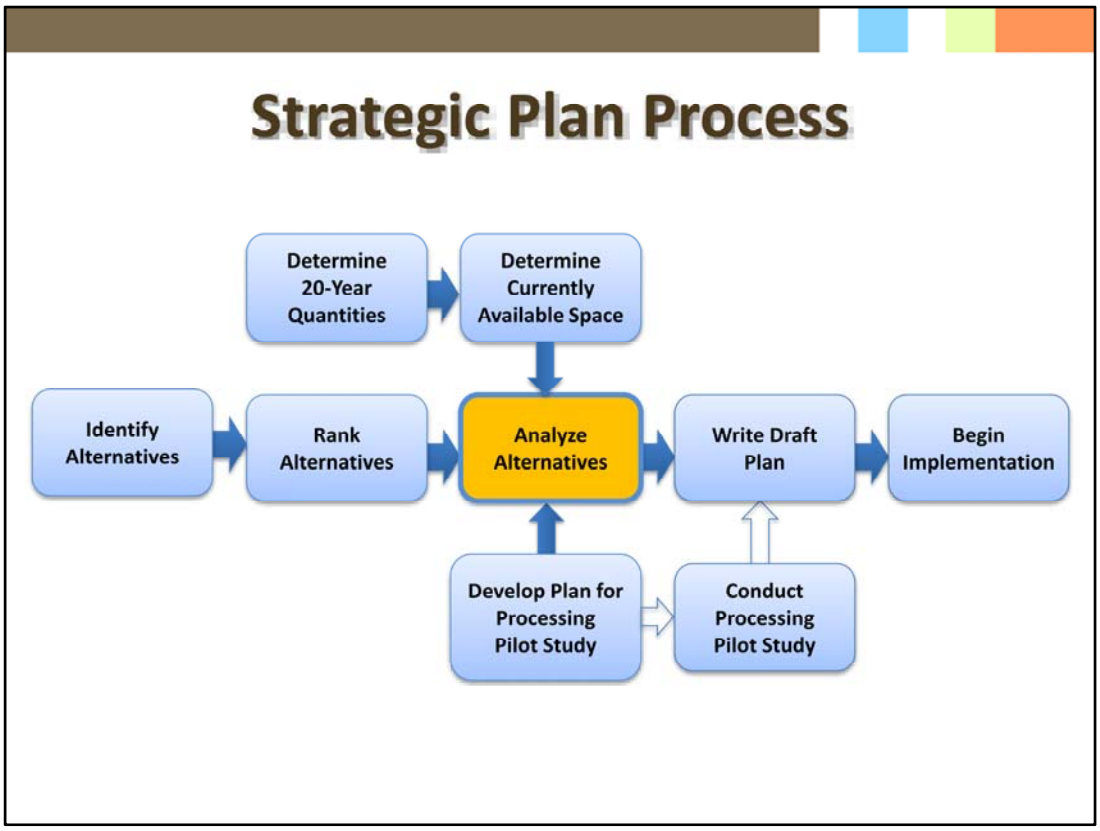
# Sediment Management Strategic Plan
# Task Force Meeting # 4

## Analysis of Alternatives for Subregions West 2 & 3

**September 7, 2011**

# Goal

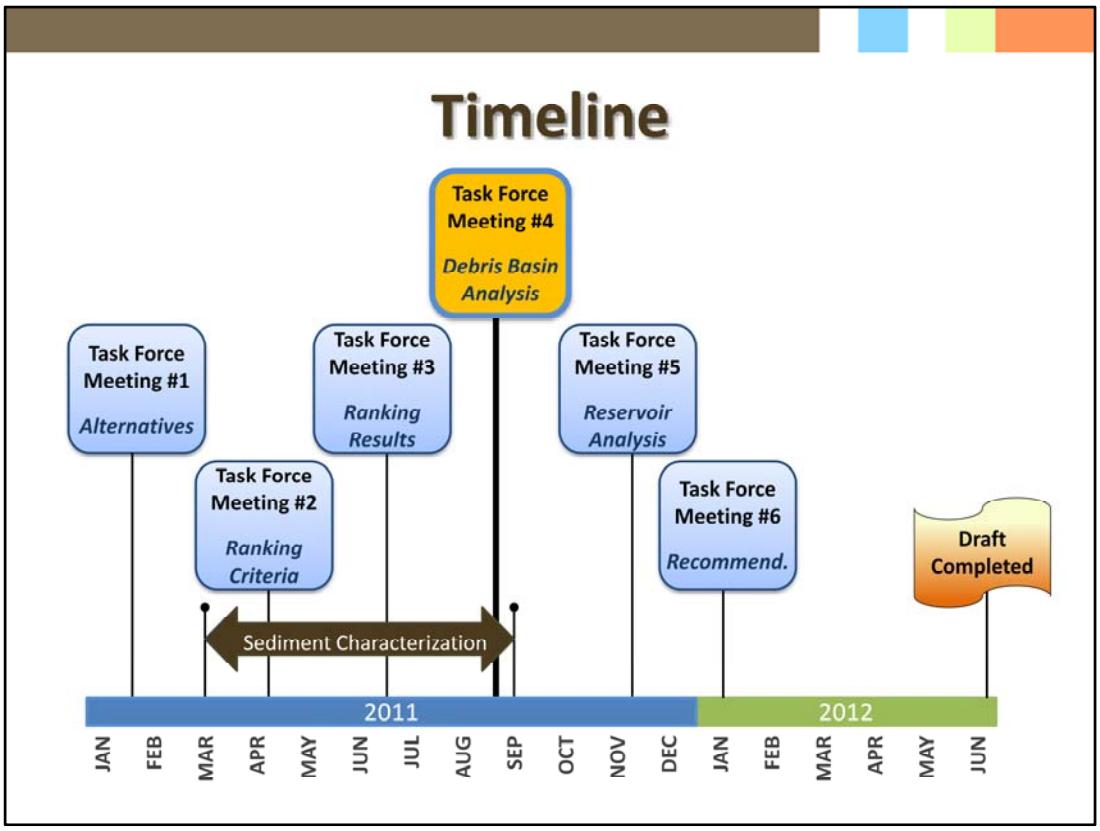
Manage sediment in order to provide for the flood risk management and water conservation needs of the region while balancing environmental, social, and economic concerns.




The schematic depicts the Sediment Management Strategic Plan Process. We currently are in the analysis of alternatives phase.

Testing of the sediment from several facilities revealed that there is the potential for the sediment that accumulates in the reservoirs and debris basins to be processed into a useable product. Based on the testing results, it has been determined that a processing pilot study by the Flood Control District is not necessary and therefore it will not be pursued. The Flood Control District has begun talking to representatives from the aggregate industry about the sediment.

We have heard from the Task Force and the Advisory Working Group that we should look into somehow redeveloping the Flood Control District's system so that it is more natural. We are considering how to address that longer-term plan. However, we need to continue with the development of the Sediment Management Strategic Plan because even if naturalization efforts are feasible, we still need to address the sediment in our system over the next 20 years. We appreciate your understanding and participation in this current effort.




Based on the feedback received, alternatives were ranked according to broad environmental and social considerations. Those rankings were presented during the last meeting. We heard from a few of you that the ranking tool was too complex. However, we did not receive any negative feedback about the rankings determined by the tool. Therefore, we have concentrated our analysis efforts on the alternatives that were ranked the most environmentally and socially acceptable. In addition, we are moving away from use of the ranking tool as we move forward and will discuss that later in our presentation.

