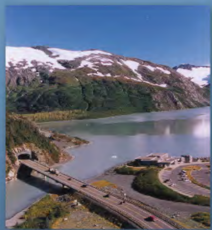
March 19, 2013

GAC Briefing



Port of Anchorage Intermodal Expansion Project
Concept Design Study

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Briefing Outline

- Recap the Design Charrette
- Design Criteria
- Overview of the 3 Concept Plans using visual simulations
- Cost and Schedule Risk Assessment (CSRA)
- Selection Criteria and Recommended Option
- Attributes of the Recommended Option
- Recommended Pile Test Program

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Design Charrette


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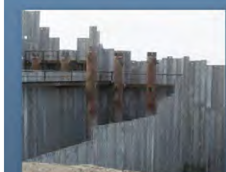
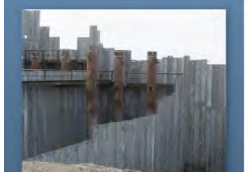
Charrette Goals for the POA



- Provide adequate facilities at POA to support local commerce and the National Strategic Military Transport
- Provide modern, safe and efficient facilities
- Expand and maintain existing port property
- Encourage natural resource exports and attract new business




Organizations Represented

- US Maritime Administration (MARAD)
- Municipality of Anchorage (MOA)
  - Port of Anchorage
  - Project Management & Engineering
  - Development Services / Building Safety
- Totem Ocean Trailer Express (TOTE)
- Horizon Lines
- Cook Inlet Tug & Barge
- Southwest Alaska Pilots Association
- US Army Corps of Engineers Alaska District (USACE)
  - Project Management & Engineering
  - Regulatory

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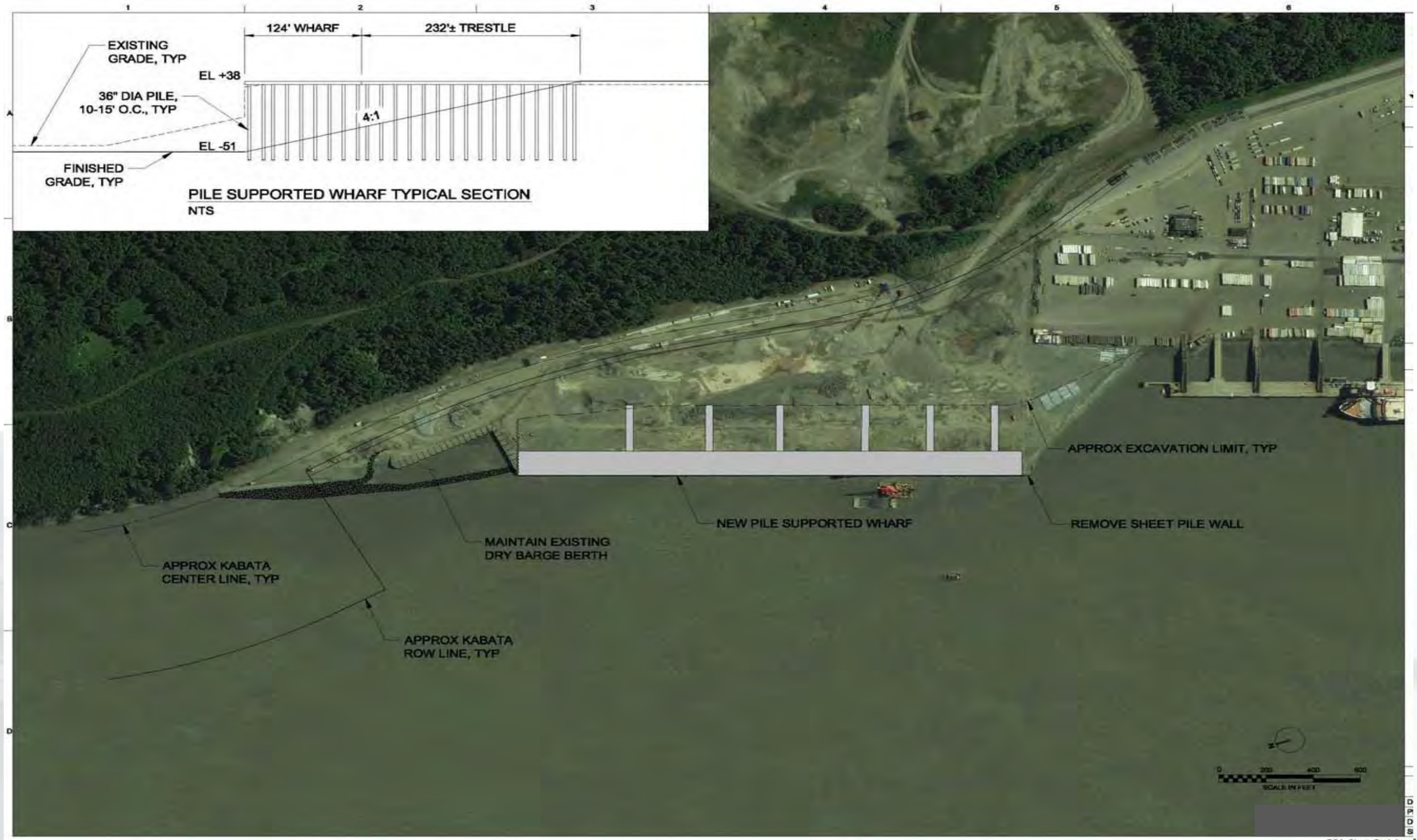
Option 1 – Charrette



