Port of Everett Pacific Terminal Dredging Project

An integrated navigational and environmental cleanup dredging project

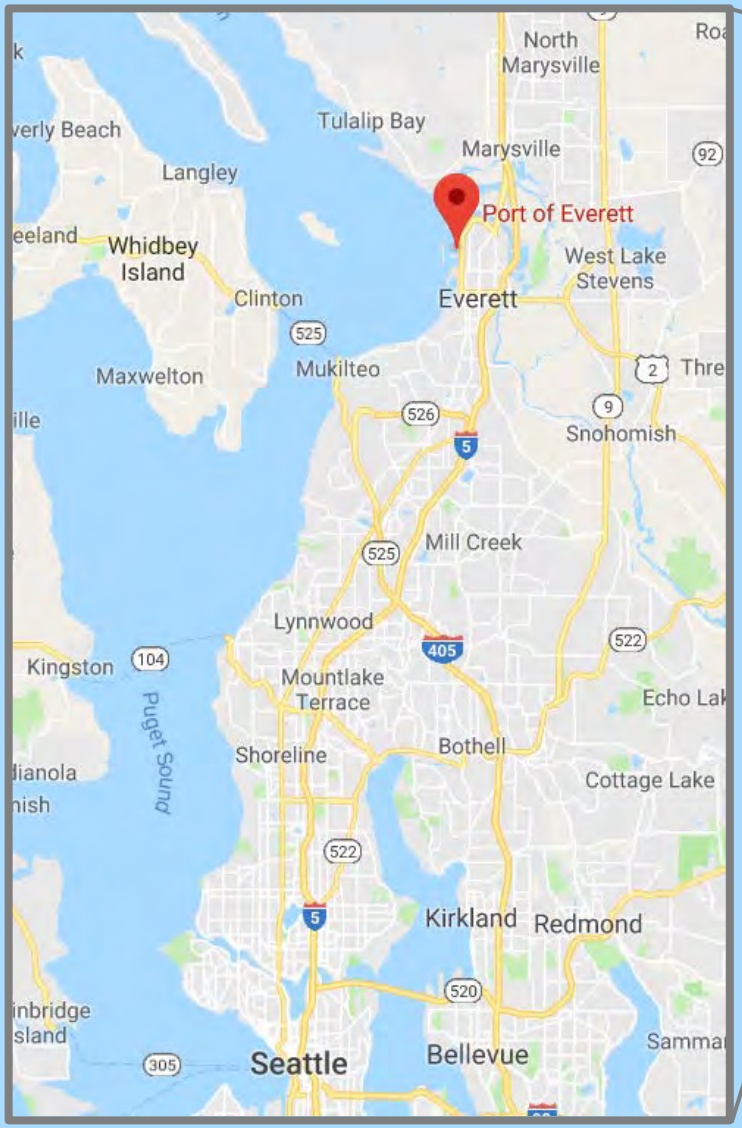
Presented by: Abhijit Joshi

Date: October 24, 2018

GeoEngineers

Port of Everett and the Need/Significance of the Dredging Project…

GeoEngineers



Port of Everett

Port of Everett's Seaport Dredging Project

History and Contamination…

GeoEngineers

Lumber Mill Operations, 1890s through 1930s

Former Weyerhaeuser Mill A Site

Pulp Mill Operations, 1930s through 1970s

Former Weyerhaeuser Mill A Site

Log Rafting and Storage, 1980s through early 2000s

Site Contamination

Historical Activities Resulted in Contaminated Sediment, Soil and Groundwater. Contamination includes:

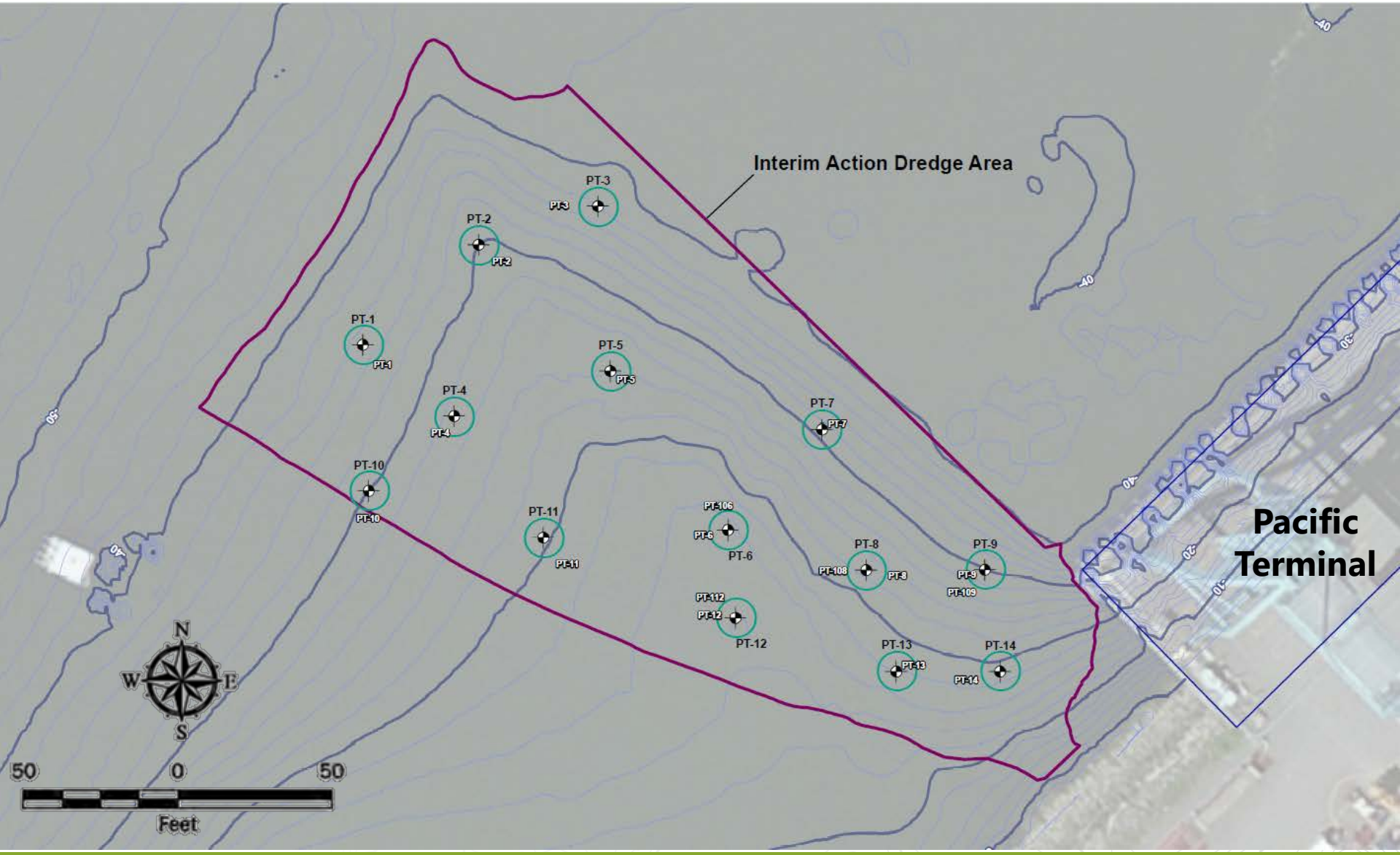
- Sawdust and Wood Debris
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Metals
- Dioxins/Furans
- Polychlorinated Biphenyls (PCBs)

