom of layer	=	41.000000 pcf
Undrained cohesion at top of layer	=	365.000000 psf
Undrained cohesion at bottom of layer	=	365.000000 psf
Epsilon-50 at top of layer	=	0.0000
Epsilon-50 at bottom of layer	=	0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	25.000000 ft
Distance from top of pile to bottom of layer	=	40.000000 ft
Effective unit weight at top of layer	=	51.000000 pcf
Effective unit weight at bottom of layer	=	51.000000 pcf

3047-0-0-101 boarding floats 14 inch sq.lp110

Friction angle at top of layer = 31.000000 deg.
 Friction angle at bottom of layer = 31.000000 deg.
 Subgrade k at top of layer = 0.0000 pci
 Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 40.000000 ft
 Distance from top of pile to bottom of layer = 70.000000 ft
 Effective unit weight at top of layer = 68.000000 pcf
 Effective unit weight at bottom of layer = 68.000000 pcf
 Friction angle at top of layer = 33.000000 deg.
 Friction angle at bottom of layer = 33.000000 deg.
 Subgrade k at top of layer = 0.0000 pci
 Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

(Depth of the lowest soil layer extends 30.000 ft below the pile tip)

 Summary of Input Soil Properties

Layer E50 Layer or Num. krm	Soil Type Name (p-y Curve Type) kpy pci	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.
1 default	Soft --	20.0000	41.0000	365.0000	--
default	Clay --	25.0000	41.0000	365.0000	--
2 --	Sand default (Reese, et al.)	25.0000 40.0000	51.0000 51.0000	-- --	31.0000 31.0000
3 --	Sand default (Reese, et al.)	40.0000 70.0000	68.0000 68.0000	-- --	33.0000 33.0000
--	default				

 Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

 Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load Compute No.	Load Top y Type vs. Pile Length	Condition 1	Condition 2	Axial Thrust Force, lbs
1	1 Yes	V = 1000.000000 lbs	M = 0.0000 in-lbs	1000.00000000
2	1 Yes	V = 2000. lbs	M = 0.0000 in-lbs	1000.00000000

V = shear force applied normal to pile axis
 M = bending moment applied to pile head
 y = lateral deflection normal to pile axis
 S = pile slope relative to original pile batter angle
 R = rotational stiffness applied to pile head
 Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
 Thrust force is assumed to be acting axially for all pile batter angles.

 Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

3047-0-0-101 boarding floats 14 inch sq.lp110

Dimensions of Square Prestressed Pile Section:

Length of Section = 40.0000 ft
 Pile Width = 14.000 in
 Corner Chamfer = 0.500 in

Prestressing Strand Details:

Strand Type = Deformed bars (150-160
 ksi)
 Yield Stress, fpu = 157. ksi
 Elasticity Modulus, Es = 29000. ksi
 Number of Reinforcing Strands = 8
 Cross-sectional Area of Single Strand = 0.280 sq. in.
 Concrete Cover Thickness Over Strands = 2.000 in

Prestressing Strand Geometry:

Strand No.	Diameter in	Area sq. in	X in	Y in
1	0.625	0.280	4.688	0.000
2	0.625	0.280	3.315	3.315
3	0.625	0.280	0.000	4.688
4	0.625	0.280	-3.315	3.315
5	0.625	0.280	-4.688	0.000
6	0.625	0.280	-3.315	-3.315
7	0.625	0.280	-0.000	-4.688
8	0.625	0.280	3.315	-3.315

Computation of Loss of Prestress:

Initial Prestressing Force = 244.000 kips
 Fraction of Loss of Prestress = 0.250
 Effective Prestressing Force After Losses = 183.000 kips
 Area of Concrete, Ac = 193.260 sq.in
 Area of Steel, As = 2.240 sq.in
 Stress in Concrete After Losses, f_{pc} = 0.947 ksi
 Stress in Steel After Losses = -81.696 ksi
 Compressive Strain in Concrete After Losses = 0.0002627
 Tensile Strain in Steel After Losses = -0.0028171
 Axial Tension Load for Cracking of Concrete = -229.174 kips

3047-0-0-101 boarding floats 14 inch sq.lp110

Estimated Structural Capacities Computed Using PCI Equations:

Nom. Axial Cap., $P_n = (0.85 f'_c - 0.60 f_{pc}) A_g$ = 553.627 kips
Unfac. Axial Load Cap. $N = (0.33 f'_c - 0.27 f_{pc}) A_g$ = 208.077 kips
Axial Capacity in Tension, $N_t = A_s f_{pu}$ = -351.680 kips
Nom. Moment Capacity, $M_n = 0.37 D A_s f_{pu}$ = 1821.702 in-kip

Note: The estimate of nominal moment capacity is based on equations that assume compressive strength of concrete is 6,000 psi (41.4 MPa), the value of prestress after losses is 700 psi (4.83 MPa), and axial thrust force is zero. When input values for these factors are different, the estimated value of nominal moment capacity will differ from the capacity computed by LPILE and should be considered only as an approximate check.

Concrete Properties:

Compressive Strength of Concrete = 4000. psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Prestressed Concrete = -252.982213 psi
Compression Strain at Peak Stress = 0.001886
Tensile Strain at Fracture of Concrete = -0.0000606
Maximum Coarse Aggregate Size = 0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
-----	-----
1	1.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.

3047-0-0-101 boarding floats 14 inch sq.lp110

Position of neutral axis is measured from edge of compression side of pile.

Compressive stresses and strains are positive in sign.

Tensile stresses and strains are negative in sign.

Axial Thrust Force = 1.000 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
0.00000125	13.2652841	10612227.	182.9049940	0.0004913	0.0002111
0.9105728	-75.5000350				
0.00000250	28.9262050	11570482.	94.9604169	0.0005001	0.0002024
0.9428496	-75.6796233				
0.00000375	44.5864164	11889711.	65.6493017	0.0005089	0.0001937
0.9750088	-75.8588045				
0.00000500	60.2455452	12049109.	50.9965520	0.0005176	0.0001850
1.0070493	-76.0375785				
0.00000625	75.9032181	12144515.	42.2071488	0.0005265	0.0001763
1.0389706	-76.2159453				
0.00000750	91.5590616	12207875.	36.3494189	0.0005353	0.0001676
1.0707716	-76.3939049				
0.00000875	107.2127024	12252880.	32.1669312	0.0005441	0.0001590
1.1024517	-76.5714573				
0.00001000	122.8637669	12286377.	29.0314700	0.0005530	0.0001503
1.1340099	-76.7486022				
0.00001125	138.5118815	12312167.	26.5940268	0.0005618	0.0001417
1.1654455	-76.9253398				
0.00001250	154.1566726	12332534.	24.6451963	0.0005707	0.0001331
1.1967576	-77.1016699				
0.00001375	169.7977665	12348928.	23.0517207	0.0005796	0.0001245
1.2279455	-77.2775925				
0.00001500	185.4347889	12362319.	21.7247616	0.0005885	0.0001159
1.2590082	-77.4531074				
0.00001625	201.0673659	12373376.	20.6028154	0.0005975	0.0001073
1.2899450	-77.6282145				
0.00001750	216.6951232	12382578.	19.6419510	0.0006064	0.00009873
1.3207550	-77.8029138				
0.00001875	232.3176835	12390276.	18.8099522	0.0006154	0.00009019
1.3514375	-77.9772045				
0.00002000	247.9346765	12396734.	18.0826570	0.0006243	0.00008165
1.3819916	-78.1510875				
0.00002125	263.5457253	12402152.	17.4415885	0.0006333	0.00007313

3047-0-0-101 boarding floats 14 inch sq.lp110

1.4124164	-78.3245621				
0.00002250	279.1504549	12406687.	16.8723758	0.0006423	0.00006463
1.4427112	-78.4976283				
0.00002375	294.7484897	12410463.	16.3636736	0.0006513	0.00005614
1.4728751	-78.6702858				
0.00002500	310.3394543	12413578.	15.9064055	0.0006603	0.00004766
1.5029072	-78.8425345				
0.00002625	325.9229725	12416113.	15.4932239	0.0006694	0.00003920
1.5328069	-79.0143743				
0.00002750	341.4986682	12418133.	15.1181174	0.0006784	0.00003075
1.5625731	-79.1858048				
0.00002875	357.0661648	12419693.	14.7761199	0.0006875	0.00002231
1.5922052	-79.3568260				
0.00003000	372.6250918	12420836.	14.4630930	0.0006966	0.00001389
1.6217021	-79.5274384				
0.00003125	388.1750578	12421602.	14.1755605	0.0007057	0.00000549
1.6510633	-79.6976399				
0.00003250	403.7156840	12422021.	13.9105808	0.0007148	-0.00000291
1.6802877	-79.8674317				
0.00003375	419.2439532	12422043.	13.6656335	0.0007239	-0.00001128
1.7093731	-80.0368272				
0.00003500	434.7535569	12421530.	13.4385388	0.0007330	-0.00001965
1.7383147	-80.2058616				
0.00003625	450.2387972	12420381.	13.2274201	0.0007422	-0.00002801
1.7671084	-80.3745655				
0.00003750	465.6949171	12418531.	13.0306549	0.0007513	-0.00003635
1.7957505	-80.5429663				
0.00003875	481.1179096	12415946.	12.8468330	0.0007605	-0.00004469
1.8242379	-80.7110874				
0.00004000	496.5044554	12412611.	12.6747238	0.0007697	-0.00005301
1.8525679	-80.8789489				
0.00004125	511.8516926	12408526.	12.5132475	0.0007788	-0.00006133
1.8807379	-81.0465687				
0.00004250	520.6069779	12249576.	12.3311797	0.0007867	-0.00007092
1.9047984	-81.2512744 C				
0.00004375	531.7324188	12153884.	12.1699355	0.0007951	-0.00008007
1.9301126	-81.4427603 C				
0.00004500	539.1047517	11980106.	11.9999772	0.0008027	-0.00009000
1.9528608	-81.6573082 C				
0.00004625	549.0452279	11871248.	11.8506133	0.0008108	-0.00009941
1.9770748	-81.8565559 C				
0.00004750	558.5123303	11758154.	11.7068498	0.0008187	-0.0001089
2.0008229	-82.0589178 C				
0.00004875	567.5314585	11641671.	11.5682978	0.0008266	-0.0001185
2.0241167	-82.2643350 C				
0.00005125	581.3092420	11342619.	11.2909985	0.0008413	-0.0001388
2.0672030	-82.7055944 C				
0.00005375	596.6249373	11099999.	11.0453397	0.0008564	-0.0001588

3047-0-0-101 boarding floats 14 inch sq.lp110

2.1107302	-83.1377427 C				
0.00005625	610.7006993	10856901.	10.8152011	0.0008710	-0.0001791
2.1527379	-83.5801941 C				
0.00005875	623.8940107	10619473.	10.5999142	0.0008854	-0.0001998
2.1934805	-84.0307122 C				
0.00006125	636.1405015	10385967.	10.3970716	0.0008995	-0.0002207
2.2328831	-84.4903425 C				
0.00006375	649.9124930	10194706.	10.2174036	0.0009140	-0.0002411
2.2731423	-84.9365410 C				
0.00006625	660.3924311	9968188.	10.0351973	0.0009275	-0.0002627
2.3099987	-85.4136681 C				
0.00006875	672.6321708	9783741.	9.8746229	0.0009415	-0.0002836
2.3480283	-85.8740864 C				
0.00007125	684.2507104	9603519.	9.7224871	0.0009554	-0.0003048
2.3850818	-86.3403519 C				
0.00007375	687.0715847	9316225.	9.5333843	0.0009658	-0.0003294
2.4124117	-86.9077401 C				
0.00007625	697.6362986	9149329.	9.3960195	0.0009791	-0.0003511
2.4474440	-87.3881427 C				
0.00007875	707.8484212	8988551.	9.2657356	0.0009923	-0.0003728
2.4817479	-87.8722922 C				
0.00008125	717.7408035	8833733.	9.1420016	0.0010055	-0.0003947
2.5153606	-88.3598996 C				
0.00008375	727.3451407	8684718.	9.0243593	0.0010185	-0.0004167
2.5483198	-88.8506531 C				
0.00008625	736.6319397	8540660.	8.9120287	0.0010313	-0.0004388
2.5805803	-89.3451791 C				
0.00008875	745.6603406	8401807.	8.8048484	0.0010441	-0.0004611
2.6122172	-89.8427374 C				
0.00009125	754.4744038	8268213.	8.7026209	0.0010568	-0.0004834
2.6432902	-90.3427303 C				
0.00009375	763.1019216	8139754.	8.6050952	0.0010694	-0.0005058
2.6738396	-90.8447632 C				
0.00009625	771.4527193	8015093.	8.5112932	0.0010819	-0.0005283
2.7037291	-91.3505436 C				
0.00009875	779.6432692	7895122.	8.4216007	0.0010943	-0.0005509
2.7331271	-91.8581568 C				
0.0001013	787.6951813	7779705.	8.3358417	0.0011067	-0.0005735
2.7620695	-92.3672257 C				
0.0001038	795.5007570	7667477.	8.2530073	0.0011189	-0.0005963
2.7903851	-92.8799303 C				
0.0001063	803.2210121	7559727.	8.1738751	0.0011311	-0.0006190
2.8183252	-93.3932380 C				
0.0001088	810.7382193	7455064.	8.0974281	0.0011433	-0.0006419
2.8457026	-93.9095520 C				
0.0001113	818.1577481	7354227.	8.0241164	0.0011553	-0.0006648
2.8726839	-94.4268351 C				
0.0001138	825.4169953	7256413.	7.9533261	0.0011674	-0.0006878

3047-0-0-101 boarding floats 14 inch sq.lp110

2.8991686	-94.9464314 C				
0.0001163	832.5813391	7161990.	7.8852794	0.0011793	-0.0007108
2.9252616	-95.4670427 C				
0.0001188	839.5958659	7070281.	7.8194420	0.0011912	-0.0007339
2.9508725	-95.9899125 C				
0.0001213	846.5481561	6981840.	7.7562177	0.0012031	-0.0007571
2.9761480	-96.5131401 C				
0.0001238	853.3309273	6895603.	7.6947398	0.0012149	-0.0007803
3.0009034	-97.0392683 C				
0.0001263	860.0935456	6812622.	7.6358638	0.0012267	-0.0008035
3.0254000	-97.5647842 C				
0.0001288	866.6754799	6731460.	7.5783653	0.0012384	-0.0008268
3.0493506	-98.0936944 C				
0.0001313	873.2194390	6653100.	7.5230956	0.0012501	-0.0008501
3.0730136	-98.6224580 C				
0.0001338	879.6799268	6577046.	7.4696140	0.0012617	-0.0008734
3.0963033	-99.1523005 C				
0.0001363	886.0175975	6502881.	7.4175536	0.0012733	-0.0008969
3.1191499	-99.6842819 C				
0.0001388	892.3357677	6431249.	7.3675165	0.0012849	-0.0009203
3.1417442	-100.2156711 C				
0.0001413	898.5350745	6361310.	7.3187129	0.0012964	-0.0009437
3.1638976	-100.7492629 C				
0.0001438	904.6595094	6293284.	7.2713704	0.0013079	-0.0009672
3.1856963	-101.2838403 C				
0.0001463	910.7647049	6227451.	7.2257842	0.0013194	-0.0009907
3.2072452	-101.8178333 C				
0.0001488	916.7631009	6163113.	7.1812563	0.0013309	-0.0010143
3.2283737	-102.3538714 C				
0.0001588	940.2111042	5922590.	7.0160234	0.0013765	-0.0011087
3.3097137	-104.5032979 C				
0.0001688	962.8500110	5705778.	6.8688207	0.0014218	-0.0012034
3.3860891	-106.6603243 C				
0.0001788	984.7704957	5509206.	6.7369642	0.0014669	-0.0012983
3.4576743	-108.8231772 C				
0.0001888	1006.	5330059.	6.6183335	0.0015119	-0.0013933
3.5246175	-110.9901123 C				
0.0001988	1027.	5166038.	6.5112567	0.0015568	-0.0014884
3.5870485	-113.1592601 C				
0.0002088	1047.	5014682.	6.4134543	0.0016015	-0.0015837
3.6448268	-115.3343681 C				
0.0002188	1066.	4875068.	6.3248296	0.0016462	-0.0016789
3.6983131	-117.5079778 C				
0.0002288	1086.	4745718.	6.2443036	0.0016911	-0.0017741
3.7475221	-119.6792663 C				
0.0002388	1104.	4625064.	6.1702423	0.0017358	-0.0018694
3.7922880	-121.8525012 C				
0.0002488	1123.	4512684.	6.1031386	0.0017808	-0.0019643

3047-0-0-101 boarding floats 14 inch sq.lp110

3.8329052	-124.0184995	C				
0.0002588	1140.		4407139.	6.0411322	0.0018258	-0.0020594
3.8690900	-126.1851703	C				
0.0002688	1158.		4308114.	5.9847184	0.0018711	-0.0021541
3.9010403	-128.3442165	C				
0.0002788	1175.		4214832.	5.9331644	0.0019165	-0.0022486
3.9286563	-130.4966979	C				
0.0002888	1192.		4126496.	5.8854843	0.0019621	-0.0023431
3.9518051	-132.6466411	C				
0.0002988	1208.		4042945.	5.8423294	0.0020081	-0.0024371
3.9705733	-134.7850337	C				
0.0003088	1224.		3963608.	5.8030751	0.0020544	-0.0025308
3.9848245	-136.9135316	C				
0.0003188	1239.		3887839.	5.7666004	0.0021008	-0.0026244
3.9944156	-139.0391026	C				
0.0003288	1254.		3815569.	5.7337066	0.0021476	-0.0027175
3.9993347	-141.1516897	C				
0.0003388	1269.		3746282.	5.7042840	0.0021950	-0.0028102
3.9992927	-143.2492549	C				
0.0003488	1283.		3679596.	5.6781734	0.0022429	-0.0029022
3.9991142	-145.3303887	C				
0.0003588	1297.		3615274.	5.6544649	0.0022912	-0.0029940
3.9987369	-147.4016765	C				
0.0003688	1310.		3553273.	5.6332065	0.0023399	-0.0030853
3.9980789	-149.4605132	C				
0.0003788	1323.		3493000.	5.6140713	0.0023890	-0.0031762
3.9995466	-150.0000000	C				
0.0003888	1334.		3431634.	5.5949588	0.0024377	-0.0032675
3.9998744	-150.0000000	C				
0.0003988	1344.		3369344.	5.5755556	0.0024859	-0.0033592
3.9992470	-150.0000000	C				
0.0004088	1352.		3307463.	5.5565533	0.0025339	-0.0034513
3.9978020	-150.0000000	C				
0.0004188	1360.		3247538.	5.5390685	0.0025822	-0.0035430
3.9999529	-150.0000000	C				
0.0004288	1368.		3189813.	5.5230501	0.0026307	-0.0036345
3.9990884	-150.0000000	C				
0.0004388	1375.		3134248.	5.5081743	0.0026794	-0.0037258
3.9973889	-150.0000000	C				
0.0004488	1382.		3080698.	5.4948431	0.0027285	-0.0038167
3.9996636	-150.0000000	C				
0.0004588	1390.		3029091.	5.4828778	0.0027779	-0.0039072
3.9976866	-150.0000000	C				
0.0004688	1396.		2978601.	5.4713743	0.0028274	-0.0039978
3.9998730	-150.0000000	C				
0.0004788	1402.		2928216.	5.4592839	0.0028763	-0.0040889
3.9978799	-150.0000000	C				
0.0004888	1406.		2877470.	5.4457905	0.0029243	-0.0041809

3047-0-0-101 boarding floats 14 inch sq.lp110

3.9998506	-150.0000000	C				
0.0004988	1410.		2826231.	5.4307585	0.0029713	-0.0042739
3.9971338	-150.0000000	C				
0.0005088	1412.		2774456.	5.4138669	0.0030170	-0.0043682
3.9994420	-150.0000000	C				
0.0005188	1413.		2723996.	5.3973043	0.0030625	-0.0044626
3.9981915	-150.0000000	C				
0.0005288	1414.		2675005.	5.3810476	0.0031079	-0.0045573
3.9981670	-150.0000000	C				
0.0005388	1416.		2627706.	5.3652498	0.0031532	-0.0046520
3.9997803	-150.0000000	C				
0.0005488	1417.		2582018.	5.3504210	0.0031987	-0.0047465
3.9960386	-150.0000000	C				
0.0006088	1423.		2337743.	5.2779647	0.0034756	-0.0053095
3.9982121	-150.0000000	C				
0.0006688	1428.		2135008.	5.2257161	0.0037574	-0.0058678
3.9989875	-150.0000000	C				
0.0007288	1431.		1964067.	5.1876316	0.0040432	-0.0064220
3.9978827	-150.0000000	C				

 Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
 or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	1.000	1410.791	0.00300000

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Resist.	Nominal	Ult. (Fac)	Ult. (Fac)	Bend. Stiff.
---------------	---------	------------	------------	--------------

3047-0-0-101 boarding floats 14 inch sq.lp110

Load No.	Factor for Moment	Moment Cap in-kips	Ax. Thrust kips	Moment Cap in-kips	at Ult Mom kip-in ²
1	0.65	1411.	0.650000	917.014209	6160537.
1	0.75	1411.	0.700000	1058.	4934370.
1	0.90	1411.	0.750000	1270.	3743189.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	20.0000	0.00	N.A.	No	0.00	9267.
2	25.0000	6.1361	No	No	9267.	267497.
3	40.0000	20.0000	No	No	276764.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 1000.0 lbs
 Applied moment at pile head = 0.0 in-lbs
 Axial thrust load on pile head = 1000.0 lbs

Depth Res.	Deflect. Soil Spr.	Bending Distrib. Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
X	y						

3047-0-0-101 boarding floats 14 inch sq.lp110

Es*h feet lb/inch	Lat. inches lb/inch	Load in-lbs lb/inch	lbs	radians	psi*	in-lb^2
0.00	1.0348	-4.09E-07	1000.0000	-0.00458	0.00	1.06E+10
0.00	0.00	0.00				
0.4000	1.0128	4822.	1000.	-0.00458	0.00	1.06E+10
0.00	0.00	0.00				
0.8000	0.9909	9644.	1000.0000	-0.00457	0.00	1.06E+10
0.00	0.00	0.00				
1.2000	0.9689	14466.	1000.0000	-0.00457	0.00	1.07E+10
0.00	0.00	0.00				
1.6000	0.9470	19288.	1000.0000	-0.00456	0.00	1.11E+10
0.00	0.00	0.00				
2.0000	0.9251	24110.	1000.0000	-0.00455	0.00	1.14E+10
0.00	0.00	0.00				
2.4000	0.9033	28931.	1000.0000	-0.00454	0.00	1.16E+10
0.00	0.00	0.00				
2.8000	0.8815	33753.	1000.0000	-0.00453	0.00	1.17E+10
0.00	0.00	0.00				
3.2000	0.8598	38575.	1000.0000	-0.00451	0.00	1.18E+10
0.00	0.00	0.00				
3.6000	0.8382	43397.	1000.0000	-0.00450	0.00	1.19E+10
0.00	0.00	0.00				
4.0000	0.8167	48218.	1000.0000	-0.00448	0.00	1.19E+10
0.00	0.00	0.00				
4.4000	0.7952	53040.	1000.0000	-0.00446	0.00	1.20E+10
0.00	0.00	0.00				
4.8000	0.7739	57861.	1000.0000	-0.00444	0.00	1.20E+10
0.00	0.00	0.00				
5.2000	0.7526	62682.	1000.0000	-0.00441	0.00	1.21E+10
0.00	0.00	0.00				
5.6000	0.7315	67503.	1000.0000	-0.00439	0.00	1.21E+10
0.00	0.00	0.00				
6.0000	0.7105	72324.	1000.0000	-0.00436	0.00	1.21E+10
0.00	0.00	0.00				
6.4000	0.6897	77145.	1000.0000	-0.00433	0.00	1.22E+10
0.00	0.00	0.00				
6.8000	0.6690	81966.	1000.0000	-0.00430	0.00	1.22E+10
0.00	0.00	0.00				
7.2000	0.6484	86786.	1000.0000	-0.00426	0.00	1.22E+10
0.00	0.00	0.00				
7.6000	0.6281	91607.	1000.0000	-0.00423	0.00	1.22E+10
0.00	0.00	0.00				
8.0000	0.6078	96427.	1000.0000	-0.00419	0.00	1.22E+10
0.00	0.00	0.00				
8.4000	0.5878	101247.	1000.0000	-0.00415	0.00	1.22E+10

3047-0-0-101 boarding floats 14 inch sq.lp110

0.00	0.00	0.00					
8.8000	0.5680	106067.	1000.0000	-0.00411	0.00	1.23E+10	
0.00	0.00	0.00					
9.2000	0.5483	110886.	1000.0000	-0.00407	0.00	1.23E+10	
0.00	0.00	0.00					
9.6000	0.5289	115706.	1000.0000	-0.00403	0.00	1.23E+10	
0.00	0.00	0.00					
10.0000	0.5097	120525.	1000.0000	-0.00398	0.00	1.23E+10	
0.00	0.00	0.00					
10.4000	0.4907	125344.	1000.0000	-0.00393	0.00	1.23E+10	
0.00	0.00	0.00					
10.8000	0.4720	130163.	1000.0000	-0.00388	0.00	1.23E+10	
0.00	0.00	0.00					
11.2000	0.4534	134981.	1000.0000	-0.00383	0.00	1.23E+10	
0.00	0.00	0.00					
11.6000	0.4352	139800.	1000.0000	-0.00378	0.00	1.23E+10	
0.00	0.00	0.00					
12.0000	0.4172	144618.	1000.0000	-0.00372	0.00	1.23E+10	
0.00	0.00	0.00					
12.4000	0.3995	149435.	1000.0000	-0.00366	0.00	1.23E+10	
0.00	0.00	0.00					
12.8000	0.3820	154253.	1000.0000	-0.00360	0.00	1.23E+10	
0.00	0.00	0.00					
13.2000	0.3649	159070.	1000.0000	-0.00354	0.00	1.23E+10	
0.00	0.00	0.00					
13.6000	0.3480	163887.	1000.0000	-0.00348	0.00	1.23E+10	
0.00	0.00	0.00					
14.0000	0.3315	168703.	1000.0000	-0.00342	0.00	1.23E+10	
0.00	0.00	0.00					
14.4000	0.3152	173520.	1000.0000	-0.00335	0.00	1.24E+10	
0.00	0.00	0.00					
14.8000	0.2993	178335.	1000.0000	-0.00328	0.00	1.24E+10	
0.00	0.00	0.00					
15.2000	0.2837	183151.	1000.0000	-0.00321	0.00	1.24E+10	
0.00	0.00	0.00					
15.6000	0.2685	187966.	1000.0000	-0.00314	0.00	1.24E+10	
0.00	0.00	0.00					
16.0000	0.2536	192781.	1000.0000	-0.00306	0.00	1.24E+10	
0.00	0.00	0.00					
16.4000	0.2391	197596.	1000.0000	-0.00299	0.00	1.24E+10	
0.00	0.00	0.00					
16.8000	0.2249	202410.	1000.0000	-0.00291	0.00	1.24E+10	
0.00	0.00	0.00					
17.2000	0.2111	207224.	1000.0000	-0.00283	0.00	1.24E+10	
0.00	0.00	0.00					
17.6000	0.1977	212037.	1000.0000	-0.00275	0.00	1.24E+10	
0.00	0.00	0.00					
18.0000	0.1847	216850.	1000.0000	-0.00267	0.00	1.24E+10	