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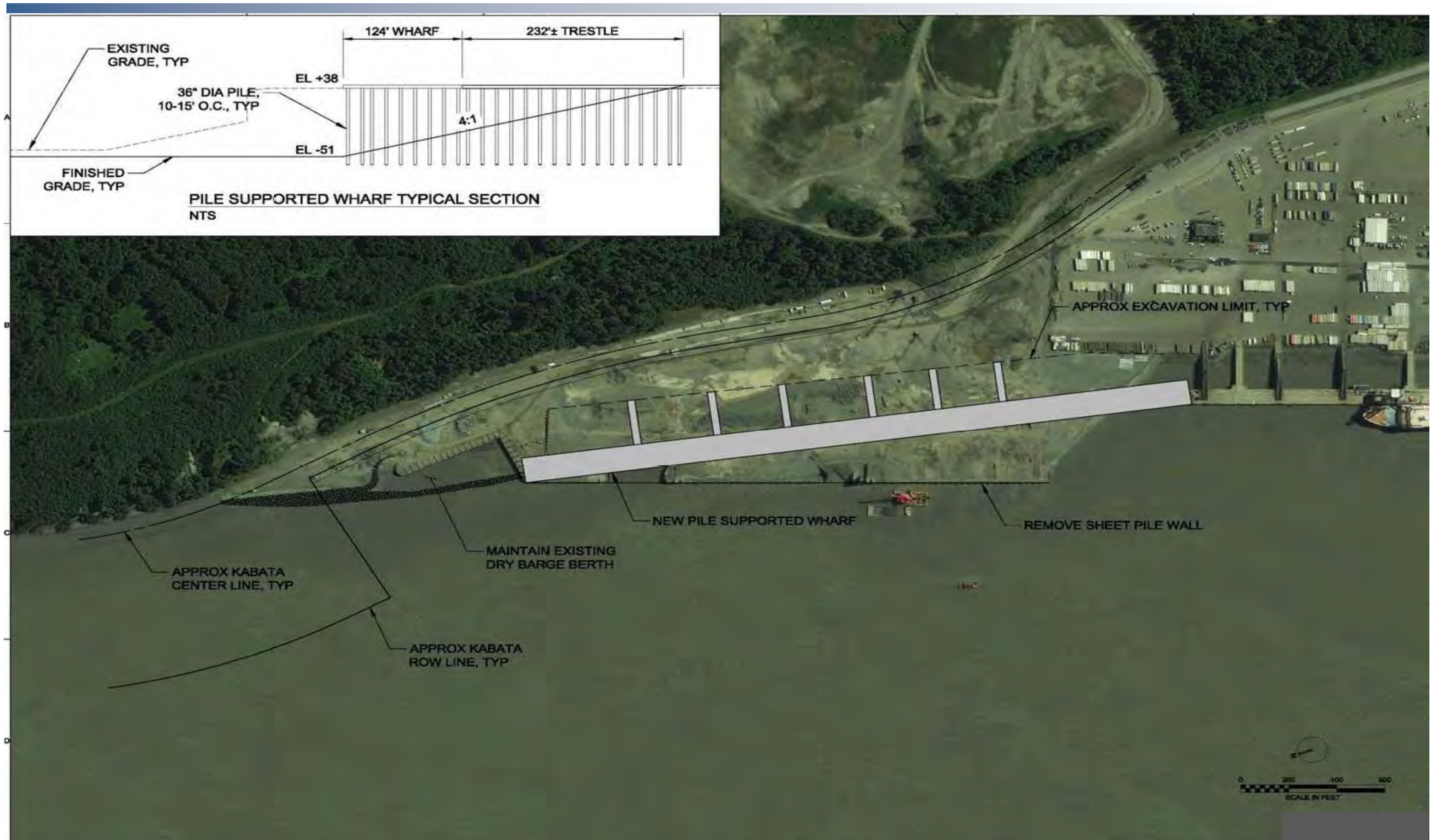
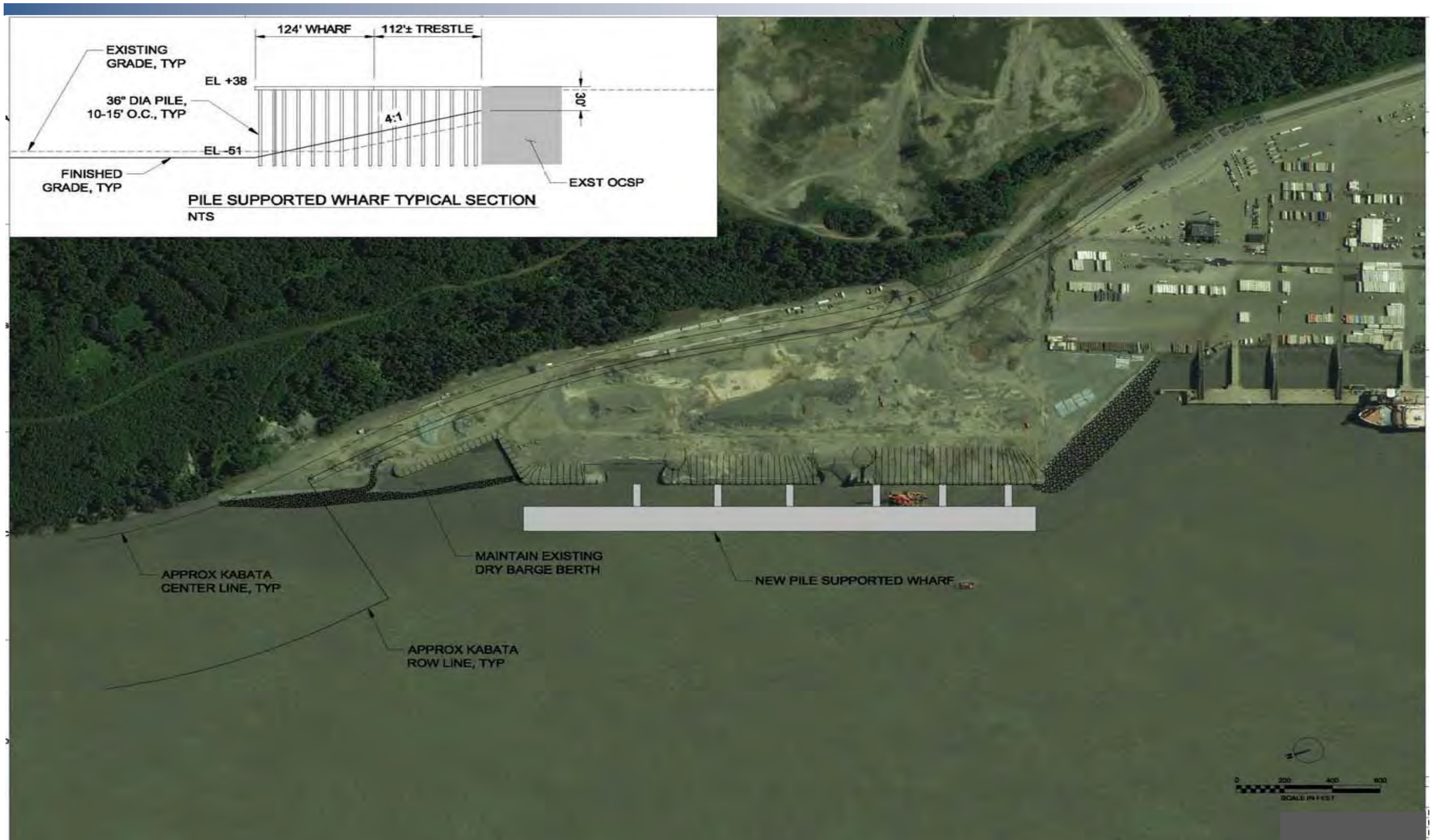
Option 2 – Charrette