GeoEngineers

Dredged Material Characterization…

GeoEngineers

Dredge Prism and Sediment Core Locations



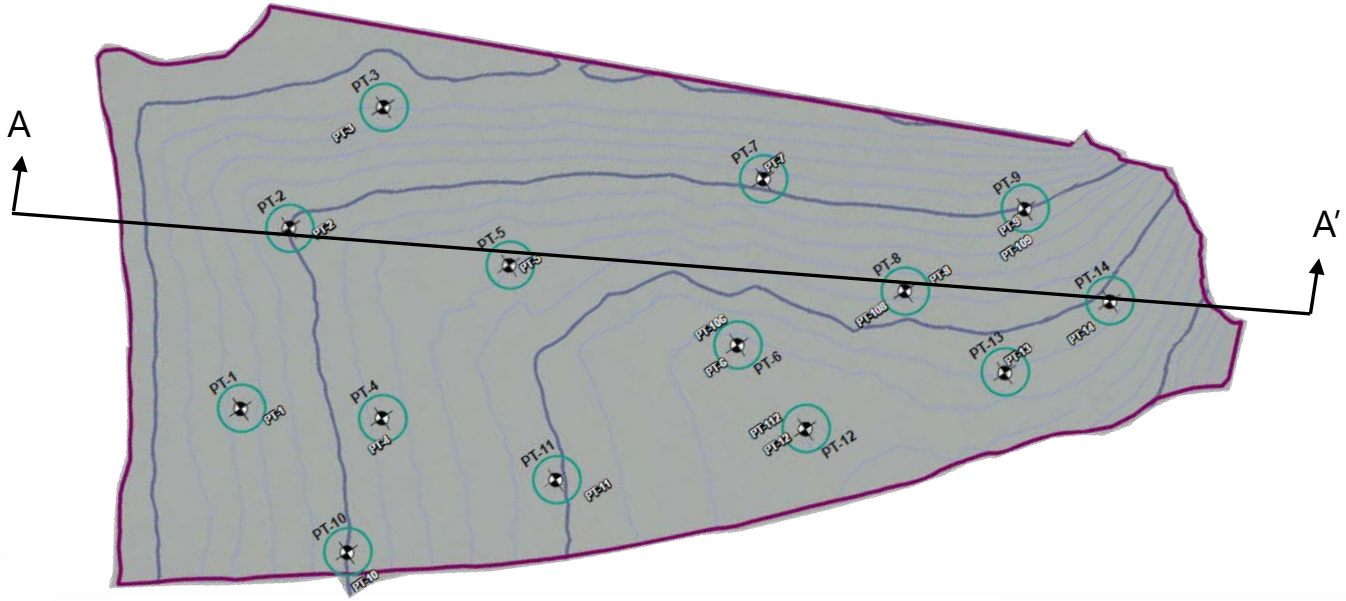
Sediment Sampling Field Work

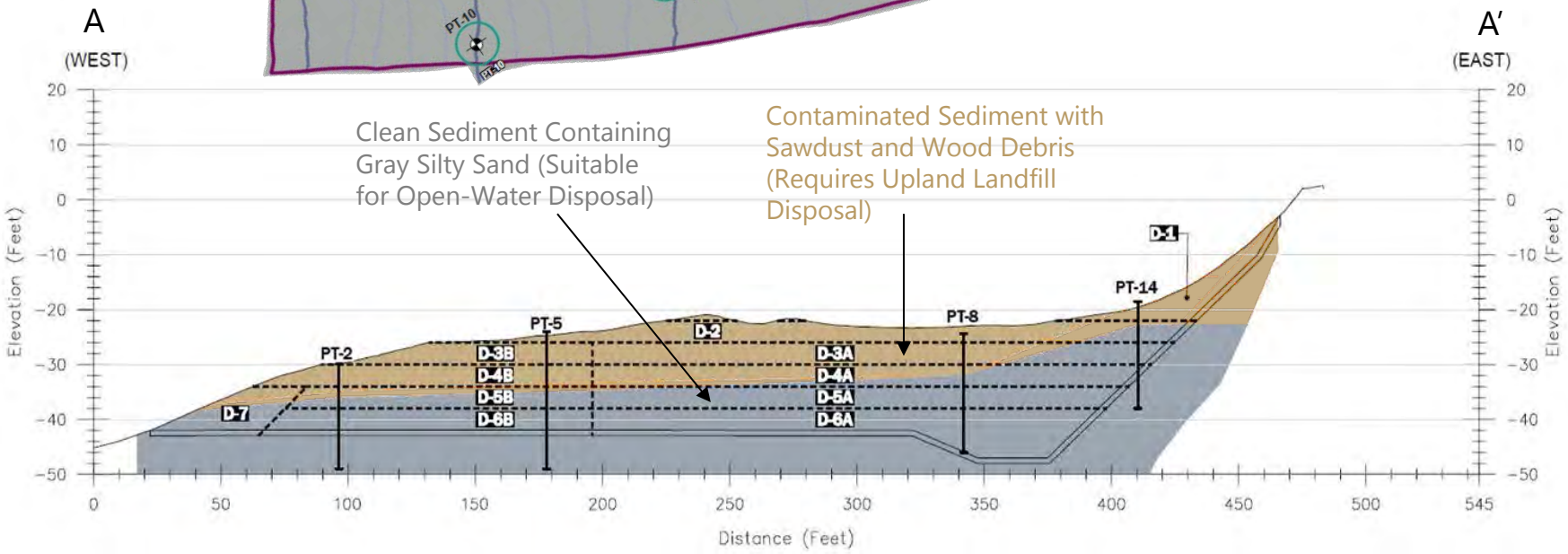
Continuous Cores Collected to Characterize the Dredge Prism