3047-0-0-101 boarding floats 14 inch sq.lp110

0.00	0.00	0.00					
18.4000	0.1721	221663.	1000.0000	-0.00258	0.00	1.24E+10	
0.00	0.00	0.00					
18.8000	0.1599	226475.	1000.0000	-0.00250	0.00	1.24E+10	
0.00	0.00	0.00					
19.2000	0.1481	231287.	1000.0000	-0.00241	0.00	1.24E+10	
0.00	0.00	0.00					
19.6000	0.1368	236098.	1000.0000	-0.00232	0.00	1.24E+10	
0.00	0.00	0.00					
20.0000	0.1259	240909.	927.8886	-0.00222	0.00	1.24E+10	
-30.0464	1146.	0.00					
20.4000	0.1154	245027.	780.6668	-0.00213	0.00	1.24E+10	
-31.2960	1301.	0.00					
20.8000	0.1054	248424.	627.7776	-0.00203	0.00	1.24E+10	
-32.4079	1475.	0.00					
21.2000	0.09591	251073.	469.8889	-0.00194	0.00	1.24E+10	
-33.3791	1670.	0.00					
21.6000	0.08684	252953.	307.6829	-0.00184	0.00	1.24E+10	
-34.2067	1891.	0.00					
22.0000	0.07824	254045.	141.8566	-0.00174	0.00	1.24E+10	
-34.8876	2140.	0.00					
22.4000	0.07012	254332.	-26.8773	-0.00164	0.00	1.24E+10	
-35.4182	2425.	0.00					
22.8000	0.06246	253802.	-197.7890	-0.00155	0.00	1.24E+10	
-35.7950	2751.	0.00					
23.2000	0.05528	252448.	-370.1305	-0.00145	0.00	1.24E+10	
-36.0139	3127.	0.00					
23.6000	0.04857	250263.	-543.1325	-0.00135	0.00	1.24E+10	
-36.0703	3565.	0.00					
24.0000	0.04232	247247.	-716.0020	-0.00125	0.00	1.24E+10	
-35.9587	4079.	0.00					
24.4000	0.03653	243402.	-887.9177	-0.00116	0.00	1.24E+10	
-35.6728	4687.	0.00					
24.8000	0.03119	238734.	-1058.	-0.00107	0.00	1.24E+10	
-35.2048	5417.	0.00					
25.2000	0.02630	233255.	-1257.	-9.74E-04	0.00	1.24E+10	
-47.8310	8729.	0.00					
25.6000	0.02184	226673.	-1489.	-8.85E-04	0.00	1.24E+10	
-48.5114	10660.	0.00					
26.0000	0.01781	218973.	-1721.	-7.99E-04	0.00	1.24E+10	
-48.2480	13006.	0.00					
26.4000	0.01418	210162.	-1949.	-7.15E-04	0.00	1.24E+10	
-46.9638	15900.	0.00					
26.8000	0.01094	200267.	-2158.	-6.36E-04	0.00	1.24E+10	
-39.8064	17467.	0.00					
27.2000	0.00807	189456.	-2328.	-5.60E-04	0.00	1.24E+10	
-31.1070	18495.	0.00					
27.6000	0.00556	177927.	-2457.	-4.89E-04	0.00	1.24E+10	

3047-0-0-101 boarding floats 14 inch sq.lp110

-22.6165	19522.	0.00					
28.0000	0.00338	165876.	-2546.	-4.22E-04	0.00	1.23E+10	
-14.4708	20550.	0.00					
28.4000	0.00151	153493.	-2597.	-3.60E-04	0.00	1.23E+10	
-6.7831	21577.	0.00					
28.8000	-7.54E-05	140952.	-2612.	-3.03E-04	0.00	1.23E+10	
0.3552	22604.	0.00					
29.2000	-0.00140	128419.	-2595.	-2.50E-04	0.00	1.23E+10	
6.8735	23632.	0.00					
29.6000	-0.00248	116045.	-2548.	-2.02E-04	0.00	1.23E+10	
12.7211	24659.	0.00					
30.0000	-0.00334	103963.	-2474.	-1.59E-04	0.00	1.22E+10	
17.8653	25687.	0.00					
30.4000	-0.00400	92293.	-2378.	-1.21E-04	0.00	1.22E+10	
22.2898	26714.	0.00					
30.8000	-0.00450	81136.	-2262.	-8.66E-05	0.00	1.22E+10	
25.9932	27742.	0.00					
31.2000	-0.00484	70578.	-2130.	-5.66E-05	0.00	1.21E+10	
28.9866	28769.	0.00					
31.6000	-0.00504	60688.	-1985.	-3.05E-05	0.00	1.21E+10	
31.2920	29797.	0.00					
32.0000	-0.00513	51518.	-1831.	-8.13E-06	0.00	1.20E+10	
32.9400	30824.	0.00					
32.4000	-0.00512	43108.	-1671.	1.09E-05	0.00	1.19E+10	
33.9680	31852.	0.00					
32.8000	-0.00502	35480.	-1507.	2.69E-05	0.00	1.17E+10	
34.4182	32879.	0.00					
33.2000	-0.00486	28644.	-1342.	4.01E-05	0.00	1.16E+10	
34.3361	33907.	0.00					
33.6000	-0.00464	22600.	-1178.	5.08E-05	0.00	1.13E+10	
33.7684	34934.	0.00					
34.0000	-0.00437	17334.	-1018.	5.94E-05	0.00	1.10E+10	
32.7617	35962.	0.00					
34.4000	-0.00407	12823.	-864.5388	6.61E-05	0.00	1.06E+10	
31.3612	36989.	0.00					
34.8000	-0.00374	9034.	-718.2073	7.10E-05	0.00	1.06E+10	
29.6103	38017.	0.00					
35.2000	-0.00339	5927.	-581.0029	7.44E-05	0.00	1.06E+10	
27.5582	39044.	0.00					
35.6000	-0.00302	3456.	-454.2670	7.65E-05	0.00	1.06E+10	
25.2485	40072.	0.00					
36.0000	-0.00265	1566.	-339.1453	7.77E-05	0.00	1.06E+10	
22.7189	41099.	0.00					
36.4000	-0.00228	199.0825	-236.6184	7.81E-05	0.00	1.06E+10	
20.0006	42127.	0.00					
36.8000	-0.00190	-706.6534	-147.5332	7.79E-05	0.00	1.06E+10	
17.1182	43154.	0.00					
37.2000	-0.00153	-1218.	-72.6350	7.75E-05	0.00	1.06E+10	

3047-0-0-101 boarding floats 14 inch sq.lp110

14.0894	44181.	0.00					
37.6000	-0.00116	-1405.	-12.5988	7.69E-05	0.00	1.06E+10	
10.9257	45209.	0.00					
38.0000	-7.92E-04	-1340.	31.9410	7.63E-05	0.00	1.06E+10	
7.6326	46236.	0.00					
38.4000	-4.28E-04	-1099.	60.3651	7.57E-05	0.00	1.06E+10	
4.2108	47264.	0.00					
38.8000	-6.53E-05	-760.8932	72.0474	7.53E-05	0.00	1.06E+10	
0.6568	48291.	0.00					
39.2000	2.95E-04	-407.8597	66.3391	7.51E-05	0.00	1.06E+10	
-3.0353	49319.	0.00					
39.6000	6.55E-04	-124.7584	42.5603	7.49E-05	0.00	1.06E+10	
-6.8725	50346.	0.00					
40.0000	0.00101	0.00	0.00	7.49E-05	0.00	1.06E+10	
-10.8609	25687.	0.00					

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 1.03479650 inches
 Computed slope at pile head = -0.00457822 radians
 Maximum bending moment = 254332. inch-lbs
 Maximum shear force = -2612. lbs
 Depth of maximum bending moment = 22.40000000 feet below pile head
 Depth of maximum shear force = 28.80000000 feet below pile head
 Number of iterations = 14
 Number of zero deflection points = 2

 Pile-head Deflection vs. Pile Length for Load Case 1

Boundary Condition Type 1, Shear and Moment

Shear = 1000. lbs
 Moment = 0. in-lbs
 Axial Load = 1000. lbs

3047-0-0-101 boarding floats 14 inch sq.lp110

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
40.00000	1.03479650	254332.	-2612.
38.00000	1.04355098	255866.	-2633.
36.00000	1.04992307	256047.	-2724.
34.00000	1.07034512	254822.	-3065.
32.00000	1.21515372	254781.	-3863.
30.00000	1.94578241	251962.	-4924.
28.00000	7.37168679	253060.	-6117.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 2000.0 lbs
 Applied moment at pile head = 0.0 in-lbs
 Axial thrust load on pile head = 1000.0 lbs

Depth Res.	Deflect. Soil Spr.	Bending Distrib. Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
X	y	Lat. Load					
Es*h	Lat. Load						
feet	inches	in-lbs	lbs	radians	psi*	in-lb^2	
lb/inch	lb/inch	lb/inch					
0.00	2.2974	-7.16E-06	2000.	-0.00979	0.00	1.06E+10	
0.00	0.00	0.00					
0.4000	2.2504	9647.	2000.	-0.00979	0.00	1.06E+10	
0.00	0.00	0.00					
0.8000	2.2034	19294.	2000.	-0.00978	0.00	1.11E+10	
0.00	0.00	0.00					
1.2000	2.1565	28941.	2000.	-0.00977	0.00	1.16E+10	
0.00	0.00	0.00					
1.6000	2.1096	38588.	2000.	-0.00976	0.00	1.18E+10	
0.00	0.00	0.00					
2.0000	2.0628	48235.	2000.	-0.00974	0.00	1.19E+10	
0.00	0.00	0.00					
2.4000	2.0161	57881.	2000.	-0.00972	0.00	1.20E+10	
0.00	0.00	0.00					
2.8000	1.9695	67528.	2000.	-0.00969	0.00	1.21E+10	
0.00	0.00	0.00					

3047-0-0-101 boarding floats 14 inch sq.lp11o

3.2000	1.9230	77174.	2000.	-0.00966	0.00	1.22E+10
0.00	0.00	0.00				
3.6000	1.8767	86821.	2000.	-0.00963	0.00	1.22E+10
0.00	0.00	0.00				
4.0000	1.8306	96467.	2000.	-0.00960	0.00	1.22E+10
0.00	0.00	0.00				
4.4000	1.7846	106113.	2000.	-0.00956	0.00	1.23E+10
0.00	0.00	0.00				
4.8000	1.7388	115759.	2000.	-0.00951	0.00	1.23E+10
0.00	0.00	0.00				
5.2000	1.6933	125404.	2000.	-0.00947	0.00	1.23E+10
0.00	0.00	0.00				
5.6000	1.6479	135049.	2000.	-0.00942	0.00	1.23E+10
0.00	0.00	0.00				
6.0000	1.6029	144694.	2000.	-0.00936	0.00	1.23E+10
0.00	0.00	0.00				
6.4000	1.5581	154339.	2000.	-0.00930	0.00	1.23E+10
0.00	0.00	0.00				
6.8000	1.5136	163984.	2000.	-0.00924	0.00	1.23E+10
0.00	0.00	0.00				
7.2000	1.4694	173628.	2000.	-0.00918	0.00	1.24E+10
0.00	0.00	0.00				
7.6000	1.4255	183272.	2000.	-0.00911	0.00	1.24E+10
0.00	0.00	0.00				
8.0000	1.3820	192915.	2000.	-0.00903	0.00	1.24E+10
0.00	0.00	0.00				
8.4000	1.3388	202559.	2000.	-0.00896	0.00	1.24E+10
0.00	0.00	0.00				
8.8000	1.2960	212201.	2000.	-0.00888	0.00	1.24E+10
0.00	0.00	0.00				
9.2000	1.2536	221844.	2000.	-0.00879	0.00	1.24E+10
0.00	0.00	0.00				
9.6000	1.2116	231486.	2000.	-0.00870	0.00	1.24E+10
0.00	0.00	0.00				
10.0000	1.1700	241127.	2000.	-0.00861	0.00	1.24E+10
0.00	0.00	0.00				
10.4000	1.1289	250768.	2000.	-0.00852	0.00	1.24E+10
0.00	0.00	0.00				
10.8000	1.0883	260409.	2000.	-0.00842	0.00	1.24E+10
0.00	0.00	0.00				
11.2000	1.0481	270049.	2000.	-0.00832	0.00	1.24E+10
0.00	0.00	0.00				
11.6000	1.0084	279689.	2000.	-0.00821	0.00	1.24E+10
0.00	0.00	0.00				
12.0000	0.9693	289328.	2000.	-0.00810	0.00	1.24E+10
0.00	0.00	0.00				
12.4000	0.9307	298967.	2000.	-0.00799	0.00	1.24E+10
0.00	0.00	0.00				

3047-0-0-101 boarding floats 14 inch sq.lp110

12.8000	0.8926	308605.	2000.	-0.00787	0.00	1.24E+10
0.00	0.00	0.00				
13.2000	0.8551	318242.	2000.	-0.00775	0.00	1.24E+10
0.00	0.00	0.00				
13.6000	0.8183	327879.	2000.	-0.00762	0.00	1.24E+10
0.00	0.00	0.00				
14.0000	0.7820	337515.	2000.	-0.00749	0.00	1.24E+10
0.00	0.00	0.00				
14.4000	0.7463	347151.	2000.	-0.00736	0.00	1.24E+10
0.00	0.00	0.00				
14.8000	0.7113	356786.	2000.	-0.00722	0.00	1.24E+10
0.00	0.00	0.00				
15.2000	0.6770	366420.	2000.	-0.00708	0.00	1.24E+10
0.00	0.00	0.00				
15.6000	0.6433	376054.	2000.	-0.00694	0.00	1.24E+10
0.00	0.00	0.00				
16.0000	0.6103	385687.	2000.	-0.00679	0.00	1.24E+10
0.00	0.00	0.00				
16.4000	0.5781	395319.	2000.	-0.00664	0.00	1.24E+10
0.00	0.00	0.00				
16.8000	0.5466	404951.	2000.	-0.00649	0.00	1.24E+10
0.00	0.00	0.00				
17.2000	0.5158	414582.	2000.	-0.00633	0.00	1.24E+10
0.00	0.00	0.00				
17.6000	0.4858	424212.	2000.	-0.00617	0.00	1.24E+10
0.00	0.00	0.00				
18.0000	0.4566	433841.	2000.	-0.00600	0.00	1.24E+10
0.00	0.00	0.00				
18.4000	0.4282	443469.	2000.	-0.00583	0.00	1.24E+10
0.00	0.00	0.00				
18.8000	0.4006	453097.	2000.	-0.00566	0.00	1.24E+10
0.00	0.00	0.00				
19.2000	0.3738	462724.	2000.	-0.00548	0.00	1.24E+10
0.00	0.00	0.00				
19.6000	0.3479	472349.	2000.	-0.00530	0.00	1.24E+10
0.00	0.00	0.00				
20.0000	0.3229	481974.	1901.	-0.00512	0.00	1.24E+10
-41.1296	611.3470	0.00				
20.4000	0.2988	490651.	1699.	-0.00493	0.00	1.24E+10
-42.9696	690.2461	0.00				
20.8000	0.2756	498336.	1489.	-0.00474	0.00	1.24E+10
-44.6408	777.4714	0.00				
21.2000	0.2533	504993.	1271.	-0.00454	0.00	1.24E+10
-46.1395	874.2527	0.00				
21.6000	0.2320	510585.	1047.	-0.00435	0.00	1.24E+10
-47.4621	982.0559	0.00				
22.0000	0.2116	515082.	816.1096	-0.00415	0.00	1.23E+10
-48.6046	1103.	0.00				

3047-0-0-101 boarding floats 14 inch sq.lp110

22.4000	0.1921	518459.	580.5068	-0.00395	0.00	1.23E+10
-49.5633	1238.	0.00				
22.8000	0.1737	520693.	340.7525	-0.00374	0.00	1.22E+10
-50.3344	1391.	0.00				
23.2000	0.1562	521766.	97.7565	-0.00354	0.00	1.22E+10
-50.9139	1565.	0.00				
23.6000	0.1397	521666.	-147.5506	-0.00334	0.00	1.22E+10
-51.2974	1763.	0.00				
24.0000	0.1242	520382.	-394.2162	-0.00313	0.00	1.23E+10
-51.4799	1990.	0.00				
24.4000	0.1096	517911.	-641.2626	-0.00293	0.00	1.23E+10
-51.4561	2253.	0.00				
24.8000	0.09607	514254.	-887.6833	-0.00273	0.00	1.24E+10
-51.2192	2559.	0.00				
25.2000	0.08346	509416.	-1242.	-0.00253	0.00	1.24E+10
-96.5174	5551.	0.00				
25.6000	0.07179	502353.	-1714.	-0.00233	0.00	1.24E+10
-100.0063	6686.	0.00				
26.0000	0.06106	492984.	-2199.	-0.00214	0.00	1.24E+10
-102.0603	8023.	0.00				
26.4000	0.05124	481264.	-2690.	-0.00195	0.00	1.24E+10
-102.5742	9608.	0.00				
26.8000	0.04232	467179.	-3180.	-0.00177	0.00	1.24E+10
-101.4466	11507.	0.00				
27.2000	0.03426	450756.	-3660.	-0.00159	0.00	1.24E+10
-98.5737	13812.	0.00				
27.6000	0.02703	432062.	-4121.	-0.00142	0.00	1.24E+10
-93.8382	16661.	0.00				
28.0000	0.02061	411204.	-4556.	-0.00126	0.00	1.24E+10
-87.0894	20279.	0.00				
28.4000	0.01495	388339.	-4926.	-0.00110	0.00	1.24E+10
-67.2252	21577.	0.00				
28.8000	0.01002	363924.	-5201.	-9.58E-04	0.00	1.24E+10
-47.1707	22604.	0.00				
29.2000	0.00575	338422.	-5382.	-8.23E-04	0.00	1.24E+10
-28.3258	23632.	0.00				
29.6000	0.00212	312267.	-5476.	-6.97E-04	0.00	1.24E+10
-10.8816	24659.	0.00				
30.0000	-9.38E-04	285860.	-5490.	-5.81E-04	0.00	1.24E+10
5.0174	25687.	0.00				
30.4000	-0.00346	259569.	-5432.	-4.76E-04	0.00	1.24E+10
19.2705	26714.	0.00				
30.8000	-0.00551	233721.	-5309.	-3.80E-04	0.00	1.24E+10
31.8174	27742.	0.00				
31.2000	-0.00711	208605.	-5130.	-2.95E-04	0.00	1.24E+10
42.6339	28769.	0.00				
31.6000	-0.00833	184472.	-4904.	-2.18E-04	0.00	1.24E+10
51.7285	29797.	0.00				

3047-0-0-101 boarding floats 14 inch sq.lp110

32.0000	-0.00921	161530.	-4638.	-1.51E-04	0.00	1.23E+10
59.1374	30824.	0.00				
32.4000	-0.00978	139950.	-4340.	-9.24E-05	0.00	1.23E+10
64.9201	31852.	0.00				
32.8000	-0.01010	119866.	-4018.	-4.17E-05	0.00	1.23E+10
69.1551	32879.	0.00				
33.2000	-0.01018	101374.	-3680.	1.62E-06	0.00	1.22E+10
71.9353	33907.	0.00				
33.6000	-0.01008	84540.	-3331.	3.82E-05	0.00	1.22E+10
73.3640	34934.	0.00				
34.0000	-0.00982	69397.	-2978.	6.86E-05	0.00	1.21E+10
73.5506	35962.	0.00				
34.4000	-0.00942	55947.	-2628.	9.35E-05	0.00	1.20E+10
72.6071	36989.	0.00				
34.8000	-0.00892	44171.	-2284.	1.14E-04	0.00	1.19E+10
70.6447	38017.	0.00				
35.2000	-0.00833	34022.	-1952.	1.29E-04	0.00	1.17E+10
67.7706	39044.	0.00				
35.6000	-0.00768	25434.	-1635.	1.42E-04	0.00	1.15E+10
64.0856	40072.	0.00				
36.0000	-0.00697	18323.	-1338.	1.51E-04	0.00	1.11E+10
59.6820	41099.	0.00				
36.4000	-0.00623	12587.	-1064.	1.58E-04	0.00	1.06E+10
54.6417	42127.	0.00				
36.8000	-0.00545	8109.	-814.9093	1.63E-04	0.00	1.06E+10
49.0371	43154.	0.00				
37.2000	-0.00467	4762.	-594.1642	1.66E-04	0.00	1.06E+10
42.9401	44181.	0.00				
37.6000	-0.00387	2404.	-403.7294	1.67E-04	0.00	1.06E+10
36.4078	45209.	0.00				
38.0000	-0.00306	884.4796	-245.5918	1.68E-04	0.00	1.06E+10
29.4829	46236.	0.00				
38.4000	-0.00225	44.4752	-121.5659	1.68E-04	0.00	1.06E+10
22.1946	47264.	0.00				
38.8000	-0.00145	-284.1669	-33.3553	1.68E-04	0.00	1.06E+10
14.5599	48291.	0.00				
39.2000	-6.41E-04	-277.3487	17.3951	1.68E-04	0.00	1.06E+10
6.5861	49319.	0.00				
39.6000	1.65E-04	-118.7857	29.0583	1.68E-04	0.00	1.06E+10
-1.7265	50346.	0.00				
40.0000	9.70E-04	0.00	0.00	1.68E-04	0.00	1.06E+10
-10.3812	25687.	0.00				

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the

3047-0-0-101 boarding floats 14 inch sq.lp110
 magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection = 2.29735410 inches
 Computed slope at pile head = -0.00978975 radians
 Maximum bending moment = 521766. inch-lbs
 Maximum shear force = -5490. lbs
 Depth of maximum bending moment = 23.20000000 feet below pile head
 Depth of maximum shear force = 30.00000000 feet below pile head
 Number of iterations = 15
 Number of zero deflection points = 2

 Pile-head Deflection vs. Pile Length for Load Case 2

Boundary Condition Type 1, Shear and Moment

Shear = 2000. lbs
 Moment = 0. in-lbs
 Axial Load = 1000. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
40.00000	2.29735410	521766.	-5490.
38.00000	2.31212233	524776.	-5578.
36.00000	2.34173739	524927.	-6013.
34.00000	2.44933325	521528.	-7134.
32.00000	3.16907190	518510.	-9174.
30.00000	6.86188399	511005.	-11233.

 Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
 Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
 Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs

3047-0-0-101 boarding floats 14 inch sq.lp110

Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

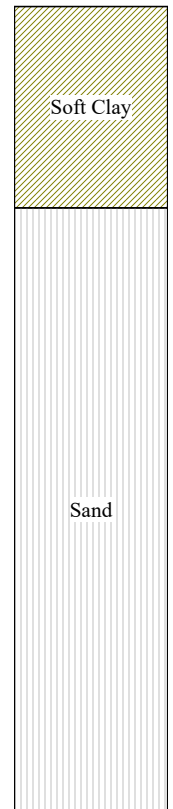
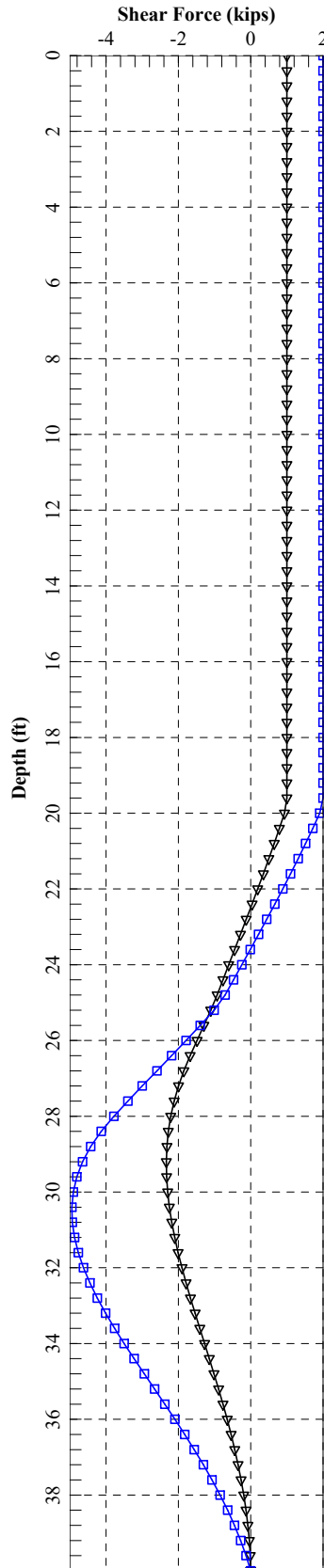
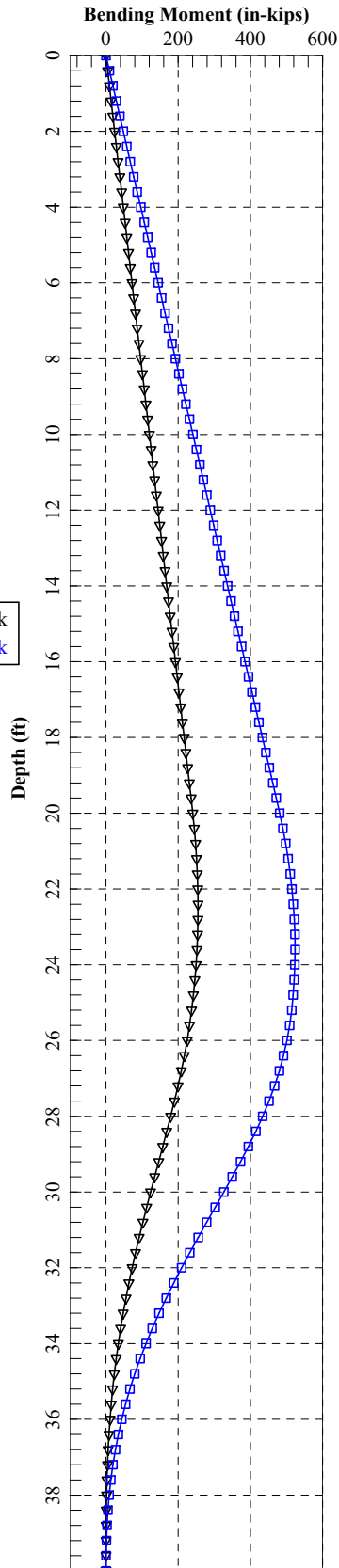
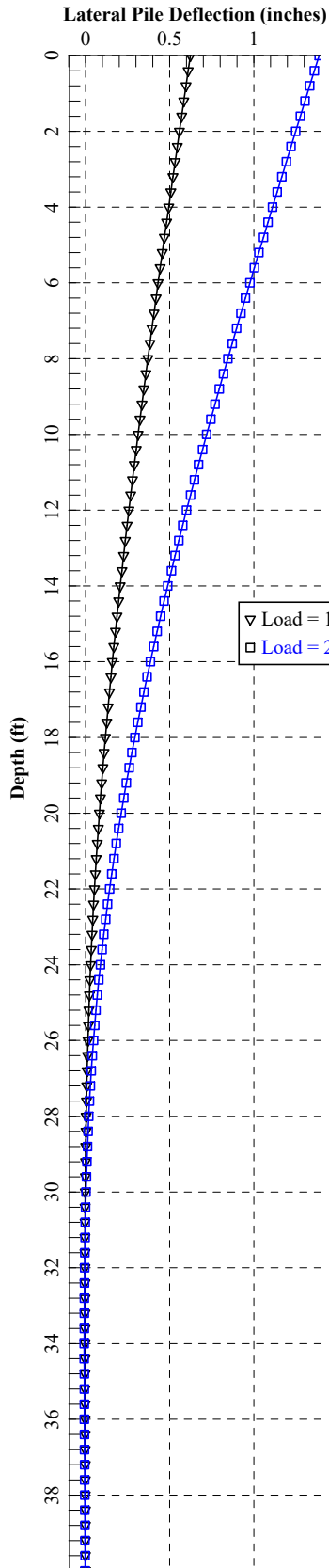
Load Case	Load Type	Load 1 Pile-head in-lbs	Load 2 Type	Load 2 Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max in
1	V, lb	1000.0000	M, in-lb	0.00	1000.0000	1.0348	-0.00458	
		-2612.254332						
2	V, lb	2000.	M, in-lb	0.00	1000.0000	2.2974	-0.00979	
		-5490.521766						

Maximum pile-head deflection = 2.2973540979 inches

Maximum pile-head rotation = -0.0097897475 radians = -0.560911 deg.