Option 3 – Charrette



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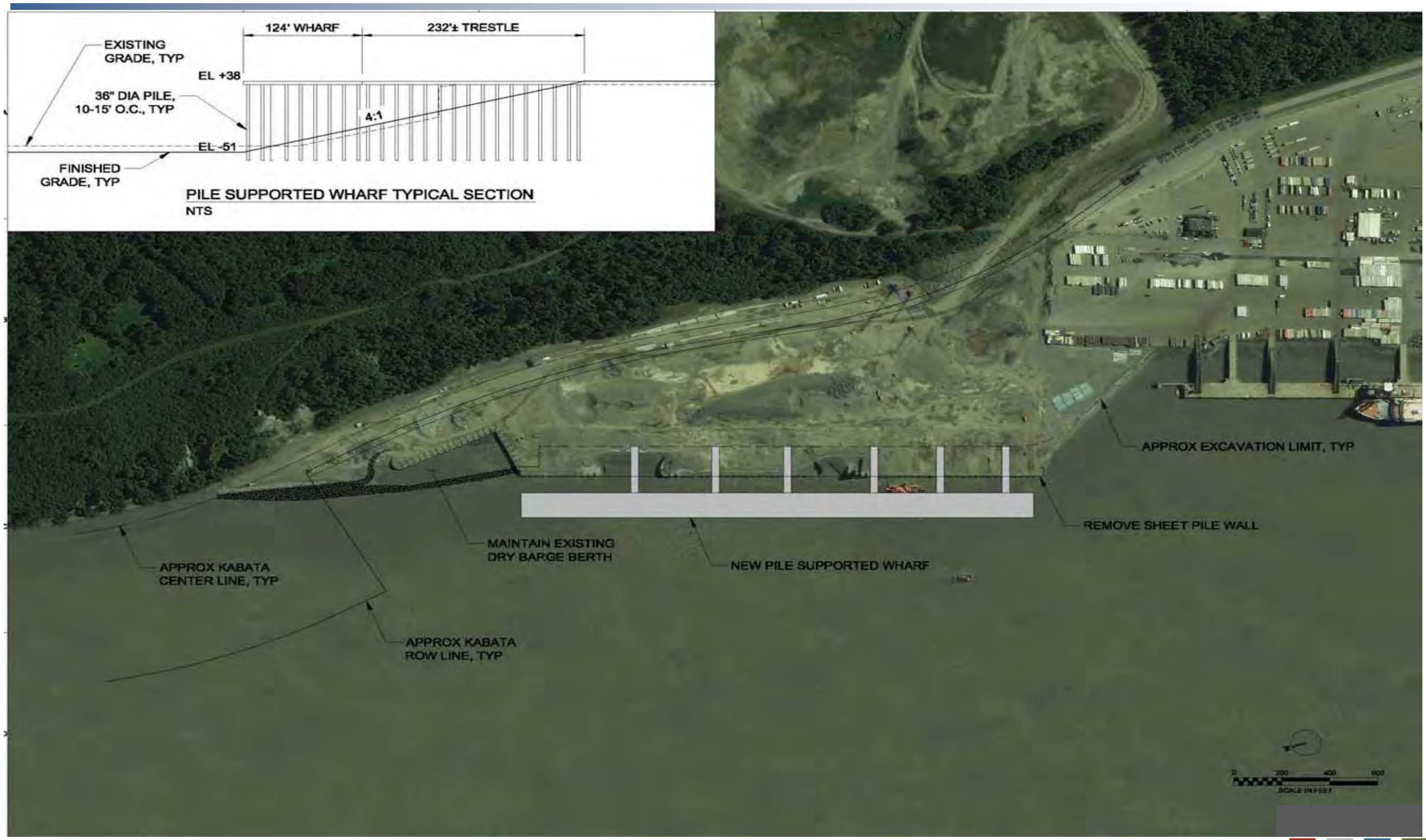
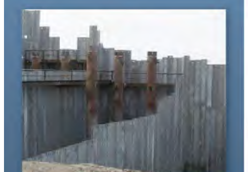
Option 4 – Charrette