Typical Sediment Core in Upper Horizon

Typical Sediment Core in Deeper Horizon

Subsurface Sediment Conditions

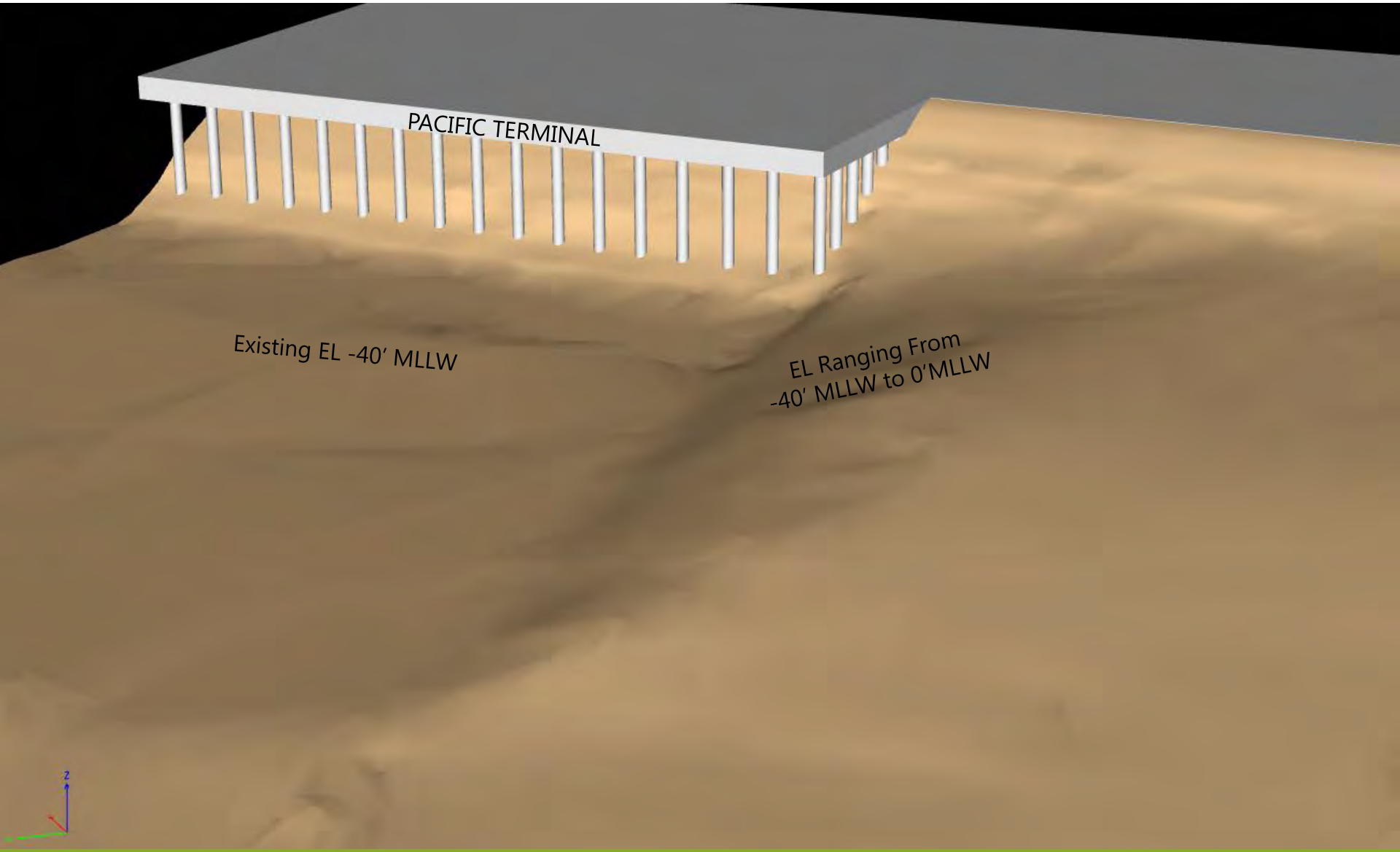




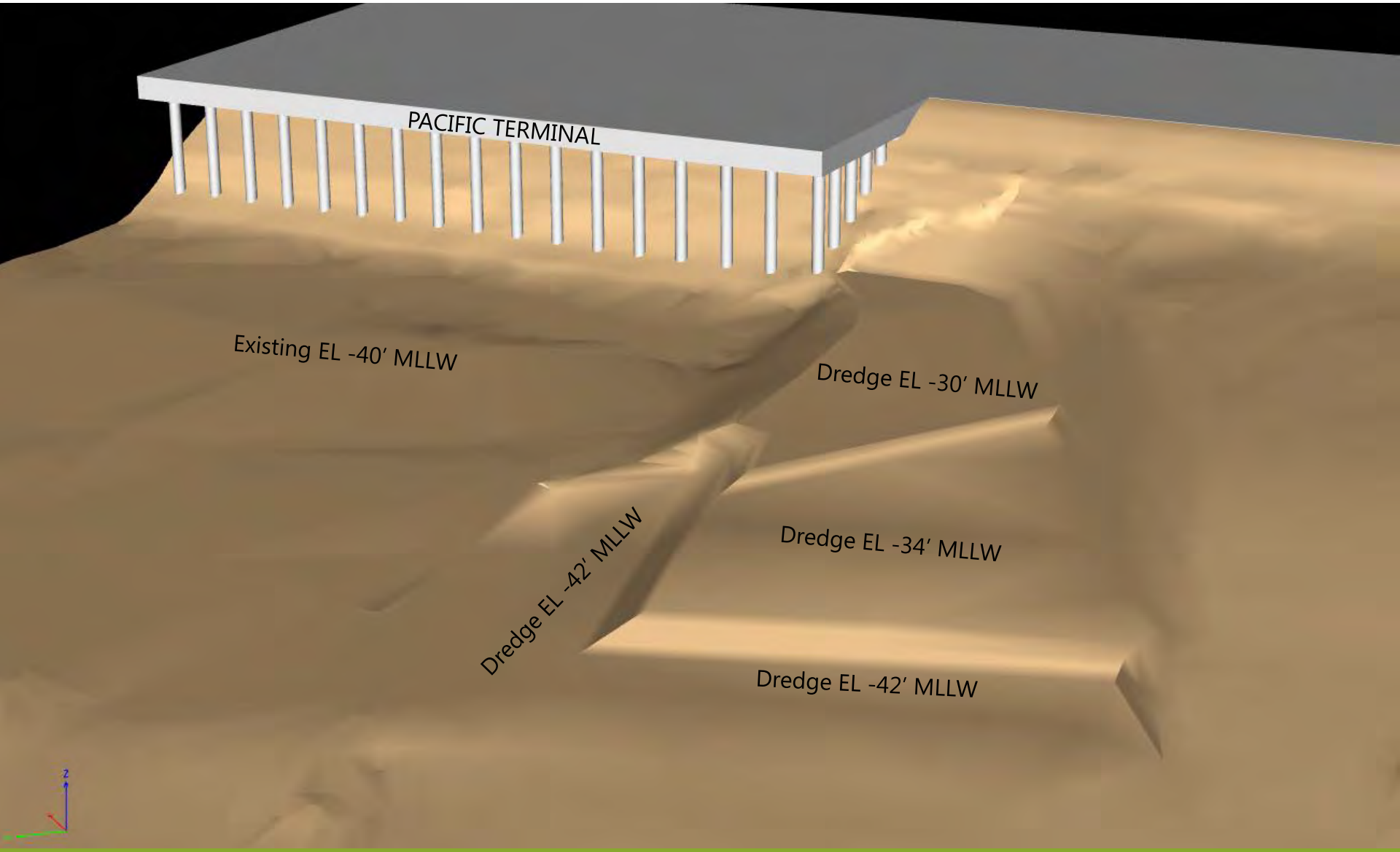
Design…

GeoEngineers

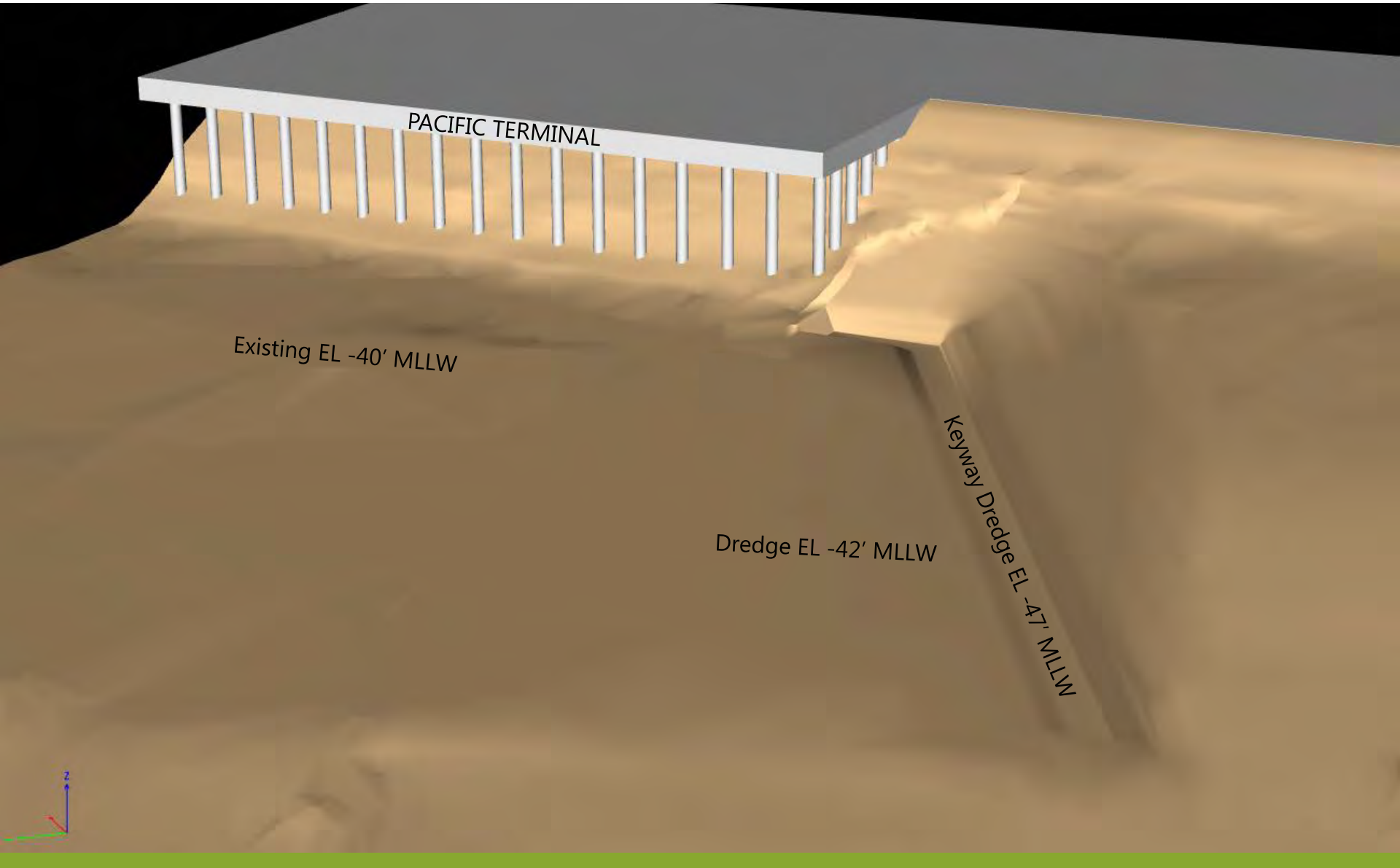
Existing Conditions



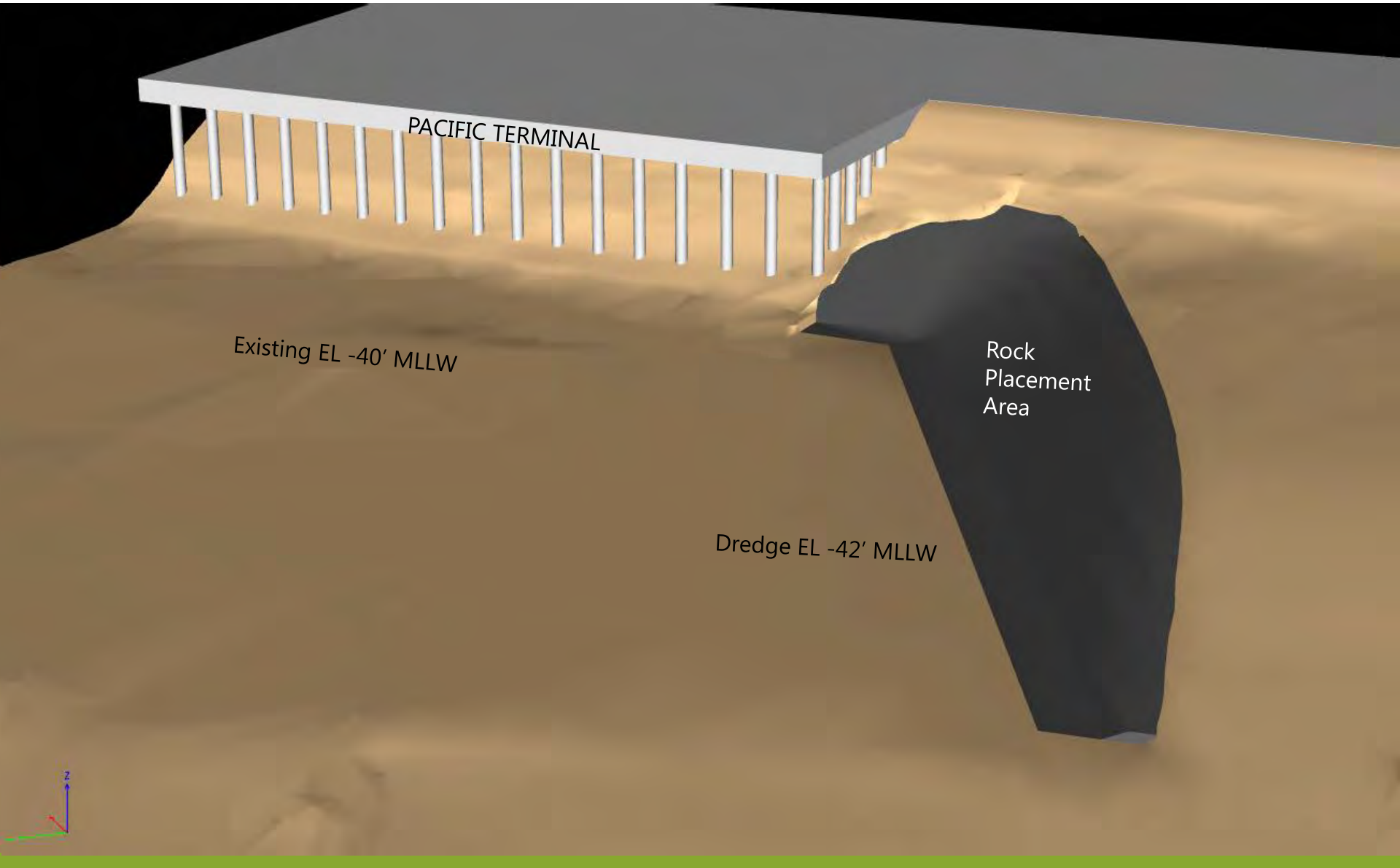
Contaminated Sediment Dredge Design



Clean Sediment Dredge Design



Rock Placement



Permitting…

GeoEngineers

Permits and Substantive Requirements

It took approximately 12 months to obtain all the project permits. Following permits were obtained:

- Army Corps Permit
- Washington Department of Ecology's (Ecology's) Water Quality Certification
- Ecology's Coastal Zone Management (CZM) Consistency Determination
- Washington Department of Fish and Wildlife's (WDFW's) Substantive Requirements
- City of Everett's Shoreline Master Program and Public Works Substantive Requirement