The analysis ended normally.

16" square boarding floats



3047-0-0-101 boarding floats 16 inch sq.lp11o

=====
LPile for Windows, Version 2019-11.001

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
© 1985-2019 by Ensoft, Inc.
All Rights Reserved

=====
This copy of LPile is being used by:

GAI
Gorian and Associates, INC.

Serial Number of Security Device: 139304473

This copy of LPile is licensed for exclusive use by:

Gorian & Associates, Inc., Thous

Use of this program by any entity other than Gorian & Associates, Inc., Thous
is a violation of the software license agreement.

Files Used for Analysis

Path to file locations:

\\SERVER\Server\gorian\GORIAN MASTER FILES\3047-0-0 Noble MDR Pavement\Pile Calcs\

Name of input data file:

3047-0-0-101 boarding floats 16 inch sq.lp11

Name of output report file:

3047-0-0-101 boarding floats 16 inch sq.lp11

Name of plot output file:

3047-0-0-101 boarding floats 16 inch sq.lp11

Name of runtime message file:

3047-0-0-101 boarding floats 16 inch sq.lp11

Date and Time of Analysis

3047-0-0-101 boarding floats 16 inch sq.lp11o

Date: April 16, 2019

Time: 11:37:16

Problem Title

Project Name: MDR Boat Launch Renovation

Work Order: 3047-0-0-101

Client: Noble GEC

Engineer: GAI

Description: Boarding Floats 16" sq

Program Options and Settings

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

3047-0-0-101 boarding floats 16 inch sq.lp110

Loading Type and Number of Cycles of Loading:

- Static loading specified
- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1
Total length of pile = 40.000 ft
Depth of ground surface below top of pile = 20.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	16.0000
2	40.000	16.0000

Input Structural Properties for Pile Sections:

3047-0-0-101 boarding floats 16 inch sq.lp110

Pile Section No. 1:

Section 1 is a square prestressed concrete pile

Length of section	=	40.000000 ft
Pile Width	=	16.000000 in
Corner Chamfer	=	0.500000 in
Shear capacity of section	=	100.000000 lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	20.000000 ft
Distance from top of pile to bottom of layer	=	25.000000 ft
Effective unit weight at top of layer	=	41.000000 pcf
Effective unit weight at bottom of layer	=	41.000000 pcf
Undrained cohesion at top of layer	=	365.000000 psf
Undrained cohesion at bottom of layer	=	365.000000 psf
Epsilon-50 at top of layer	=	0.0000
Epsilon-50 at bottom of layer	=	0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	25.000000 ft
Distance from top of pile to bottom of layer	=	40.000000 ft
Effective unit weight at top of layer	=	51.000000 pcf
Effective unit weight at bottom of layer	=	51.000000 pcf

3047-0-0-101 boarding floats 16 inch sq.lp110

Friction angle at top of layer = 31.000000 deg.
 Friction angle at bottom of layer = 31.000000 deg.
 Subgrade k at top of layer = 0.0000 pci
 Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 40.000000 ft
 Distance from top of pile to bottom of layer = 70.000000 ft
 Effective unit weight at top of layer = 68.000000 pcf
 Effective unit weight at bottom of layer = 68.000000 pcf
 Friction angle at top of layer = 33.000000 deg.
 Friction angle at bottom of layer = 33.000000 deg.
 Subgrade k at top of layer = 0.0000 pci
 Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

(Depth of the lowest soil layer extends 30.000 ft below the pile tip)

 Summary of Input Soil Properties

Layer E50 Layer or Num. krm	Soil Type Name (p-y Curve Type) kpy pci	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.
1 default	Soft -- Clay	20.0000	41.0000	365.0000	--
2 default	Sand -- (Reese, et al.)	25.0000 40.0000	51.0000 51.0000	-- --	31.0000 31.0000
3 --	Sand -- (Reese, et al.)	40.0000 70.0000	68.0000 68.0000	-- --	33.0000 33.0000
--	default				

 Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

 Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load Compute No.	Load Top y Type vs. Pile Length	Condition 1	Condition 2	Axial Thrust Force, lbs
1	1 Yes	V = 1000.000000 lbs	M = 0.0000 in-lbs	1000.00000000
2	1 Yes	V = 2000. lbs	M = 0.0000 in-lbs	1000.00000000

V = shear force applied normal to pile axis
 M = bending moment applied to pile head
 y = lateral deflection normal to pile axis
 S = pile slope relative to original pile batter angle
 R = rotational stiffness applied to pile head
 Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
 Thrust force is assumed to be acting axially for all pile batter angles.

 Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

3047-0-0-101 boarding floats 16 inch sq.lp110

Dimensions of Square Prestressed Pile Section:

Length of Section = 40.0000 ft
 Pile Width = 16.000 in
 Corner Chamfer = 0.500 in

Prestressing Strand Details:

Strand Type = Deformed bars (150-160
 ksi)
 Yield Stress, f_{pu} = 157. ksi
 Elasticity Modulus, E_s = 29000. ksi
 Number of Reinforcing Strands = 8
 Cross-sectional Area of Single Strand = 0.280 sq. in.
 Concrete Cover Thickness Over Strands = 2.000 in

Prestressing Strand Geometry:

Strand No.	Diameter in	Area sq. in	X in	Y in
1	0.625	0.280	5.688	0.000
2	0.625	0.280	4.022	4.022
3	0.625	0.280	0.000	5.688
4	0.625	0.280	-4.022	4.022
5	0.625	0.280	-5.688	0.000
6	0.625	0.280	-4.022	-4.022
7	0.625	0.280	-0.000	-5.688
8	0.625	0.280	4.022	-4.022

Computation of Loss of Prestress:

Initial Prestressing Force = 244.000 kips
 Fraction of Loss of Prestress = 0.250
 Effective Prestressing Force After Losses = 183.000 kips
 Area of Concrete, A_c = 253.260 sq.in
 Area of Steel, A_s = 2.240 sq.in
 Stress in Concrete After Losses, f_{pc} = 0.723 ksi
 Stress in Steel After Losses = -81.696 ksi
 Compressive Strain in Concrete After Losses = 0.0002004
 Tensile Strain in Steel After Losses = -0.0028171
 Axial Tension Load for Cracking of Concrete = -242.287 kips

3047-0-0-101 boarding floats 16 inch sq.lp110

Estimated Structural Capacities Computed Using PCI Equations:

Nom. Axial Cap., $P_n = (0.85 f'_c - 0.60 f_{pc}) A_g$ = 757.929 kips
Unfac. Axial Load Cap. $N = (0.33 f'_c - 0.27 f_{pc}) A_g$ = 287.413 kips
Axial Capacity in Tension, $N_t = A_s f_{pu}$ = -351.680 kips
Nom. Moment Capacity, $M_n = 0.37 D A_s f_{pu}$ = 2081.946 in-kip

Note: The estimate of nominal moment capacity is based on equations that assume compressive strength of concrete is 6,000 psi (41.4 MPa), the value of prestress after losses is 700 psi (4.83 MPa), and axial thrust force is zero. When input values for these factors are different, the estimated value of nominal moment capacity will differ from the capacity computed by LPILE and should be considered only as an approximate check.

Concrete Properties:

Compressive Strength of Concrete = 4000. psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Prestressed Concrete = -252.982213 psi
Compression Strain at Peak Stress = 0.001886
Tensile Strain at Fracture of Concrete = -0.0000606
Maximum Coarse Aggregate Size = 0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
-----	-----
1	1.000

Definitions of Run Messages and Notes:

- C = concrete in section has cracked in tension.
- Y = stress in reinforcing steel has reached yield stress.
- T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.
- Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.

3047-0-0-101 boarding floats 16 inch sq.lp110

Position of neutral axis is measured from edge of compression side of pile.

Compressive stresses and strains are positive in sign.

Tensile stresses and strains are negative in sign.

Axial Thrust Force = 1.000 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
0.00000125	25.0074451	20005956.	142.9208021	0.0003791	0.0001587
0.7214249	-77.0230495				
0.00000250	52.3604454	20944178.	75.4709369	0.0003891	0.0001487
0.7594284	-77.2397856				
0.00000375	79.7118400	21256491.	52.9924935	0.0003992	0.0001387
0.7972793	-77.4559949				
0.00000500	107.0608024	21412160.	41.7569059	0.0004092	0.0001288
0.8349764	-77.6716772				
0.00000625	134.4065063	21505041.	35.0184608	0.0004193	0.0001189
0.8725185	-77.8868325				
0.00000750	161.7481248	21566417.	30.5285873	0.0004294	0.0001090
0.9099043	-78.1014608				
0.00000875	189.0848312	21609695.	27.3236122	0.0004395	0.00009908
0.9471327	-78.3155620				
0.00001000	216.4157982	21641580.	24.9216990	0.0004497	0.00008922
0.9842025	-78.5291358				
0.00001125	243.7401987	21665795.	23.0551606	0.0004598	0.00007937
1.0211123	-78.7421824				
0.00001250	271.0572049	21684576.	21.5633851	0.0004700	0.00006954
1.0578610	-78.9547015				
0.00001375	298.3659885	21699345.	20.3441648	0.0004802	0.00005973
1.0944475	-79.1666929				
0.00001500	325.6657212	21711048.	19.3293612	0.0004904	0.00004994
1.1308704	-79.3781565				
0.00001625	352.9555740	21720343.	18.4718016	0.0005006	0.00004017
1.1671285	-79.5890921				
0.00001750	380.2347172	21727698.	17.7377913	0.0005108	0.00003041
1.2032207	-79.7994995				
0.00001875	407.5023212	21733457.	17.1026207	0.0005211	0.00002067
1.2391457	-80.0093786				
0.00002000	434.7575551	21737878.	16.5477579	0.0005314	0.00001096
1.2749023	-80.2187290				
0.00002125	461.9995879	21741157.	16.0590313	0.0005417	0.00000125

3047-0-0-101 boarding floats 16 inch sq.lp110

1.3104892	-80.4275505				
0.00002250	489.2253696	21743350.	15.6254061	0.0005520	-0.00000843
1.3459043	-80.6358511				
0.00002375	516.4193208	21743971.	15.2381029	0.0005623	-0.00001810
1.3811399	-80.8436852				
0.00002500	543.5647963	21742592.	14.8900881	0.0005727	-0.00002775
1.4161876	-81.0511146				
0.00002625	570.6490761	21739012.	14.5756843	0.0005830	-0.00003739
1.4510407	-81.2581888				
0.00002750	597.6622941	21733174.	14.2902577	0.0005934	-0.00004702
1.4856936	-81.4649480				
0.00002875	624.5966933	21725102.	14.0299890	0.0006038	-0.00005664
1.5201419	-81.6714252				
0.00003000	646.4872861	21549576.	13.7707066	0.0006136	-0.00006688
1.5522924	-81.8959138 C				
0.00003125	661.9985600	21183954.	13.5053597	0.0006225	-0.00007796
1.5814712	-82.1446963 C				
0.00003250	671.2106471	20652635.	13.2319787	0.0006305	-0.00008996
1.6074436	-82.4202885 C				
0.00003375	688.6069102	20403168.	13.0118897	0.0006396	-0.0001008
1.6369125	-82.6635414 C				
0.00003500	700.2321263	20006632.	12.7825275	0.0006478	-0.0001126
1.6633640	-82.9321630 C				
0.00003625	710.9401377	19612142.	12.5636131	0.0006559	-0.0001246
1.6890390	-83.2064302 C				
0.00003750	720.8946242	19223857.	12.3545691	0.0006637	-0.0001367
1.7140043	-83.4858346 C				
0.00003875	734.3805340	18951756.	12.1737180	0.0006722	-0.0001483
1.7406508	-83.7487129 C				
0.00004000	743.1840209	18579601.	11.9829552	0.0006798	-0.0001607
1.7644513	-84.0362004 C				
0.00004125	755.1437320	18306515.	11.8169932	0.0006879	-0.0001725
1.7898478	-84.3078504 C				
0.00004250	766.4644177	18034457.	11.6577880	0.0006959	-0.0001845
1.8146988	-84.5832047 C				
0.00004375	777.2076675	17764747.	11.5049215	0.0007038	-0.0001967
1.8390331	-84.8620592 C				
0.00004500	783.5126343	17411392.	11.3399423	0.0007107	-0.0002097
1.8603559	-85.1678038 C				
0.00004625	793.2165191	17150627.	11.1984096	0.0007184	-0.0002221
1.8836464	-85.4540615 C				
0.00004750	802.4700481	16894106.	11.0620396	0.0007259	-0.0002346
1.9064763	-85.7434689 C				
0.00004875	811.4677092	16645491.	10.9312544	0.0007333	-0.0002471
1.9289728	-86.0348675 C				
0.00005125	815.9422469	15920824.	10.6189542	0.0007447	-0.0002758
1.9627776	-86.7215077 C				
0.00005375	833.1401746	15500282.	10.3944763	0.0007591	-0.0003013

3047-0-0-101 boarding floats 16 inch sq.lp110

2.0057753	-87.3165385 C				
0.00005625	849.5648946	15103376.	10.1862518	0.0007734	-0.0003270
2.0476977	-87.9176053 C				
0.00005875	865.2541302	14727730.	9.9922052	0.0007875	-0.0003530
2.0885645	-88.5247089 C				
0.00006125	880.2472510	14371384.	9.8106115	0.0008013	-0.0003791
2.1283972	-89.1378298 C				
0.00006375	894.6716702	14034065.	9.6405561	0.0008150	-0.0004054
2.1673155	-89.7559503 C				
0.00006625	908.5801295	13714417.	9.4808972	0.0008285	-0.0004319
2.2053662	-90.3787547 C				
0.00006875	922.0234911	13411251.	9.3306730	0.0008419	-0.0004585
2.2425970	-91.0058991 C				
0.00007125	935.0507016	13123519.	9.1890716	0.0008552	-0.0004853
2.2790571	-91.6370093 C				
0.00007375	947.6619119	12849653.	9.0551126	0.0008683	-0.0005122
2.3147376	-92.2723063 C				
0.00007625	959.8922991	12588751.	8.9281426	0.0008812	-0.0005392
2.3496715	-92.9115731 C				
0.00007875	971.8193569	12340563.	8.8078767	0.0008941	-0.0005664
2.3839513	-93.5539400 C				
0.00008125	983.4855398	12104437.	8.6939026	0.0009068	-0.0005936
2.4176310	-94.1989203 C				
0.00008375	994.8489281	11878793.	8.5853497	0.0009195	-0.0006210
2.4506502	-94.8472602 C				
0.00008625	1006.	11662944.	8.4817775	0.0009320	-0.0006484
2.4830257	-95.4988825 C				
0.00008875	1017.	11457421.	8.3834665	0.0009445	-0.0006760
2.5149278	-96.1519815 C				
0.00009125	1027.	11259968.	8.2891583	0.0009568	-0.0007036
2.5461679	-96.8087432 C				
0.00009375	1038.	11071362.	8.1992870	0.0009691	-0.0007313
2.5769353	-97.4671167 C				
0.00009625	1048.	10890647.	8.1133408	0.0009813	-0.0007591
2.6071946	-98.1275657 C				
0.00009875	1058.	10717248.	8.0309801	0.0009935	-0.0007869
2.6369414	-98.7902092 C				
0.0001013	1068.	10551127.	7.9522492	0.0010056	-0.0008148
2.6662586	-99.4541366 C				
0.0001038	1078.	10391429.	7.8766268	0.0010176	-0.0008428
2.6950848	-100.1201273 C				
0.0001063	1088.	10238045.	7.8041178	0.0010296	-0.0008708
2.7234826	-100.7874903 C				
0.0001088	1097.	10090708.	7.7345863	0.0010416	-0.0008989
2.7514763	-101.4559768 C				
0.0001113	1107.	9948457.	7.6674322	0.0010534	-0.0009270
2.7789647	-102.1268751 C				
0.0001138	1116.	9812247.	7.6034154	0.0010653	-0.0009551

3047-0-0-101 boarding floats 16 inch sq.lp110

2.8061961	-102.7971616	C				
0.0001163	1125.		9679866.	7.5409499	0.0010771	-0.0009834
2.8328002	-103.4715010	C				
0.0001188	1134.		9552759.	7.4812102	0.0010888	-0.0010116
2.8591302	-104.1455107	C				
0.0001213	1143.		9430216.	7.4237134	0.0011006	-0.0010399
2.8851000	-104.8202960	C				
0.0001238	1152.		9311239.	7.3677323	0.0011122	-0.0010682
2.9105497	-105.4979789	C				
0.0001263	1161.		9196792.	7.3141293	0.0011238	-0.0010966
2.9357500	-106.1750725	C				
0.0001288	1170.		9086108.	7.2623292	0.0011355	-0.0011250
2.9605778	-106.8532066	C				
0.0001313	1178.		8978515.	7.2118242	0.0011470	-0.0011534
2.9849224	-107.5339222	C				
0.0001338	1187.		8874775.	7.1633570	0.0011585	-0.0011819
3.0090208	-108.2140571	C				
0.0001363	1196.		8774587.	7.1167329	0.0011701	-0.0012103
3.0328481	-108.8939373	C				
0.0001388	1204.		8676690.	7.0708418	0.0011815	-0.0012389
3.0561146	-109.5776283	C				
0.0001413	1212.		8582101.	7.0267152	0.0011930	-0.0012675
3.0791382	-110.2607460	C				
0.0001438	1221.		8490647.	6.9842616	0.0012044	-0.0012960
3.1019174	-110.9432875	C				
0.0001463	1229.		8401727.	6.9429471	0.0012158	-0.0013246
3.1243206	-111.6271539	C				
0.0001488	1237.		8315032.	6.9025210	0.0012272	-0.0013532
3.1462951	-112.3131780	C				
0.0001588	1269.		7993039.	6.7535252	0.0012726	-0.0014679
3.2313936	-115.0573864	C				
0.0001688	1300.		7704462.	6.6210067	0.0013177	-0.0015827
3.3116744	-117.8073764	C				
0.0001788	1331.		7443882.	6.5021786	0.0013627	-0.0016977
3.3871909	-120.5632601	C				
0.0001888	1360.		7207258.	6.3951285	0.0014075	-0.0018129
3.4580812	-123.3235944	C				
0.0001988	1390.		6991857.	6.2992357	0.0014524	-0.0019280
3.5247273	-126.0817085	C				
0.0002088	1418.		6794065.	6.2119692	0.0014972	-0.0020433
3.5868425	-128.8432196	C				
0.0002188	1446.		6612269.	6.1333500	0.0015421	-0.0021583
3.6447943	-131.6004887	C				
0.0002288	1474.		6443960.	6.0615320	0.0015870	-0.0022734
3.6983497	-134.3582399	C				
0.0002388	1501.		6288195.	5.9970951	0.0016322	-0.0023882
3.7478784	-137.1065411	C				
0.0002488	1528.		6142573.	5.9373208	0.0016773	-0.0025031

3047-0-0-101 boarding floats 16 inch sq.lp110

3.7928441	-139.8585803	C				
0.0002588	1554.		6006780.	5.8835942	0.0017228	-0.0026176
3.8337163	-142.5999080	C				
0.0002688	1580.		5879605.	5.8351088	0.0017686	-0.0027318
3.8703568	-145.3315486	C				
0.0002788	1605.		5759610.	5.7900216	0.0018144	-0.0028460
3.9024282	-148.0638406	C				
0.0002888	1630.		5646255.	5.7493626	0.0018606	-0.0029599
3.9301614	-150.0000000	C				
0.0002988	1652.		5531217.	5.7097348	0.0019062	-0.0030742
3.9530365	-150.0000000	C				
0.0003088	1671.		5410784.	5.6689157	0.0019507	-0.0031897
3.9709700	-150.0000000	C				
0.0003188	1687.		5294065.	5.6297324	0.0019949	-0.0033055
3.9845332	-150.0000000	C				
0.0003288	1704.		5183403.	5.5942022	0.0020395	-0.0034209
3.9939305	-150.0000000	C				
0.0003388	1720.		5078222.	5.5620512	0.0020846	-0.0035359
3.9990397	-150.0000000	C				
0.0003488	1736.		4977865.	5.5331727	0.0021301	-0.0036503
3.9981763	-150.0000000	C				
0.0003588	1750.		4877257.	5.5042537	0.0021751	-0.0037653
3.9992851	-150.0000000	C				
0.0003688	1759.		4769314.	5.4709067	0.0022178	-0.0038826
3.9996986	-150.0000000	C				
0.0003788	1764.		4658540.	5.4355928	0.0022592	-0.0040013
3.9982335	-150.0000000	C				
0.0003888	1769.		4551059.	5.4018340	0.0023004	-0.0041200
3.9999819	-150.0000000	C				
0.0003988	1774.		4448367.	5.3708053	0.0023420	-0.0042384
3.9988658	-150.0000000	C				
0.0004088	1778.		4350076.	5.3409933	0.0023836	-0.0043569
3.9991973	-150.0000000	C				
0.0004188	1782.		4255844.	5.3129700	0.0024252	-0.0044752
3.9989906	-150.0000000	C				
0.0004288	1786.		4165719.	5.2868860	0.0024672	-0.0045932
3.9990025	-150.0000000	C				
0.0004388	1790.		4079273.	5.2628539	0.0025095	-0.0047109
3.9987388	-150.0000000	C				
0.0004488	1793.		3996449.	5.2404293	0.0025521	-0.0048284
3.9999980	-150.0000000	C				
0.0004588	1797.		3916848.	5.2197960	0.0025950	-0.0049454
3.9979989	-150.0000000	C				
0.0004688	1800.		3840440.	5.2005338	0.0026382	-0.0050622
3.9998635	-150.0000000	C				
0.0004788	1803.		3766761.	5.1815800	0.0026811	-0.0051793
3.9963871	-150.0000000	C				
0.0004888	1806.		3695881.	5.1639081	0.0027243	-0.0052961

3047-0-0-101 boarding floats 16 inch sq.lp110

3.9991737	-150.0000000	C				
0.0004988	1809.		3627676.	5.1474004	0.0027677	-0.0054127
3.9991550	-150.0000000	C				
0.0005088	1812.		3561886.	5.1322122	0.0028115	-0.0055290
3.9973492	-150.0000000	C				
0.0005188	1815.		3498503.	5.1179884	0.0028554	-0.0056450
3.9995586	-150.0000000	C				
0.0005288	1817.		3437349.	5.1047727	0.0028996	-0.0057609
3.9971226	-150.0000000	C				
0.0005388	1820.		3378267.	5.0925864	0.0029441	-0.0058764
3.9974378	-150.0000000	C				
0.0005488	1823.		3321230.	5.0811808	0.0029887	-0.0059917
3.9995560	-150.0000000	C				
0.0006088	1836.		3015686.	5.0275940	0.0032610	-0.0066795
3.9978997	-150.0000000	C				
0.0006688	1847.		2761624.	4.9923623	0.0035391	-0.0073614
3.9975321	-150.0000000	C				
0.0007288	1856.		2546682.	4.9719196	0.0038237	-0.0080367
3.9944465	-150.0000000	C				

 Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
 or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	1.000	1823.074	0.00300000

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Resist.	Nominal	Ult. (Fac)	Ult. (Fac)	Bend. Stiff.
---------------	---------	------------	------------	--------------

3047-0-0-101 boarding floats 16 inch sq.lp110

Load No.	Factor for Moment	Moment Cap in-kips	Ax. Thrust kips	Moment Cap in-kips	at Ult Mom kip-in ²
1	0.65	1823.	0.650000	1185.	8899018.
1	0.75	1823.	0.700000	1367.	7156203.
1	0.90	1823.	0.750000	1641.	5592053.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	20.0000	0.00	N.A.	No	0.00	10265.
2	25.0000	6.1550	No	No	10265.	289169.
3	40.0000	20.0000	No	No	299433.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 1000.0 lbs
 Applied moment at pile head = 0.0 in-lbs
 Axial thrust load on pile head = 1000.0 lbs

Depth Res. X	Deflect. Soil Spr. y	Bending Distrib. Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
--------------	----------------------	-------------------------	-------------	---------	--------------	-------------------	--------