During this meeting, details for alternatives for the management needs of two subgroups of debris basins (total 62) along the western San Gabriel Mountains and the Verdugo Hills will be presented. Your feedback on this analysis will be useful in determining the best alternatives for those debris basins. Your feedback will also help guide us in the analysis of the alternatives for other groups of facilities and individual reservoirs, which we will be conducting in the next couple of months and bring it back to you.

# Goal of Today's Meeting

- Review progress
- Present planning quantities
- Provide detailed analysis of alternatives for two groups of debris basins in the West Area
- Obtain feedback from the Task Force and determine which alternatives to continue evaluating further
- Discuss next steps

# Agenda

- Progress review
- Planning quantities
- Alternatives analysis process
- Transportation alternatives for West 2 and West 3
- Placement alternatives for West 2 and West 3

## Planning Quantity

- Based on historical cleanouts & accumulation
- Includes factor of safety but not worst-case scenario

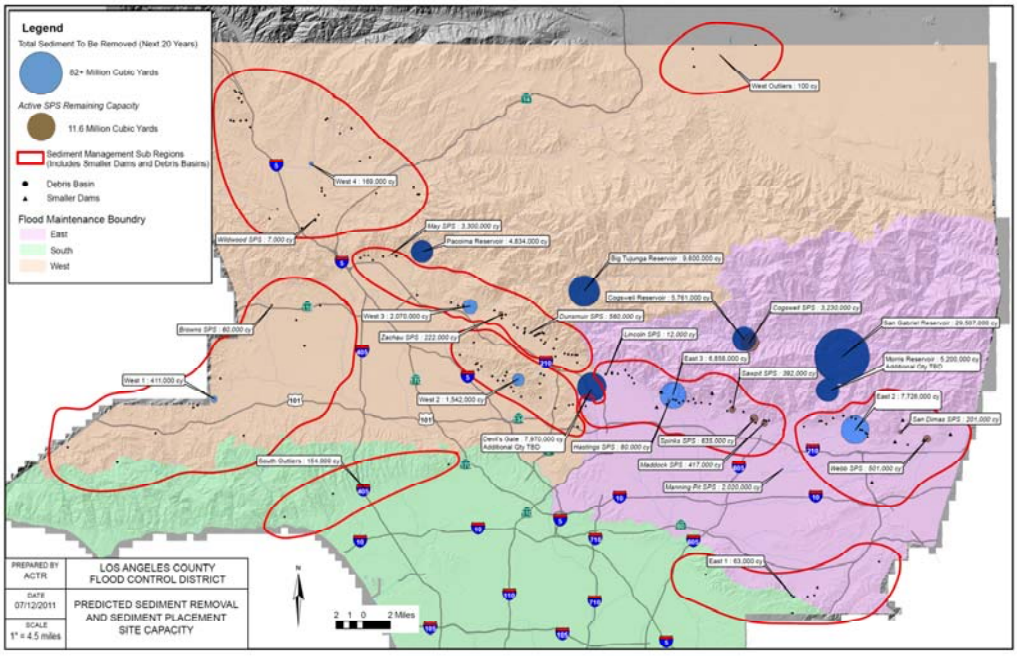
| Facilities | Quantity (MCY) |
|---|---|
| Debris Basins | 10 |
| Reservoirs | 55+ |
| Reservoirs - improved operations & water conservation | 15 |
| | 70+ |
| Total | 80+ |

The 20-year sediment management projections were developed using historical records, which include the effects of heavy rains and fires. The recorded sediment removals were combined into rolling 20-year totals and then the 80$^{th}$ percentile of each data set was selected as the planning quantity as it is a conservative estimate but not the worst-case scenario.

The sediment quantity from the 162 debris basins is relatively small compared to the overall quantity.
Most of the sediment needing to be managed is from the 14 reservoirs under Flood Control District jurisdiction.

Because the quantities to be removed from Devil's Gate and Pacoima Reservoirs are still to be determined, the total planning quantity is unknown.

# Planning Quantity (cont.)

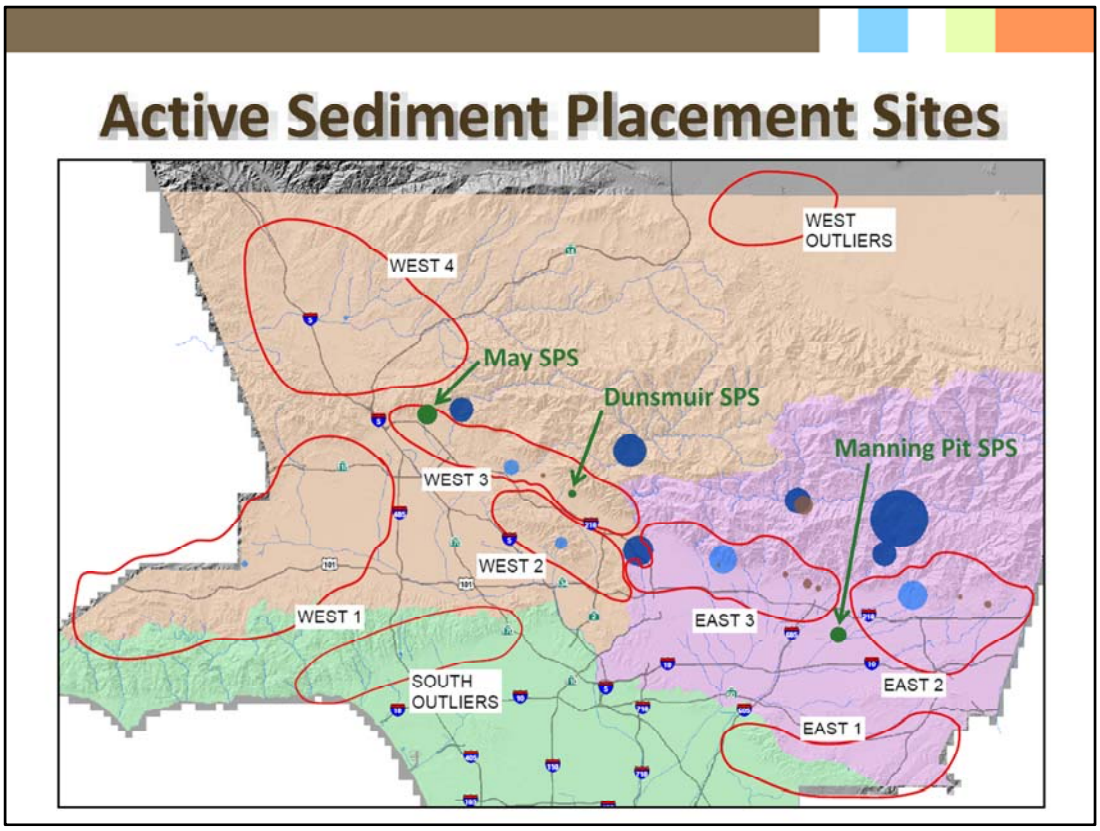



Explanation of the map:

The size of the circles is relative to the quantity they represent. That is, the bigger the circle, the larger the quantity.

Dark blue circles represent sediment from reservoirs being planned for individually.