GeoEngineers

Construction…

GeoEngineers

Construction Project Team

Owner: Port of Everett

Engineer: GeoEngineers

Surveyor: Tetra Tech & eTrac

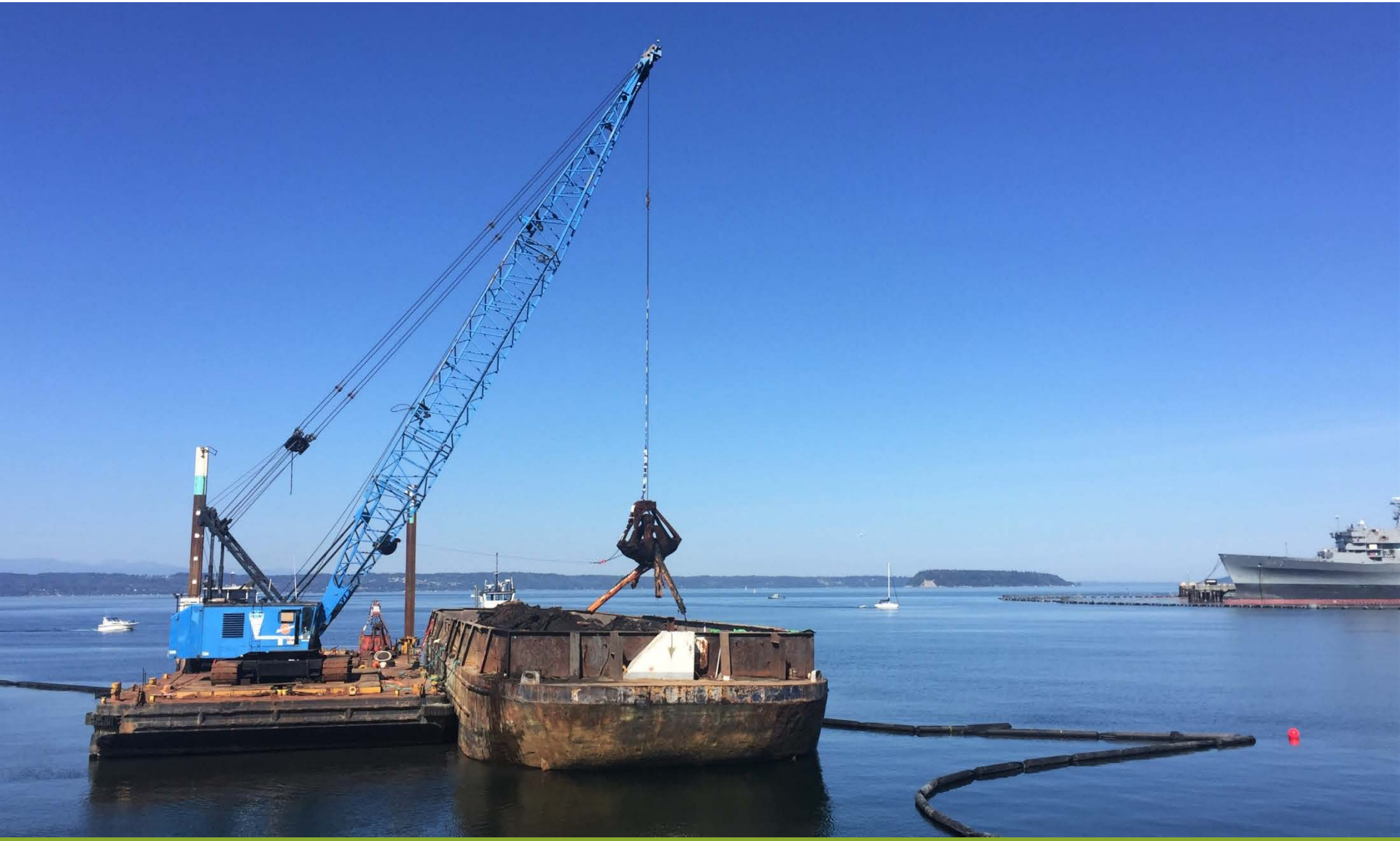
Contractor: Orion Marine Group

Construction – Contaminated Material Dredging…

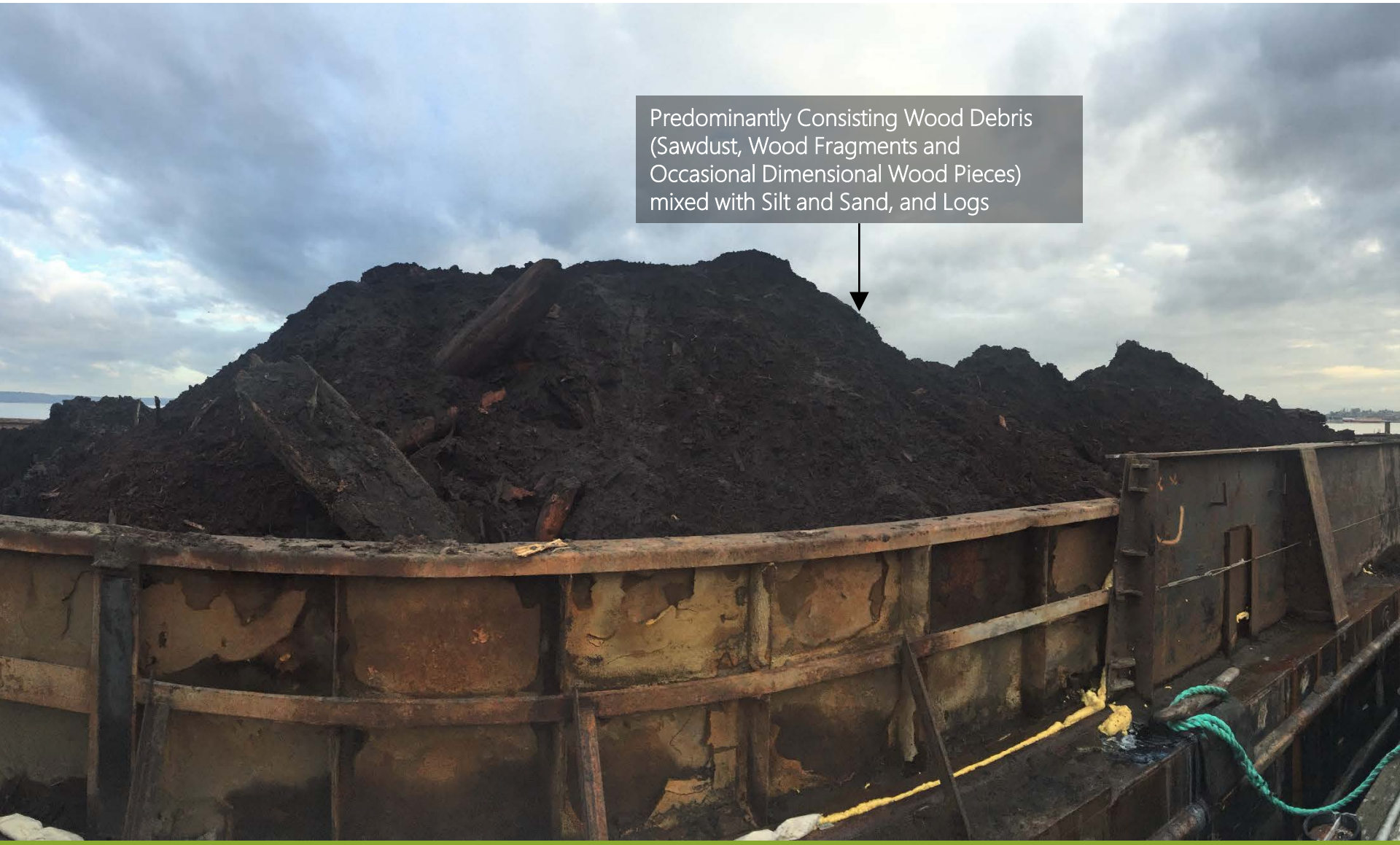
GeoEngineers

Contaminated Material Dredging

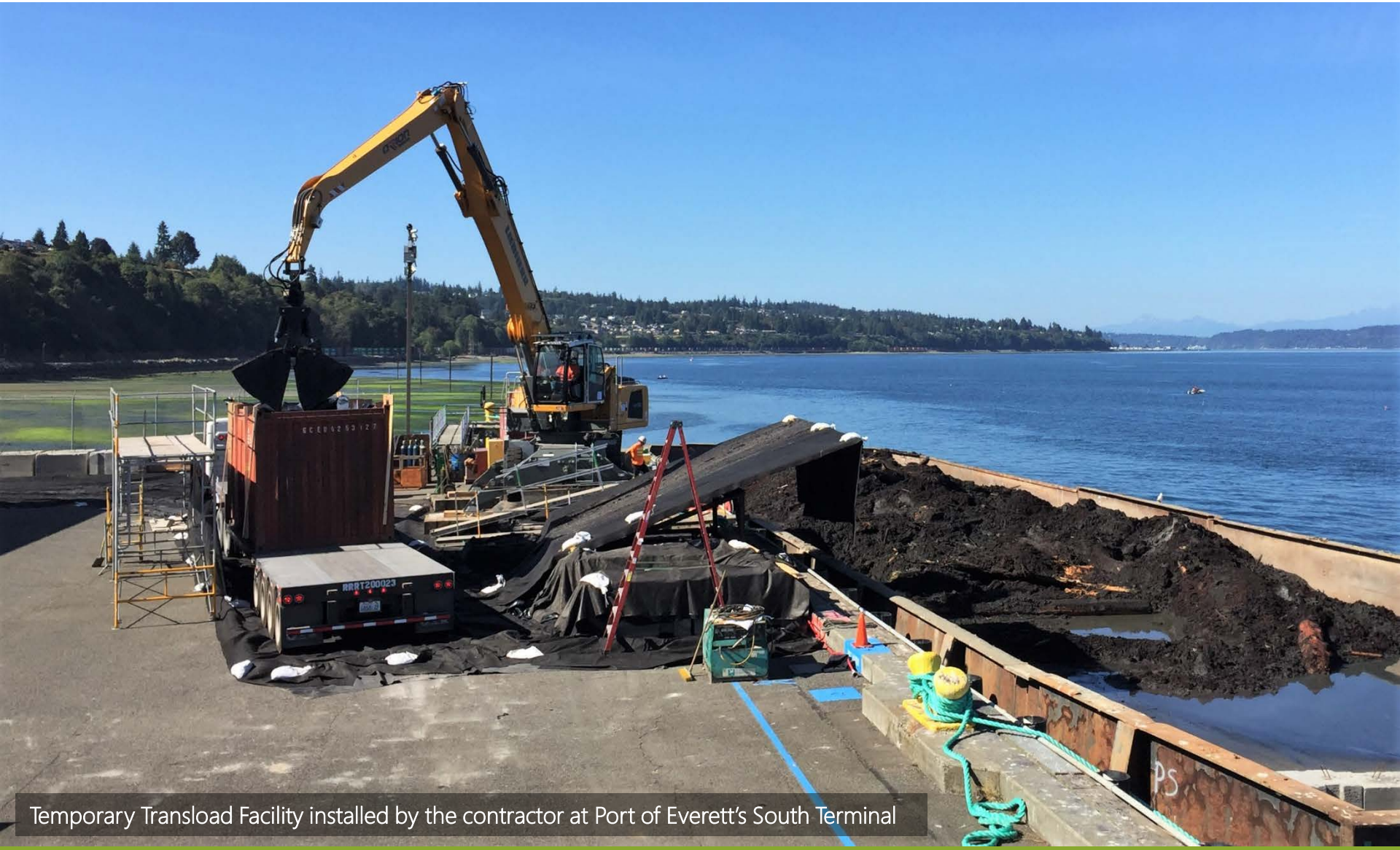
Wood Debris/Piles Removal



Contaminated Dredged Material



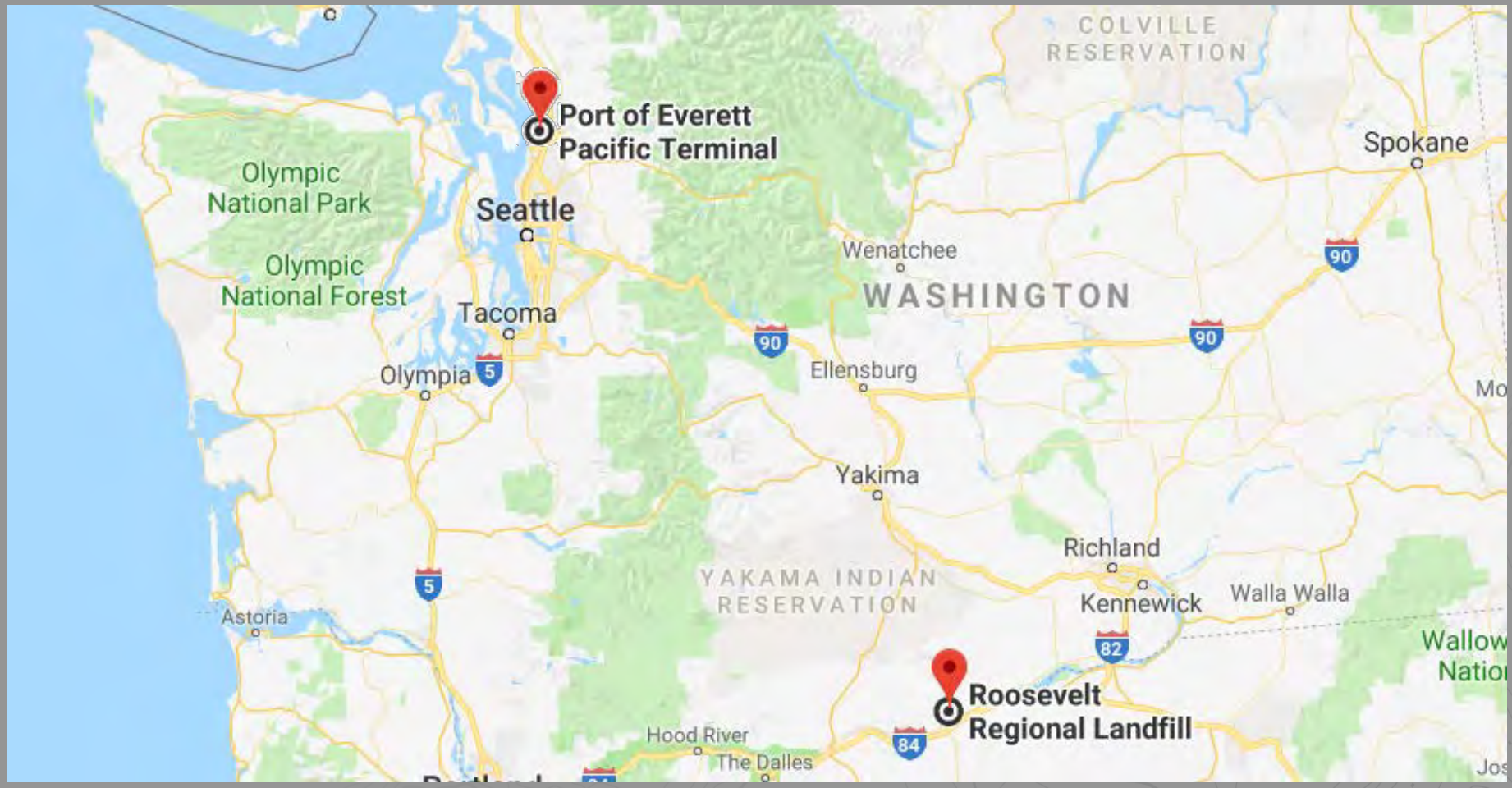
Contaminated Dredged Material Transload