3047-0-0-101 boarding floats 16 inch sq.lp110

Es*h feet lb/inch	Lat. inches lb/inch	Load in-lbs lb/inch	lbs	radians	psi*	in-lb^2
0.00	0.6232	-2.70E-06	1000.	-0.00271	0.00	2.00E+10
0.00	0.00	0.00				
0.4000	0.6102	4813.	1000.	-0.00270	0.00	2.00E+10
0.00	0.00	0.00				
0.8000	0.5972	9626.	1000.0000	-0.00270	0.00	2.00E+10
0.00	0.00	0.00				
1.2000	0.5842	14439.	1000.0000	-0.00270	0.00	2.00E+10
0.00	0.00	0.00				
1.6000	0.5713	19252.	1000.0000	-0.00270	0.00	2.00E+10
0.00	0.00	0.00				
2.0000	0.5583	24065.	1000.0000	-0.00269	0.00	2.00E+10
0.00	0.00	0.00				
2.4000	0.5454	28878.	1000.0000	-0.00268	0.00	2.02E+10
0.00	0.00	0.00				
2.8000	0.5326	33691.	1000.0000	-0.00268	0.00	2.05E+10
0.00	0.00	0.00				
3.2000	0.5197	38503.	1000.0000	-0.00267	0.00	2.06E+10
0.00	0.00	0.00				
3.6000	0.5069	43316.	1000.0000	-0.00266	0.00	2.08E+10
0.00	0.00	0.00				
4.0000	0.4942	48129.	1000.0000	-0.00265	0.00	2.09E+10
0.00	0.00	0.00				
4.4000	0.4815	52942.	1000.0000	-0.00264	0.00	2.10E+10
0.00	0.00	0.00				
4.8000	0.4689	57754.	1000.0000	-0.00262	0.00	2.10E+10
0.00	0.00	0.00				
5.2000	0.4563	62567.	1000.0000	-0.00261	0.00	2.11E+10
0.00	0.00	0.00				
5.6000	0.4438	67379.	1000.0000	-0.00260	0.00	2.11E+10
0.00	0.00	0.00				
6.0000	0.4314	72192.	1000.0000	-0.00258	0.00	2.12E+10
0.00	0.00	0.00				
6.4000	0.4191	77004.	1000.0000	-0.00256	0.00	2.12E+10
0.00	0.00	0.00				
6.8000	0.4068	81816.	1000.0000	-0.00255	0.00	2.13E+10
0.00	0.00	0.00				
7.2000	0.3946	86629.	1000.0000	-0.00253	0.00	2.13E+10
0.00	0.00	0.00				
7.6000	0.3825	91441.	1000.0000	-0.00251	0.00	2.13E+10
0.00	0.00	0.00				
8.0000	0.3706	96253.	1000.0000	-0.00249	0.00	2.14E+10
0.00	0.00	0.00				
8.4000	0.3587	101064.	1000.0000	-0.00246	0.00	2.14E+10

3047-0-0-101 boarding floats 16 inch sq.lp110

0.00	0.00	0.00					
8.8000	0.3469	105876.	1000.0000	-0.00244	0.00	2.14E+10	
0.00	0.00	0.00					
9.2000	0.3353	110688.	1000.0000	-0.00242	0.00	2.14E+10	
0.00	0.00	0.00					
9.6000	0.3237	115499.	1000.0000	-0.00239	0.00	2.14E+10	
0.00	0.00	0.00					
10.0000	0.3123	120311.	1000.0000	-0.00236	0.00	2.15E+10	
0.00	0.00	0.00					
10.4000	0.3010	125122.	1000.0000	-0.00234	0.00	2.15E+10	
0.00	0.00	0.00					
10.8000	0.2899	129933.	1000.0000	-0.00231	0.00	2.15E+10	
0.00	0.00	0.00					
11.2000	0.2789	134744.	1000.0000	-0.00228	0.00	2.15E+10	
0.00	0.00	0.00					
11.6000	0.2680	139555.	1000.0000	-0.00225	0.00	2.15E+10	
0.00	0.00	0.00					
12.0000	0.2573	144366.	1000.0000	-0.00222	0.00	2.15E+10	
0.00	0.00	0.00					
12.4000	0.2467	149176.	1000.0000	-0.00218	0.00	2.15E+10	
0.00	0.00	0.00					
12.8000	0.2363	153987.	1000.0000	-0.00215	0.00	2.16E+10	
0.00	0.00	0.00					
13.2000	0.2261	158797.	1000.0000	-0.00211	0.00	2.16E+10	
0.00	0.00	0.00					
13.6000	0.2160	163607.	1000.0000	-0.00208	0.00	2.16E+10	
0.00	0.00	0.00					
14.0000	0.2061	168417.	1000.0000	-0.00204	0.00	2.16E+10	
0.00	0.00	0.00					
14.4000	0.1964	173227.	1000.0000	-0.00200	0.00	2.16E+10	
0.00	0.00	0.00					
14.8000	0.1869	178036.	1000.0000	-0.00196	0.00	2.16E+10	
0.00	0.00	0.00					
15.2000	0.1776	182846.	1000.0000	-0.00192	0.00	2.16E+10	
0.00	0.00	0.00					
15.6000	0.1684	187655.	1000.0000	-0.00188	0.00	2.16E+10	
0.00	0.00	0.00					
16.0000	0.1595	192464.	1000.0000	-0.00184	0.00	2.16E+10	
0.00	0.00	0.00					
16.4000	0.1508	197272.	1000.0000	-0.00180	0.00	2.16E+10	
0.00	0.00	0.00					
16.8000	0.1422	202081.	1000.0000	-0.00175	0.00	2.16E+10	
0.00	0.00	0.00					
17.2000	0.1339	206889.	1000.0000	-0.00171	0.00	2.16E+10	
0.00	0.00	0.00					
17.6000	0.1258	211697.	1000.0000	-0.00166	0.00	2.16E+10	
0.00	0.00	0.00					
18.0000	0.1180	216505.	1000.0000	-0.00161	0.00	2.16E+10	

3047-0-0-101 boarding floats 16 inch sq.lp110

0.00	0.00	0.00					
18.4000	0.1103	221313.	1000.0000	-0.00157	0.00	2.16E+10	
0.00	0.00	0.00					
18.8000	0.1029	226120.	1000.0000	-0.00152	0.00	2.17E+10	
0.00	0.00	0.00					
19.2000	0.09577	230927.	1000.0000	-0.00147	0.00	2.17E+10	
0.00	0.00	0.00					
19.6000	0.08885	235734.	1000.0000	-0.00141	0.00	2.17E+10	
0.00	0.00	0.00					
20.0000	0.08219	240541.	931.6175	-0.00136	0.00	2.17E+10	
-28.4927	1664.	0.00					
20.4000	0.07579	244691.	792.3525	-0.00131	0.00	2.17E+10	
-29.5344	1871.	0.00					
20.8000	0.06964	248160.	648.3534	-0.00125	0.00	2.17E+10	
-30.4653	2100.	0.00					
21.2000	0.06376	250927.	500.1566	-0.00120	0.00	2.17E+10	
-31.2834	2355.	0.00					
21.6000	0.05814	252973.	348.3095	-0.00114	0.00	2.17E+10	
-31.9863	2641.	0.00					
22.0000	0.05280	254282.	193.3705	-0.00109	0.00	2.17E+10	
-32.5717	2961.	0.00					
22.4000	0.04772	254840.	35.9097	-0.00103	0.00	2.17E+10	
-33.0370	3323.	0.00					
22.8000	0.04292	254636.	-123.4901	-9.73E-04	0.00	2.17E+10	
-33.3796	3733.	0.00					
23.2000	0.03838	253664.	-284.2323	-9.17E-04	0.00	2.17E+10	
-33.5963	4202.	0.00					
23.6000	0.03412	251917.	-445.7050	-8.61E-04	0.00	2.17E+10	
-33.6839	4739.	0.00					
24.0000	0.03012	249393.	-607.2787	-8.05E-04	0.00	2.17E+10	
-33.6384	5361.	0.00					
24.4000	0.02639	246094.	-768.3036	-7.50E-04	0.00	2.17E+10	
-33.4553	6086.	0.00					
24.8000	0.02292	242025.	-928.1058	-6.96E-04	0.00	2.17E+10	
-33.1290	6939.	0.00					
25.2000	0.01970	237191.	-1104.	-6.43E-04	0.00	2.17E+10	
-40.0275	9751.	0.00					
25.6000	0.01674	231436.	-1294.	-5.91E-04	0.00	2.17E+10	
-39.2748	11259.	0.00					
26.0000	0.01403	224775.	-1483.	-5.41E-04	0.00	2.16E+10	
-39.6617	13569.	0.00					
26.4000	0.01156	217200.	-1673.	-4.92E-04	0.00	2.16E+10	
-39.3569	16349.	0.00					
26.8000	0.00931	208718.	-1849.	-4.44E-04	0.00	2.16E+10	
-33.8839	17467.	0.00					
27.2000	0.00729	199455.	-1998.	-3.99E-04	0.00	2.16E+10	
-28.0882	18495.	0.00					
27.6000	0.00548	189544.	-2119.	-3.56E-04	0.00	2.16E+10	

3047-0-0-101 boarding floats 16 inch sq.lp110

-22.2915	19522.	0.00				
28.0000	0.00387	179120.	-2212.	-3.15E-04	0.00	2.16E+10
-16.5854	20550.	0.00				
28.4000	0.00246	168314.	-2278.	-2.76E-04	0.00	2.16E+10
-11.0505	21577.	0.00				
28.8000	0.00122	157253.	-2318.	-2.40E-04	0.00	2.16E+10
-5.7558	22604.	0.00				
29.2000	1.54E-04	146059.	-2334.	-2.06E-04	0.00	2.15E+10
-0.7593	23632.	0.00				
29.6000	-7.57E-04	134847.	-2327.	-1.75E-04	0.00	2.15E+10
3.8915	24659.	0.00				
30.0000	-0.00152	123725.	-2298.	-1.46E-04	0.00	2.15E+10
8.1595	25687.	0.00				
30.4000	-0.00216	112791.	-2249.	-1.20E-04	0.00	2.14E+10
12.0172	26714.	0.00				
30.8000	-0.00267	102133.	-2183.	-9.55E-05	0.00	2.14E+10
15.4459	27742.	0.00				
31.2000	-0.00308	91831.	-2102.	-7.37E-05	0.00	2.13E+10
18.4350	28769.	0.00				
31.6000	-0.00338	81954.	-2007.	-5.41E-05	0.00	2.13E+10
20.9811	29797.	0.00				
32.0000	-0.00360	72561.	-1902.	-3.66E-05	0.00	2.12E+10
23.0874	30824.	0.00				
32.4000	-0.00373	63699.	-1787.	-2.12E-05	0.00	2.11E+10
24.7625	31852.	0.00				
32.8000	-0.00380	55407.	-1665.	-7.61E-06	0.00	2.10E+10
26.0197	32879.	0.00				
33.2000	-0.00380	47715.	-1538.	4.22E-06	0.00	2.09E+10
26.8760	33907.	0.00				
33.6000	-0.00376	40642.	-1408.	1.44E-05	0.00	2.07E+10
27.3514	34934.	0.00				
34.0000	-0.00367	34200.	-1276.	2.31E-05	0.00	2.05E+10
27.4677	35962.	0.00				
34.4000	-0.00354	28390.	-1145.	3.05E-05	0.00	2.02E+10
27.2481	36989.	0.00				
34.8000	-0.00337	23207.	-1015.	3.67E-05	0.00	2.00E+10
26.7164	38017.	0.00				
35.2000	-0.00318	18641.	-889.1863	4.17E-05	0.00	2.00E+10
25.8977	39044.	0.00				
35.6000	-0.00297	14671.	-767.4670	4.57E-05	0.00	2.00E+10
24.8187	40072.	0.00				
36.0000	-0.00275	11273.	-651.4909	4.88E-05	0.00	2.00E+10
23.5047	41099.	0.00				
36.4000	-0.00250	8416.	-542.3294	5.12E-05	0.00	2.00E+10
21.9792	42127.	0.00				
36.8000	-0.00225	6066.	-440.9466	5.29E-05	0.00	2.00E+10
20.2636	43154.	0.00				
37.2000	-0.00200	4183.	-348.2106	5.41E-05	0.00	2.00E+10

3047-0-0-101 boarding floats 16 inch sq.lp110

18.3764	44181.	0.00					
37.6000	-0.00173	2723.	-264.9065	5.50E-05	0.00	2.00E+10	
16.3336	45209.	0.00					
38.0000	-0.00147	1639.	-191.7497	5.55E-05	0.00	2.00E+10	
14.1484	46236.	0.00					
38.4000	-0.00120	881.2246	-129.3993	5.58E-05	0.00	2.00E+10	
11.8309	47264.	0.00					
38.8000	-9.33E-04	396.1322	-78.4718	5.59E-05	0.00	2.00E+10	
9.3888	48291.	0.00					
39.2000	-6.64E-04	127.3584	-39.5533	5.60E-05	0.00	2.00E+10	
6.8272	49319.	0.00					
39.6000	-3.96E-04	15.8832	-13.2105	5.60E-05	0.00	2.00E+10	
4.1490	50346.	0.00					
40.0000	-1.27E-04	0.00	0.00	5.60E-05	0.00	2.00E+10	
1.3554	25687.	0.00					

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.62315058 inches
 Computed slope at pile head = -0.00270526 radians
 Maximum bending moment = 254840. inch-lbs
 Maximum shear force = -2334. lbs
 Depth of maximum bending moment = 22.40000000 feet below pile head
 Depth of maximum shear force = 29.20000000 feet below pile head
 Number of iterations = 13
 Number of zero deflection points = 2

 Pile-head Deflection vs. Pile Length for Load Case 1

Boundary Condition Type 1, Shear and Moment

Shear = 1000. lbs
 Moment = 0. in-lbs
 Axial Load = 1000. lbs

3047-0-0-101 boarding floats 16 inch sq.lp110

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
40.00000	0.62315058	254840.	-2334.
38.00000	0.62983405	256278.	-2400.
36.00000	0.64038460	256414.	-2612.
34.00000	0.67469496	254831.	-3055.
32.00000	0.83228145	254285.	-3842.
30.00000	1.57482409	251152.	-4779.
28.00000	6.59399469	252099.	-5847.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 2000.0 lbs
 Applied moment at pile head = 0.0 in-lbs
 Axial thrust load on pile head = 1000.0 lbs

Depth Res.	Deflect. Soil Spr.	Bending Distrib. Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
X	y	Lat. Load					
Es*h	Lat. Load						
feet	inches	in-lbs	lbs	radians	psi*	in-lb^2	
lb/inch	lb/inch	lb/inch					
0.00	1.3880	-9.64E-06	2000.	-0.00579	0.00	2.00E+10	
0.00	0.00	0.00					
0.4000	1.3601	9628.	2000.	-0.00579	0.00	2.00E+10	
0.00	0.00	0.00					
0.8000	1.3323	19256.	2000.	-0.00579	0.00	2.00E+10	
0.00	0.00	0.00					
1.2000	1.3046	28883.	2000.	-0.00578	0.00	2.02E+10	
0.00	0.00	0.00					
1.6000	1.2768	38511.	2000.	-0.00578	0.00	2.06E+10	
0.00	0.00	0.00					
2.0000	1.2491	48139.	2000.	-0.00576	0.00	2.09E+10	
0.00	0.00	0.00					
2.4000	1.2215	57766.	2000.	-0.00575	0.00	2.10E+10	
0.00	0.00	0.00					
2.8000	1.1939	67394.	2000.	-0.00574	0.00	2.11E+10	
0.00	0.00	0.00					

3047-0-0-101 boarding floats 16 inch sq.lp110

3.2000	1.1664	77022.	2000.	-0.00572	0.00	2.12E+10
0.00	0.00	0.00				
3.6000	1.1390	86649.	2000.	-0.00570	0.00	2.13E+10
0.00	0.00	0.00				
4.0000	1.1116	96276.	2000.	-0.00568	0.00	2.14E+10
0.00	0.00	0.00				
4.4000	1.0844	105904.	2000.	-0.00566	0.00	2.14E+10
0.00	0.00	0.00				
4.8000	1.0573	115531.	2000.	-0.00564	0.00	2.14E+10
0.00	0.00	0.00				
5.2000	1.0303	125158.	2000.	-0.00561	0.00	2.15E+10
0.00	0.00	0.00				
5.6000	1.0035	134784.	2000.	-0.00558	0.00	2.15E+10
0.00	0.00	0.00				
6.0000	0.9767	144411.	2000.	-0.00555	0.00	2.15E+10
0.00	0.00	0.00				
6.4000	0.9502	154038.	2000.	-0.00552	0.00	2.16E+10
0.00	0.00	0.00				
6.8000	0.9238	163664.	2000.	-0.00548	0.00	2.16E+10
0.00	0.00	0.00				
7.2000	0.8976	173290.	2000.	-0.00544	0.00	2.16E+10
0.00	0.00	0.00				
7.6000	0.8715	182916.	2000.	-0.00540	0.00	2.16E+10
0.00	0.00	0.00				
8.0000	0.8457	192542.	2000.	-0.00536	0.00	2.16E+10
0.00	0.00	0.00				
8.4000	0.8201	202168.	2000.	-0.00532	0.00	2.16E+10
0.00	0.00	0.00				
8.8000	0.7947	211793.	2000.	-0.00527	0.00	2.16E+10
0.00	0.00	0.00				
9.2000	0.7695	221418.	2000.	-0.00522	0.00	2.16E+10
0.00	0.00	0.00				
9.6000	0.7445	231043.	2000.	-0.00517	0.00	2.17E+10
0.00	0.00	0.00				
10.0000	0.7198	240668.	2000.	-0.00512	0.00	2.17E+10
0.00	0.00	0.00				
10.4000	0.6954	250293.	2000.	-0.00507	0.00	2.17E+10
0.00	0.00	0.00				
10.8000	0.6712	259917.	2000.	-0.00501	0.00	2.17E+10
0.00	0.00	0.00				
11.2000	0.6473	269541.	2000.	-0.00495	0.00	2.17E+10
0.00	0.00	0.00				
11.6000	0.6236	279164.	2000.	-0.00489	0.00	2.17E+10
0.00	0.00	0.00				
12.0000	0.6003	288788.	2000.	-0.00483	0.00	2.17E+10
0.00	0.00	0.00				
12.4000	0.5773	298411.	2000.	-0.00476	0.00	2.17E+10
0.00	0.00	0.00				

3047-0-0-101 boarding floats 16 inch sq.lp11o

12.8000	0.5546	308033.	2000.	-0.00470	0.00	2.17E+10
0.00	0.00	0.00				
13.2000	0.5322	317656.	2000.	-0.00463	0.00	2.17E+10
0.00	0.00	0.00				
13.6000	0.5102	327278.	2000.	-0.00456	0.00	2.17E+10
0.00	0.00	0.00				
14.0000	0.4885	336899.	2000.	-0.00448	0.00	2.17E+10
0.00	0.00	0.00				
14.4000	0.4671	346521.	2000.	-0.00441	0.00	2.17E+10
0.00	0.00	0.00				
14.8000	0.4462	356142.	2000.	-0.00433	0.00	2.17E+10
0.00	0.00	0.00				
15.2000	0.4256	365762.	2000.	-0.00425	0.00	2.17E+10
0.00	0.00	0.00				
15.6000	0.4054	375383.	2000.	-0.00417	0.00	2.17E+10
0.00	0.00	0.00				
16.0000	0.3856	385002.	2000.	-0.00408	0.00	2.17E+10
0.00	0.00	0.00				
16.4000	0.3662	394622.	2000.	-0.00400	0.00	2.17E+10
0.00	0.00	0.00				
16.8000	0.3472	404241.	2000.	-0.00391	0.00	2.17E+10
0.00	0.00	0.00				
17.2000	0.3287	413859.	2000.	-0.00382	0.00	2.17E+10
0.00	0.00	0.00				
17.6000	0.3105	423477.	2000.	-0.00373	0.00	2.17E+10
0.00	0.00	0.00				
18.0000	0.2929	433095.	2000.	-0.00363	0.00	2.17E+10
0.00	0.00	0.00				
18.4000	0.2757	442712.	2000.	-0.00353	0.00	2.17E+10
0.00	0.00	0.00				
18.8000	0.2589	452329.	2000.	-0.00344	0.00	2.17E+10
0.00	0.00	0.00				
19.2000	0.2427	461945.	2000.	-0.00334	0.00	2.17E+10
0.00	0.00	0.00				
19.6000	0.2269	471561.	2000.	-0.00323	0.00	2.17E+10
0.00	0.00	0.00				
20.0000	0.2117	481176.	1906.	-0.00313	0.00	2.17E+10
-39.0536	885.6412	0.00				
20.4000	0.1969	489891.	1715.	-0.00302	0.00	2.17E+10
-40.6015	989.7335	0.00				
20.8000	0.1827	497670.	1517.	-0.00291	0.00	2.17E+10
-42.0145	1104.	0.00				
21.2000	0.1690	504481.	1312.	-0.00280	0.00	2.17E+10
-43.2902	1230.	0.00				
21.6000	0.1558	510293.	1102.	-0.00269	0.00	2.17E+10
-44.4257	1369.	0.00				
22.0000	0.1432	515082.	885.9453	-0.00257	0.00	2.17E+10
-45.4184	1523.	0.00				

3047-0-0-101 boarding floats 16 inch sq.lp110

22.4000	0.1311	518823.	665.9041	-0.00246	0.00	2.17E+10
-46.2654	1694.	0.00				
22.8000	0.1195	521498.	442.1545	-0.00235	0.00	2.17E+10
-46.9636	1886.	0.00				
23.2000	0.1086	523090.	215.4184	-0.00223	0.00	2.17E+10
-47.5098	2101.	0.00				
23.6000	0.09812	523587.	-13.5665	-0.00212	0.00	2.17E+10
-47.9006	2343.	0.00				
24.0000	0.08825	522980.	-244.0449	-0.00200	0.00	2.17E+10
-48.1321	2618.	0.00				
24.4000	0.07892	521264.	-475.2431	-0.00188	0.00	2.17E+10
-48.2005	2931.	0.00				
24.8000	0.07016	518436.	-706.3666	-0.00177	0.00	2.17E+10
-48.1010	3291.	0.00				
25.2000	0.06194	514500.	-1012.	-0.00166	0.00	2.17E+10
-79.2007	6138.	0.00				
25.6000	0.05426	508738.	-1395.	-0.00154	0.00	2.17E+10
-80.2711	7101.	0.00				
26.0000	0.04713	501126.	-1786.	-0.00143	0.00	2.17E+10
-82.8486	8439.	0.00				
26.4000	0.04052	491605.	-2187.	-0.00132	0.00	2.17E+10
-84.3936	9997.	0.00				
26.8000	0.03444	480139.	-2594.	-0.00121	0.00	2.17E+10
-84.8323	11824.	0.00				
27.2000	0.02886	466718.	-2999.	-0.00111	0.00	2.17E+10
-84.0921	13985.	0.00				
27.6000	0.02378	451358.	-3398.	-0.00101	0.00	2.17E+10
-82.0976	16569.	0.00				
28.0000	0.01918	434107.	-3784.	-9.11E-04	0.00	2.17E+10
-78.7637	19710.	0.00				
28.4000	0.01504	415041.	-4135.	-8.17E-04	0.00	2.17E+10
-67.6071	21577.	0.00				
28.8000	0.01134	394417.	-4426.	-7.28E-04	0.00	2.17E+10
-53.3945	22604.	0.00				
29.2000	0.00805	372562.	-4649.	-6.43E-04	0.00	2.17E+10
-39.6559	23632.	0.00				
29.6000	0.00517	349793.	-4808.	-5.63E-04	0.00	2.17E+10
-26.5415	24659.	0.00				
30.0000	0.00265	326412.	-4906.	-4.88E-04	0.00	2.17E+10
-14.1762	25687.	0.00				
30.4000	4.78E-04	302704.	-4946.	-4.19E-04	0.00	2.17E+10
-2.6611	26714.	0.00				
30.8000	-0.00137	278934.	-4933.	-3.54E-04	0.00	2.17E+10
7.9260	27742.	0.00				
31.2000	-0.00292	255347.	-4872.	-2.95E-04	0.00	2.17E+10
17.5290	28769.	0.00				
31.6000	-0.00421	232163.	-4768.	-2.41E-04	0.00	2.17E+10
26.1120	29797.	0.00				

3047-0-0-101 boarding floats 16 inch sq.lp110

32.0000	-0.00524	209581.	-4624.	-1.92E-04	0.00	2.16E+10
33.6576	30824.	0.00				
32.4000	-0.00605	187774.	-4447.	-1.48E-04	0.00	2.16E+10
40.1651	31852.	0.00				
32.8000	-0.00666	166892.	-4241.	-1.09E-04	0.00	2.16E+10
45.6486	32879.	0.00				
33.2000	-0.00710	147062.	-4011.	-7.39E-05	0.00	2.15E+10
50.1349	33907.	0.00				
33.6000	-0.00737	128386.	-3762.	-4.31E-05	0.00	2.15E+10
53.6616	34934.	0.00				
34.0000	-0.00751	110947.	-3498.	-1.64E-05	0.00	2.14E+10
56.2750	35962.	0.00				
34.4000	-0.00753	94805.	-3224.	6.72E-06	0.00	2.14E+10
58.0283	36989.	0.00				
34.8000	-0.00745	79999.	-2943.	2.64E-05	0.00	2.13E+10
58.9796	38017.	0.00				
35.2000	-0.00728	66552.	-2659.	4.30E-05	0.00	2.11E+10
59.1898	39044.	0.00				
35.6000	-0.00703	54469.	-2376.	5.68E-05	0.00	2.10E+10
58.7216	40072.	0.00				
36.0000	-0.00673	43738.	-2097.	6.81E-05	0.00	2.08E+10
57.6374	41099.	0.00				
36.4000	-0.00638	34336.	-1824.	7.71E-05	0.00	2.05E+10
55.9978	42127.	0.00				
36.8000	-0.00599	26223.	-1561.	8.43E-05	0.00	2.01E+10
53.8607	43154.	0.00				
37.2000	-0.00557	19352.	-1308.	8.98E-05	0.00	2.00E+10
51.2799	44181.	0.00				
37.6000	-0.00513	13662.	-1069.	9.37E-05	0.00	2.00E+10
48.3095	45209.	0.00				
38.0000	-0.00467	9085.	-845.4369	9.64E-05	0.00	2.00E+10
44.9984	46236.	0.00				
38.4000	-0.00420	5545.	-638.1089	9.82E-05	0.00	2.00E+10
41.3883	47264.	0.00				
38.8000	-0.00373	2958.	-448.7447	9.92E-05	0.00	2.00E+10
37.5135	48291.	0.00				
39.2000	-0.00325	1236.	-278.5513	9.97E-05	0.00	2.00E+10
33.4005	49319.	0.00				
39.6000	-0.00277	283.0270	-128.6271	9.99E-05	0.00	2.00E+10
29.0679	50346.	0.00				
40.0000	-0.00229	0.00	0.00	9.99E-05	0.00	2.00E+10
24.5267	25687.	0.00				

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the

3047-0-0-101 boarding floats 16 inch sq.lp110
 magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection = 1.38795169 inches
 Computed slope at pile head = -0.00579327 radians
 Maximum bending moment = 523587. inch-lbs
 Maximum shear force = -4946. lbs
 Depth of maximum bending moment = 23.60000000 feet below pile head
 Depth of maximum shear force = 30.40000000 feet below pile head
 Number of iterations = 14
 Number of zero deflection points = 1

 Pile-head Deflection vs. Pile Length for Load Case 2

Boundary Condition Type 1, Shear and Moment

Shear = 2000. lbs
 Moment = 0. in-lbs
 Axial Load = 1000. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
40.00000	1.38795169	523587.	-4946.
38.00000	1.40318410	526290.	-5221.
36.00000	1.44979153	525685.	-5965.
34.00000	1.60227246	521032.	-7197.
32.00000	2.41458436	516500.	-9048.
30.00000	6.16839620	508724.	-10858.

 Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
 Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
 Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs

3047-0-0-101 boarding floats 16 inch sq.lp110

Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

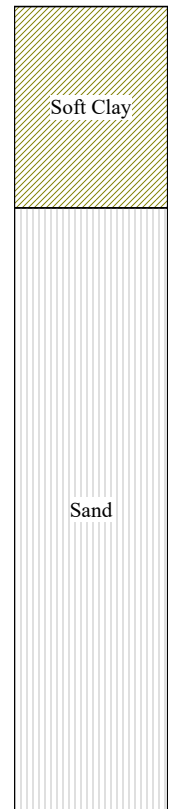
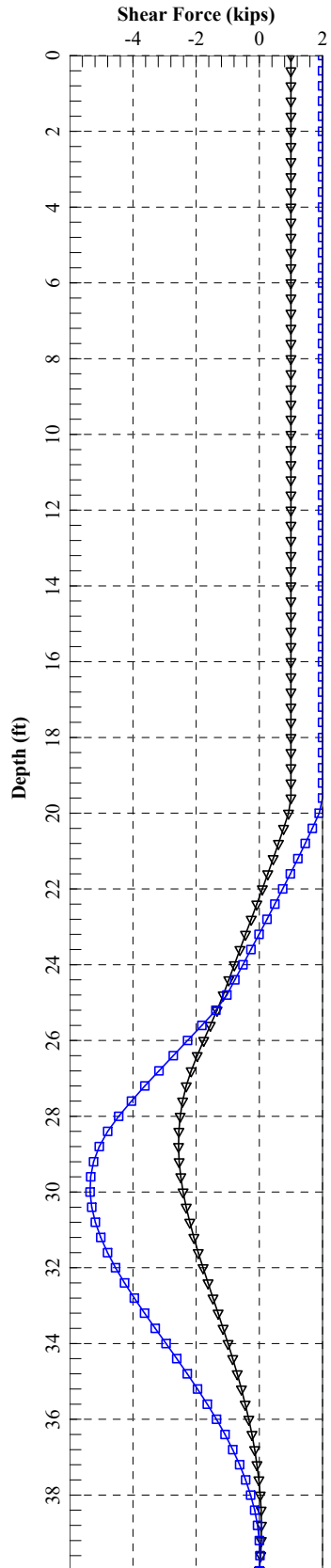
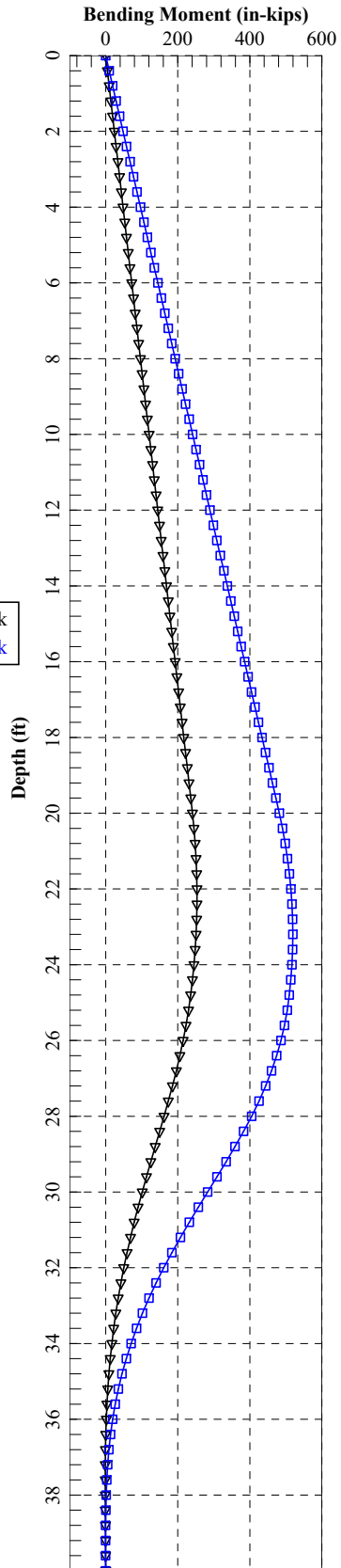
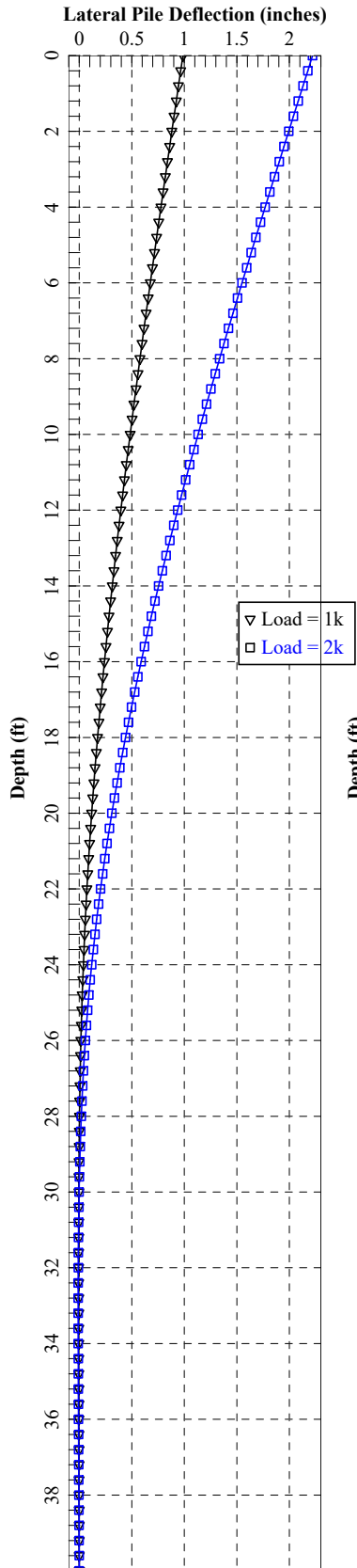
Case No.	Load Type	Load 1 Pile-head in-lbs	Load 2 Type	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max in
1	V, lb	1000.0000	M, in-lb	0.00	1000.0000	0.6232	-0.00271	
-2334.		254840.						
2	V, lb	2000.	M, in-lb	0.00	1000.0000	1.3880	-0.00579	
-4946.		523587.						

Maximum pile-head deflection = 1.3879516942 inches

Maximum pile-head rotation = -0.0057932661 radians = -0.331930 deg.

The analysis ended normally.

16" round boarding floats



3047-0-0-101 boarding floats 16 inch round.lp11o

=====
LPIle for Windows, Version 2019-11.001

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
© 1985-2019 by Ensoft, Inc.
All Rights Reserved

=====
This copy of LPIle is being used by:

GAI
Gorian and Associates, INC.

Serial Number of Security Device: 139304473

This copy of LPIle is licensed for exclusive use by:

Gorian & Associates, Inc., Thous

Use of this program by any entity other than Gorian & Associates, Inc., Thous
is a violation of the software license agreement.

Files Used for Analysis

Path to file locations:

\\SERVER\Server\gorian\GORIAN MASTER FILES\3047-0-0 Noble MDR Pavement\Pile Calcs\

Name of input data file:

3047-0-0-101 boarding floats 16 inch round.lp11

Name of output report file:

3047-0-0-101 boarding floats 16 inch round.lp11

Name of plot output file:

3047-0-0-101 boarding floats 16 inch round.lp11

Name of runtime message file:

3047-0-0-101 boarding floats 16 inch round.lp11

Date and Time of Analysis

3047-0-0-101 boarding floats 16 inch round.lp11o

Date: April 16, 2019

Time: 12:01:55

Problem Title

Project Name: MDR Boat Launch Renovation

Work Order: 3047-0-0-101

Client: Noble GEC

Engineer: GAI

Description: Boarding Floats 16" round

Program Options and Settings

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

3047-0-0-101 boarding floats 16 inch round.lp11o

Loading Type and Number of Cycles of Loading:

- Static loading specified
- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1
Total length of pile = 40.000 ft
Depth of ground surface below top of pile = 20.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	16.0000
2	40.000	16.0000

Input Structural Properties for Pile Sections:

3047-0-0-101 boarding floats 16 inch round.lp11o

Pile Section No. 1:

Section 1 is a round prestressed concrete pile

Length of section	=	40.000000 ft
Pile Diameter	=	16.000000 in
Shear capacity of section	=	100.000000 lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	20.000000 ft
Distance from top of pile to bottom of layer	=	25.000000 ft
Effective unit weight at top of layer	=	41.000000 pcf
Effective unit weight at bottom of layer	=	41.000000 pcf
Undrained cohesion at top of layer	=	365.000000 psf
Undrained cohesion at bottom of layer	=	365.000000 psf
Epsilon-50 at top of layer	=	0.0000
Epsilon-50 at bottom of layer	=	0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	25.000000 ft
Distance from top of pile to bottom of layer	=	40.000000 ft
Effective unit weight at top of layer	=	51.000000 pcf
Effective unit weight at bottom of layer	=	51.000000 pcf
Friction angle at top of layer	=	31.000000 deg.

3047-0-0-101 boarding floats 16 inch round.lp11o

Friction angle at bottom of layer = 31.000000 deg.
 Subgrade k at top of layer = 0.0000 pci
 Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 40.000000 ft
 Distance from top of pile to bottom of layer = 70.000000 ft
 Effective unit weight at top of layer = 68.000000 pcf
 Effective unit weight at bottom of layer = 68.000000 pcf
 Friction angle at top of layer = 33.000000 deg.
 Friction angle at bottom of layer = 33.000000 deg.
 Subgrade k at top of layer = 0.0000 pci
 Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

(Depth of the lowest soil layer extends 30.000 ft below the pile tip)

 Summary of Input Soil Properties

Layer E50 Layer or Num. krm	Soil Type Name (p-y Curve Type) kpy pci	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.
1 default	Soft --	20.0000	41.0000	365.0000	--
default	Clay --	25.0000	41.0000	365.0000	--
2 --	Sand default (Reese, et al.)	25.0000 40.0000	51.0000 51.0000	-- --	31.0000 31.0000
3 --	Sand default (Reese, et al.)	40.0000 70.0000	68.0000 68.0000	-- --	33.0000 33.0000
--	default				

 Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

 Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load Compute No.	Load Top y Type vs. Pile Length	Condition 1	Condition 2	Axial Thrust Force, lbs
1	1 Yes	V = 1000.000000 lbs	M = 0.0000 in-lbs	1000.000000000
2	1 Yes	V = 2000. lbs	M = 0.0000 in-lbs	1000.000000000

V = shear force applied normal to pile axis
 M = bending moment applied to pile head
 y = lateral deflection normal to pile axis
 S = pile slope relative to original pile batter angle
 R = rotational stiffness applied to pile head
 Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
 Thrust force is assumed to be acting axially for all pile batter angles.

 Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

3047-0-0-101 boarding floats 16 inch round.lp11o

Dimensions and Properties of Circular Prestressed Pile:

Length of Section = 40.000000 ft
Diameter = 16.000000 in

Prestressing Strand Details:

Strand Type = Deformed bars (150-160
ksi)
Yield Stress, f_{pu} = 157. ksi
Elasticity Modulus, E_s = 29000. ksi
Number of Reinforcing Strands = 8
Cross-sectional Area of Single Strand = 0.280 sq. in.
Concrete Cover Thickness Over Strands = 2.000 in

Prestressing Strand Geometry:

Strand No.	Diameter in	Area sq. in	X in	Y in
1	0.625	0.280	5.688	0.000
2	0.625	0.280	4.022	4.022
3	0.625	0.280	0.000	5.688
4	0.625	0.280	-4.022	4.022
5	0.625	0.280	-5.688	0.000
6	0.625	0.280	-4.022	-4.022
7	0.625	0.280	-0.000	-5.688
8	0.625	0.280	4.022	-4.022

Computation of Loss of Prestress:

Initial Prestressing Force = 244.000 kips
Fraction of Loss of Prestress = 0.250
Effective Prestressing Force After Losses = 183.000 kips
Area of Concrete, A_c = 198.822 sq.in
Area of Steel, A_s = 2.240 sq.in
Stress in Concrete After Losses, f_{pc} = 0.920 ksi
Stress in Steel After Losses = -81.696 ksi
Compressive Strain in Concrete After Losses = 0.0002553
Tensile Strain in Steel After Losses = -0.0028171
Axial Tension Load for Cracking of Concrete = -230.390 kips

Estimated Structural Capacities Computed Using PCI Equations:

3047-0-0-101 boarding floats 16 inch round.lp11o

Nom. Axial Cap., $P_n = (0.85 f'_c - 0.60 f_{pc}) A_g = 572.574$ kips
 Unfac. Axial Load Cap. $N = (0.33 f'_c - 0.27 f_{pc}) A_g = 215.435$ kips
 Axial Capacity in Tension, $N_t = A_s f_{pu} = -351.680$ kips
 Nom. Moment Capacity, $M_n = 0.32 D A_s f_{pu} = 1800.602$ in-kip

Note: The estimate of nominal moment capacity is based on equations that assume compressive strength of concrete is 6,000 psi (41.4 MPa), the value of prestress after losses is 700 psi (4.83 MPa), and axial thrust force is zero. When input values for these factors are different, the estimated value of nominal moment capacity will differ from the capacity computed by LPILE and should be considered only as an approximate check.

Concrete Properties:

Compressive Strength of Concrete = 4000. psi
 Modulus of Elasticity of Concrete = 3604997. psi
 Modulus of Rupture of Prestressed Concrete = -252.982213 psi
 Compression Strain at Peak Stress = 0.001886
 Tensile Strain at Fracture of Concrete = -0.0000606
 Maximum Coarse Aggregate Size = 0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	1.000

Definitions of Run Messages and Notes:

- C = concrete in section has cracked in tension.
- Y = stress in reinforcing steel has reached yield stress.
- T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.
- Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
 Position of neutral axis is measured from edge of compression side of pile.
 Compressive stresses and strains are positive in sign.
 Tensile stresses and strains are negative in sign.

3047-0-0-101 boarding floats 16 inch round.lp11o

Axial Thrust Force = 1.000 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
0.00000125	13.9555625	11164450.	179.0883138	0.0004792	0.0002039
0.8927181	-75.7119772				
0.00000250	30.2226441	12089058.	93.5519386	0.0004892	0.0001939
0.9296870	-75.9289130				
0.00000375	46.4890249	12397073.	65.0434813	0.0004992	0.0001839
0.9664854	-76.1454500				
0.00000500	62.7543358	12550867.	50.7920035	0.0005093	0.0001740
1.0031125	-76.3615881				
0.00000625	79.0182079	12642913.	42.2433177	0.0005193	0.0001640
1.0395674	-76.5773272				
0.00000750	95.2802721	12704036.	36.5460282	0.0005294	0.0001541
1.0758490	-76.7926674				
0.00000875	111.5401594	12747447.	32.4781080	0.0005395	0.0001442
1.1119565	-77.0076086				
0.00001000	127.7975007	12779750.	29.4285440	0.0005496	0.0001343
1.1478890	-77.2221508				
0.00001125	144.0519265	12804616.	27.0578842	0.0005597	0.0001244
1.1836455	-77.4362938				
0.00001250	160.3030676	12824245.	25.1624577	0.0005698	0.0001145
1.2192252	-77.6500376				
0.00001375	176.5505545	12840040.	23.6126555	0.0005800	0.0001047
1.2546270	-77.8633822				
0.00001500	192.7940176	12852935.	22.3220718	0.0005901	0.00009483
1.2898502	-78.0763274				
0.00001625	209.0330870	12863575.	21.2308871	0.0006003	0.00008500
1.3248937	-78.2888731				
0.00001750	225.2673927	12872422.	20.2963733	0.0006105	0.00007519
1.3597566	-78.5010192				
0.00001875	241.4965650	12879817.	19.4871966	0.0006207	0.00006538
1.3944380	-78.7127657				
0.00002000	257.7202328	12886012.	18.7798563	0.0006309	0.00005560
1.4289371	-78.9241122				
0.00002125	273.9380259	12891201.	18.1563815	0.0006411	0.00004582
1.4632528	-79.1350588				
0.00002250	290.1495736	12895537.	17.6027950	0.0006514	0.00003606
1.4973842	-79.3456052				

3047-0-0-101 boarding floats 16 inch round.lp11o					
0.00002375	306.3545048	12899137.	17.1080620	0.0006616	0.00002632
1.5313305	-79.5557513				
0.00002500	322.5524483	12902098.	16.6633546	0.0006719	0.00001658
1.5650907	-79.7654969				
0.00002625	338.7430326	12904496.	16.2615266	0.0006822	0.00000687
1.5986638	-79.9748419				
0.00002750	354.9258820	12906396.	15.8967310	0.0006925	-0.00000284
1.6320490	-80.1837859				
0.00002875	371.0996714	12907815.	15.5641324	0.0007028	-0.00001253
1.6652448	-80.3923331				
0.00003000	387.2604323	12908681.	15.2596864	0.0007131	-0.00002221
1.6982483	-80.6005014				
0.00003125	403.4032135	12908903.	14.9799894	0.0007234	-0.00003188
1.7310562	-80.8083131				
0.00003250	419.5231907	12908406.	14.7221610	0.0007338	-0.00004153
1.7636650	-81.0157917				
0.00003375	435.6158554	12907136.	14.4837482	0.0007441	-0.00005117
1.7960714	-81.2229599				
0.00003500	451.6772083	12905063.	14.2626501	0.0007545	-0.00006081
1.8282726	-81.4298387				
0.00003625	465.7760498	12848994.	14.0483043	0.0007646	-0.00007075
1.8592813	-81.6456492 C				
0.00003750	479.8884239	12797025.	13.8484669	0.0007746	-0.00008068
1.8900923	-81.8612212 C				
0.00003875	491.4285200	12682026.	13.6500110	0.0007843	-0.00009106
1.9193158	-82.0897294 C				
0.00004000	504.1008567	12602521.	13.4689201	0.0007941	-0.0001012
1.9489382	-82.3124822 C				
0.00004125	513.8668208	12457377.	13.2855215	0.0008033	-0.0001120
1.9766960	-82.5511234 C				
0.00004250	525.2681818	12359251.	13.1200512	0.0008129	-0.0001224
2.0051735	-82.7809653 C				
0.00004375	536.1626795	12255147.	12.9617543	0.0008224	-0.0001329
2.0331523	-83.0137027 C				
0.00004500	543.9577996	12087951.	12.7977308	0.0008312	-0.0001441
2.0590035	-83.2653897 C				
0.00004625	553.8162893	11974406.	12.6516637	0.0008405	-0.0001549
2.0859173	-83.5048844 C				
0.00004750	563.3504231	11860009.	12.5117250	0.0008496	-0.0001657
2.1124275	-83.7465272 C				
0.00004875	572.5176305	11743951.	12.3771855	0.0008587	-0.0001766
2.1385021	-83.9906824 C				
0.00005125	589.6238898	11504856.	12.1218431	0.0008766	-0.0001988
2.1892369	-84.4878392 C				
0.00005375	605.2494241	11260454.	11.8828915	0.0008940	-0.0002213
2.2381571	-84.9964713 C				
0.00005625	622.4462074	11065710.	11.6724547	0.0009119	-0.0002434
2.2875431	-85.4932366 C				

3047-0-0-101 boarding floats 16 inch round.lp11o					
0.00005875	635.7714924	10821642.	11.4617565	0.0009287	-0.0002666
2.3333058	-86.0209608 C				
0.00006125	650.9742785	10628151.	11.2768417	0.0009460	-0.0002893
2.3798681	-86.5334383 C				
0.00006375	662.9335888	10398958.	11.0908396	0.0009624	-0.0003130
2.4231252	-87.0747387 C				
0.00006625	668.7975055	10095057.	10.8847273	0.0009764	-0.0003389
2.4598490	-87.6816460 C				
0.00006875	681.6957094	9915574.	10.7288753	0.0009929	-0.0003624
2.5024393	-88.2182334 C				
0.00007125	694.1446305	9742381.	10.5818955	0.0010093	-0.0003860
2.5440561	-88.7590868 C				
0.00007375	706.1885375	9575438.	10.4430463	0.0010255	-0.0004098
2.5847452	-89.3038631 C				
0.00007625	717.8706944	9414698.	10.3117018	0.0010416	-0.0004337
2.6245542	-89.8521778 C				
0.00007875	729.1482492	9259025.	10.1867966	0.0010575	-0.0004578
2.6634285	-90.4048315 C				
0.00008125	740.0985678	9108905.	10.0680998	0.0010734	-0.0004820
2.7014553	-90.9609683 C				
0.00008375	750.7878268	8964631.	9.9553988	0.0010891	-0.0005062
2.7387159	-91.5197535 C				
0.00008625	761.2278906	8825831.	9.8482112	0.0011047	-0.0005306
2.7752276	-92.0810901 C				
0.00008875	771.3194433	8690923.	9.7453839	0.0011202	-0.0005551
2.8108586	-92.6467467 C				
0.00009125	781.2442337	8561581.	9.6476133	0.0011357	-0.0005797
2.8458436	-93.2139317 C				
0.00009375	790.9206501	8436487.	9.5539744	0.0011510	-0.0006043
2.8800784	-93.7840605 C				
0.00009625	800.3741805	8315576.	9.4642321	0.0011663	-0.0006291
2.9135920	-94.3568904 C				
0.00009875	809.6816135	8199307.	9.3785572	0.0011815	-0.0006539
2.9464940	-94.9310852 C				
0.0001013	818.7326707	8086249.	9.2959035	0.0011965	-0.0006788
2.9786277	-95.5088318 C				
0.0001038	827.6897777	7977733.	9.2170551	0.0012116	-0.0007037
3.0102247	-96.0871137 C				
0.0001063	836.4042790	7872040.	9.1407630	0.0012265	-0.0007288
3.0410706	-96.6689524 C				
0.0001088	845.0294989	7770386.	9.0678065	0.0012414	-0.0007539
3.0713900	-97.2513336 C				
0.0001113	853.4702127	7671642.	8.9973171	0.0012563	-0.0007790
3.1010408	-97.8363342 C				
0.0001138	861.7817201	7576103.	8.9294767	0.0012710	-0.0008043
3.1301093	-98.4228170 C				
0.0001163	870.0079795	7483940.	8.8643663	0.0012858	-0.0008295
3.1586577	-99.0099334 C				

3047-0-0-101 boarding floats 16 inch round.lp11o					
0.0001188	878.0236415	7393883.	8.8009927	0.0013004	-0.0008549
3.1865015	-99.6005098 C				
0.0001213	886.0127619	7307322.	8.7404177	0.0013151	-0.0008802
3.2139191	-100.1904344 C				
0.0001238	893.8283839	7222856.	8.6814936	0.0013297	-0.0009057
3.2406845	-100.7832183 C				
0.0001263	901.5398986	7140910.	8.6245677	0.0013442	-0.0009311
3.2669095	-101.3772296 C				
0.0001288	909.2253440	7061944.	8.5700244	0.0013587	-0.0009566
3.2927131	-101.9705994 C				
0.0001313	916.7156856	6984500.	8.5165893	0.0013731	-0.0009822
3.3178315	-102.5676602 C				
0.0001338	924.1413919	6909468.	8.4650550	0.0013875	-0.0010078
3.3424735	-103.1650960 C				
0.0001363	931.5415350	6837002.	8.4155719	0.0014019	-0.0010334
3.3666990	-103.7618996 C				
0.0001388	938.7862648	6766027.	8.3671401	0.0014163	-0.0010591
3.3903016	-104.3616482 C				
0.0001413	945.9441016	6696949.	8.3201578	0.0014305	-0.0010848
3.4133953	-104.9624819 C				
0.0001438	953.0769082	6630100.	8.2749593	0.0014448	-0.0011105
3.4360774	-105.5626916 C				
0.0001463	960.1506830	6565133.	8.2312165	0.0014591	-0.0011362
3.4582919	-106.1632811 C				
0.0001488	967.0640696	6501271.	8.1881514	0.0014733	-0.0011620
3.4798796	-106.7672902 C				
0.0001588	994.2776087	6263166.	8.0294379	0.0015300	-0.0012653
3.5618375	-109.1834033 C				
0.0001688	1021.	6047888.	7.8880494	0.0015864	-0.0013689
3.6364525	-111.6067865 C				
0.0001788	1046.	5852268.	7.7616347	0.0016427	-0.0014726
3.7039336	-114.0345545 C				
0.0001888	1071.	5672829.	7.6470642	0.0016987	-0.0015766
3.7641916	-116.4708124 C				
0.0001988	1095.	5508261.	7.5439080	0.0017547	-0.0016806
3.8175801	-118.9077286 C				
0.0002088	1118.	5356675.	7.4509049	0.0018107	-0.0017846
3.8641694	-121.3430123 C				
0.0002188	1141.	5215690.	7.3655052	0.0018665	-0.0018888
3.9037720	-123.7840065 C				
0.0002288	1163.	5085122.	7.2888162	0.0019226	-0.0019927
3.9367181	-126.2167434 C				
0.0002388	1185.	4962714.	7.2178876	0.0019786	-0.0020967
3.9627203	-128.6540804 C				
0.0002488	1206.	4848399.	7.1538973	0.0020349	-0.0022005
3.9819704	-131.0825014 C				
0.0002588	1227.	4740949.	7.0954423	0.0020913	-0.0023041
3.9943288	-133.5065032 C				

3047-0-0-101 boarding floats 16 inch round.lp11o					
0.0002688	1247.	4639463.	7.0416260	0.0021478	-0.0024076
3.9997357	-135.9282552 C				
0.0002788	1267.	4543673.	6.9932182	0.0022047	-0.0025106
3.9999837	-138.3375000 C				
0.0002888	1286.	4452705.	6.9493404	0.0022619	-0.0026134
3.9984790	-140.7368889 C				
0.0002988	1304.	4365831.	6.9087047	0.0023193	-0.0027160
3.9984279	-143.1336370 C				
0.0003088	1322.	4283119.	6.8722323	0.0023771	-0.0028182
3.9985293	-145.5166776 C				
0.0003188	1340.	4204227.	6.8395149	0.0024354	-0.0029199
3.9984042	-147.8861616 C				
0.0003288	1357.	4128796.	6.8101487	0.0024942	-0.0030212
3.9980231	-150.0000000 C				
0.0003388	1373.	4054017.	6.7817155	0.0025526	-0.0031227
3.9985781	-150.0000000 C				
0.0003488	1387.	3976154.	6.7521762	0.0026101	-0.0032252
3.9999628	-150.0000000 C				
0.0003588	1398.	3896735.	6.7224409	0.0026670	-0.0033283
3.9995550	-150.0000000 C				
0.0003688	1409.	3820438.	6.6950009	0.0027241	-0.0034312
3.9984618	-150.0000000 C				
0.0003788	1419.	3747562.	6.6699231	0.0027816	-0.0035338
3.9988517	-150.0000000 C				
0.0003888	1430.	3677796.	6.6470914	0.0028394	-0.0036359
3.9996552	-150.0000000 C				
0.0003988	1440.	3610876.	6.6254815	0.0028972	-0.0037381
3.9980301	-150.0000000 C				
0.0004088	1450.	3546720.	6.6053367	0.0029552	-0.0038401
3.9999834	-150.0000000 C				
0.0004188	1459.	3484555.	6.5865446	0.0030134	-0.0039419
3.9988012	-150.0000000 C				
0.0004288	1467.	3421871.	6.5666781	0.0030708	-0.0040445
3.9990305	-150.0000000 C				
0.0004388	1473.	3357145.	6.5445241	0.0031267	-0.0041486
3.9987934	-150.0000000 C				
0.0004488	1477.	3290603.	6.5197406	0.0031811	-0.0042543
3.9999970	-150.0000000 C				
0.0004588	1479.	3224538.	6.4945846	0.0032347	-0.0043606
3.9977657	-150.0000000 C				
0.0004688	1482.	3160925.	6.4700874	0.0032882	-0.0044671
3.9997152	-150.0000000 C				
0.0004788	1484.	3099655.	6.4460807	0.0033414	-0.0045739
3.9960840	-150.0000000 C				
0.0004888	1486.	3040754.	6.4234681	0.0033948	-0.0046805
3.9984525	-150.0000000 C				
0.0004988	1488.	2984132.	6.4020495	0.0034483	-0.0047870
3.9998887	-150.0000000 C				

3047-0-0-101 boarding floats 16 inch round.lp11o					
0.0005088	1490.	2929600.	6.3818858	0.0035021	-0.0048932
3.9953971	-150.0000000 C				
0.0005188	1492.	2877071.	6.3628262	0.0035560	-0.0049993
3.9983719	-150.0000000 C				
0.0005288	1494.	2826461.	6.3447360	0.0036101	-0.0051052
3.9998383	-150.0000000 C				
0.0005388	1496.	2777622.	6.3276693	0.0036644	-0.0052110
3.9955288	-150.0000000 C				
0.0005488	1498.	2730386.	6.3108698	0.0037184	-0.0053169
3.9974655	-150.0000000 C				
0.0006088	1508.	2477992.	6.2231913	0.0040437	-0.0059516
3.9991233	-150.0000000 C				

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	1.000	1456.979	0.00300000

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor for Moment	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	1457.	0.650000	947.036326	6686713.
1	0.75	1457.	0.700000	1093.	5522187.