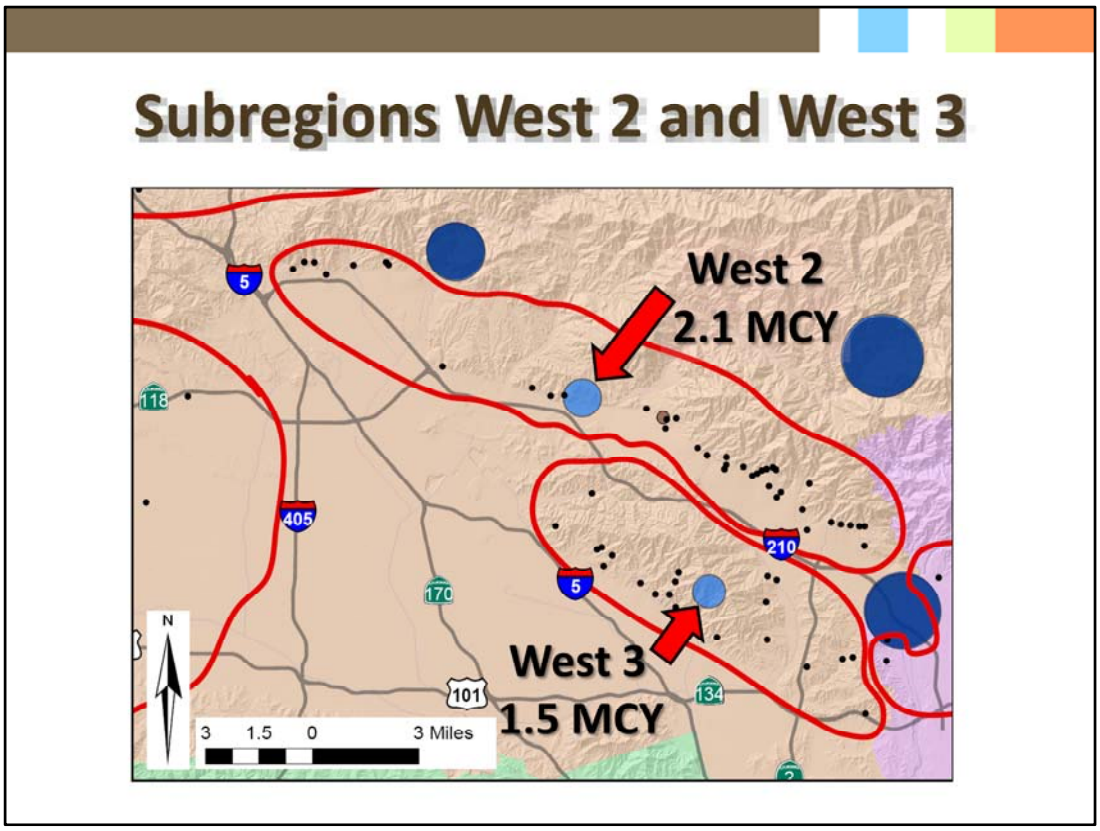
Light blue circles represent sediment from subregions of debris basins and small reservoirs.




The brown and green circles represent the estimated remaining capacity at the active Sediment Placement Sites (SPSs). May, Dunsmuir, and Manning Pit SPSs are the most accessible active SPSs with significant remaining capacity for the placement of sediment from debris basins.

The active SPSs have a small capacity compared to the planning quantities (the light & dark blue circles).

The active SPSs will continue to be used while other solutions are brought online.

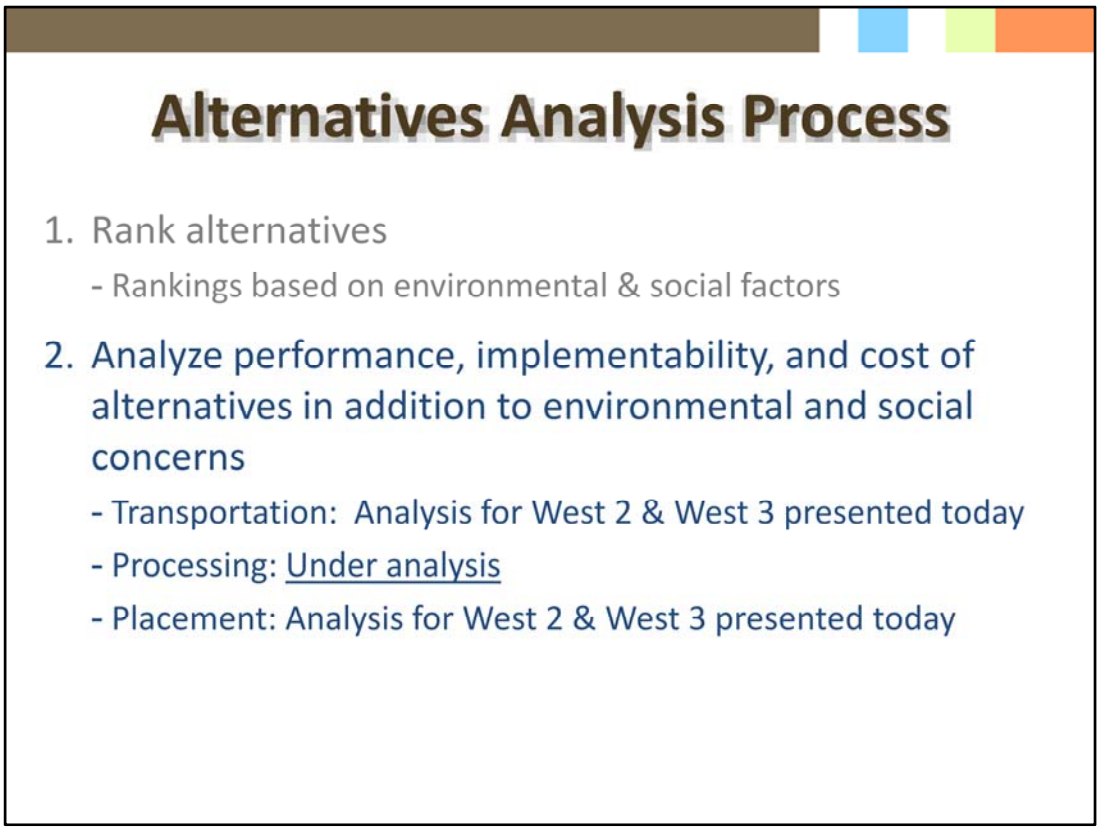



The focus of this meeting is on Subregions West 2 and West 3, which are comprised of debris basins at the foothills of the San Gabriel and Verdugo Mountains. The black circles on the map depict the debris basins; as these show, the debris basins are scattered.


3.6 million cubic yards of sediment would fill up the Rose Bowl to the rim over 8 times.

Because sediment is carried down by runoff, sediment flows are unpredictable both in volume and occurrence.

In order for debris basins to maintain their ability to manage flood risk, a certain capacity needs to remain available in the debris basins for new inflow of sediment.




The alternatives are being analyzed through a two-step process. First, the alternatives were ranked by use of the ranking tool. The rankings, which were presented during the third Task Force meeting, provided a good starting point. The second step is to analyze the alternatives for performance, implementability, and cost. During this meeting, that second phase of the analysis for the transportation and placement alternatives for West 2 and West 3 will be discussed.