Temporary Transload Facility installed by the contractor at Port of Everett's South Terminal

Contaminated Material Transport and Disposal

- Dredged contaminated material were transported approximately 250 miles and disposed at Republic Services Roosevelt Regional Subtitle D Landfill



Contaminated Material Dredging Quantities/Cost

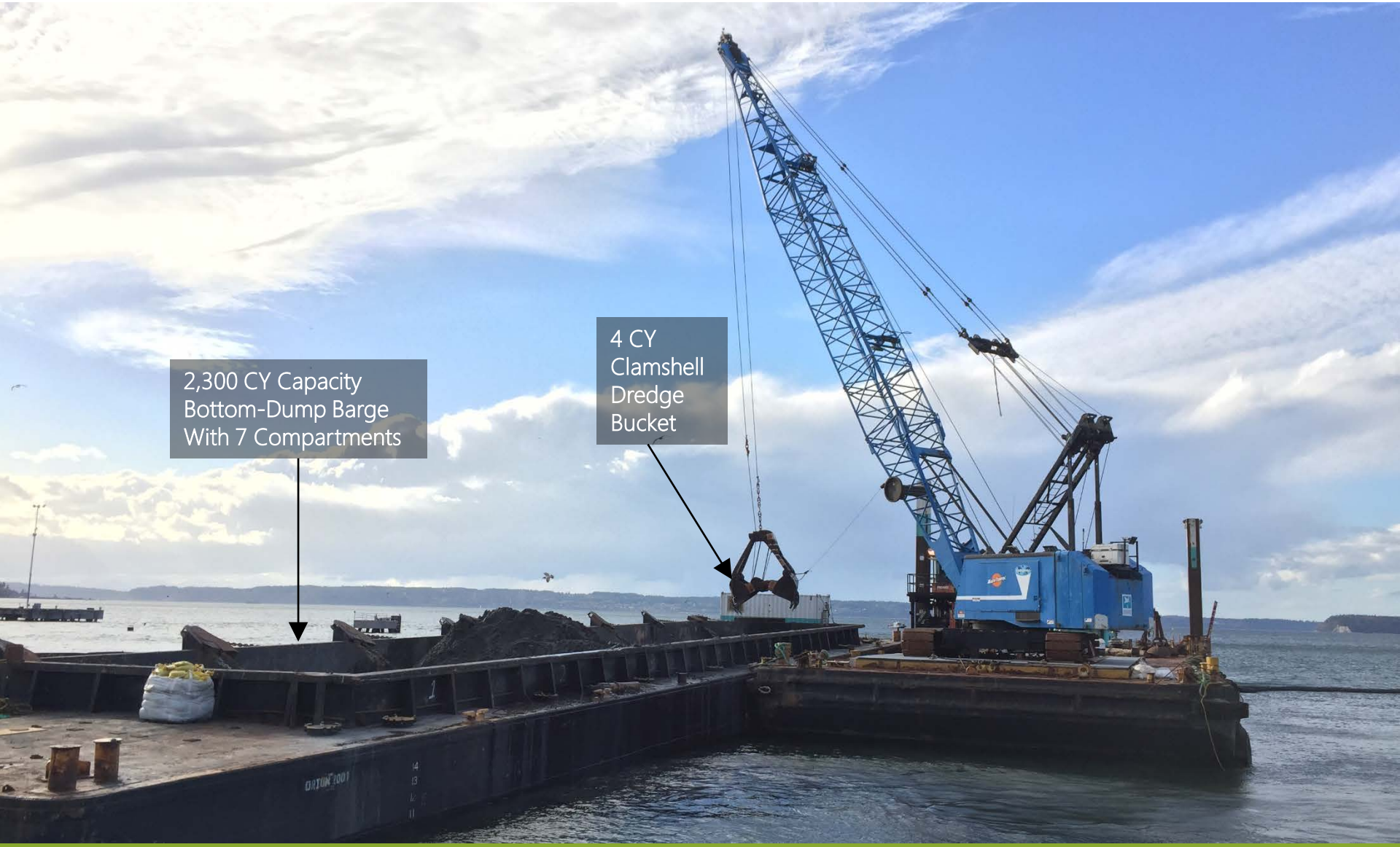
- Approximately 22,200 CY dredged.
- Dredge rate of approximately 800 CY/day.
- Contaminated material estimated bulk density of 1.04 Tons/CY.
- Dredging Cost: $20/CY
- Offload Cost: $12/CY
- Upland Transport and Disposal: $50/Ton

