

Dredging 101

Beach Renourishment in Southern California

Presented By:

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1

Dredging 101

Beach Renourishment in Southern California

- Understanding of Dredging is Critical to Successful Project Design and Implementation
- Major Factors in the Cost of a Dredging Project
 - Types of Dredges and Applicability
 - Placement Methods
 - Borrow Site Location and Design
 - Environmental Constraints / Weather-Wave Conditions
 - Execution Factors – Pipeline, Attendant Plant
 - Historic Success, Lessons Learned
 - Factor to Control Costs



2

Dredging Methods – Types of Dredges

Trailing Suction Hopper Dredge



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3

Placement Methods & Required Handling

Trailing Suction Hopper Dredge

- Bottom Dump
- Pump-out / Beach Placement
- Rainbow (rare in USA)



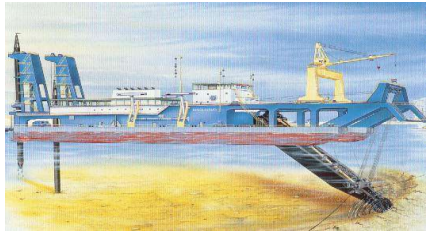
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4

Dredging Methods – Types of Dredges

Cutter Dredges (also called cutterhead dredges, pipeline dredges, or hydraulic dredges)

- Measured by diameter of discharge pipe
- 30 inch dredge is massive



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5

Placement Methods & Required Handling

Pipeline Dredges

- Beach Fill
- Land Reclamation
- Wetland Creation



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6

Dredging Methods – Types of Dredges

Large Cutter Dredges

- 24 inch diameter discharge pipe and up



7

Dredging Methods – Types of Dredges

Small Cutter Dredges

- 6 inches to 18 inches discharge pipe diameter
- Often truckable



8

Dredging Methods – Types of Dredges

Mechanical Dredges

- Clamshell
- Backhoe
- Ladder/Dipper
- Dragline



Backhoe Dredge



Clamshell Dredge

9

Placement Methods & Required Handling

Mechanical Dredges

- Barges/Scows towed to disposal location with tugboat
- Material Bottom Dumped, or
- Hydraulic Offload, or
- Mechanical Offload

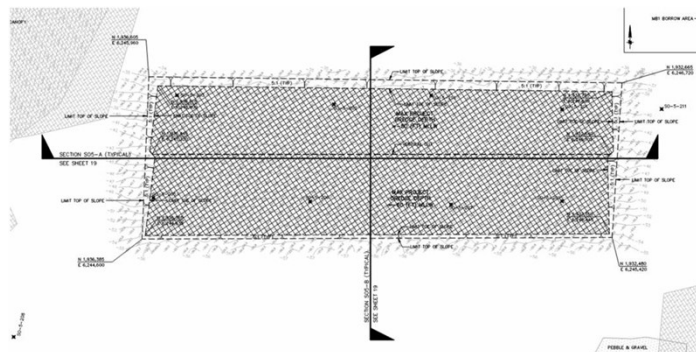


Source: USACE Galveston District

10

Borrow Site Design Factors

- Proximity to Disposal Sites
- Material Quality
- Reachable Depth
- Borrow Length to Minimize Dredge Turns during Loading
- Wave Conditions



11

Borrow Site Design Factors

- Wide Array of Receiver Sites
- Each site needs a Borrow Source no more than 20 miles away, the closer the better
- Work is currently being done to identify more borrow sites



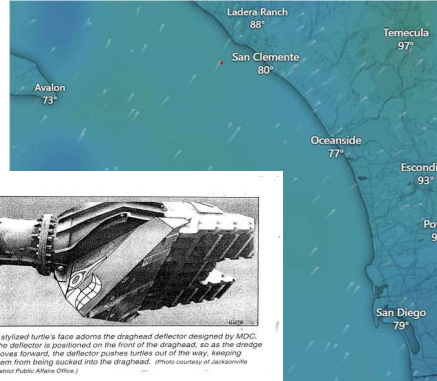
Taken from 2012 SANDAG Presentation

12

Environmental Constraints and Weather

Environmental Constraints

- Marine Mammals (Speed, Observers, Time of Year)
- Turtles
- Grunion
- Bird Nesting
- Commercial Lobster Fishing
- Air and Water Quality