# Agenda

- Progress review
- Planning quantities
- Alternatives analysis process
- Transportation alternatives for West 2 and West 3
- Placement alternatives for West 2 and West 3

# Sediment Transport

Ranking for distances of 10-20 miles, based on environmental & social factors only.

| Transportation Alternatives | Score | Rank |
|---|---|---|
| Truck to Existing Rail Network | 8.0 | 1 |
| Low Emission Trucking | 7.8 | 2 |
| Standard Trucking | 7.5 | 3 |
| Slurry Pipelines | 7.5 | 3 |
| Sluicing in Existing Channels | 7.0 | 5 |
| Cable/Bucket Systems | 6.5 | 6 |
| Conveyor Systems | 6.3 | 7 |
| Trucking In Channels | 5.8 | 8 |
| New Rail Lines* | 3.8 | 9 |

* New Rail Lines are not currently being evaluated due to the high environmental and social concerns.

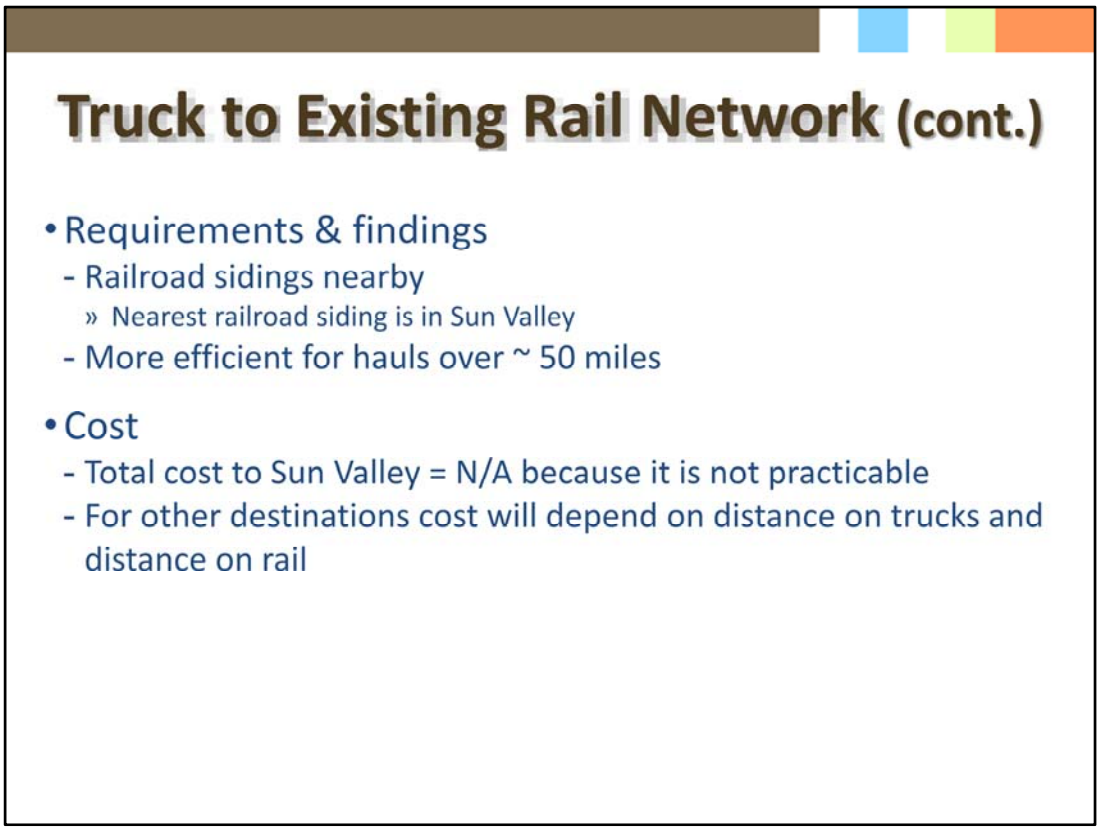
The following slides present the analysis of the sediment transport alternatives for West 2 and West 3. The analysis considers the performance, implementability, and cost of the transportation alternatives in addition to environmental and social concerns.

For comparison purposes, an example destination was used for the sediment from West 2 and 3. The Sun Valley area, which is 18 miles away from the West 2 and 3 debris basins on average, was selected as the example destination.

New rail lines were not analyzed due to the high environmental and social concerns.

# Truck to Existing Rail Network

- Description
  - Transport sediment on existing rail network as feasible and truck to and from rail network as necessary
- Environmental
  - Minimal – Uses existing transportation infrastructure
- Social
  - Traffic & noise
  - Emissions

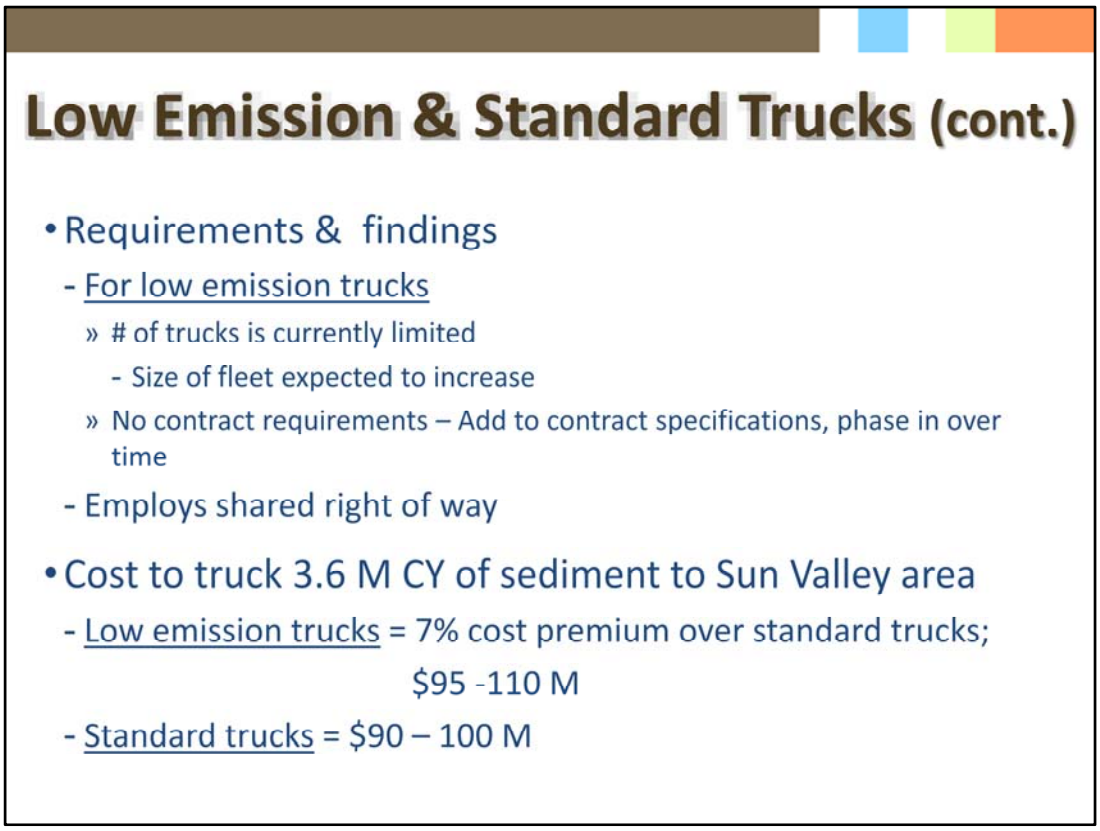



The nearest siding where sediment can be loaded onto trains is in Sun Valley. Due to the nearest siding being so close to the potential placement area for the sediment from West 2 and 3, the truck to existing rail network alternative is it is not a practicable option. This may be a more efficient alternative for longer hauls to other placement sites.