3047-0-0-101 boarding floats 16 inch round.lp11o

0.4000	0.9653	4821.	1000.0000	-0.00438	0.00	1.12E+10
0.00	0.00	0.00				
0.8000	0.9443	9642.	1000.	-0.00437	0.00	1.12E+10
0.00	0.00	0.00				
1.2000	0.9234	14463.	1000.	-0.00437	0.00	1.12E+10
0.00	0.00	0.00				
1.6000	0.9024	19284.	1000.0000	-0.00436	0.00	1.16E+10
0.00	0.00	0.00				
2.0000	0.8815	24105.	1000.0000	-0.00435	0.00	1.19E+10
0.00	0.00	0.00				
2.4000	0.8606	28926.	1000.0000	-0.00434	0.00	1.21E+10
0.00	0.00	0.00				
2.8000	0.8398	33747.	1000.0000	-0.00433	0.00	1.22E+10
0.00	0.00	0.00				
3.2000	0.8191	38567.	1000.0000	-0.00431	0.00	1.23E+10
0.00	0.00	0.00				
3.6000	0.7984	43388.	1000.0000	-0.00430	0.00	1.24E+10
0.00	0.00	0.00				
4.0000	0.7778	48209.	1000.0000	-0.00428	0.00	1.24E+10
0.00	0.00	0.00				
4.4000	0.7573	53029.	1000.0000	-0.00426	0.00	1.25E+10
0.00	0.00	0.00				
4.8000	0.7369	57849.	1000.0000	-0.00424	0.00	1.25E+10
0.00	0.00	0.00				
5.2000	0.7166	62670.	1000.0000	-0.00422	0.00	1.26E+10
0.00	0.00	0.00				
5.6000	0.6965	67490.	1000.0000	-0.00419	0.00	1.26E+10
0.00	0.00	0.00				
6.0000	0.6764	72310.	1000.0000	-0.00416	0.00	1.26E+10
0.00	0.00	0.00				
6.4000	0.6565	77130.	1000.0000	-0.00414	0.00	1.26E+10
0.00	0.00	0.00				
6.8000	0.6367	81950.	1000.0000	-0.00411	0.00	1.27E+10
0.00	0.00	0.00				
7.2000	0.6171	86769.	1000.0000	-0.00407	0.00	1.27E+10
0.00	0.00	0.00				
7.6000	0.5976	91589.	1000.0000	-0.00404	0.00	1.27E+10
0.00	0.00	0.00				
8.0000	0.5783	96408.	1000.0000	-0.00400	0.00	1.27E+10
0.00	0.00	0.00				
8.4000	0.5591	101227.	1000.0000	-0.00397	0.00	1.27E+10
0.00	0.00	0.00				
8.8000	0.5402	106046.	1000.0000	-0.00393	0.00	1.27E+10
0.00	0.00	0.00				
9.2000	0.5214	110865.	1000.0000	-0.00389	0.00	1.27E+10
0.00	0.00	0.00				
9.6000	0.5029	115683.	1000.0000	-0.00384	0.00	1.28E+10
0.00	0.00	0.00				

3047-0-0-101 boarding floats 16 inch round.lp11o

10.0000	0.4845	120502.	1000.0000	-0.00380	0.00	1.28E+10
0.00	0.00	0.00				
10.4000	0.4664	125320.	1000.	-0.00375	0.00	1.28E+10
0.00	0.00	0.00				
10.8000	0.4485	130138.	1000.	-0.00371	0.00	1.28E+10
0.00	0.00	0.00				
11.2000	0.4308	134956.	1000.	-0.00366	0.00	1.28E+10
0.00	0.00	0.00				
11.6000	0.4134	139773.	1000.	-0.00361	0.00	1.28E+10
0.00	0.00	0.00				
12.0000	0.3962	144590.	1000.	-0.00355	0.00	1.28E+10
0.00	0.00	0.00				
12.4000	0.3793	149407.	1000.	-0.00350	0.00	1.28E+10
0.00	0.00	0.00				
12.8000	0.3626	154224.	1000.	-0.00344	0.00	1.28E+10
0.00	0.00	0.00				
13.2000	0.3462	159040.	1000.	-0.00338	0.00	1.28E+10
0.00	0.00	0.00				
13.6000	0.3302	163856.	1000.	-0.00332	0.00	1.28E+10
0.00	0.00	0.00				
14.0000	0.3144	168672.	1000.	-0.00326	0.00	1.28E+10
0.00	0.00	0.00				
14.4000	0.2989	173487.	1000.	-0.00319	0.00	1.28E+10
0.00	0.00	0.00				
14.8000	0.2837	178303.	1000.	-0.00313	0.00	1.28E+10
0.00	0.00	0.00				
15.2000	0.2688	183118.	1000.	-0.00306	0.00	1.28E+10
0.00	0.00	0.00				
15.6000	0.2543	187932.	1000.	-0.00299	0.00	1.28E+10
0.00	0.00	0.00				
16.0000	0.2401	192746.	1000.	-0.00292	0.00	1.29E+10
0.00	0.00	0.00				
16.4000	0.2263	197560.	1000.	-0.00285	0.00	1.29E+10
0.00	0.00	0.00				
16.8000	0.2128	202374.	1000.	-0.00277	0.00	1.29E+10
0.00	0.00	0.00				
17.2000	0.1996	207187.	1000.	-0.00270	0.00	1.29E+10
0.00	0.00	0.00				
17.6000	0.1869	211999.	1000.	-0.00262	0.00	1.29E+10
0.00	0.00	0.00				
18.0000	0.1745	216812.	1000.	-0.00254	0.00	1.29E+10
0.00	0.00	0.00				
18.4000	0.1625	221624.	1000.	-0.00246	0.00	1.29E+10
0.00	0.00	0.00				
18.8000	0.1509	226435.	1000.	-0.00237	0.00	1.29E+10
0.00	0.00	0.00				
19.2000	0.1397	231247.	1000.	-0.00229	0.00	1.29E+10
0.00	0.00	0.00				

3047-0-0-101 boarding floats 16 inch round.lp11o

19.6000	0.1290	236057.	1000.	-0.00220	0.00	1.29E+10
0.00	0.00	0.00				
20.0000	0.1186	240868.	922.7288	-0.00211	0.00	1.29E+10
-32.1963	1303.	0.00				
20.4000	0.1087	244936.	765.5277	-0.00202	0.00	1.29E+10
-33.3041	1471.	0.00				
20.8000	0.09919	248236.	603.3338	-0.00193	0.00	1.29E+10
-34.2767	1659.	0.00				
21.2000	0.09015	250746.	436.8030	-0.00184	0.00	1.29E+10
-35.1112	1869.	0.00				
21.6000	0.08156	252447.	266.6047	-0.00174	0.00	1.29E+10
-35.8048	2107.	0.00				
22.0000	0.07342	253323.	93.4225	-0.00165	0.00	1.29E+10
-36.3544	2377.	0.00				
22.4000	0.06573	253360.	-82.0446	-0.00155	0.00	1.29E+10
-36.7568	2684.	0.00				
22.8000	0.05849	252550.	-259.0811	-0.00146	0.00	1.29E+10
-37.0084	3037.	0.00				
23.2000	0.05171	250887.	-436.9532	-0.00137	0.00	1.29E+10
-37.1050	3444.	0.00				
23.6000	0.04538	248368.	-614.9066	-0.00127	0.00	1.29E+10
-37.0422	3918.	0.00				
24.0000	0.03949	244996.	-792.1626	-0.00118	0.00	1.29E+10
-36.8145	4475.	0.00				
24.4000	0.03403	240775.	-967.9143	-0.00109	0.00	1.29E+10
-36.4154	5136.	0.00				
24.8000	0.02901	235714.	-1141.	-0.00100	0.00	1.29E+10
-35.8367	5929.	0.00				
25.2000	0.02441	229828.	-1336.	-9.15E-04	0.00	1.29E+10
-45.4765	8942.	0.00				
25.6000	0.02022	222893.	-1551.	-8.31E-04	0.00	1.29E+10
-44.0509	10455.	0.00				
26.0000	0.01643	214943.	-1762.	-7.49E-04	0.00	1.29E+10
-43.6640	12753.	0.00				
26.4000	0.01303	205986.	-1968.	-6.71E-04	0.00	1.29E+10
-42.3372	15597.	0.00				
26.8000	0.00999	196054.	-2157.	-5.96E-04	0.00	1.29E+10
-36.3688	17467.	0.00				
27.2000	0.00731	185283.	-2312.	-5.25E-04	0.00	1.28E+10
-28.1662	18495.	0.00				
27.6000	0.00496	173864.	-2428.	-4.57E-04	0.00	1.28E+10
-20.1658	19522.	0.00				
28.0000	0.00292	161979.	-2506.	-3.95E-04	0.00	1.28E+10
-12.4944	20550.	0.00				
28.4000	0.00117	149806.	-2549.	-3.36E-04	0.00	1.28E+10
-5.2577	21577.	0.00				
28.8000	-3.10E-04	137511.	-2558.	-2.82E-04	0.00	1.28E+10
1.4590	22604.	0.00				

3047-0-0-101 boarding floats 16 inch round.lp11o

29.2000	-0.00154	125250.	-2536.	-2.33E-04	0.00	1.28E+10
7.5900	23632.	0.00				
29.6000	-0.00255	113164.	-2487.	-1.88E-04	0.00	1.28E+10
13.0879	24659.	0.00				
30.0000	-0.00335	101379.	-2412.	-1.48E-04	0.00	1.27E+10
17.9222	25687.	0.00				
30.4000	-0.00397	90007.	-2316.	-1.12E-04	0.00	1.27E+10
22.0778	26714.	0.00				
30.8000	-0.00442	79143.	-2202.	-7.96E-05	0.00	1.26E+10
25.5532	27742.	0.00				
31.2000	-0.00473	68868.	-2073.	-5.15E-05	0.00	1.26E+10
28.3587	28769.	0.00				
31.6000	-0.00492	59246.	-1931.	-2.70E-05	0.00	1.25E+10
30.5147	29797.	0.00				
32.0000	-0.00499	50327.	-1781.	-5.95E-06	0.00	1.24E+10
32.0496	30824.	0.00				
32.4000	-0.00497	42146.	-1625.	1.20E-05	0.00	1.23E+10
32.9983	31852.	0.00				
32.8000	-0.00488	34726.	-1466.	2.70E-05	0.00	1.22E+10
33.4001	32879.	0.00				
33.2000	-0.00471	28075.	-1306.	3.94E-05	0.00	1.20E+10
33.2973	33907.	0.00				
33.6000	-0.00450	22191.	-1147.	4.95E-05	0.00	1.18E+10
32.7335	34934.	0.00				
34.0000	-0.00424	17061.	-992.4316	5.76E-05	0.00	1.15E+10
31.7522	35962.	0.00				
34.4000	-0.00394	12663.	-843.2773	6.39E-05	0.00	1.12E+10
30.3954	36989.	0.00				
34.8000	-0.00362	8965.	-701.4340	6.86E-05	0.00	1.12E+10
28.7059	38017.	0.00				
35.2000	-0.00329	5929.	-568.3901	7.18E-05	0.00	1.12E+10
26.7290	39044.	0.00				
35.6000	-0.00294	3508.	-445.4284	7.38E-05	0.00	1.12E+10
24.5050	40072.	0.00				
36.0000	-0.00258	1652.	-333.6507	7.49E-05	0.00	1.12E+10
22.0690	41099.	0.00				
36.4000	-0.00222	304.0839	-234.0057	7.53E-05	0.00	1.12E+10
19.4498	42127.	0.00				
36.8000	-0.00185	-595.4440	-147.3176	7.53E-05	0.00	1.12E+10
16.6703	43154.	0.00				
37.2000	-0.00149	-1111.	-74.3160	7.49E-05	0.00	1.12E+10
13.7471	44181.	0.00				
37.6000	-0.00114	-1310.	-15.6643	7.44E-05	0.00	1.12E+10
10.6911	45209.	0.00				
38.0000	-7.79E-04	-1262.	28.0128	7.38E-05	0.00	1.12E+10
7.5077	46236.	0.00				
38.4000	-4.26E-04	-1041.	56.1057	7.33E-05	0.00	1.12E+10
4.1977	47264.	0.00				

3047-0-0-101 boarding floats 16 inch round.lp11o

38.8000	-7.54E-05	-724.0687	67.9996	7.30E-05	0.00	1.12E+10
0.7581	48291.	0.00				
39.2000	2.74E-04	-389.2871	63.0596	7.27E-05	0.00	1.12E+10
-2.8164	49319.	0.00				
39.6000	6.23E-04	-119.3944	40.6234	7.26E-05	0.00	1.12E+10
-6.5321	50346.	0.00				
40.0000	9.71E-04	0.00	0.00	7.26E-05	0.00	1.12E+10
-10.3943	25687.	0.00				

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.98634019 inches
 Computed slope at pile head = -0.00437630 radians
 Maximum bending moment = 253360. inch-lbs
 Maximum shear force = -2558. lbs
 Depth of maximum bending moment = 22.40000000 feet below pile head
 Depth of maximum shear force = 28.80000000 feet below pile head
 Number of iterations = 15
 Number of zero deflection points = 2

 Pile-head Deflection vs. Pile Length for Load Case 1

Boundary Condition Type 1, Shear and Moment

Shear = 1000. lbs
 Moment = 0. in-lbs
 Axial Load = 1000. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
40.00000	0.98634019	253360.	-2558.
38.00000	0.99544321	254986.	-2580.
36.00000	1.00175956	255241.	-2672.

3047-0-0-101 boarding floats 16 inch round.lp11o

34.00000	1.02113927	253944.	-2999.
32.00000	1.15982060	254033.	-3761.
30.00000	1.86735137	251297.	-4751.
28.00000	6.86600386	252349.	-5847.

 Computed Values of Pile Loading and Deflection
 for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 2000.0 lbs
 Applied moment at pile head = 0.0 in-lbs
 Axial thrust load on pile head = 1000.0 lbs

Depth Res.	Soil X	Deflect. Spr. y	Bending Distrib. Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
feet	Es*h	inches	in-lbs	lbs	radians	psi*	in-lb^2	
lb/inch		lb/inch	lb/inch					
0.00	0.00	2.2203	2.15E-07	2000.	-0.00946	0.00	1.12E+10	
0.00	0.00	0.00	0.00					
0.4000	0.00	2.1749	9645.	2000.	-0.00946	0.00	1.12E+10	
0.00	0.00	0.00	0.00					
0.8000	0.00	2.1295	19291.	2000.	-0.00945	0.00	1.16E+10	
0.00	0.00	0.00	0.00					
1.2000	0.00	2.0842	28936.	2000.	-0.00944	0.00	1.21E+10	
0.00	0.00	0.00	0.00					
1.6000	0.00	2.0389	38581.	2000.	-0.00943	0.00	1.23E+10	
0.00	0.00	0.00	0.00					
2.0000	0.00	1.9937	48227.	2000.	-0.00941	0.00	1.24E+10	
0.00	0.00	0.00	0.00					
2.4000	0.00	1.9485	57872.	2000.	-0.00939	0.00	1.25E+10	
0.00	0.00	0.00	0.00					
2.8000	0.00	1.9035	67517.	2000.	-0.00937	0.00	1.26E+10	
0.00	0.00	0.00	0.00					
3.2000	0.00	1.8586	77162.	2000.	-0.00934	0.00	1.26E+10	
0.00	0.00	0.00	0.00					
3.6000	0.00	1.8139	86806.	2000.	-0.00931	0.00	1.27E+10	
0.00	0.00	0.00	0.00					
4.0000	0.00	1.7693	96451.	2000.	-0.00927	0.00	1.27E+10	
0.00	0.00	0.00	0.00					
4.4000	0.00	1.7248	106095.	2000.	-0.00923	0.00	1.27E+10	

3047-0-0-101 boarding floats 16 inch round.lp11o

0.00	0.00	0.00					
4.8000	1.6806	115740.	2000.	-0.00919	0.00	1.28E+10	
0.00	0.00	0.00					
5.2000	1.6366	125384.	2000.	-0.00915	0.00	1.28E+10	
0.00	0.00	0.00					
5.6000	1.5928	135027.	2000.	-0.00910	0.00	1.28E+10	
0.00	0.00	0.00					
6.0000	1.5492	144671.	2000.	-0.00905	0.00	1.28E+10	
0.00	0.00	0.00					
6.4000	1.5060	154314.	2000.	-0.00899	0.00	1.28E+10	
0.00	0.00	0.00					
6.8000	1.4629	163957.	2000.	-0.00893	0.00	1.28E+10	
0.00	0.00	0.00					
7.2000	1.4202	173600.	2000.	-0.00887	0.00	1.28E+10	
0.00	0.00	0.00					
7.6000	1.3778	183242.	2000.	-0.00880	0.00	1.28E+10	
0.00	0.00	0.00					
8.0000	1.3357	192885.	2000.	-0.00873	0.00	1.29E+10	
0.00	0.00	0.00					
8.4000	1.2940	202526.	2000.	-0.00866	0.00	1.29E+10	
0.00	0.00	0.00					
8.8000	1.2526	212168.	2000.	-0.00858	0.00	1.29E+10	
0.00	0.00	0.00					
9.2000	1.2116	221809.	2000.	-0.00850	0.00	1.29E+10	
0.00	0.00	0.00					
9.6000	1.1710	231449.	2000.	-0.00841	0.00	1.29E+10	
0.00	0.00	0.00					
10.0000	1.1309	241089.	2000.	-0.00833	0.00	1.29E+10	
0.00	0.00	0.00					
10.4000	1.0911	250729.	2000.	-0.00823	0.00	1.29E+10	
0.00	0.00	0.00					
10.8000	1.0518	260368.	2000.	-0.00814	0.00	1.29E+10	
0.00	0.00	0.00					
11.2000	1.0130	270007.	2000.	-0.00804	0.00	1.29E+10	
0.00	0.00	0.00					
11.6000	0.9746	279646.	2000.	-0.00794	0.00	1.29E+10	
0.00	0.00	0.00					
12.0000	0.9368	289284.	2000.	-0.00783	0.00	1.29E+10	
0.00	0.00	0.00					
12.4000	0.8994	298921.	2000.	-0.00772	0.00	1.29E+10	
0.00	0.00	0.00					
12.8000	0.8626	308558.	2000.	-0.00761	0.00	1.29E+10	
0.00	0.00	0.00					
13.2000	0.8264	318194.	2000.	-0.00749	0.00	1.29E+10	
0.00	0.00	0.00					
13.6000	0.7907	327830.	2000.	-0.00737	0.00	1.29E+10	
0.00	0.00	0.00					
14.0000	0.7556	337465.	2000.	-0.00725	0.00	1.29E+10	

3047-0-0-101 boarding floats 16 inch round.lp11o

0.00	0.00	0.00					
14.4000	0.7211	347099.	2000.	-0.00712	0.00	1.29E+10	
0.00	0.00	0.00					
14.8000	0.6872	356733.	2000.	-0.00699	0.00	1.29E+10	
0.00	0.00	0.00					
15.2000	0.6540	366366.	2000.	-0.00686	0.00	1.29E+10	
0.00	0.00	0.00					
15.6000	0.6214	375999.	2000.	-0.00672	0.00	1.29E+10	
0.00	0.00	0.00					
16.0000	0.5895	385631.	2000.	-0.00658	0.00	1.29E+10	
0.00	0.00	0.00					
16.4000	0.5583	395262.	2000.	-0.00643	0.00	1.29E+10	
0.00	0.00	0.00					
16.8000	0.5277	404893.	2000.	-0.00628	0.00	1.29E+10	
0.00	0.00	0.00					
17.2000	0.4980	414522.	2000.	-0.00613	0.00	1.29E+10	
0.00	0.00	0.00					
17.6000	0.4689	424151.	2000.	-0.00597	0.00	1.29E+10	
0.00	0.00	0.00					
18.0000	0.4406	433780.	2000.	-0.00582	0.00	1.29E+10	
0.00	0.00	0.00					
18.4000	0.4131	443407.	2000.	-0.00565	0.00	1.29E+10	
0.00	0.00	0.00					
18.8000	0.3863	453034.	2000.	-0.00549	0.00	1.29E+10	
0.00	0.00	0.00					
19.2000	0.3604	462660.	2000.	-0.00531	0.00	1.29E+10	
0.00	0.00	0.00					
19.6000	0.3353	472285.	2000.	-0.00514	0.00	1.28E+10	
0.00	0.00	0.00					
20.0000	0.3111	481909.	1893.	-0.00496	0.00	1.28E+10	
-44.4017	685.1447	0.00					
20.4000	0.2877	490510.	1676.	-0.00478	0.00	1.27E+10	
-46.0712	768.6757	0.00					
20.8000	0.2652	498048.	1452.	-0.00459	0.00	1.26E+10	
-47.5738	861.0505	0.00					
21.2000	0.2436	504489.	1220.	-0.00440	0.00	1.26E+10	
-48.9061	963.5716	0.00					
21.6000	0.2230	509802.	982.4709	-0.00421	0.00	1.25E+10	
-50.0648	1078.	0.00					
22.0000	0.2032	513961.	739.8032	-0.00401	0.00	1.25E+10	
-51.0467	1206.	0.00					
22.4000	0.1845	516942.	492.8549	-0.00381	0.00	1.24E+10	
-51.8484	1349.	0.00					
22.8000	0.1667	518729.	242.4992	-0.00361	0.00	1.24E+10	
-52.4665	1511.	0.00					
23.2000	0.1498	519305.	-10.3732	-0.00341	0.00	1.24E+10	
-52.8970	1695.	0.00					
23.6000	0.1339	518662.	-264.8529	-0.00321	0.00	1.24E+10	

3047-0-0-101 boarding floats 16 inch round.lp11o

-53.1362	1904.	0.00					
24.0000	0.1190	516793.	-520.0103	-0.00301	0.00	1.24E+10	
-53.1794	2145.	0.00					
24.4000	0.1051	513699.	-774.8935	-0.00281	0.00	1.25E+10	
-53.0219	2423.	0.00					
24.8000	0.09204	509381.	-1029.	-0.00261	0.00	1.25E+10	
-52.6581	2746.	0.00					
25.2000	0.07997	503850.	-1376.	-0.00242	0.00	1.26E+10	
-92.2274	5536.	0.00					
25.6000	0.06881	496193.	-1820.	-0.00223	0.00	1.27E+10	
-92.7458	6469.	0.00					
26.0000	0.05856	486397.	-2270.	-0.00204	0.00	1.27E+10	
-94.5486	7750.	0.00					
26.4000	0.04919	474423.	-2724.	-0.00186	0.00	1.28E+10	
-94.9523	9265.	0.00					
26.8000	0.04067	460260.	-3178.	-0.00169	0.00	1.29E+10	
-93.8648	11077.	0.00					
27.2000	0.03298	443934.	-3622.	-0.00152	0.00	1.29E+10	
-91.1917	13273.	0.00					
27.6000	0.02608	425506.	-4049.	-0.00136	0.00	1.29E+10	
-86.8259	15982.	0.00					
28.0000	0.01994	405076.	-4451.	-0.00120	0.00	1.29E+10	
-80.6322	19414.	0.00					
28.4000	0.01452	382788.	-4801.	-0.00106	0.00	1.29E+10	
-65.2546	21577.	0.00					
28.8000	0.00978	358996.	-5068.	-9.20E-04	0.00	1.29E+10	
-46.0597	22604.	0.00					
29.2000	0.00569	334142.	-5246.	-7.91E-04	0.00	1.29E+10	
-27.9924	23632.	0.00					
29.6000	0.00219	308643.	-5340.	-6.71E-04	0.00	1.29E+10	
-11.2370	24659.	0.00					
30.0000	-7.60E-04	282884.	-5357.	-5.61E-04	0.00	1.29E+10	
4.0660	25687.	0.00					
30.4000	-0.00320	257218.	-5305.	-4.61E-04	0.00	1.29E+10	
17.8174	26714.	0.00					
30.8000	-0.00518	231962.	-5190.	-3.70E-04	0.00	1.29E+10	
29.9561	27742.	0.00					
31.2000	-0.00675	207396.	-5021.	-2.88E-04	0.00	1.29E+10	
40.4552	28769.	0.00					
31.6000	-0.00794	183762.	-4806.	-2.15E-04	0.00	1.28E+10	
49.3190	29797.	0.00					
32.0000	-0.00881	161264.	-4552.	-1.50E-04	0.00	1.28E+10	
56.5779	30824.	0.00					
32.4000	-0.00939	140069.	-4266.	-9.37E-05	0.00	1.28E+10	
62.2850	31852.	0.00					
32.8000	-0.00971	120309.	-3957.	-4.48E-05	0.00	1.28E+10	
66.5114	32879.	0.00					
33.2000	-0.00982	102081.	-3631.	-2.95E-06	0.00	1.27E+10	