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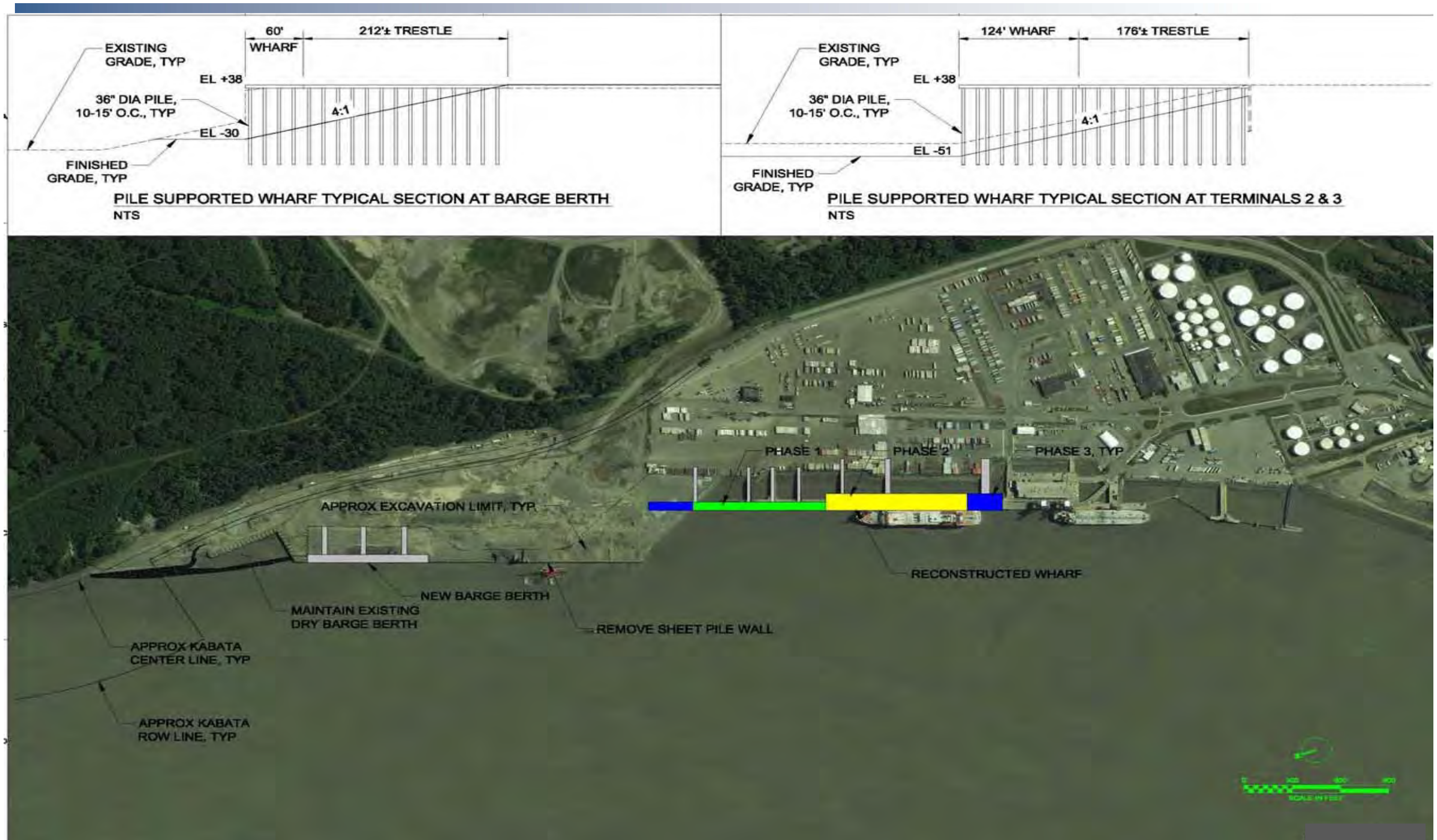
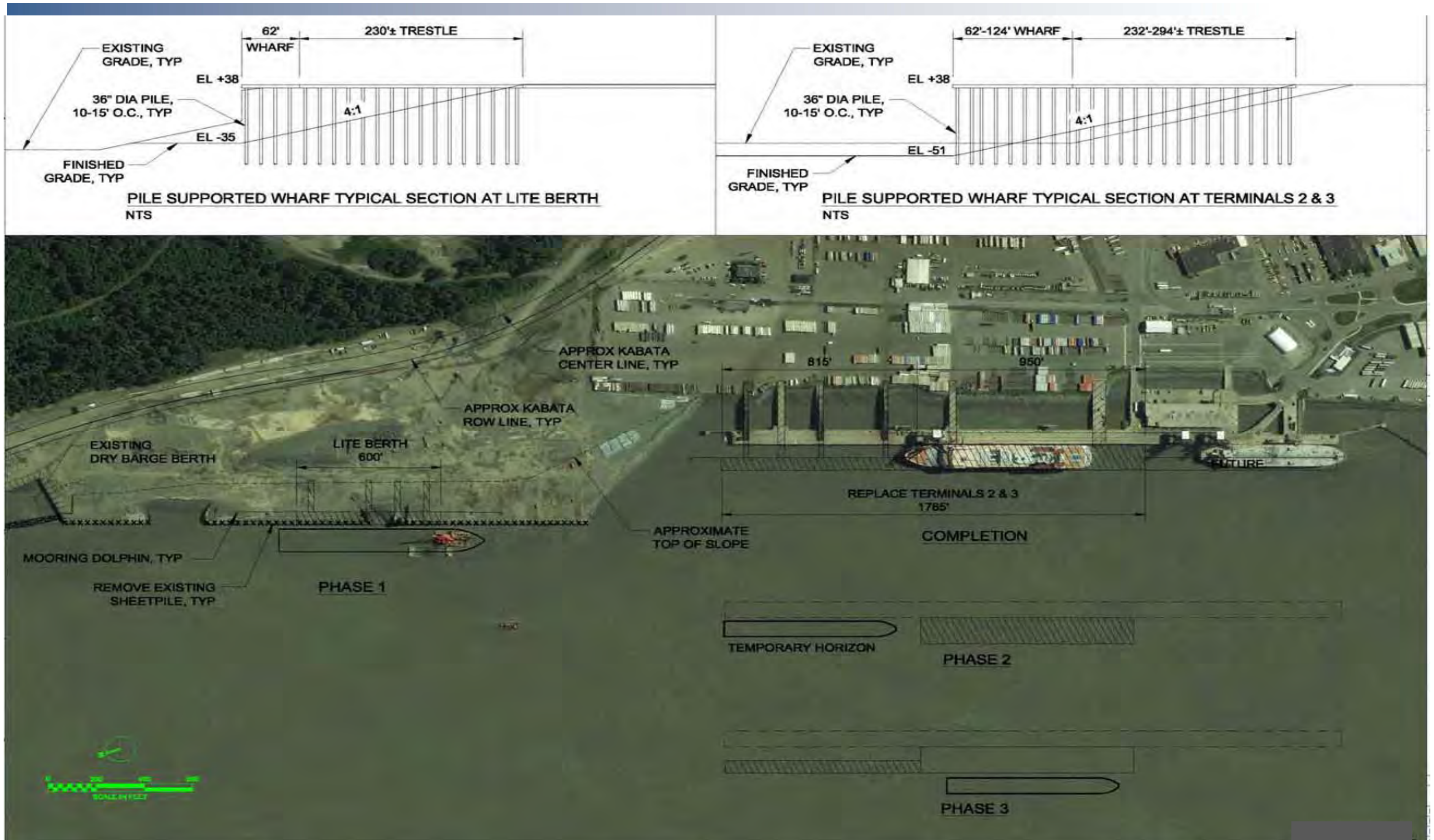
Option 5– Charrette



Option 5-1 Hybrid - Charrette



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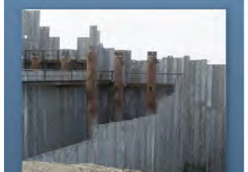


Charrette Direction

- Option 1 should be carried forward
- Option 2 wasted too much backlands and should be dropped
- Options 3 and 4 were dropped for several reasons:
  - Pushing further offshore is outside the permit area
  - Pushing further offshore creates more challenges for vessel approach and mooring
  - Pushing further offshore exacerbates shoaling at Terminal 3
- Option 5 should be carried forward (popular with carriers)
- Option 5 – 1 Hybrid should be developed further

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Design Criteria

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Design Criteria for 15% Concept Design

- Overall – Meet Project Goals
  - Provide adequate facilities to support transportation needs of POA
    - State and local commerce
    - National strategic transport mission
  - Provide modern, safe, and efficient port
  - Expand and maintain existing properties, facilities, and equipment to meet expected growth
  - Encourage natural resource exports and create employment opportunities

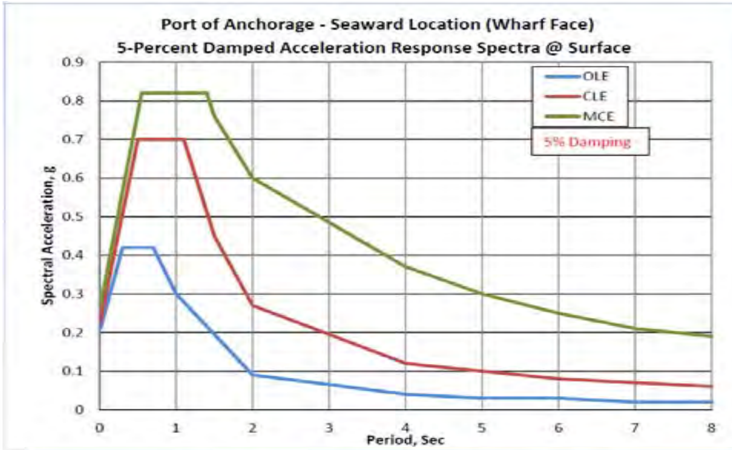


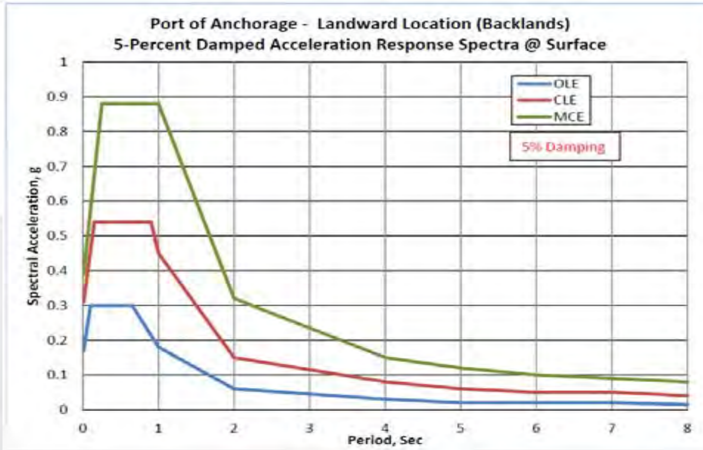

Review of Wharf Design Criteria

- Design codes and references – update to include MOTEMS, AASHTO, ASCE 7-10, etc.
- Facility design requirements
  - Service life
    - 75 years for wharf and trestle
    - 20 years for pavements and fenders
    - 50 years for buildings
  - Design live loads
    - 1,000 psf
    - AASHTO HS25 trucks
    - 275-ton mobile crane
    - 40-ton top pick & 100-ton fork lift
    - 100 gauge rail