## Low Emission & Standard Trucks

- Description
  - Sediment is loaded on low emission or standard trucks
- Environmental
  - Minimal habitat impacts – uses existing roadways
  - Emissions:
    - » Lower emissions
    - » Regular emissions
- Social
  - Traffic & noise

The use of low emission trucks was suggested by the Task Force. Low emission trucks would be utilized in the same way standard trucks have been used, with the added benefit of lower emissions.



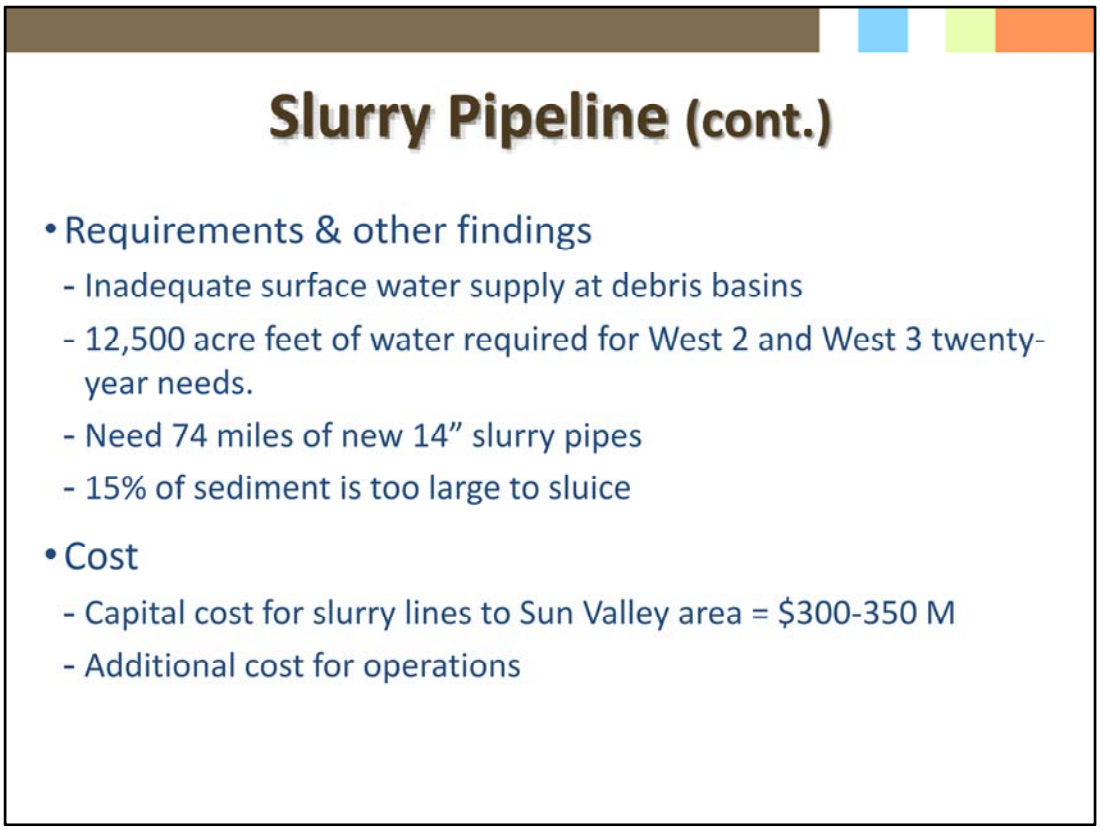

The Flood Control District may be able to include a requirement for low emission trucks in contract specifications. One option would be to phase in low emission trucks by requiring a percentage of low emission trucks in a fleet.

Trucking adapts to the amount of sediment to be managed. The less sediment we have the fewer trucks we use.

Based on the research done, contracting low emission trucks today could cost approximately 7% more than regular trucks.

# Slurry Pipeline

- Description
  - Pressurized mix of sediment and water is pumped through a pipe
- Environmental
  - Minimal impacts – if placed under streets
- Social
  - Noise and traffic disruption during construction
  - No visual impacts if placed underground
  - Additional strain on water resources




There is inadequate surface water supply at the debris basins for slurrying the sediment. Water from the existing water lines cannot be used because the water lines in the foothills are not large enough to provide water for slurrying the sediment. Therefore, in order to slurry sediment from the debris basins, a water line would need to be constructed to each basin. In addition, slurry pipelines would need to be built from each debris basin to a main slurry line, which would then carry the sediment to a placement or processing location. It is estimated that it would take a total of approximately 74 miles of 14-inch slurry lines to transport the slurry from the debris basins in subregions West 2 and 3 to the Sun Valley area, which is the closest placement alternative.

It would take approximately 12,500 acre feet of water to slurry the 20-year sediment quantity from West 2 & 3. That quantity of water is equivalent to the water consumption of approximately 500 families of 4 during a 18-year period.

# Sluicing in Channels

- Description
  - Mixture of water and sediment sent downstream of debris basins
  - Limiting analysis to debris basins with channels downstream because sediment could result in clogged pipes (pipes not designed to carry sediment)
- Environmental
  - Minimal – uses existing concrete-lined channels
- Social
  - Additional strain on water resources



There are two types of debris basins.
1. Debris basins with open channels downstream - No concerns about plugging
2. Debris basins with pipe outlets or pipes downstream - Concerns about plugging

## Sluicing in Channels (cont.)

- Requirements & findings
  - Inadequate surface water supply at debris basins
  - Channel downstream of debris basin
    - » 16 out of 62 debris basins have channels
    - » No channels to placement areas
  - 16,500 acre feet of water required to sluice 20-year sediment quantity from 16 DBs
  - 15% of sediment is too large to sluice
- Cost
  - Total to Sun Valley area for 3.6 MCY = $190-220M Million

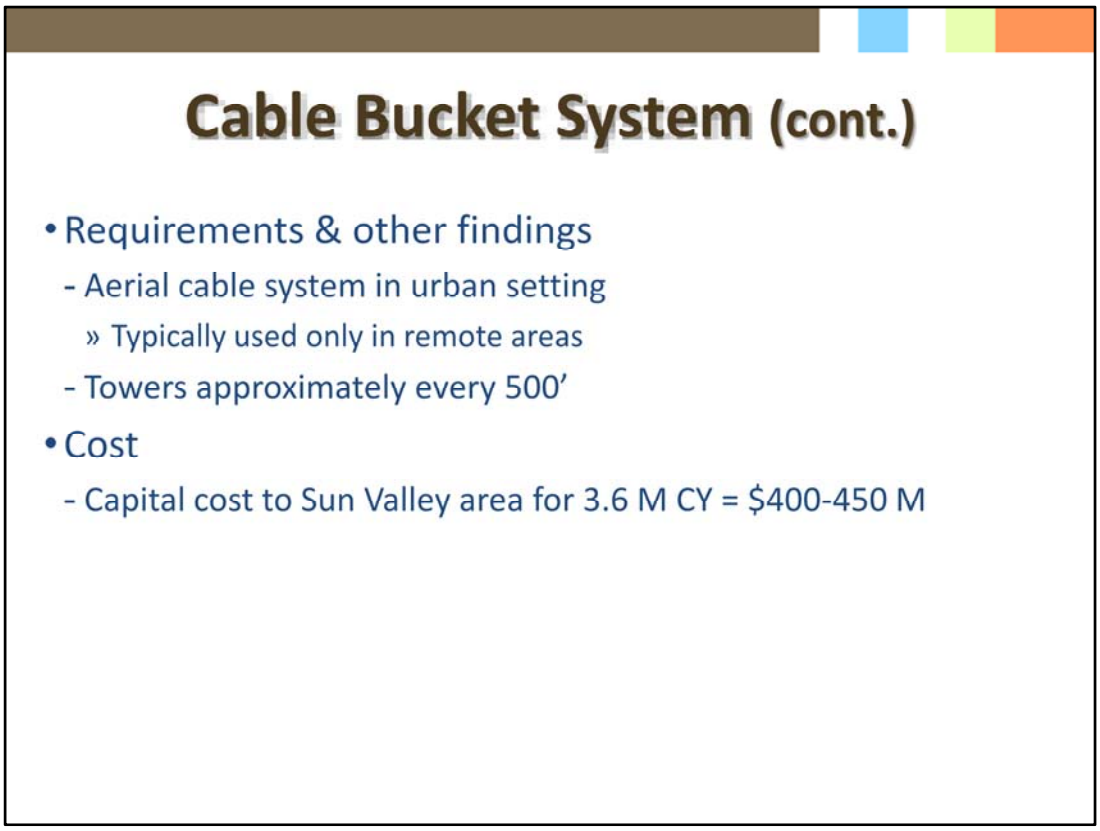
Similar to stormwater flows but with higher sediment loads