Weather

- Wave Conditions, Downtime, Safety

13

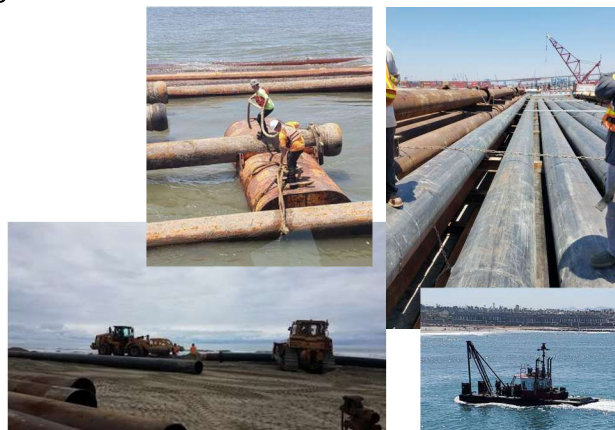
Mobilization and Execution

Offshore Pipeline

- Dedicated Crew - Bullgang
- Crane Barge
- Work Boats
- Floating and Submerged Pipeline
- Pontoons

Shore Pipeline

- Shore Crew with Flagmen for Public Safety
- Bull Dozers
- Front End Loaders
- Excavators



14

West Coast Hopper Dredge Market – Past Bids

SANDAG Regional Beach Sand Project II - 2012

| Bidder 1 | Bidder 2 | Bidder 3 |
|--------------|--------------|--------------|
| \$23,817,200 | \$25,558,700 | \$28,185,590 |

SANDAG Regional Beach Sand Project I - 2001

| Bidder 1 | Bidder 2 | Bidder 3 | Bidder 4 |
|--------------|--------------|--------------|--------------|
| \$10,827,163 | \$16,955,200 | \$18,800,200 | \$25,300,000 |



15

West Coast Hopper Dredge Market – Past Bids

USACE West Coast Hopper (Columbia River) Bid Results 2015-2025

| Year | Bids | | | Winning Bidder |
|------|--------------|--------------|--------------|----------------|
| | Bidder 1 | Bidder 2 | Bidder 3 | |
| 2025 | | \$32,858,750 | | Bidder 2 |
| 2024 | | \$30,482,500 | | Bidder 2 |
| 2023 | | \$68,929,000 | | Bidder 2 |
| 2022 | | \$26,993,500 | | Bidder 2 |
| 2021 | | \$32,452,500 | \$28,996,369 | Bidder 3 |
| 2020 | | \$26,782,500 | \$25,815,000 | Bidder 3 |
| 2019 | \$28,558,000 | \$22,851,000 | \$25,404,000 | Bidder 2 |
| 2018 | \$33,013,750 | \$25,787,500 | \$23,228,055 | Bidder 3 |
| 2017 | \$19,618,320 | \$20,762,500 | | Bidder 1 |
| 2016 | | \$23,817,000 | | Bidder 2 |
| 2015 | | \$26,993,500 | | Bidder 2 |



16

Summary

Factors that Determine Applicable Dredge Plant and Cost

- Dredge Volume, Template, Location, and Adjacent Infrastructure
- Dredged Material Type, Quality and Disposal
- Placement Site, Methods, and Handling
- Applicable Dredge Type Production Capabilities
- Environmental Constraints and Estimated Weather Downtime
- Other Current and Projected Market Needs for Applicable Dredge Type
- Project Frequency (Annual, Every 5 Years?, 10 Years?)



17

Summary

Things You Can Do to Help Control Costs

- Early Engagement with Permit Agencies to Negotiate Restrictions, Time of Year Dredging and Placement Allowed and BMPs
- Identify and Permit Nearby Borrow Sources with Desired Material Qualities
- Early Contractor Engagement (Once Likely Dredge Plant Type Determined),
Understand Market and Schedule Constraints
- Allow Contractor Flexibility (Tolerances, Oversized Borrow Areas, Project Delivery Timeline) as Much as Practicable
- Bid Early – allows time for planning



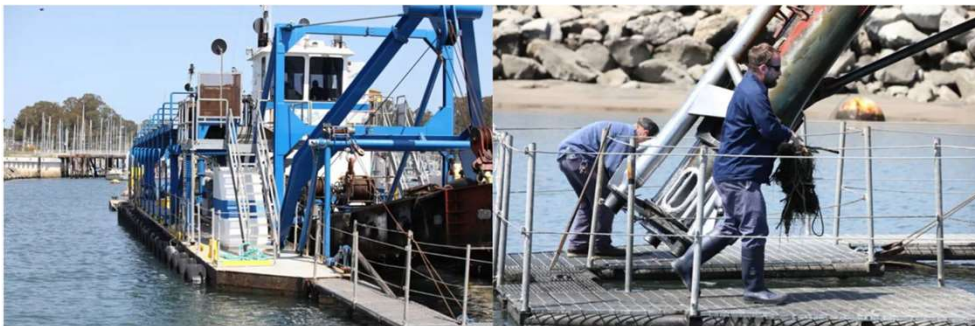
18

Thank You, Question?



19

Harbor Owned Dredge – Santa Cruz



20

Dredge Production Rates

Material Transport To/From Distance Affects Production Rate and Costs

Typical Beach Fill Cost vs. Distance from Borrow Area