3047-0-0-101 boarding floats 16 inch round.lp11o

69.3426	33907.	0.00					
33.6000	-0.00974	85450.	-3295.	3.25E-05	0.00	1.27E+10	
70.8741	34934.	0.00					
34.0000	-0.00950	70452.	-2954.	6.21E-05	0.00	1.26E+10	
71.2079	35962.	0.00					
34.4000	-0.00914	57095.	-2614.	8.65E-05	0.00	1.25E+10	
70.4489	36989.	0.00					
34.8000	-0.00867	45361.	-2280.	1.06E-04	0.00	1.24E+10	
68.7017	38017.	0.00					
35.2000	-0.00812	35210.	-1956.	1.22E-04	0.00	1.22E+10	
66.0677	39044.	0.00					
35.6000	-0.00750	26580.	-1647.	1.34E-04	0.00	1.20E+10	
62.6427	40072.	0.00					
36.0000	-0.00683	19394.	-1357.	1.44E-04	0.00	1.16E+10	
58.5150	41099.	0.00					
36.4000	-0.00613	13556.	-1087.	1.50E-04	0.00	1.12E+10	
53.7633	42127.	0.00					
36.8000	-0.00539	8957.	-841.7144	1.55E-04	0.00	1.12E+10	
48.4570	43154.	0.00					
37.2000	-0.00464	5474.	-623.0206	1.58E-04	0.00	1.12E+10	
42.6654	44181.	0.00					
37.6000	-0.00387	2975.	-433.1573	1.60E-04	0.00	1.12E+10	
36.4443	45209.	0.00					
38.0000	-0.00310	1315.	-274.0839	1.61E-04	0.00	1.12E+10	
29.8363	46236.	0.00					
38.4000	-0.00232	341.9805	-147.5865	1.61E-04	0.00	1.12E+10	
22.8710	47264.	0.00					
38.8000	-0.00155	-103.7365	-55.3356	1.62E-04	0.00	1.12E+10	
15.5669	48291.	0.00					
39.2000	-7.72E-04	-190.7916	1.0645	1.61E-04	0.00	1.12E+10	
7.9331	49319.	0.00					
39.6000	2.72E-06	-95.0678	20.0355	1.61E-04	0.00	1.12E+10	
-0.02848	50346.	0.00					
40.0000	7.77E-04	0.00	0.00	1.61E-04	0.00	1.12E+10	
-8.3197	25687.	0.00					

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection = 2.22029637 inches
 Computed slope at pile head = -0.00945870 radians

3047-0-0-101 boarding floats 16 inch round.lp11o

Maximum bending moment = 519305. inch-lbs
 Maximum shear force = -5357. lbs
 Depth of maximum bending moment = 23.20000000 feet below pile head
 Depth of maximum shear force = 30.00000000 feet below pile head
 Number of iterations = 15
 Number of zero deflection points = 2

 Pile-head Deflection vs. Pile Length for Load Case 2

Boundary Condition Type 1, Shear and Moment

Shear = 2000. lbs
 Moment = 0. in-lbs
 Axial Load = 1000. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
40.00000	2.22029637	519305.	-5357.
38.00000	2.23690435	522258.	-5457.
36.00000	2.26710924	522400.	-5901.
34.00000	2.37410665	519081.	-6995.
32.00000	3.11713364	516228.	-8946.
30.00000	6.79857081	509157.	-10843.

 Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
 Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
 Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
 Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case	Load Type	Load	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max in
Shear	Max Moment					
Case Type	Pile-head in	Pile-head				
Pile						

3047-0-0-101 boarding floats 16 inch round.lp11o

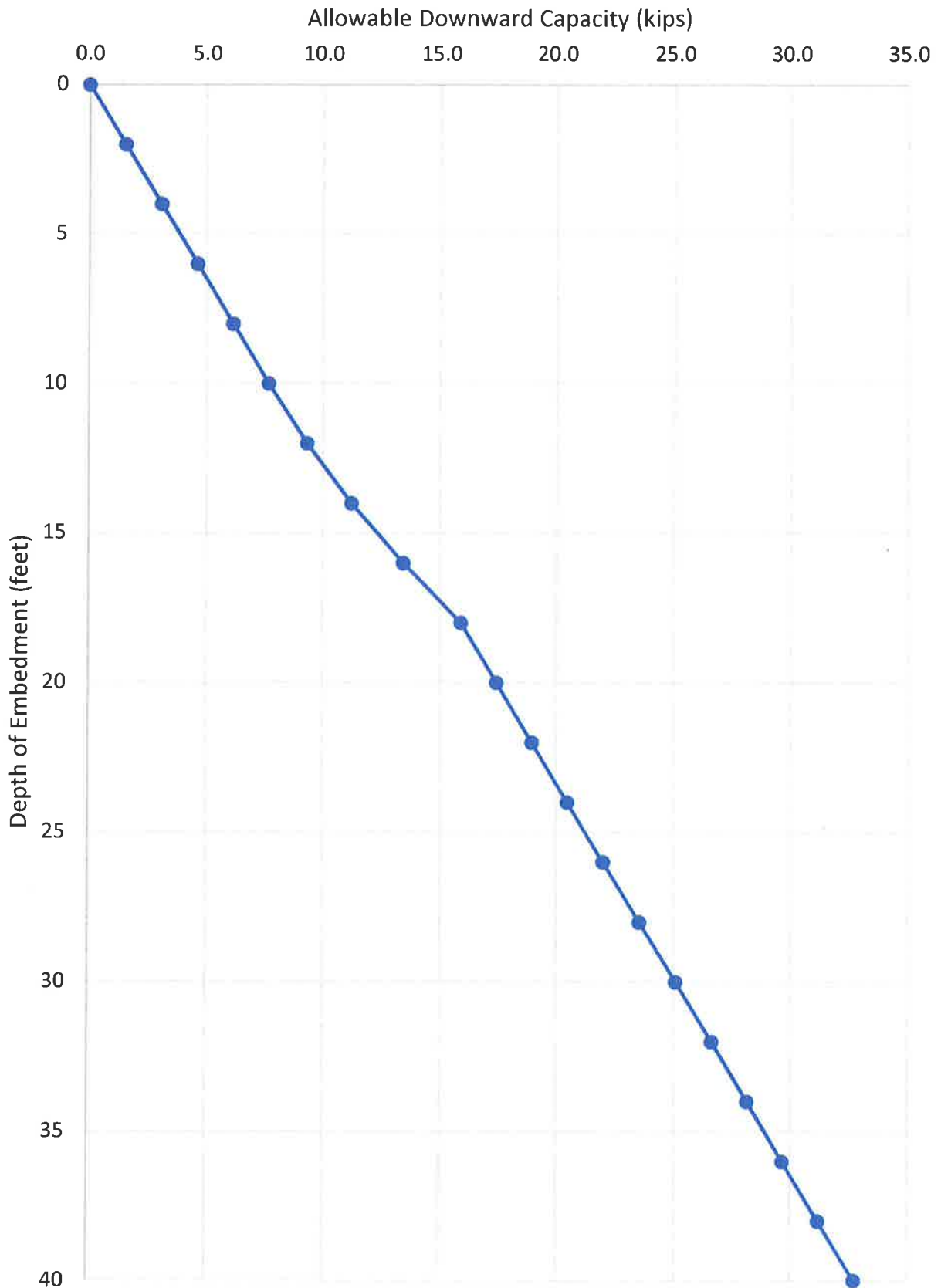
No.	1	Load 1	2	Load 2	lbs	inches	radians
lbs	in-lbs						
1	V, lb	1000.0000	M, in-lb	0.00	1000.0000	0.9863	-0.00438
-2558.	253360.						
2	V, lb	2000.	M, in-lb	0.00	1000.0000	2.2203	-0.00946
-5357.	519305.						

Maximum pile-head deflection = 2.2202963682 inches

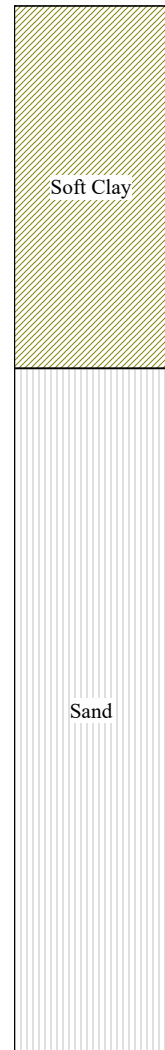
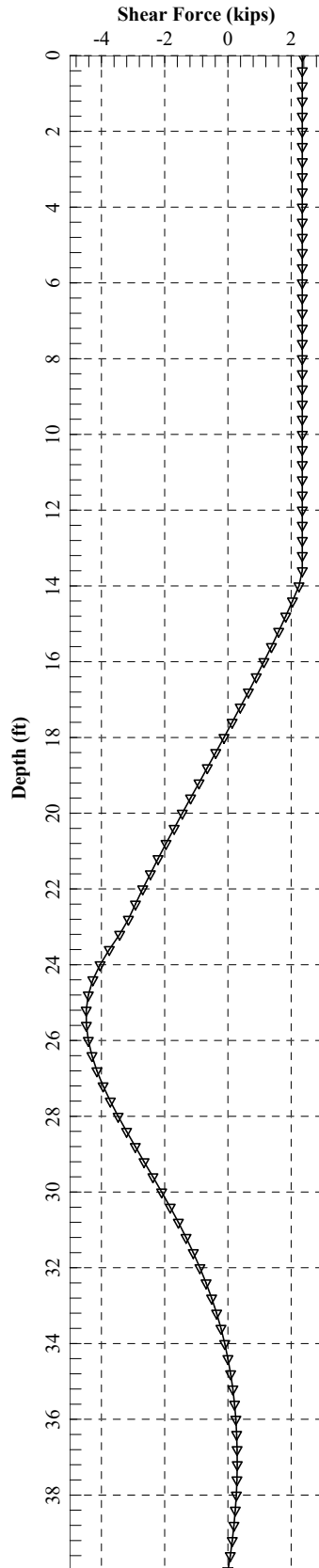
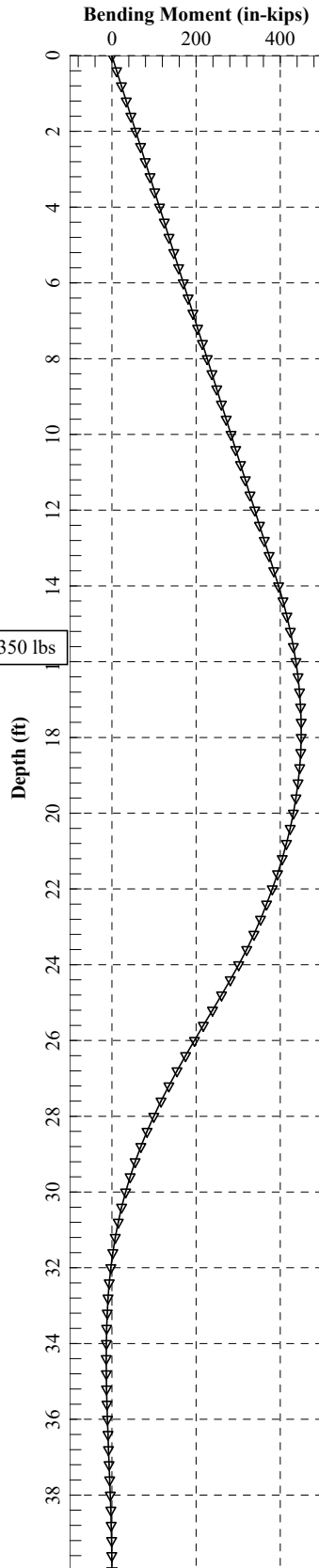
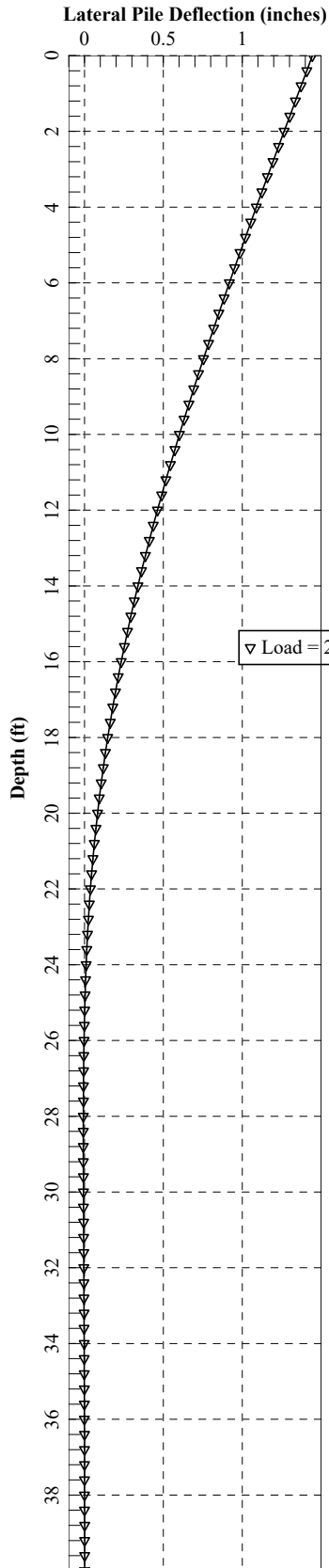
Maximum pile-head rotation = -0.0094586979 radians = -0.541943 deg.

The analysis ended normally.

14" sq pile



14" square gangway landing



3047-0-0-101 gangway landing 14 inch sq.lp11o

=====
LPile for Windows, Version 2019-11.001

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
© 1985-2019 by Ensoft, Inc.
All Rights Reserved

=====
This copy of LPile is being used by:

GAI
Gorian and Associates, INC.

Serial Number of Security Device: 139304473

This copy of LPile is licensed for exclusive use by:

Gorian & Associates, Inc., Thous

Use of this program by any entity other than Gorian & Associates, Inc., Thous
is a violation of the software license agreement.

Files Used for Analysis

Path to file locations:

\\SERVER\Server\gorian\GORIAN MASTER FILES\3047-0-0 Noble MDR Pavement\Pile Calcs\

Name of input data file:

3047-0-0-101 gangway landing 14 inch sq.lp11

Name of output report file:

3047-0-0-101 gangway landing 14 inch sq.lp11

Name of plot output file:

3047-0-0-101 gangway landing 14 inch sq.lp11

Name of runtime message file:

3047-0-0-101 gangway landing 14 inch sq.lp11

Date and Time of Analysis

3047-0-0-101 gangway landing 14 inch sq.lp110

Date: April 16, 2019

Time: 14:58:55

Problem Title

Project Name: MDR Boat Launch Renovation

Work Order: 3047-0-0-101

Client: Noble GEC

Engineer: GAI

Description: Gangway Landing 14" sq

Program Options and Settings

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

3047-0-0-101 gangway landing 14 inch sq.lp110

Loading Type and Number of Cycles of Loading:

- Static loading specified
- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1
Total length of pile = 40.000 ft
Depth of ground surface below top of pile = 14.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	14.0000
2	40.000	14.0000

Input Structural Properties for Pile Sections:

3047-0-0-101 gangway landing 14 inch sq.lp110

Pile Section No. 1:

Section 1 is a square prestressed concrete pile

Length of section	=	40.000000 ft
Pile Width	=	14.000000 in
Corner Chamfer	=	0.500000 in
Shear capacity of section	=	100.000000 lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	14.000000 ft
Distance from top of pile to bottom of layer	=	23.000000 ft
Effective unit weight at top of layer	=	41.000000 pcf
Effective unit weight at bottom of layer	=	41.000000 pcf
Undrained cohesion at top of layer	=	365.000000 psf
Undrained cohesion at bottom of layer	=	365.000000 psf
Epsilon-50 at top of layer	=	0.0000
Epsilon-50 at bottom of layer	=	0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	23.000000 ft
Distance from top of pile to bottom of layer	=	40.000000 ft
Effective unit weight at top of layer	=	51.000000 pcf
Effective unit weight at bottom of layer	=	51.000000 pcf

3047-0-0-101 gangway landing 14 inch sq.lp110

Friction angle at top of layer = 31.000000 deg.
 Friction angle at bottom of layer = 31.000000 deg.
 Subgrade k at top of layer = 0.0000 pci
 Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 40.000000 ft
 Distance from top of pile to bottom of layer = 70.000000 ft
 Effective unit weight at top of layer = 68.000000 pcf
 Effective unit weight at bottom of layer = 68.000000 pcf
 Friction angle at top of layer = 33.000000 deg.
 Friction angle at bottom of layer = 33.000000 deg.
 Subgrade k at top of layer = 0.0000 pci
 Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

(Depth of the lowest soil layer extends 30.000 ft below the pile tip)

 Summary of Input Soil Properties

Layer E50 Layer or Num. krm	Soil Type Name (p-y Curve Type) kpy pci	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.
1 default	Soft --	14.0000	41.0000	365.0000	--
default	Clay --	23.0000	41.0000	365.0000	--
2 --	Sand default (Reese, et al.)	23.0000 40.0000	51.0000 51.0000	-- --	31.0000 31.0000
3 --	Sand default (Reese, et al.)	40.0000 70.0000	68.0000 68.0000	-- --	33.0000 33.0000
--	default				

 Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

 Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load Compute No.	Load Top y Type vs. Pile Length	Condition 1	Condition 2	Axial Thrust Force, lbs
1	1	V = 2350. lbs	M = 0.0000 in-lbs	1000.00000000
No				

V = shear force applied normal to pile axis
 M = bending moment applied to pile head
 y = lateral deflection normal to pile axis
 S = pile slope relative to original pile batter angle
 R = rotational stiffness applied to pile head
 Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
 Thrust force is assumed to be acting axially for all pile batter angles.

 Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions of Square Prestressed Pile Section:

3047-0-0-101 gangway landing 14 inch sq.lp110

 Length of Section = 40.0000 ft
 Pile Width = 14.000 in
 Corner Chamfer = 0.500 in

Prestressing Strand Details:

Strand Type = Deformed bars (150-160
 ksi)
 Yield Stress, f_{pu} = 157. ksi
 Elasticity Modulus, E_s = 29000. ksi
 Number of Reinforcing Strands = 8
 Cross-sectional Area of Single Strand = 0.280 sq. in.
 Concrete Cover Thickness Over Strands = 2.000 in

Prestressing Strand Geometry:

Strand No.	Diameter in	Area sq. in	X in	Y in
1	0.625	0.280	4.688	0.000
2	0.625	0.280	3.315	3.315
3	0.625	0.280	0.000	4.688
4	0.625	0.280	-3.315	3.315
5	0.625	0.280	-4.688	0.000
6	0.625	0.280	-3.315	-3.315
7	0.625	0.280	-0.000	-4.688
8	0.625	0.280	3.315	-3.315

Computation of Loss of Prestress:

Initial Prestressing Force = 244.000 kips
 Fraction of Loss of Prestress = 0.250
 Effective Prestressing Force After Losses = 183.000 kips
 Area of Concrete, A_c = 193.260 sq.in
 Area of Steel, A_s = 2.240 sq.in
 Stress in Concrete After Losses, f_{pc} = 0.947 ksi
 Stress in Steel After Losses = -81.696 ksi
 Compressive Strain in Concrete After Losses = 0.0002627
 Tensile Strain in Steel After Losses = -0.0028171
 Axial Tension Load for Cracking of Concrete = -229.174 kips

Estimated Structural Capacities Computed Using PCI Equations:

3047-0-0-101 gangway landing 14 inch sq.lp110

Nom. Axial Cap., $P_n = (0.85 f'_c - 0.60 f_{pc}) A_g$	=	553.627 kips
Unfac. Axial Load Cap. $N = (0.33 f'_c - 0.27 f_{pc}) A_g$	=	208.077 kips
Axial Capacity in Tension, $N_t = A_s f_{pu}$	=	-351.680 kips
Nom. Moment Capacity, $M_n = 0.37 D A_s f_{pu}$	=	1821.702 in-kip

Note: The estimate of nominal moment capacity is based on equations that assume compressive strength of concrete is 6,000 psi (41.4 MPa), the value of prestress after losses is 700 psi (4.83 MPa), and axial thrust force is zero. When input values for these factors are different, the estimated value of nominal moment capacity will differ from the capacity computed by LPILE and should be considered only as an approximate check.

Concrete Properties:

Compressive Strength of Concrete	=	4000. psi
Modulus of Elasticity of Concrete	=	3604997. psi
Modulus of Rupture of Prestressed Concrete	=	-252.982213 psi
Compression Strain at Peak Stress	=	0.001886
Tensile Strain at Fracture of Concrete	=	-0.0000606
Maximum Coarse Aggregate Size	=	0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
-----	-----
1	1.000

Definitions of Run Messages and Notes:

-
- C = concrete in section has cracked in tension.
 - Y = stress in reinforcing steel has reached yield stress.
 - T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.
 - Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
 Position of neutral axis is measured from edge of compression side of pile.
 Compressive stresses and strains are positive in sign.

3047-0-0-101 gangway landing 14 inch sq.lp11o

Tensile stresses and strains are negative in sign.

Axial Thrust Force = 1.000 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
0.00000125	13.2652841	10612227.	182.9049940	0.0004913	0.0002111
0.9105728	-75.5000350				
0.00000250	28.9262050	11570482.	94.9604169	0.0005001	0.0002024
0.9428496	-75.6796233				
0.00000375	44.5864164	11889711.	65.6493017	0.0005089	0.0001937
0.9750088	-75.8588045				
0.00000500	60.2455452	12049109.	50.9965520	0.0005176	0.0001850
1.0070493	-76.0375785				
0.00000625	75.9032181	12144515.	42.2071488	0.0005265	0.0001763
1.0389706	-76.2159453				
0.00000750	91.5590616	12207875.	36.3494189	0.0005353	0.0001676
1.0707716	-76.3939049				
0.00000875	107.2127024	12252880.	32.1669312	0.0005441	0.0001590
1.1024517	-76.5714573				
0.00001000	122.8637669	12286377.	29.0314700	0.0005530	0.0001503
1.1340099	-76.7486022				
0.00001125	138.5118815	12312167.	26.5940268	0.0005618	0.0001417
1.1654455	-76.9253398				
0.00001250	154.1566726	12332534.	24.6451963	0.0005707	0.0001331
1.1967576	-77.1016699				
0.00001375	169.7977665	12348928.	23.0517207	0.0005796	0.0001245
1.2279455	-77.2775925				
0.00001500	185.4347889	12362319.	21.7247616	0.0005885	0.0001159
1.2590082	-77.4531074				
0.00001625	201.0673659	12373376.	20.6028154	0.0005975	0.0001073
1.2899450	-77.6282145				
0.00001750	216.6951232	12382578.	19.6419510	0.0006064	0.00009873
1.3207550	-77.8029138				
0.00001875	232.3176835	12390276.	18.8099522	0.0006154	0.00009019
1.3514375	-77.9772045				
0.00002000	247.9346765	12396734.	18.0826570	0.0006243	0.00008165
1.3819916	-78.1510875				
0.00002125	263.5457253	12402152.	17.4415885	0.0006333	0.00007313
1.4124164	-78.3245621				
0.00002250	279.1504549	12406687.	16.8723758	0.0006423	0.00006463

3047-0-0-101 gangway landing 14 inch sq.lp110

1.4427112	-78.4976283				
0.00002375	294.7484897	12410463.	16.3636736	0.0006513	0.00005614
1.4728751	-78.6702858				
0.00002500	310.3394543	12413578.	15.9064055	0.0006603	0.00004766
1.5029072	-78.8425345				
0.00002625	325.9229725	12416113.	15.4932239	0.0006694	0.00003920
1.5328069	-79.0143743				
0.00002750	341.4986682	12418133.	15.1181174	0.0006784	0.00003075
1.5625731	-79.1858048				
0.00002875	357.0661648	12419693.	14.7761199	0.0006875	0.00002231
1.5922052	-79.3568260				
0.00003000	372.6250918	12420836.	14.4630930	0.0006966	0.00001389
1.6217021	-79.5274384				
0.00003125	388.1750578	12421602.	14.1755605	0.0007057	0.00000549
1.6510633	-79.6976399				
0.00003250	403.7156840	12422021.	13.9105808	0.0007148	-0.00000291
1.6802877	-79.8674317				
0.00003375	419.2439532	12422043.	13.6656335	0.0007239	-0.00001128
1.7093731	-80.0368272				
0.00003500	434.7535569	12421530.	13.4385388	0.0007330	-0.00001965
1.7383147	-80.2058616				
0.00003625	450.2387972	12420381.	13.2274201	0.0007422	-0.00002801
1.7671084	-80.3745655				
0.00003750	465.6949171	12418531.	13.0306549	0.0007513	-0.00003635
1.7957505	-80.5429663				
0.00003875	481.1179096	12415946.	12.8468330	0.0007605	-0.00004469
1.8242379	-80.7110874				
0.00004000	496.5044554	12412611.	12.6747238	0.0007697	-0.00005301
1.8525679	-80.8789489				
0.00004125	511.8516926	12408526.	12.5132475	0.0007788	-0.00006133
1.8807379	-81.0465687				
0.00004250	520.6069779	12249576.	12.3311797	0.0007867	-0.00007092
1.9047984	-81.2512744 C				
0.00004375	531.7324188	12153884.	12.1699355	0.0007951	-0.00008007
1.9301126	-81.4427603 C				
0.00004500	539.1047517	11980106.	11.9999772	0.0008027	-0.00009000
1.9528608	-81.6573082 C				
0.00004625	549.0452279	11871248.	11.8506133	0.0008108	-0.00009941
1.9770748	-81.8565559 C				
0.00004750	558.5123303	11758154.	11.7068498	0.0008187	-0.0001089
2.0008229	-82.0589178 C				
0.00004875	567.5314585	11641671.	11.5682978	0.0008266	-0.0001185
2.0241167	-82.2643350 C				
0.00005125	581.3092420	11342619.	11.2909985	0.0008413	-0.0001388
2.0672030	-82.7055944 C				
0.00005375	596.6249373	11099999.	11.0453397	0.0008564	-0.0001588
2.1107302	-83.1377427 C				
0.00005625	610.7006993	10856901.	10.8152011	0.0008710	-0.0001791