The water required to sluice the sediment from the debris basins in subregions West 2 and 3 is even greater than the water that would be required to slurry the sediment. As discussed for the slurry alternative, the water from surface water flows and from existing water lines is inadequate and so new water lines would have be to be constructed. Furthermore, the channels from the debris basins lead to the south and to the east. If the destination of the sediment was to be the Sun Valley area, the sediment-water mixture sluiced from the debris basins would need to be transferred to another means of transportation after the sluice portion of the trip and then taken to the Sun Valley area.

## Cable Bucket System

- Description
  - Sediment is loaded into buckets and then transported via aerial cable
- Environmental
  - Possible impact to habitat depending on route
- Social
  - Noise & traffic during construction
  - Noise during operation
  - Immitigable visual impact

If a cable bucket system was built through the foothills, the access road needed for construction could have environmental impact. To reduce habitat impact, the system could be built through residential and commercial areas along existing roadway frontages.




The system would be permanent and would not adapt to the amount of sediment that is to be transported.

## Regional Conveyor System

- Description
  - Sediment is loaded on a conveyor belt to destination
- Environmental
  - Possible impact to habitat depending on route
- Social
  - Potential for noise impacts
  - Visual impacts

Similar to the cable bucket system, if a conveyor system was built through the foothills, the access roads for construction could have environmental impact. To eliminate environmental impact, the system could be built through residential and commercial areas along existing roadways.

## Regional Conveyor System (cont.)

- Requirements & other findings
  - Relatively dry material
    - » Not appropriate for wet season cleanouts
  - Linear right of way
    - » Along channel rights of way, streets, utility corridors, etc
  - Permanent installation
- Cost
  - Capital cost to Sun Valley area for 3.6 M CY = $275-325 Million

A regional conveyor system would be permanent and would not adapt to the amount of sediment needing to be transported.

## Local Conveyor System along Channels

- Description
  - Sediment transported on a conveyor belt placed along channels and then transferred to a truck at major arterial
- Environmental
  - Possible vegetation removal along channel rights of way
- Social
  - Noise in backyards along channels

Existing trees and other vegetation that have grown in the rights of way along the channels would possibly have to be removed.

Because the channels go along the backs of residential properties, noise could be a concern.

# Local Conveyor System along Channels

- Requirements & other findings
  - Relatively dry material
    - » Not appropriate for wet season cleanouts
  - Channel downstream of debris basin
    - » 16 out of 62 debris basins have channels
  - Requires a transfer location
    - » Right of way acquisition in commercial areas
  - Roadway overcrossings
- Cost
  - Total cost to Sun Valley area for 3.6 M CY = $150 - 160 Million

Relatively dry material is needed because wet material will not stay on the belt.

Conveyors could only work for basins with channels.

At the bottom end of the local conveyor system there would need to be a transfer area where the material would be loaded onto trucks. This would likely happen near Foothill Boulevard as it is the closest arterial road. The Flood Control District would potentially have to acquire some right of way along the road.

# Trucking in Channels

- Description
  - Trucks travel in channel or channel right of way instead of on streets
- Environmental
  - Minimal – uses existing concrete-lined channels or channel access roads
- Social
  - Traffic & noise
  - Emissions

+

## Trucking in Channels (cont.)

- Requirements for implementation
  - No trucks in channel during wet season
    - » Not appropriate for wet season cleanouts
  - Minimum channel width = 12'
    & minimum bridge clearance = 12'
    - » Available at 1 debris basin - Verdugo Debris Basin
- Cost
  - $95 – 115 Million

The minimum width requirement for a truck is 12 feet. The clearance height for bridges is 12 feet as the trucks are 11 feet tall.

Only one debris basin meets the criteria - Verdugo Debris Basin. However, Verdugo Debris Basin is adjacent to a major arterial that can be used for sediment transport.

Cost includes potential cost of access ramps to the Verdugo Channel and additional maintenance of the channel as a result of truck traffic.

# West 2 and West 3 Transportation Alternatives Summary

| Alternative | Major Concern | Estimated Cost (in Million Dollars) | Proposal |
|---|---|---|---|
| Low emission trucks | - | $ 95-110 | Continue further evaluation |
| Standard trucks | - | $ 90-110 | |
| Trucking in channels | Not appropriate for wet season cleanouts. Only 1 debris basin. | $ 95-105 | |
| Truck to existing rail network | Inefficient if rail portion of route is short | N/A | Consider for longer hauls |
| Slurry pipelines | Inadequate surface water | $ 300-350 | Consider for other subregions and reservoirs |
| Sluicing | Inadequate surface water | $ 190-220 | |
| Regional conveyor | Not appropriate for wet season cleanouts | $ 275-325 | |
| Local conveyor | Not appropriate for wet season cleanouts | $ 150-160 | |
| Cable/bucket system | Aerial cable system in urban setting | $ 400-450 | |
| New rail lines | Not analyzed | N/A | No further evaluation |

Due to the scattered locations of the 62 debris basins in West 2 and 3, the largely residential character of the areas, and relatively small size of the individual debris basins (hence small sediment storage volumes), the transportation alternatives that show the most promise appear to be trucking due to the ability to handle dry and wet material, capability to readily adjust number of trucks to meet transport needs, lower level of environmental and social impacts, and relative low cost.

# West 2 and West 3 Transportation Alternatives Summary

## Discussion

# Agenda

- Progress review
- Planning quantities
- Alternatives analysis process
- Transportation alternatives for West 2 and West 3
- Placement alternatives for West 2 and West 3

# Placement Alternatives

Ranking based on environmental & social factors only.

| Alternative | Alternate Description | Score | Rank |
|---|---|---|---|
| Use as Cover at Sanitary Landfill | *Landfill Cover* | 9.3 | 1 |
| Acquire Property & Develop New SPS In Industrial Area | *Place at Pits* | 9.0 | 2 |
| Place at Operational Quarry | | 9.0 | 2 |
| Place at Retired Pit Owned by Third Party | | 9.0 | 2 |
| Place at New SPS on Flood Control District Property In Remote Area with Recoverable Habitat | *New SPS with Recoverable Habitat* | 8.5 | 5 |
| Acquire Property & Develop New SPS In Remote Area with Recoverable Habitat | | 8.5 | 5 |
| Use for Beach Nourishment | *Beach Sand* | 7.5 | 7 |
| Continued Use of Active SPS with Recoverable Habitat* | *Use Active SPSs* | 7.3 | 8 |
| Offshore Placement | *Offshore Placement* | 7.3 | 8 |

*** Active SPSs will continue to be used for immediate needs until other alternatives are usable.**

These alternatives were evaluated for performance, implementability, and cost.