Seismic Design

- Earthquakes
  - OLE, CLE, and MCE – same definitions as used for OCSP® project
  - PGA at ground surface from *Suitability Study*
    - 0.17g for OLE
    - 0.31g for CLE
    - 0.39g for MCE
  - Seismic performance goals
    - Δ = 3” for OLE
    - Δ = 12” for CLE
    - Δ = 30” for MCE





Other Environmental Loads

- Tidal
  - Highest: +34.6 feet MLLW
  - Lowest: -6.4 feet MLLW
  - Seismic: +7.5 feet MLLW
- Wind
  - 45 mph operating
  - 70 mph max speed for mooring
  - 100 mph max non-operating
- Mooring loads from vessels
  - MOTEMS
  - 150-ton bollards
- Ice
  - 24” with 300 psi crush strength
  - Ice dead load for pile design (8’ diameter)

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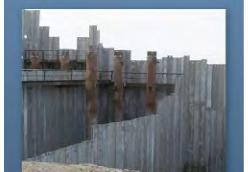

Foundation Design for 15% Concept

- Geotechnical design checks
  - Embankment stability
  - Axial and lateral pile capacity
  - Pile drivability
- Methodologies and tools
  - SLIDE for stability with transient seepage analyses
  - APILE for axial capacity and displacement; LPILE for lateral
  - GRLWEAP for drivability
- Site & groundwater conditions
  - See *Suitability Study* for North Extension
  - Existing terminal from PND/GeoEngineer/Terracon explorations for South Replacement area
  - Groundwater from recent measurements

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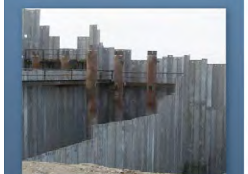
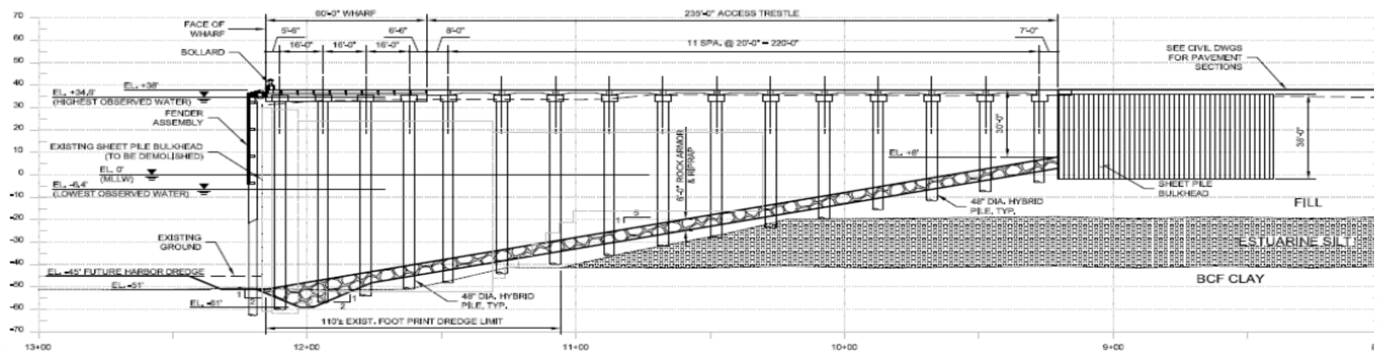
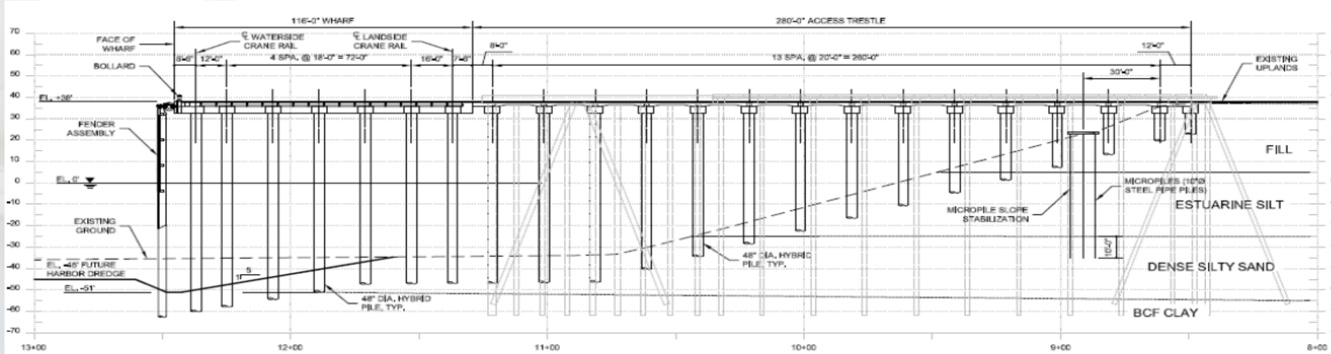


Geotechnical Conditions

Section C, Option 1 (North Expansion Area)