3047-0-0-101 gangway landing 14 inch sq.lp110

2.1527379	-83.5801941 C				
0.00005875	623.8940107	10619473.	10.5999142	0.0008854	-0.0001998
2.1934805	-84.0307122 C				
0.00006125	636.1405015	10385967.	10.3970716	0.0008995	-0.0002207
2.2328831	-84.4903425 C				
0.00006375	649.9124930	10194706.	10.2174036	0.0009140	-0.0002411
2.2731423	-84.9365410 C				
0.00006625	660.3924311	9968188.	10.0351973	0.0009275	-0.0002627
2.3099987	-85.4136681 C				
0.00006875	672.6321708	9783741.	9.8746229	0.0009415	-0.0002836
2.3480283	-85.8740864 C				
0.00007125	684.2507104	9603519.	9.7224871	0.0009554	-0.0003048
2.3850818	-86.3403519 C				
0.00007375	687.0715847	9316225.	9.5333843	0.0009658	-0.0003294
2.4124117	-86.9077401 C				
0.00007625	697.6362986	9149329.	9.3960195	0.0009791	-0.0003511
2.4474440	-87.3881427 C				
0.00007875	707.8484212	8988551.	9.2657356	0.0009923	-0.0003728
2.4817479	-87.8722922 C				
0.00008125	717.7408035	8833733.	9.1420016	0.0010055	-0.0003947
2.5153606	-88.3598996 C				
0.00008375	727.3451407	8684718.	9.0243593	0.0010185	-0.0004167
2.5483198	-88.8506531 C				
0.00008625	736.6319397	8540660.	8.9120287	0.0010313	-0.0004388
2.5805803	-89.3451791 C				
0.00008875	745.6603406	8401807.	8.8048484	0.0010441	-0.0004611
2.6122172	-89.8427374 C				
0.00009125	754.4744038	8268213.	8.7026209	0.0010568	-0.0004834
2.6432902	-90.3427303 C				
0.00009375	763.1019216	8139754.	8.6050952	0.0010694	-0.0005058
2.6738396	-90.8447632 C				
0.00009625	771.4527193	8015093.	8.5112932	0.0010819	-0.0005283
2.7037291	-91.3505436 C				
0.00009875	779.6432692	7895122.	8.4216007	0.0010943	-0.0005509
2.7331271	-91.8581568 C				
0.0001013	787.6951813	7779705.	8.3358417	0.0011067	-0.0005735
2.7620695	-92.3672257 C				
0.0001038	795.5007570	7667477.	8.2530073	0.0011189	-0.0005963
2.7903851	-92.8799303 C				
0.0001063	803.2210121	7559727.	8.1738751	0.0011311	-0.0006190
2.8183252	-93.3932380 C				
0.0001088	810.7382193	7455064.	8.0974281	0.0011433	-0.0006419
2.8457026	-93.9095520 C				
0.0001113	818.1577481	7354227.	8.0241164	0.0011553	-0.0006648
2.8726839	-94.4268351 C				
0.0001138	825.4169953	7256413.	7.9533261	0.0011674	-0.0006878
2.8991686	-94.9464314 C				
0.0001163	832.5813391	7161990.	7.8852794	0.0011793	-0.0007108

3047-0-0-101 gangway landing 14 inch sq.lp110

2.9252616	-95.4670427 C				
0.0001188	839.5958659	7070281.	7.8194420	0.0011912	-0.0007339
2.9508725	-95.9899125 C				
0.0001213	846.5481561	6981840.	7.7562177	0.0012031	-0.0007571
2.9761480	-96.5131401 C				
0.0001238	853.3309273	6895603.	7.6947398	0.0012149	-0.0007803
3.0009034	-97.0392683 C				
0.0001263	860.0935456	6812622.	7.6358638	0.0012267	-0.0008035
3.0254000	-97.5647842 C				
0.0001288	866.6754799	6731460.	7.5783653	0.0012384	-0.0008268
3.0493506	-98.0936944 C				
0.0001313	873.2194390	6653100.	7.5230956	0.0012501	-0.0008501
3.0730136	-98.6224580 C				
0.0001338	879.6799268	6577046.	7.4696140	0.0012617	-0.0008734
3.0963033	-99.1523005 C				
0.0001363	886.0175975	6502881.	7.4175536	0.0012733	-0.0008969
3.1191499	-99.6842819 C				
0.0001388	892.3357677	6431249.	7.3675165	0.0012849	-0.0009203
3.1417442	-100.2156711 C				
0.0001413	898.5350745	6361310.	7.3187129	0.0012964	-0.0009437
3.1638976	-100.7492629 C				
0.0001438	904.6595094	6293284.	7.2713704	0.0013079	-0.0009672
3.1856963	-101.2838403 C				
0.0001463	910.7647049	6227451.	7.2257842	0.0013194	-0.0009907
3.2072452	-101.8178333 C				
0.0001488	916.7631009	6163113.	7.1812563	0.0013309	-0.0010143
3.2283737	-102.3538714 C				
0.0001588	940.2111042	5922590.	7.0160234	0.0013765	-0.0011087
3.3097137	-104.5032979 C				
0.0001688	962.8500110	5705778.	6.8688207	0.0014218	-0.0012034
3.3860891	-106.6603243 C				
0.0001788	984.7704957	5509206.	6.7369642	0.0014669	-0.0012983
3.4576743	-108.8231772 C				
0.0001888	1006.	5330059.	6.6183335	0.0015119	-0.0013933
3.5246175	-110.9901123 C				
0.0001988	1027.	5166038.	6.5112567	0.0015568	-0.0014884
3.5870485	-113.1592601 C				
0.0002088	1047.	5014682.	6.4134543	0.0016015	-0.0015837
3.6448268	-115.3343681 C				
0.0002188	1066.	4875068.	6.3248296	0.0016462	-0.0016789
3.6983131	-117.5079778 C				
0.0002288	1086.	4745718.	6.2443036	0.0016911	-0.0017741
3.7475221	-119.6792663 C				
0.0002388	1104.	4625064.	6.1702423	0.0017358	-0.0018694
3.7922880	-121.8525012 C				
0.0002488	1123.	4512684.	6.1031386	0.0017808	-0.0019643
3.8329052	-124.0184995 C				
0.0002588	1140.	4407139.	6.0411322	0.0018258	-0.0020594

3047-0-0-101 gangway landing 14 inch sq.lp110

3.8690900	-126.1851703	C				
0.0002688	1158.		4308114.	5.9847184	0.0018711	-0.0021541
3.9010403	-128.3442165	C				
0.0002788	1175.		4214832.	5.9331644	0.0019165	-0.0022486
3.9286563	-130.4966979	C				
0.0002888	1192.		4126496.	5.8854843	0.0019621	-0.0023431
3.9518051	-132.6466411	C				
0.0002988	1208.		4042945.	5.8423294	0.0020081	-0.0024371
3.9705733	-134.7850337	C				
0.0003088	1224.		3963608.	5.8030751	0.0020544	-0.0025308
3.9848245	-136.9135316	C				
0.0003188	1239.		3887839.	5.7666004	0.0021008	-0.0026244
3.9944156	-139.0391026	C				
0.0003288	1254.		3815569.	5.7337066	0.0021476	-0.0027175
3.9993347	-141.1516897	C				
0.0003388	1269.		3746282.	5.7042840	0.0021950	-0.0028102
3.9992927	-143.2492549	C				
0.0003488	1283.		3679596.	5.6781734	0.0022429	-0.0029022
3.9991142	-145.3303887	C				
0.0003588	1297.		3615274.	5.6544649	0.0022912	-0.0029940
3.9987369	-147.4016765	C				
0.0003688	1310.		3553273.	5.6332065	0.0023399	-0.0030853
3.9980789	-149.4605132	C				
0.0003788	1323.		3493000.	5.6140713	0.0023890	-0.0031762
3.9995466	-150.0000000	C				
0.0003888	1334.		3431634.	5.5949588	0.0024377	-0.0032675
3.9998744	-150.0000000	C				
0.0003988	1344.		3369344.	5.5755556	0.0024859	-0.0033592
3.9992470	-150.0000000	C				
0.0004088	1352.		3307463.	5.5565533	0.0025339	-0.0034513
3.9978020	-150.0000000	C				
0.0004188	1360.		3247538.	5.5390685	0.0025822	-0.0035430
3.9999529	-150.0000000	C				
0.0004288	1368.		3189813.	5.5230501	0.0026307	-0.0036345
3.9990884	-150.0000000	C				
0.0004388	1375.		3134248.	5.5081743	0.0026794	-0.0037258
3.9973889	-150.0000000	C				
0.0004488	1382.		3080698.	5.4948431	0.0027285	-0.0038167
3.9996636	-150.0000000	C				
0.0004588	1390.		3029091.	5.4828778	0.0027779	-0.0039072
3.9976866	-150.0000000	C				
0.0004688	1396.		2978601.	5.4713743	0.0028274	-0.0039978
3.9998730	-150.0000000	C				
0.0004788	1402.		2928216.	5.4592839	0.0028763	-0.0040889
3.9978799	-150.0000000	C				
0.0004888	1406.		2877470.	5.4457905	0.0029243	-0.0041809
3.9998506	-150.0000000	C				
0.0004988	1410.		2826231.	5.4307585	0.0029713	-0.0042739

3047-0-0-101 gangway landing 14 inch sq.lp110						
3.9971338	-150.0000000	C				
0.0005088	1412.		2774456.	5.4138669	0.0030170	-0.0043682
3.9994420	-150.0000000	C				
0.0005188	1413.		2723996.	5.3973043	0.0030625	-0.0044626
3.9981915	-150.0000000	C				
0.0005288	1414.		2675005.	5.3810476	0.0031079	-0.0045573
3.9981670	-150.0000000	C				
0.0005388	1416.		2627706.	5.3652498	0.0031532	-0.0046520
3.9997803	-150.0000000	C				
0.0005488	1417.		2582018.	5.3504210	0.0031987	-0.0047465
3.9960386	-150.0000000	C				
0.0006088	1423.		2337743.	5.2779647	0.0034756	-0.0053095
3.9982121	-150.0000000	C				
0.0006688	1428.		2135008.	5.2257161	0.0037574	-0.0058678
3.9989875	-150.0000000	C				
0.0007288	1431.		1964067.	5.1876316	0.0040432	-0.0064220
3.9978827	-150.0000000	C				

 Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
 or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
----	-----	-----	-----
1	1.000	1410.791	0.00300000

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor for Moment	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
----------------	---------------------------	----------------------------	----------------------------	-------------------------------	----------------------------------

3047-0-0-101 gangway landing 14 inch sq.lp110

1	0.65	1411.	0.650000	917.014209	6160537.
1	0.75	1411.	0.700000	1058.	4934370.
1	0.90	1411.	0.750000	1270.	3743189.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	14.0000	0.00	N.A.	No	0.00	20826.
2	23.0000	8.4836	No	No	20826.	419756.
3	40.0000	26.0000	No	No	440582.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 2350.0 lbs
 Applied moment at pile head = 0.0 in-lbs
 Axial thrust load on pile head = 1000.0 lbs

Depth Res.	Deflect. Soil Spr.	Bending Distrib. Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
X feet	y inches	Lat. Load in-lbs	lbs	radians	psi*	in-lb^2	

3047-0-0-101 gangway landing 14 inch sq.lp110

lb/inch	lb/inch	lb/inch					
0.00	1.4451	-2.25E-06	2350.	-0.00749	0.00	1.06E+10	
0.00	0.00	0.00					
0.4000	1.4091	11316.	2350.	-0.00749	0.00	1.06E+10	
0.00	0.00	0.00					
0.8000	1.3732	22632.	2350.	-0.00748	0.00	1.13E+10	
0.00	0.00	0.00					
1.2000	1.3373	33948.	2350.	-0.00747	0.00	1.17E+10	
0.00	0.00	0.00					
1.6000	1.3015	45264.	2350.	-0.00745	0.00	1.19E+10	
0.00	0.00	0.00					
2.0000	1.2658	56579.	2350.	-0.00743	0.00	1.20E+10	
0.00	0.00	0.00					
2.4000	1.2302	67895.	2350.	-0.00740	0.00	1.21E+10	
0.00	0.00	0.00					
2.8000	1.1947	79210.	2350.	-0.00738	0.00	1.22E+10	
0.00	0.00	0.00					
3.2000	1.1594	90526.	2350.	-0.00734	0.00	1.22E+10	
0.00	0.00	0.00					
3.6000	1.1242	101841.	2350.	-0.00730	0.00	1.22E+10	
0.00	0.00	0.00					
4.0000	1.0893	113156.	2350.	-0.00726	0.00	1.23E+10	
0.00	0.00	0.00					
4.4000	1.0545	124471.	2350.	-0.00722	0.00	1.23E+10	
0.00	0.00	0.00					
4.8000	1.0200	135785.	2350.	-0.00716	0.00	1.23E+10	
0.00	0.00	0.00					
5.2000	0.9857	147099.	2350.	-0.00711	0.00	1.23E+10	
0.00	0.00	0.00					
5.6000	0.9517	158413.	2350.	-0.00705	0.00	1.23E+10	
0.00	0.00	0.00					
6.0000	0.9181	169727.	2350.	-0.00699	0.00	1.23E+10	
0.00	0.00	0.00					
6.4000	0.8847	181040.	2350.	-0.00692	0.00	1.24E+10	
0.00	0.00	0.00					
6.8000	0.8516	192353.	2350.	-0.00685	0.00	1.24E+10	
0.00	0.00	0.00					
7.2000	0.8190	203666.	2350.	-0.00677	0.00	1.24E+10	
0.00	0.00	0.00					
7.6000	0.7867	214978.	2350.	-0.00669	0.00	1.24E+10	
0.00	0.00	0.00					
8.0000	0.7548	226290.	2350.	-0.00660	0.00	1.24E+10	
0.00	0.00	0.00					
8.4000	0.7233	237602.	2350.	-0.00651	0.00	1.24E+10	
0.00	0.00	0.00					
8.8000	0.6922	248913.	2350.	-0.00642	0.00	1.24E+10	

3047-0-0-101 gangway landing 14 inch sq.lp110

0.00	0.00	0.00					
9.2000	0.6617	260223.	2350.	-0.00632	0.00	1.24E+10	
0.00	0.00	0.00					
9.6000	0.6316	271533.	2350.	-0.00622	0.00	1.24E+10	
0.00	0.00	0.00					
10.0000	0.6020	282843.	2350.	-0.00611	0.00	1.24E+10	
0.00	0.00	0.00					
10.4000	0.5729	294152.	2350.	-0.00600	0.00	1.24E+10	
0.00	0.00	0.00					
10.8000	0.5444	305461.	2350.	-0.00588	0.00	1.24E+10	
0.00	0.00	0.00					
11.2000	0.5164	316769.	2350.	-0.00576	0.00	1.24E+10	
0.00	0.00	0.00					
11.6000	0.4891	328076.	2350.	-0.00564	0.00	1.24E+10	
0.00	0.00	0.00					
12.0000	0.4623	339383.	2350.	-0.00551	0.00	1.24E+10	
0.00	0.00	0.00					
12.4000	0.4362	350689.	2350.	-0.00537	0.00	1.24E+10	
0.00	0.00	0.00					
12.8000	0.4107	361994.	2350.	-0.00524	0.00	1.24E+10	
0.00	0.00	0.00					
13.2000	0.3859	373299.	2350.	-0.00510	0.00	1.24E+10	
0.00	0.00	0.00					
13.6000	0.3618	384603.	2350.	-0.00495	0.00	1.24E+10	
0.00	0.00	0.00					
14.0000	0.3384	395907.	2250.	-0.00480	0.00	1.24E+10	
-41.7769	592.5516	0.00					
14.4000	0.3158	406247.	2044.	-0.00464	0.00	1.24E+10	
-43.7669	665.3311	0.00					
14.8000	0.2938	415578.	1830.	-0.00448	0.00	1.24E+10	
-45.6047	744.9577	0.00					
15.2000	0.2727	423857.	1607.	-0.00432	0.00	1.24E+10	
-47.2877	832.3217	0.00					
15.6000	0.2524	431046.	1376.	-0.00416	0.00	1.24E+10	
-48.8130	928.4589	0.00					
16.0000	0.2328	437110.	1139.	-0.00399	0.00	1.24E+10	
-50.1781	1035.	0.00					
16.4000	0.2141	442017.	895.0364	-0.00382	0.00	1.24E+10	
-51.3801	1152.	0.00					
16.8000	0.1961	445739.	645.9249	-0.00365	0.00	1.24E+10	
-52.4164	1283.	0.00					
17.2000	0.1790	448253.	392.2442	-0.00347	0.00	1.24E+10	
-53.2839	1428.	0.00					
17.6000	0.1628	449538.	134.8109	-0.00330	0.00	1.24E+10	
-53.9799	1592.	0.00					
18.0000	0.1474	449579.	-125.5439	-0.00313	0.00	1.24E+10	
-54.5012	1775.	0.00					
18.4000	0.1328	448363.	-387.9736	-0.00295	0.00	1.24E+10	

3047-0-0-101 gangway landing 14 inch sq.lp110

-54.8445	1983.	0.00					
18.8000	0.1190	445883.	-651.6156	-0.00278	0.00	1.24E+10	
-55.0063	2219.	0.00					
19.2000	0.1061	442134.	-915.5890	-0.00261	0.00	1.24E+10	
-54.9826	2488.	0.00					
19.6000	0.09394	437118.	-1179.	-0.00244	0.00	1.24E+10	
-54.7691	2798.	0.00					
20.0000	0.08264	430839.	-1441.	-0.00227	0.00	1.24E+10	
-54.3608	3158.	0.00					
20.4000	0.07213	423307.	-1700.	-0.00211	0.00	1.24E+10	
-53.7516	3577.	0.00					
20.8000	0.06241	414536.	-1956.	-0.00195	0.00	1.24E+10	
-52.9345	4071.	0.00					
21.2000	0.05346	404544.	-2208.	-0.00179	0.00	1.24E+10	
-51.9005	4660.	0.00					
21.6000	0.04525	393356.	-2454.	-0.00163	0.00	1.24E+10	
-50.6382	5371.	0.00					
22.0000	0.03778	381000.	-2694.	-0.00148	0.00	1.24E+10	
-49.1327	6242.	0.00					
22.4000	0.03102	367512.	-2925.	-0.00134	0.00	1.24E+10	
-47.3636	7330.	0.00					
22.8000	0.02493	352932.	-3148.	-0.00120	0.00	1.24E+10	
-45.3020	8721.	0.00					
23.2000	0.01950	337307.	-3426.	-0.00107	0.00	1.24E+10	
-70.6015	17376.	0.00					
23.6000	0.01470	320055.	-3752.	-9.39E-04	0.00	1.24E+10	
-65.2552	21308.	0.00					
24.0000	0.01049	301299.	-4043.	-8.19E-04	0.00	1.24E+10	
-56.1394	25687.	0.00					
24.4000	0.00684	281249.	-4269.	-7.06E-04	0.00	1.24E+10	
-38.0701	26714.	0.00					
24.8000	0.00371	260321.	-4412.	-6.01E-04	0.00	1.24E+10	
-21.4565	27742.	0.00					
25.2000	0.00107	238898.	-4479.	-5.05E-04	0.00	1.24E+10	
-6.4027	28769.	0.00					
25.6000	-0.00113	217328.	-4477.	-4.16E-04	0.00	1.24E+10	
7.0261	29797.	0.00					
26.0000	-0.00293	195919.	-4415.	-3.36E-04	0.00	1.24E+10	
18.8000	30824.	0.00					
26.4000	-0.00436	174942.	-4301.	-2.64E-04	0.00	1.24E+10	
28.9213	31852.	0.00					
26.8000	-0.00546	154632.	-4142.	-2.00E-04	0.00	1.23E+10	
37.4202	32879.	0.00					
27.2000	-0.00628	135184.	-3945.	-1.44E-04	0.00	1.23E+10	
44.3514	33907.	0.00					
27.6000	-0.00684	116757.	-3720.	-9.44E-05	0.00	1.23E+10	
49.7899	34934.	0.00					
28.0000	-0.00718	99477.	-3471.	-5.20E-05	0.00	1.22E+10	

3047-0-0-101 gangway landing 14 inch sq.lp110

53.8272	35962.	0.00					
28.4000	-0.00734	83437.	-3206.	-1.61E-05	0.00	1.22E+10	
56.5678	36989.	0.00					
28.8000	-0.00734	68700.	-2931.	1.40E-05	0.00	1.21E+10	
58.1249	38017.	0.00					
29.2000	-0.00721	55303.	-2650.	3.87E-05	0.00	1.20E+10	
58.6176	39044.	0.00					
29.6000	-0.00697	43256.	-2370.	5.85E-05	0.00	1.19E+10	
58.1678	40072.	0.00					
30.0000	-0.00665	32549.	-2094.	7.39E-05	0.00	1.17E+10	
56.8970	41099.	0.00					
30.4000	-0.00626	23152.	-1826.	8.55E-05	0.00	1.14E+10	
54.9241	42127.	0.00					
30.8000	-0.00582	15021.	-1568.	9.37E-05	0.00	1.08E+10	
52.3632	43154.	0.00					
31.2000	-0.00536	8097.	-1324.	9.89E-05	0.00	1.06E+10	
49.3217	44181.	0.00					
31.6000	-0.00487	2309.	-1096.	1.01E-04	0.00	1.06E+10	
45.9152	45209.	0.00					
32.0000	-0.00439	-2421.	-883.9470	1.01E-04	0.00	1.06E+10	
42.2534	46236.	0.00					
32.4000	-0.00390	-6178.	-690.2967	9.93E-05	0.00	1.06E+10	
38.4342	47264.	0.00					
32.8000	-0.00343	-9049.	-515.1510	9.58E-05	0.00	1.06E+10	
34.5432	48291.	0.00					
33.2000	-0.00298	-11124.	-358.6806	9.13E-05	0.00	1.06E+10	
30.6528	49319.	0.00					
33.6000	-0.00256	-12493.	-220.7385	8.59E-05	0.00	1.06E+10	
26.8231	50346.	0.00					
34.0000	-0.00216	-13244.	-100.9202	8.01E-05	0.00	1.06E+10	
23.1012	51374.	0.00					
34.4000	-0.00179	-13463.	1.3769	7.41E-05	0.00	1.06E+10	
19.5226	52401.	0.00					
34.8000	-0.00145	-13232.	86.8951	6.80E-05	0.00	1.06E+10	
16.1100	53429.	0.00					
35.2000	-0.00114	-12629.	156.4650	6.22E-05	0.00	1.06E+10	
12.8774	54456.	0.00					
35.6000	-8.50E-04	-11730.	210.9583	5.67E-05	0.00	1.06E+10	
9.8281	55484.	0.00					
36.0000	-5.91E-04	-10605.	251.2417	5.16E-05	0.00	1.06E+10	
6.9567	56511.	0.00					
36.4000	-3.55E-04	-9319.	278.1382	4.71E-05	0.00	1.06E+10	
4.2502	57539.	0.00					
36.8000	-1.38E-04	-7935.	292.3931	4.32E-05	0.00	1.06E+10	
1.6894	58566.	0.00					
37.2000	6.04E-05	-6512.	294.6475	4.00E-05	0.00	1.06E+10	
-0.7501	59594.	0.00					
37.6000	2.45E-04	-5107.	285.4167	3.73E-05	0.00	1.06E+10	

3047-0-0-101 gangway landing 14 inch sq.lp110

-3.0961	60621.	0.00					
38.0000	4.19E-04	-3773.	265.0771	3.53E-05	0.00	1.06E+10	
-5.3788	61649.	0.00					
38.4000	5.84E-04	-2562.	233.8586	3.39E-05	0.00	1.06E+10	
-7.6289	62676.	0.00					
38.8000	7.44E-04	-1528.	191.8469	3.30E-05	0.00	1.06E+10	
-9.8760	63703.	0.00					
39.2000	9.01E-04	-720.9203	138.9922	3.25E-05	0.00	1.06E+10	
-12.1468	64731.	0.00					
39.6000	0.00106	-193.8439	75.1281	3.23E-05	0.00	1.06E+10	
-14.4632	65758.	0.00					
40.0000	0.00121	0.00	0.00	3.22E-05	0.00	1.06E+10	
-16.8402	33393.	0.00					

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 1.44505228 inches
 Computed slope at pile head = -0.00748756 radians
 Maximum bending moment = 449579. inch-lbs
 Maximum shear force = -4479. lbs
 Depth of maximum bending moment = 18.00000000 feet below pile head
 Depth of maximum shear force = 25.20000000 feet below pile head
 Number of iterations = 18
 Number of zero deflection points = 2

 Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
 Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
 Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
 Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Load Load Axial Pile-head Pile-head Max

3047-0-0-101 gangway landing 14 inch sq.lp110

Shear Max Moment

Case No.	Type	Pile-head Load	Type	Pile-head Load	Loading	Deflection	Rotation	in
		in-lbs		in-lbs	lbs	inches	radians	
1	V, lb	2350.	M, in-lb	0.00	1000.0000	1.4451	-0.00749	
		-4479.						
		449579.						

Maximum pile-head deflection = 1.4450522801 inches

Maximum pile-head rotation = -0.0074875642 radians = -0.429006 deg.

The analysis ended normally.

**MARINA DEL REY BOAT LAUNCH RAMP REPLACEMENT PROJECT
SPECS. 7663; C.P. NO. 8A078**

APPENDIX D

Geotechnical Update
Boat Launch Facility Renovation, Marina del Rey, California
Work Order No. 3047-0-0-102 by Gorian & Associates, Inc.
Dated August 21, 2020



Applied Earth Sciences
Geotechnical Engineers
Engineering Geologists
DSA Accepted Testing Laboratory
Special Inspection and Materials Testing

3595 Old Conejo Road
Thousand Oaks
California 91320-2122
805 375-9262
805 375-9263 fax

August 21, 2020

Noble Consultants, Inc.
2201 Dupont Drive, Suite 830
Irvine, California 92612

Work Order: 3047-0-0-102

Attention: Patrick G. Miskel, P.E.

Subject: **Geotechnical Update, Boat Launch Facility Renovation, Marina Del Rey, California**

Reference: Gorian and Associates, Inc., April 17, 2019, *Geotechnical Evaluation, Boat Launch Facility Renovation, Marina Del Rey, California*. Work Order: 3047-0-0-101.

This letter presents a geotechnical update for the boat launch facility renovation at Marina Del Rey. We understand there have been no significant changes to the surface or subsurface conditions at the site. As such the recommendations provided in the referenced report remain applicable and should be used in the design and construction of the project.

Please call if you have any questions regarding this letter or the referenced report or require additional information.

Respectfully,

Gorian and Associates, Inc.

By: Sheryl N. Shatz, GE 2288
Senior Geotechnical Engineer

A handwritten signature in blue ink, appearing to read 'Sheryl N. Shatz', is written over the typed name and title.



Distribution: Addressee, via email