# Placement Alternatives (cont.)

Ranking based on environmental & social factors only.

| Placement Alternatives | Alternate Description | Score | Rank |
|---|---|---|---|
| New SPS on Flood Control District Land In Remote Area with Sensitive Habitat | *New SPS near Residential and/or Location with Sensitive Habitat* | 6.8 | 10 |
| Acquire Property & Develop New SPS In Remote Area with Sensitive Habitat | | 6.8 | 10 |
| Continued Use of Active SPS with Sensitive Habitat | | 5.5 | 12 |
| New SPS on Flood Control District Land Near Residential Area with Recoverable Habitat | | 4.3 | 13 |
| Acquire Property & Develop New SPS Near Residential Area with Recoverable Habitat | | 4.3 | 13 |
| New SPS on Flood Control District Land Near Residential Area with Sensitive Habitat | | 2.5 | 15 |
| Acquire Property & Develop New SPS Near Residential Area with Sensitive Habitat | | 2.5 | 15 |

These alternatives will only be considered if higher ranking alternatives are not feasible.

# Landfill Cover

- Environmental
  - Minimal
- Requirements & findings
  - Sediment must be dry
    - → Need location to dry if wet
  - Sunshine Canyon Landfill
    - » Largest of 3 landfills closest to West 2 & West 3
    - » Operational thru 2037
    - » Daily cover 1,000-2,400 CY/day
  - 6-18 months for agreement
- Cost (Sunshine Canyon Landfill)
  - Total: $40-50/CY
    - » Double handle: $10-15/CY
    - » Haul: $30
    - » Tipping fee: $0-5/CY

# Acquire a Pit in an Industrial Area

- Environmental Impact
  - Minimal
- Requirements & findings
  - Existing pits in Sun Valley area
  - Placement requirements may vary
  - 2-5+ year acquisition time
  - 30-70 MCY in volume total
- Cost
  - Acquisition cost being evaluated
  - Haul: $20-30/CY

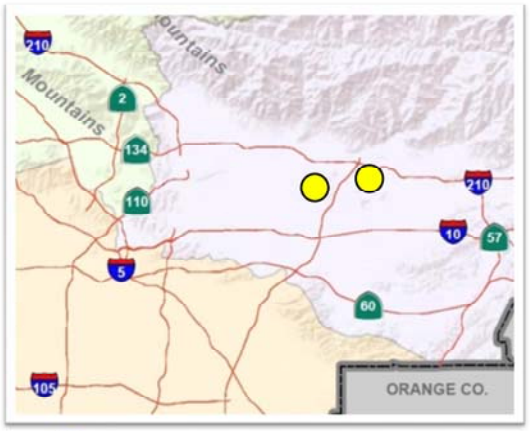
  → Total: Acquisition cost/CY + $20-30/CY

# Inert Debris Fill Operations

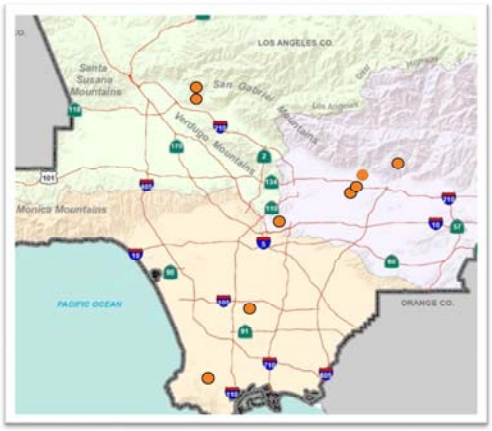
**(Engineered and Non-Engineered)**

- Environmental
  - Minimal
- Requirements & findings
  - Sediment must be dry
    → Need location to dry if wet
  - Eng. Fill: 90+ % compaction
  - 6-18 months for agreement
  - 50+ MCY available
  - 23,000 CY/day
- Cost
  - Total: $35-60/CY
    - » Double handle: $10-15
    - » Tipping fee: $0-5/CY
    - » Haul: $25-40/CY depending on location

# Potential Inert Debris Fill Locations




Non-Engineered Fill Operations
(2 sites)




Engineered Fill Operations
(9 sites)

Two non-engineered locations out near Azusa have been identified as having a large capacity to accept sediment.

Nine engineered fill locations have been identified within Los Angeles County.

# New SPS with Recoverable Habitat

At this time not able to identify a suitable parcel in a remote location with recoverable habitat

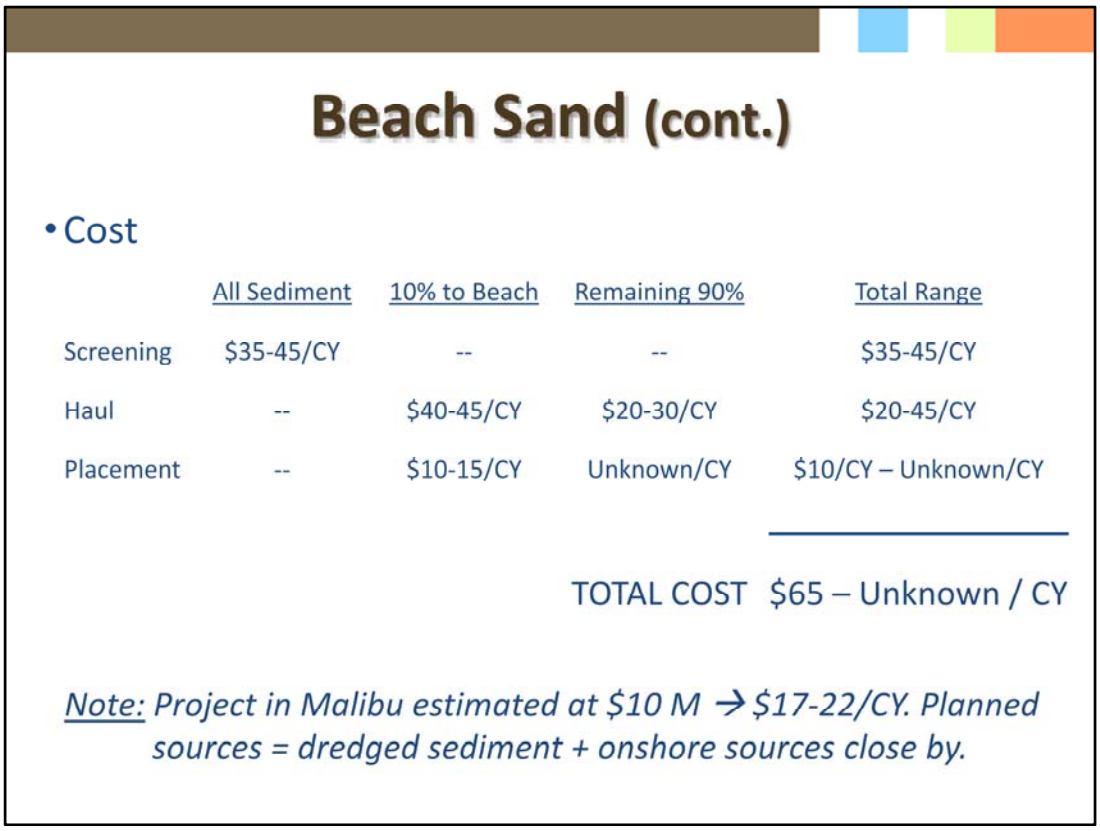
# Beach Sand

- Environmental
  - Potentially high
- Requirements & findings
  - Specific color & size gradation
    - » Requires processing
    - » Approx. 10% would meet specifications
      - → Remaining 90% placed somewhere else
  - Two potential areas
    - » nourished every 5-10 years
    - » 600,000 CY (Malibu)
  - 2-5 year planning horizon


Beach nourishment in the LA area has historically occurred in Malibu and along the South Bay beaches.