GeoEngineers

Construction – Clean Material Dredging…

GeoEngineers

Clean Material Dredging

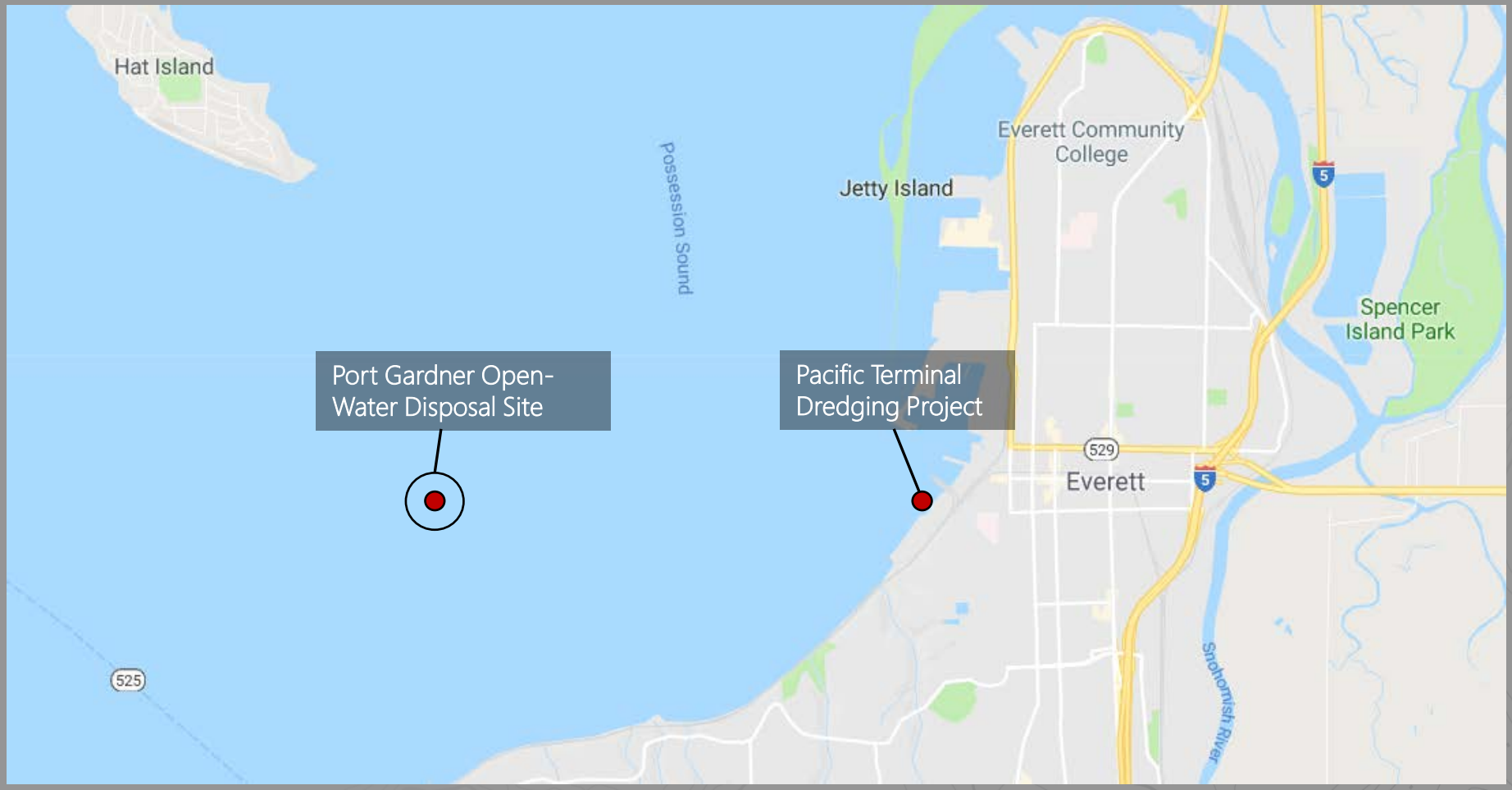


Clean Dredged Material

Gray Silty Sand with Shell Fragments

Open-Water Transport and Disposal

- Dredged clean material were transported approximately 3 miles and disposed at Port Gardner Open-Water Disposal Site



Clean Material Dredging Quantities/Cost

- Approximately 12,600 CY dredged.
- Dredge rate of approximately 800 CY/day.
- Clean material estimated bulk density of 1.4 Tons/CY.
- Dredging Cost: $15/CY
- Open-Water Transport and Disposal: $3/CY

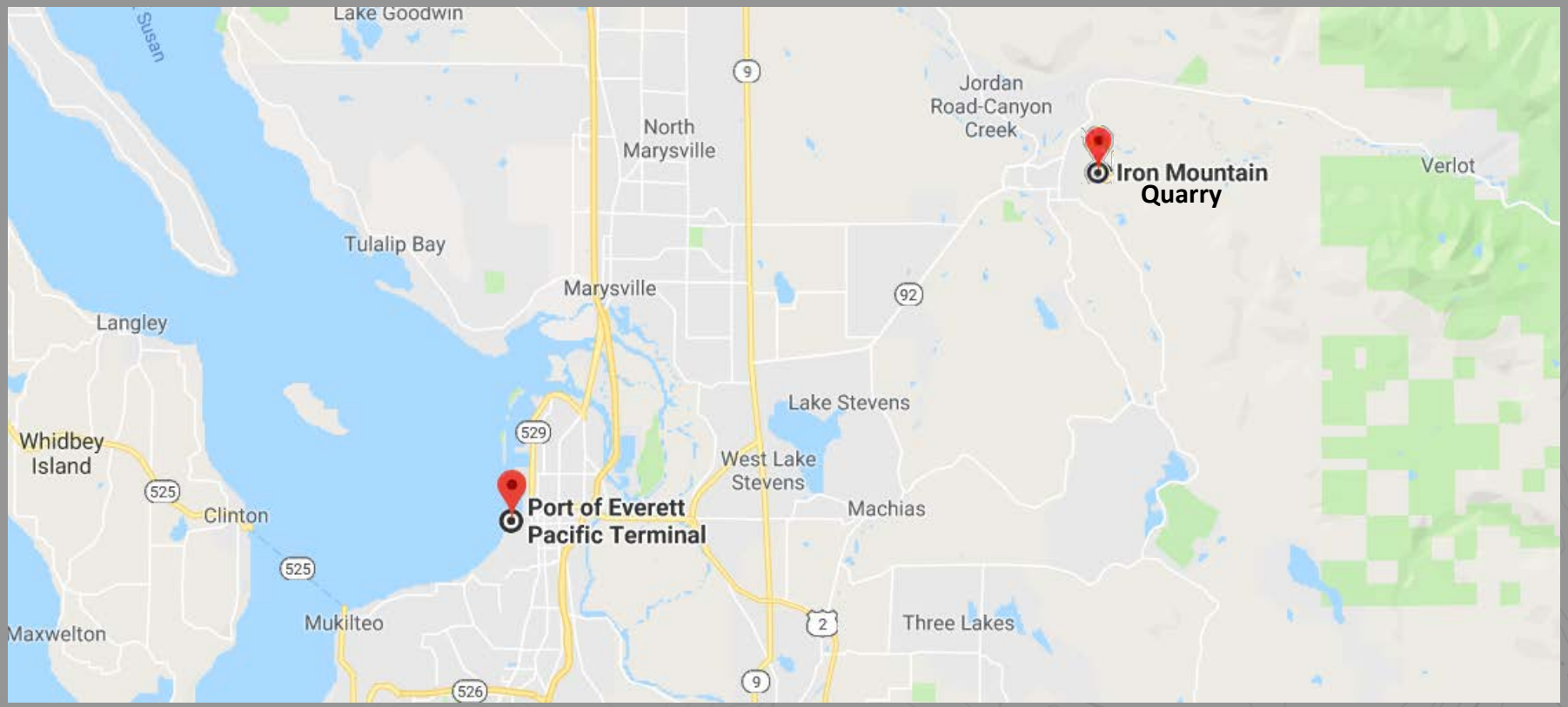
GeoEngineers

Construction – Rock Placement…

GeoEngineers

Rock Import and Transload

- Armor and bedding rocks were imported by road from Iron Mountain Quarry, located approximately 20 miles from the project site.
- At the project site, rocks were transloaded onto a barge at the South Terminal temporary transload facility