Section C, Option 5-1 Hybrid (Existing Terminal Area



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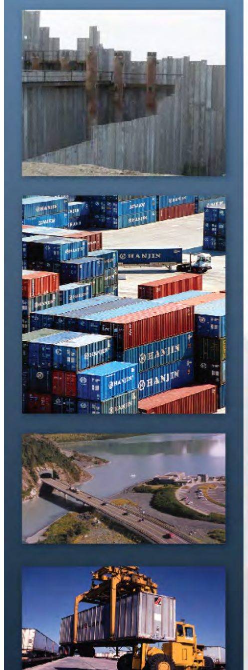
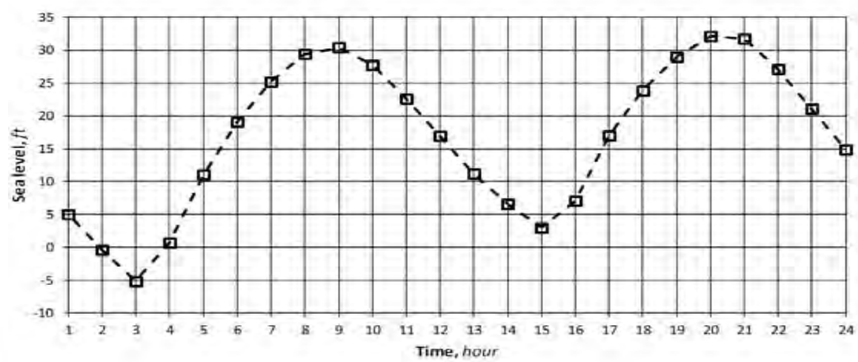
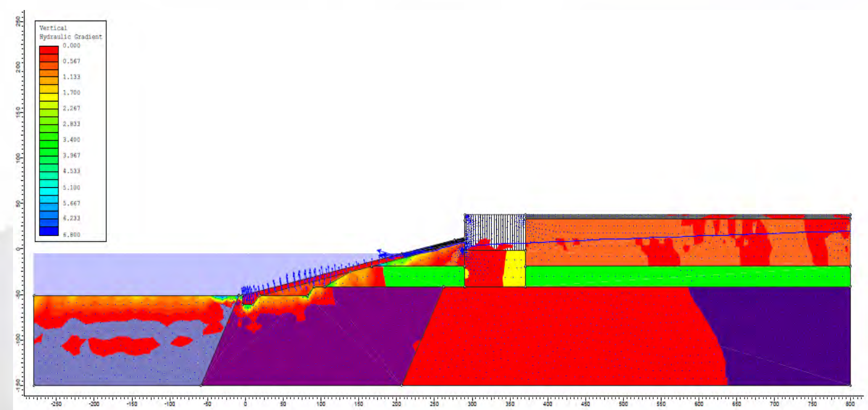
Embankment Stability for Tidal Flow



- Tidal fluctuation
  - Typical change over 24-hour period
  - Groundwater = 20 feet MLLW in backlands (approx 500 feet from pierhead)
- Effects on stability
  - Large fluctuation in seepage gradient
  - Modeled in SLIDE as transient flow
  - Required FS = 1.5 against piping at embankment
  - Needed 5 feet of armor rock to control





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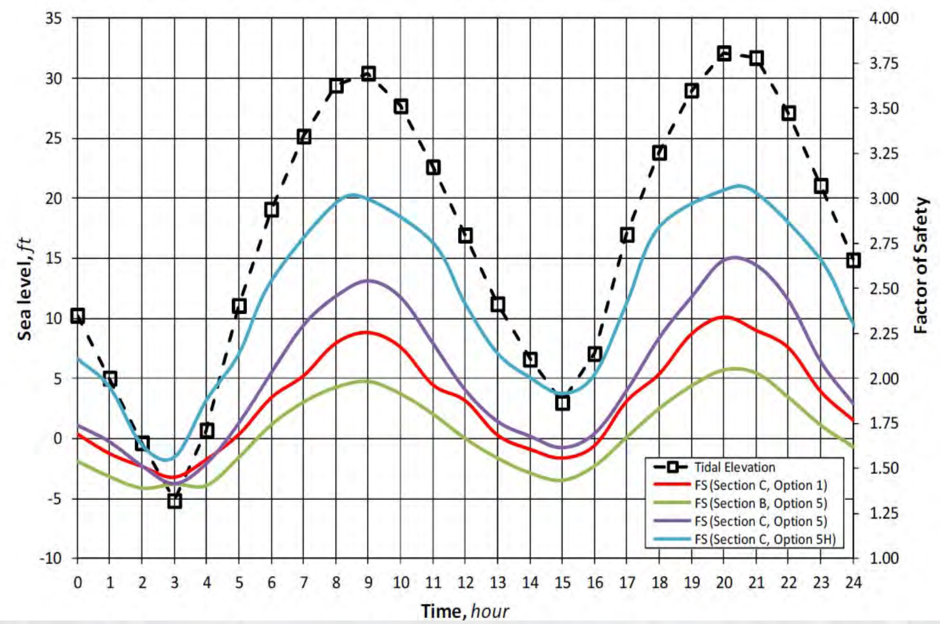
Embankment Stability – Gravity Loading

- Gravity loading with tidal effects
  - Same approach as *Suitability Study*
  - Included 24-hour tidal fluctuation
  - Accounted for removal of embankment fill (unloading) at pierhead line
  - Live load = 1,000 psf
  - FS ≈ 1.4 to 1.5



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Embankment Stability – Seismic Loading

- Pseudo-static method
  - No cyclic degradation in BCF (implies small movements)
  - K_h = 0.5∗PGA at ground surface
  - Undrained response in Estuarine Deposits with reduced S_u/σ'_v
  - Porewater buildup in loose granular soil and common fill

Results from the Pseudo-Static Global Stability Analyses for All Considered Embankments

		Global Factor of Safety				
		Option 1	Option 5		Option 5-1 Hybrid	
Case No.	Seismic Event	Section C	Section B	Section C	Section C	Range of Seismic-Induced Slope Movement
1	OLE	1.2	1.2	1.2	1.3	No to minor movement
2	CLE	0.9	0.9	1.1	1.0	Minor to considerable movement
3	MCE	0.8	0.8	1.1	0.9	Minor to considerable movement

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Permanent Seismic Deformations

- Simplified chart/equation methods to estimate deformations
- Weighted average of following
  - Hynes-Griffin and Franklin (D_1)
  - Ambraseys and Menu (D_2)
  - Bray and Travasarou (D_3)
  - Rathje and Saygill (D_4)
- Yield acceleration = 0.12g
- Displacements
  - OLE: < 1 inch
  - CLE: ≈2 to 3 inches
  - MCE: ≈4 to 6 inches

D = Average Displacement = $0.15*D_1 + 0.15*D_2 + 0.35*D_3 + 0.35*D_4$

Risk of large-deformation degradation (vis-à-vis 4th Avenue) is minimal

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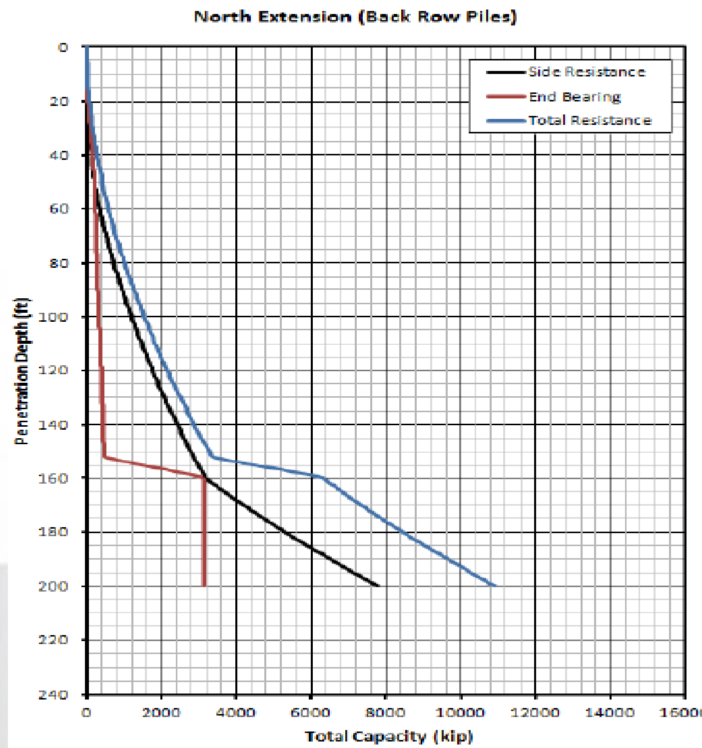
Pile Capacity Estimates