To match the specifications of a given beach nourishment project, the sediment would need to be processed. It is estimated that after processing, approximately 10% of the sediment in the debris basins would meet the specifications, leaving approximately 90% of the sediment to be placed or used somewhere else.

A 600,000 CY beach nourishment project in Malibu is currently being planned by others.




As previously indicated, the sediment would need to be processed to obtain sand that meets given specifications and allow for that sand to be placed at a beach. It was estimated that after processing, 10% of the quantity of the sediment processed would be sand usable for beach nourishment while the other 90% would have to be placed or used somewhere else. The difference in the hauling costs for the 10% that would go to the beach and the remaining 90% is the cost to haul the material from the processing location to the beach. The cost to place the remaining 90% was indicated as unknown as it depends on the placement (or reuse) alternative for that sediment.

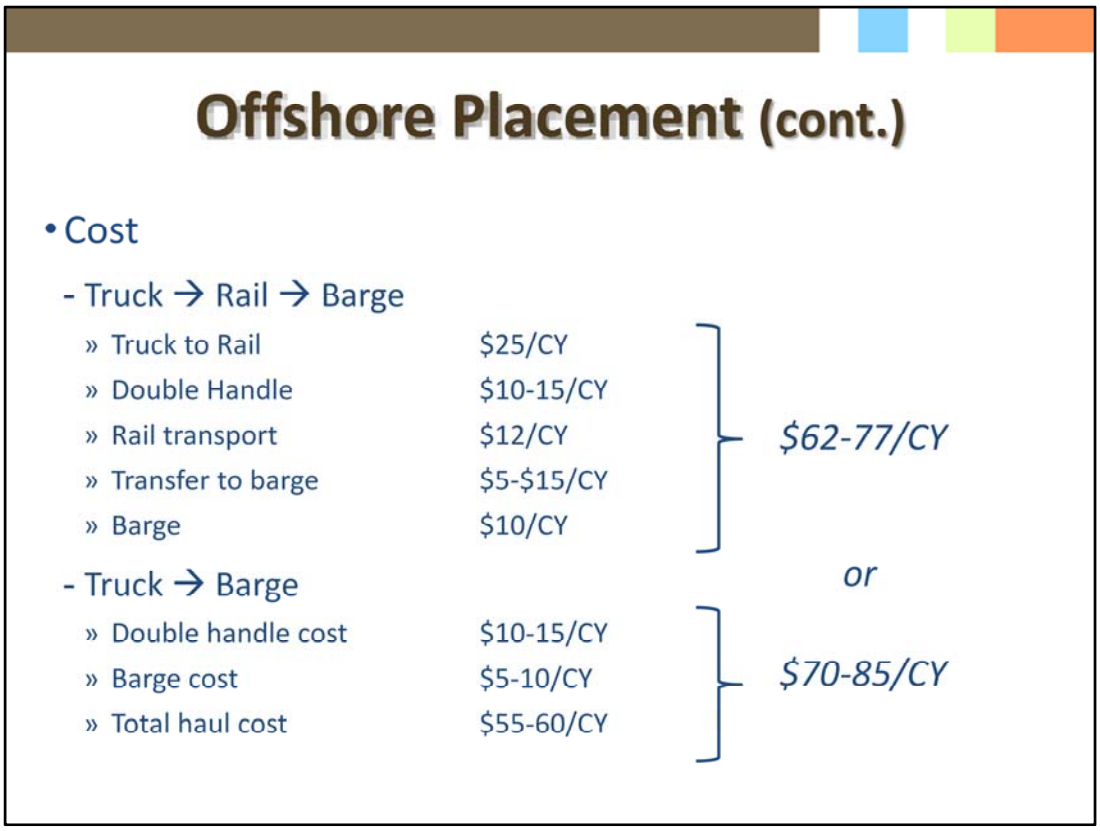
Based on information released by the proponents of the project in Malibu, the estimated cost of that project is approximately $10 Million. That cost includes beach nourishment plus other project components. An estimated cost per cubic yard (CY) of sediment to be placed at the beach was obtained by dividing the $10 Million in 60,000 cubic yards of sand.

# Offshore Placement

- Environmental
  - May alter wave energy
- Requirements & findings
  - Potential area – Canyon off coast of Redondo Beach
  - Requires extensive permitting
  - 2-5 year planning horizon
  - Operational into foreseeable future
  - Volume = 100+ MCY


This alterative is environmentally sensitive.

Further investigation would be needed to determine feasible locations in the canyon, volumes, and placement strategies that would not have negative impacts.




The costs presented are based on the assumption that the sediment would be transported from the debris basins to the Long Beach Harbor and then from there to an underwater canyon off the coast of Redondo Beach.

Two ways were evaluated: 1) Truck → Rail → Barge and 2) Truck → Barge.

# West 2 & 3 Placement Proposed for Further Evaluation

| Alternative | Major Concern | Cost |
|---|---|---|
| Landfill Cover | - Sediment must be dry<br>→ Location needed to dry sediment | $40-50/CY |
| Inert Debris Fill Operation | - Sediment must be dry<br>→ Location needed to dry sediment | $35-60/CY |
| Acquire a Pit<br>in Industrial Area | - 2-5+ years to negotiate | Acquisition Cost/CY<br>+<br>Haul at $20-30/CY |
| Place at Operational Quarry<br>(Processing) | - Not analyzed at this time | |

# West 2 & 3 Placement
# Other Alternatives Proposals

| Alternative | Major Concern | Cost | Proposal |
|---|---|---|---|
| Beach sand | - Color & size gradation specifications<br>→ Processing required, 10% of material would meet specs. | $65 – Unknown / CY | Evaluate further *if partnership available* |
| Place offshore | - Requires extensive permitting | $62-85/CY | Evaluate further *if necessary* |
| New SPS with Recoverable Habitat | - No parcel identified | N/A | No further evaluation |

The Flood Control District is willing to partner with agencies interested in processing the sediment from the West 2 and 3 debris basins to obtain sand for beach nourishment.

# West 2 and West 3 Placement

## Discussion

# Next Steps

- Evaluate alternatives for West 2 and West 3 further
- Analyze alternatives for other subregions and individually managed reservoirs
- Present results of reservoir analysis

# Thank you

Please send your comments or questions
about the Sediment Management Strategic Plan to
SedimentMgmtPlan@dpw.lacounty.gov

For information about the previous Task Force meetings
and the Strategic Plan please visit
www.lasedimentmanagement.com