Rock Placement

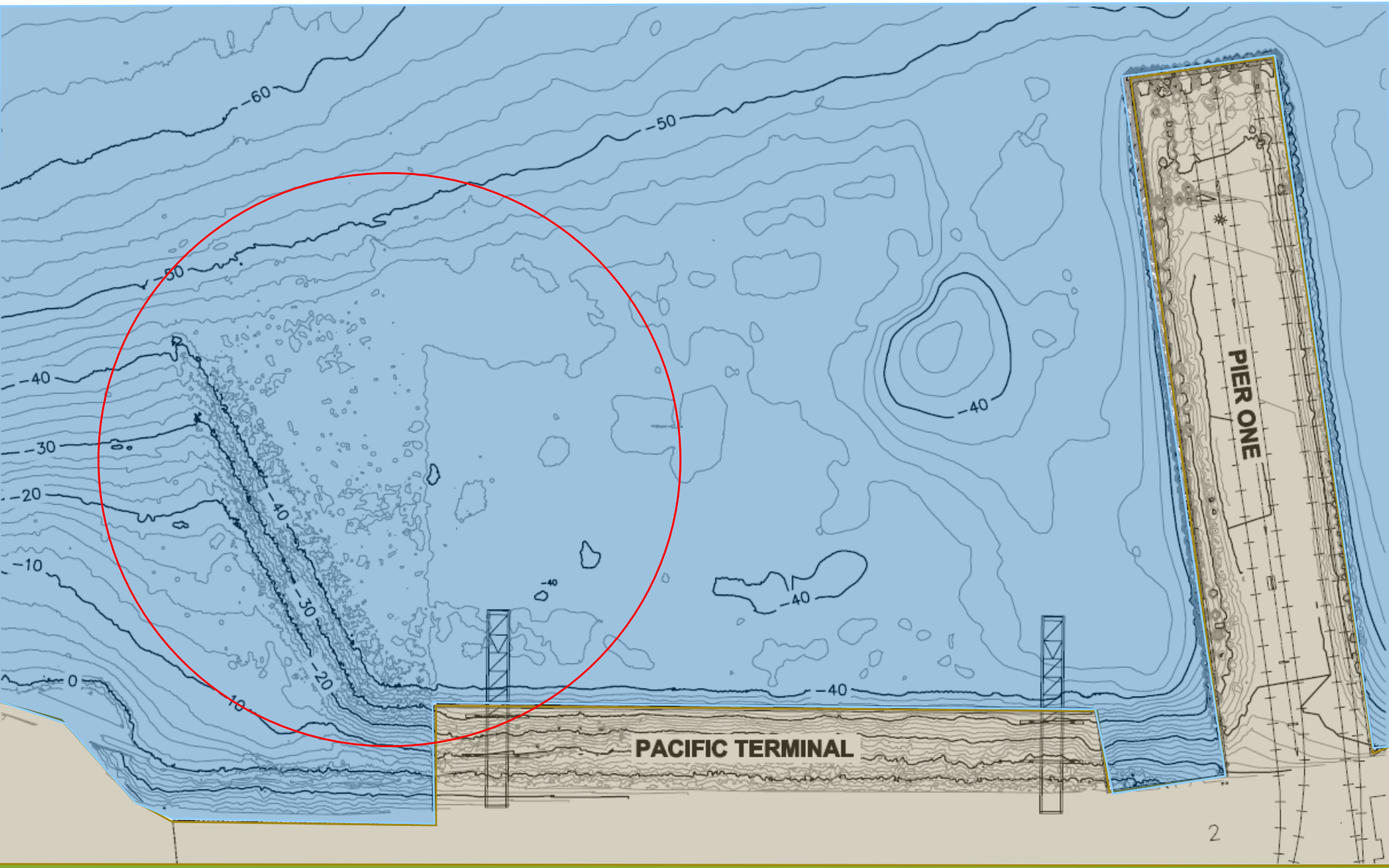
Rock Placement

Rock Placement Quantities/Cost

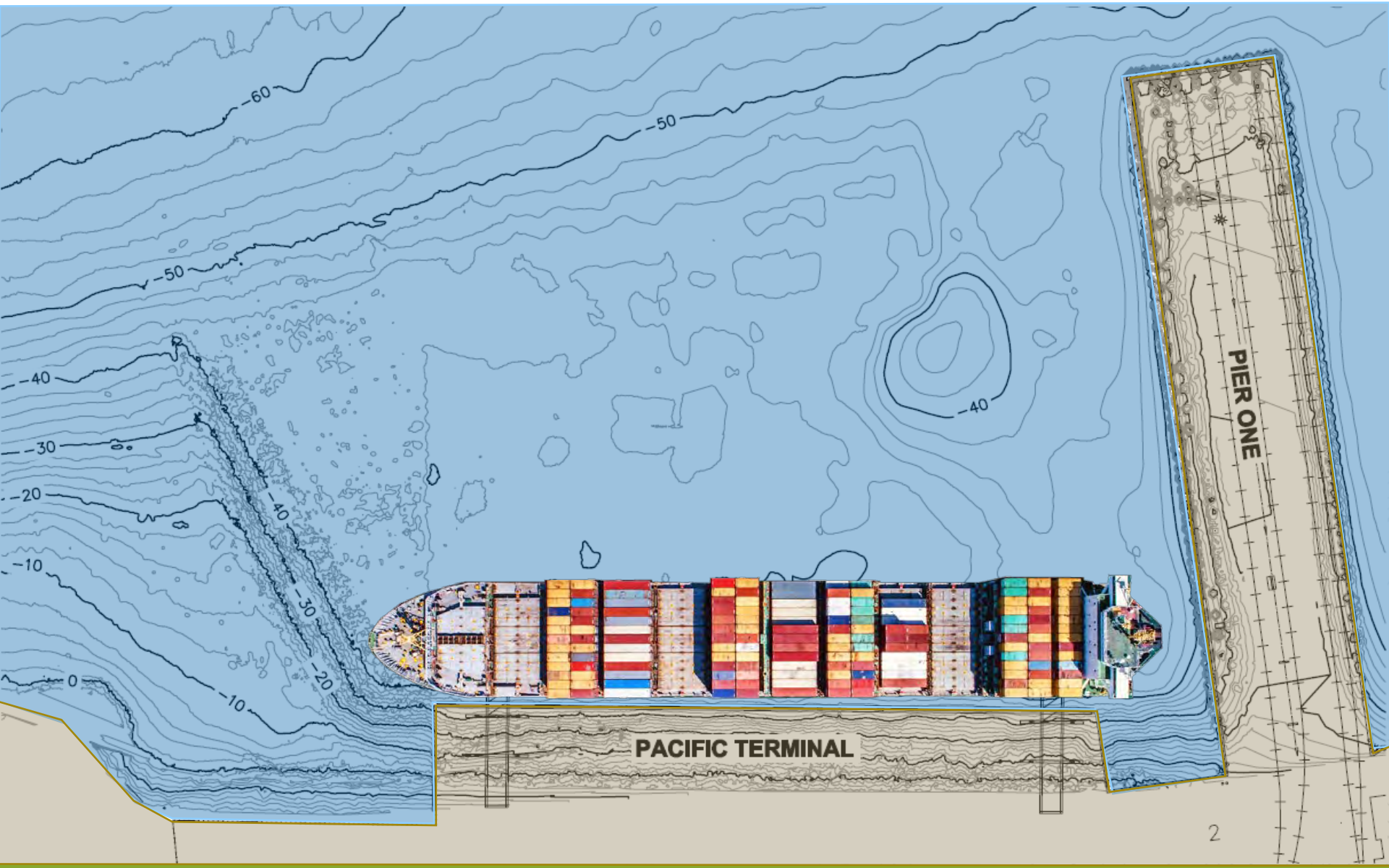
- Approximately 4,200 ton bedding rock and 6,300 ton armor rock placed.
- Placement rate ranged from approximately 500 to 1,000 tons/day.
- Rock bulk density of 1.4 Tons/CY.
- Rock Import and Placement Cost: $60/Ton

GeoEngineers

Port of Everett is Now Able to Serve Larger Cargo Vessels



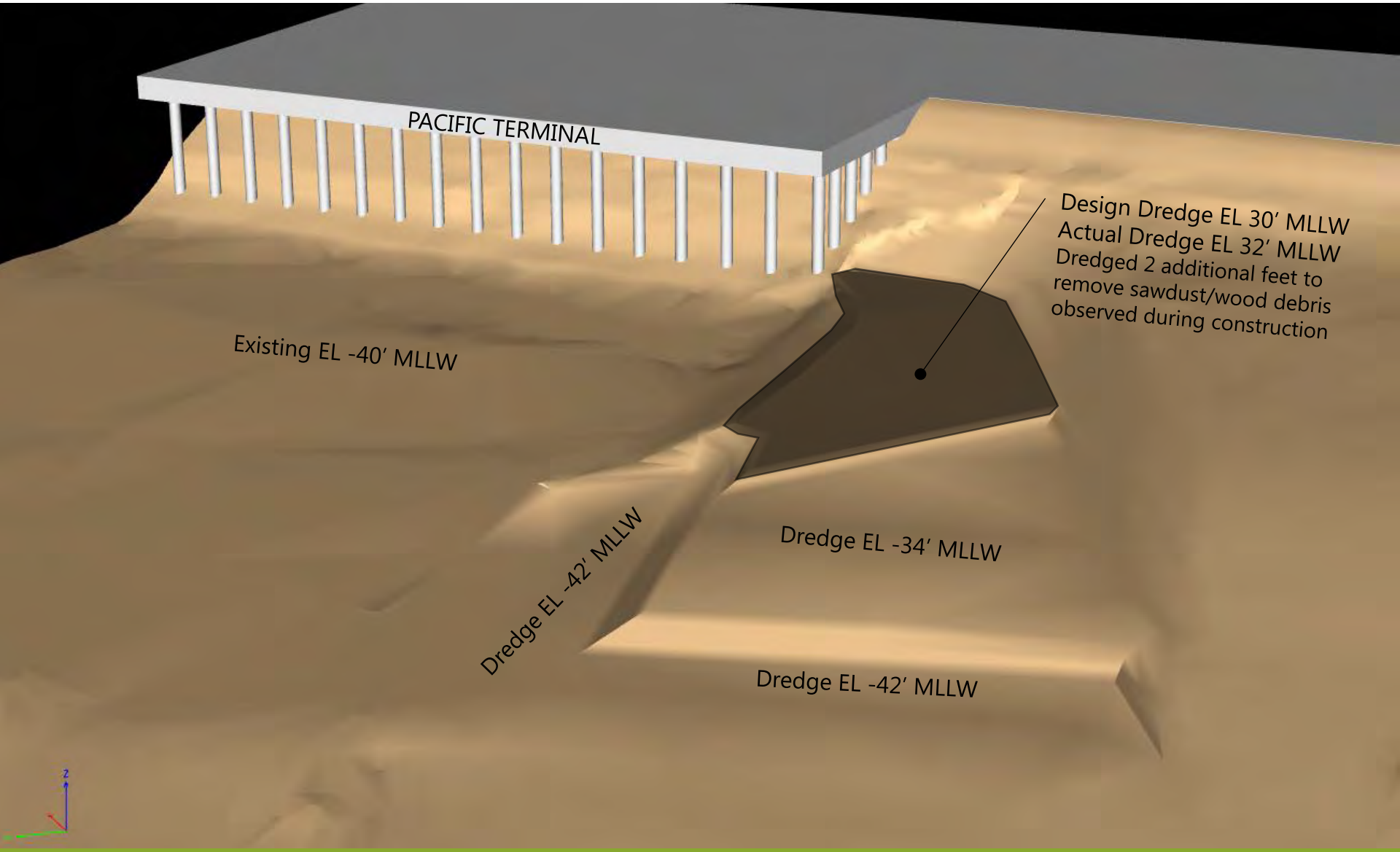
Port of Everett is Now Able to Serve Larger Cargo Vessels