- Wharf and trestle supported with pipe piles
  - 48” pipe pile with 1” wall
  - Driven open-ended to top of till
    - Pileco D-280 Hammer
    - GRLWEAP analyses
  - Capacity using LRFD
  - Assume loading testing conducted (higher R values)
  - Plugged and unplugged capacity

Nominal Capacity Chart



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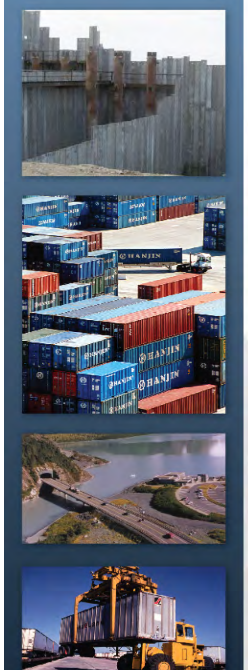
Future Foundation Design Work



- Design Considerations
  - Refinement of transient seepage analyses
  - SSI studies for wharf embankment using 2D FE/FD methods
  - Liquefaction potential next to piles and bulkhead
  - Embankment slope protection for seepage
  - Retaining wall alternatives (anchored vs cellular vs OCSP®)
  - Early pile-load testing (load and indicator piles with PDA)
- Construction
  - Effects of OCSP® demo and granular fill removal
  - Cellular bulkhead design
  - Micropile design

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Option 1 - Visualizations

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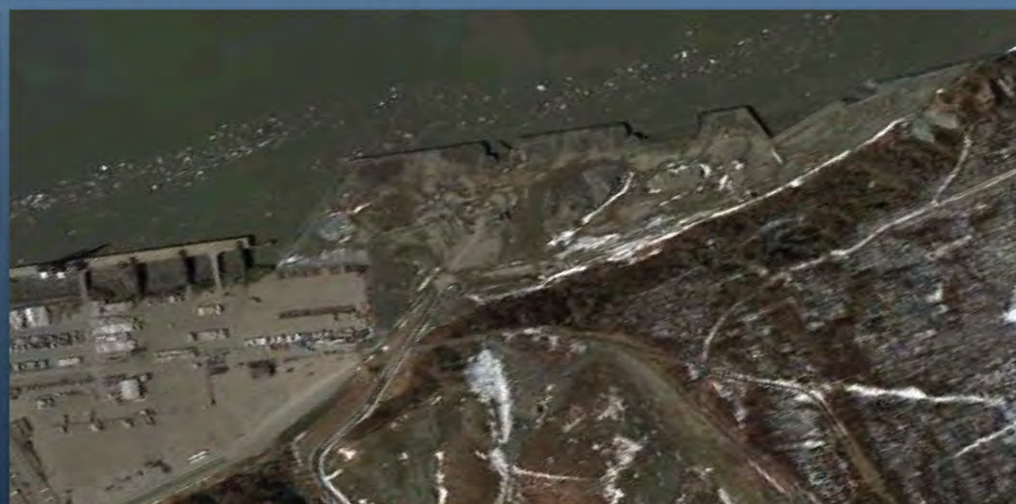
Concept Design Study



presented to


15% Concept Plan
Option 1 - Existing

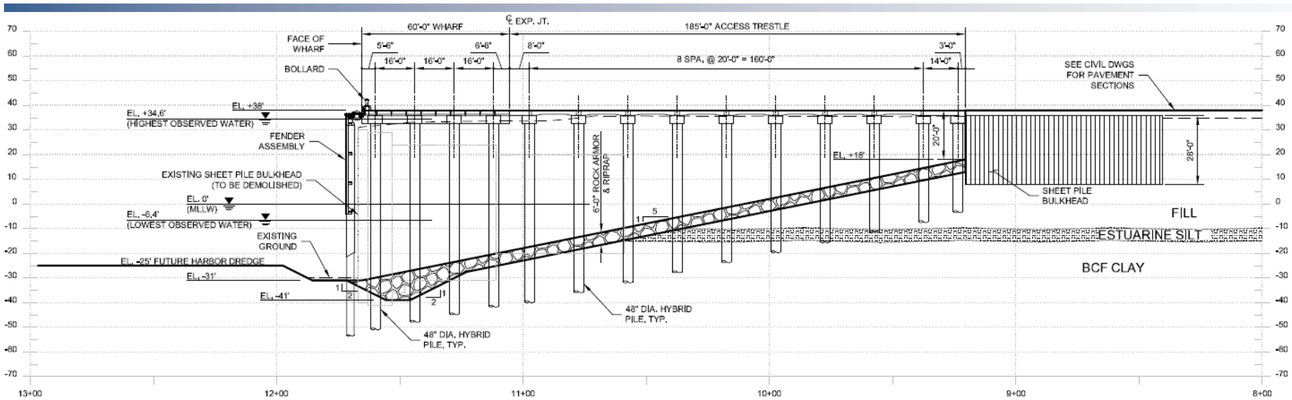

15% Concept Plan
Option 1 - Step 1


15% Concept Plan
Option 1 - Step 2

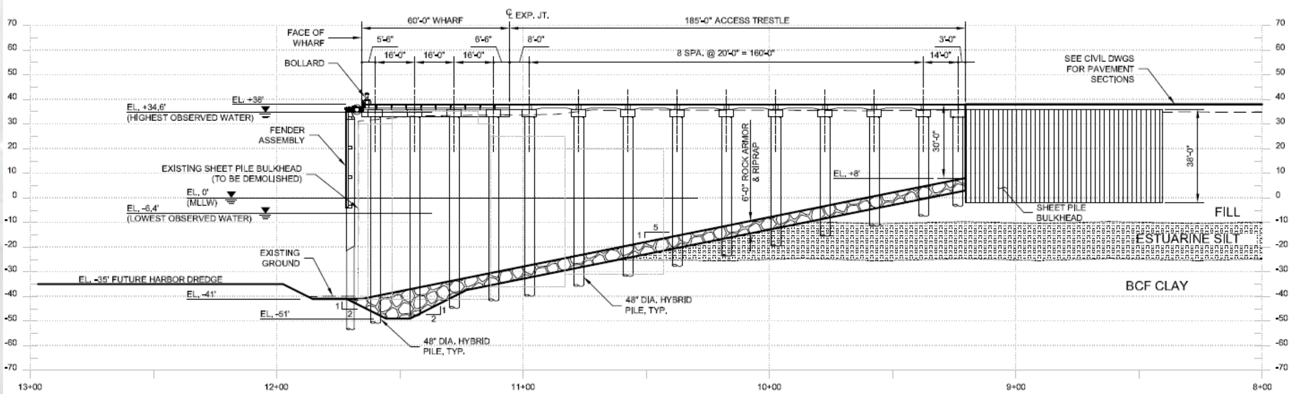

15% Concept Plan
Option 1 - Final


15% Concept Plan
Option 1

Option 1 – 15% Typical Section (s-03)