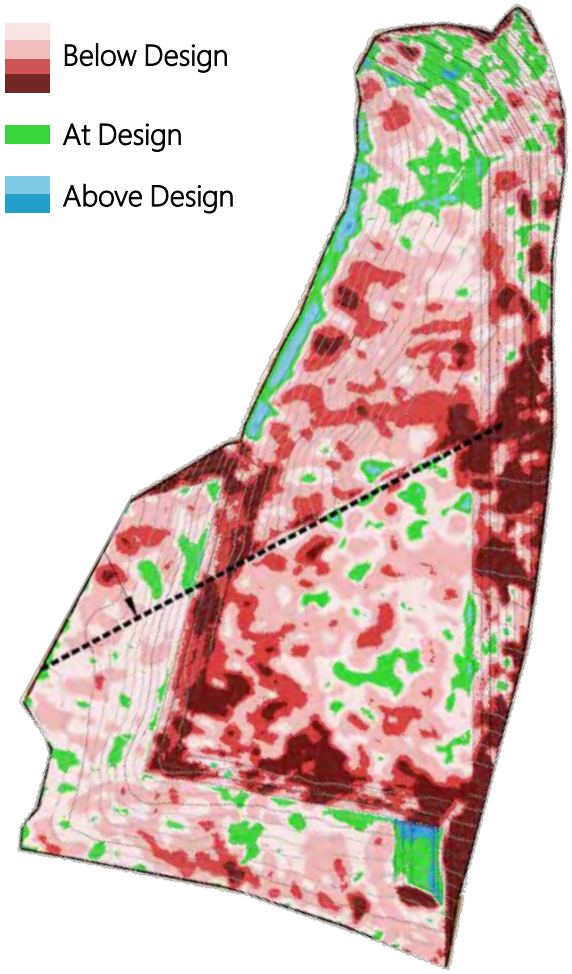
But, good things don't come easy…

GeoEngineers

Challenges Faced – More Sawdust/Wood Debris Encountered than Estimated



Challenges Faced – Overdredging



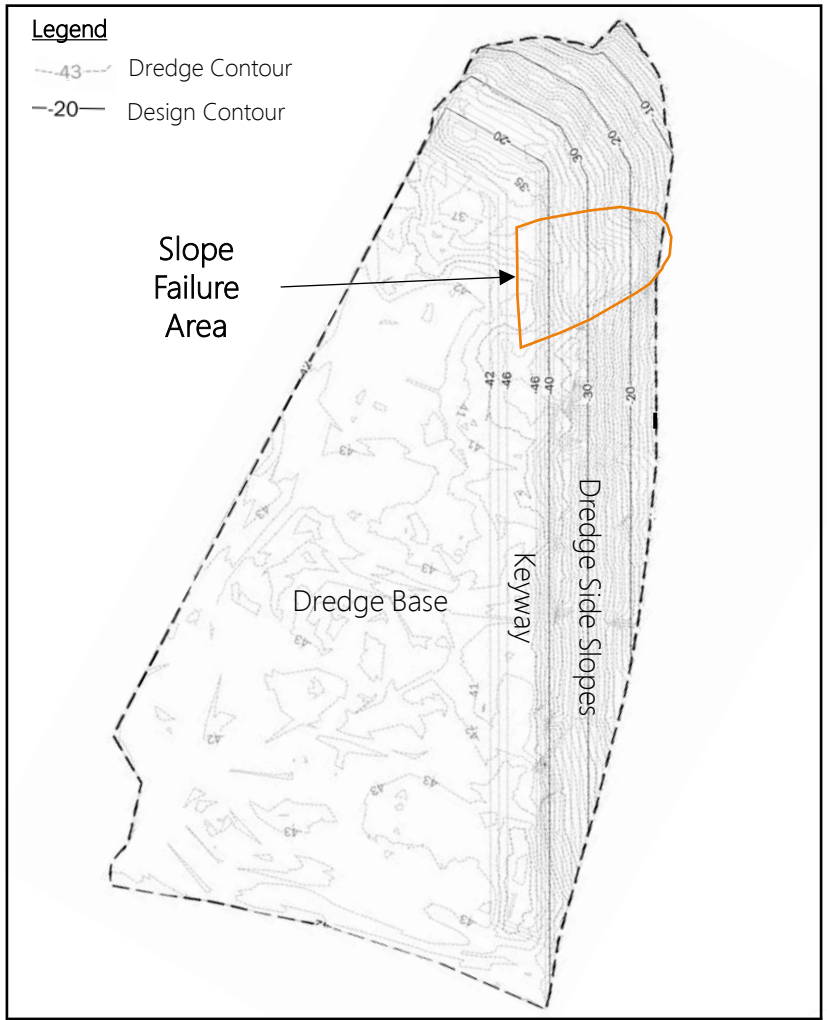
Comparison of As-Built
Contaminated Dredge Surface to Design

Overdredging can be attributed to:

- Removal of large wood debris/piles causing additional material to be removed
- Limitations of dredging method and/or equipment

GeoEngineers

Challenges Faced – Slope Failure



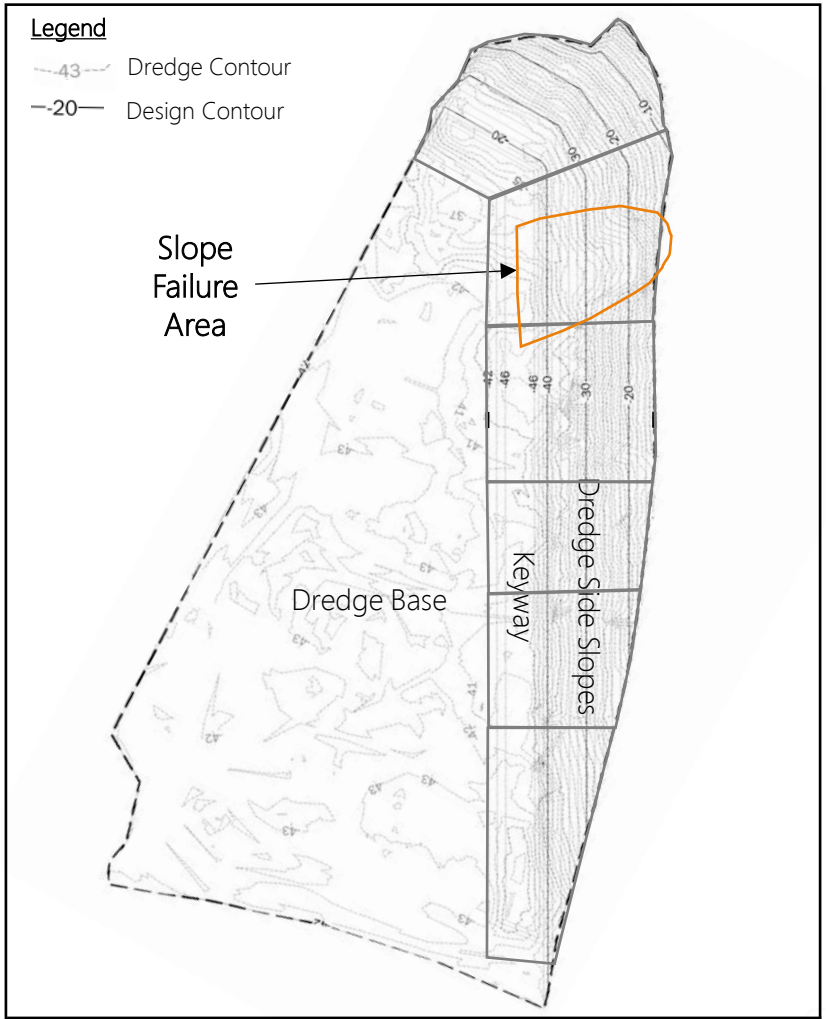
Survey Data Presenting Dredge Surface Following Slope Failure was Observed

Slope failure was observed during native sediment dredging. It is unclear what exactly caused slope failure; however, following are potential explanations:

- Exposed slope materials remained unprotected for extended periods of time due to construction sequencing/regulatory approval to transition from contaminated to clean dredging
- Native sediment were hard/dense resulting in higher ground vibrations during dredging.
- Areas of the slope were over-steepened causing a higher potential for failure.

GeoEngineers

Solutions Implemented – Slope Failure



Survey Data Presenting Dredge Surface Following Slope Failure was Observed

Dredging and rock placement sequence was modified to complete work in sections so that dredge cuts were protected soon after dredging.

Modifications required:

- Dredge and materials barges at ready
- Real-time survey of dredged area to facilitate quick placement of rock
- Efficient transition of equipment from dredging to rock placement and vise-versa.

GeoEngineers

Questions?

Contact:

John Herzog
Principal
(206) 239-3252
jherzog@geoengineers.com

Abhijit R. Joshi
Senior Environmental Engineer
(206) 239-3256
ajoshi@geoengineers.com