A SECTION



B SECTION

OPTION 1

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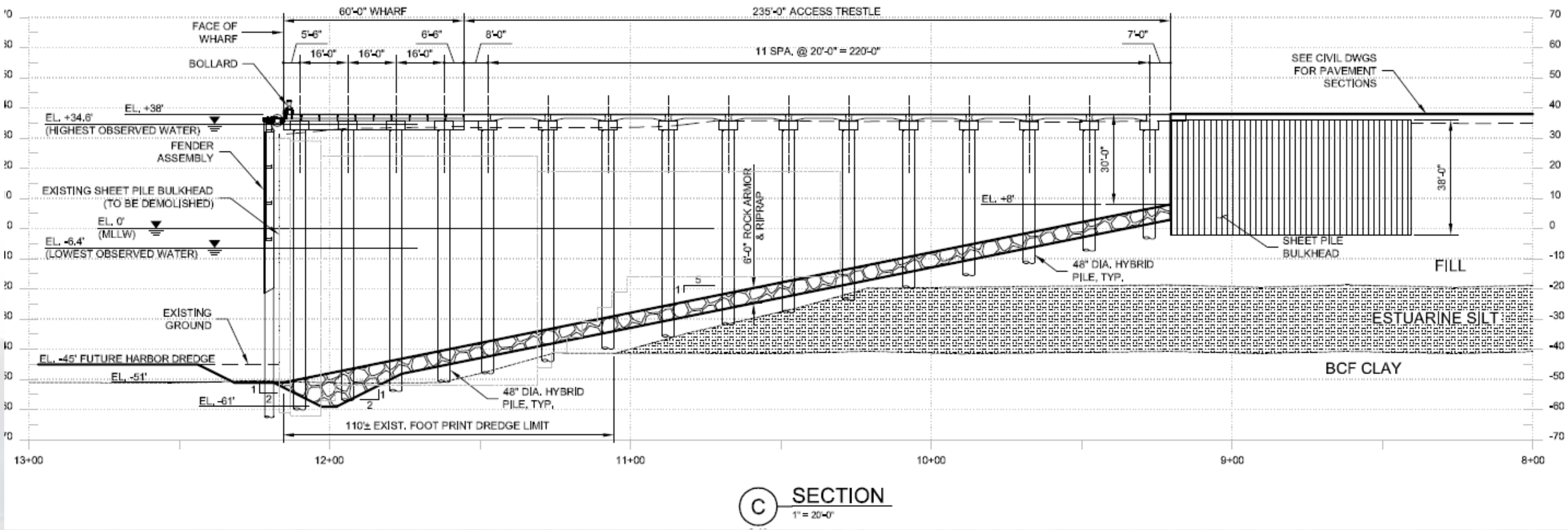
Option 1 – 15% Typical Sections (s-04)



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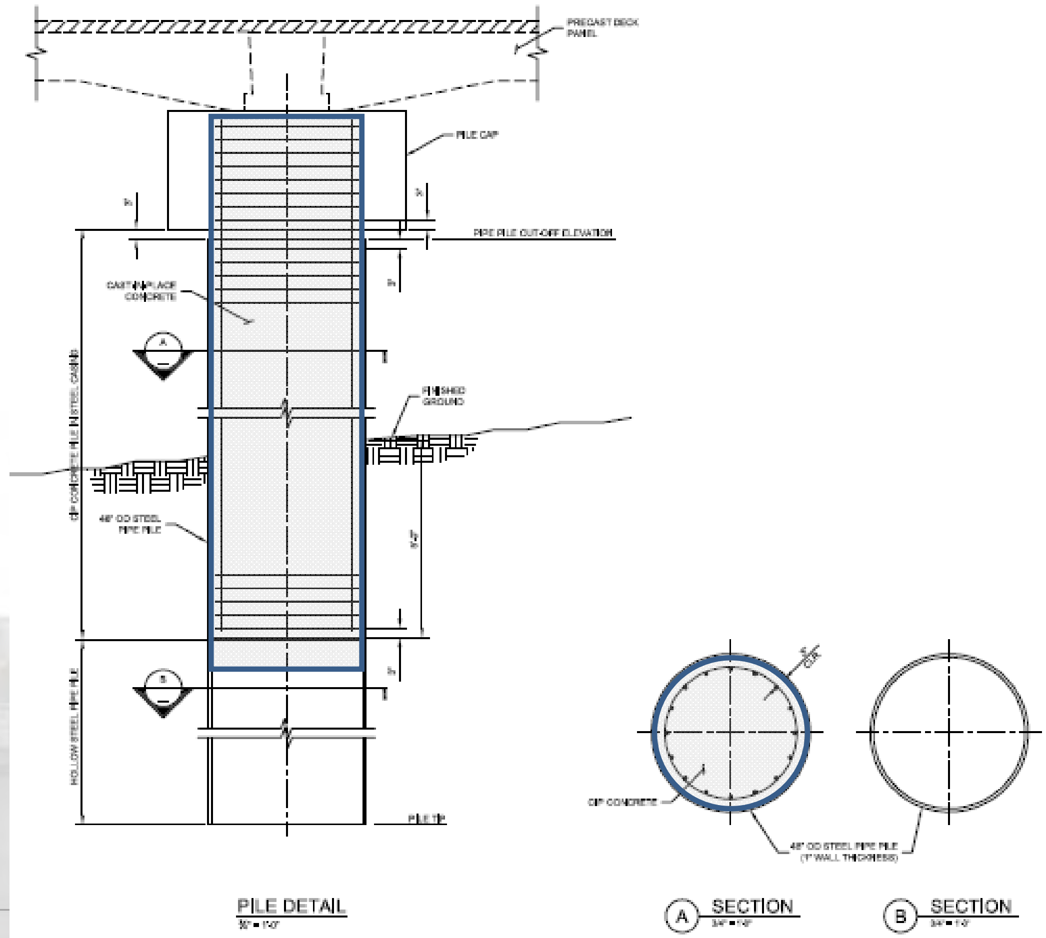
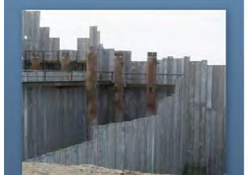
Hybrid Reinforced Concrete Piling





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Option 5 - Visualizations


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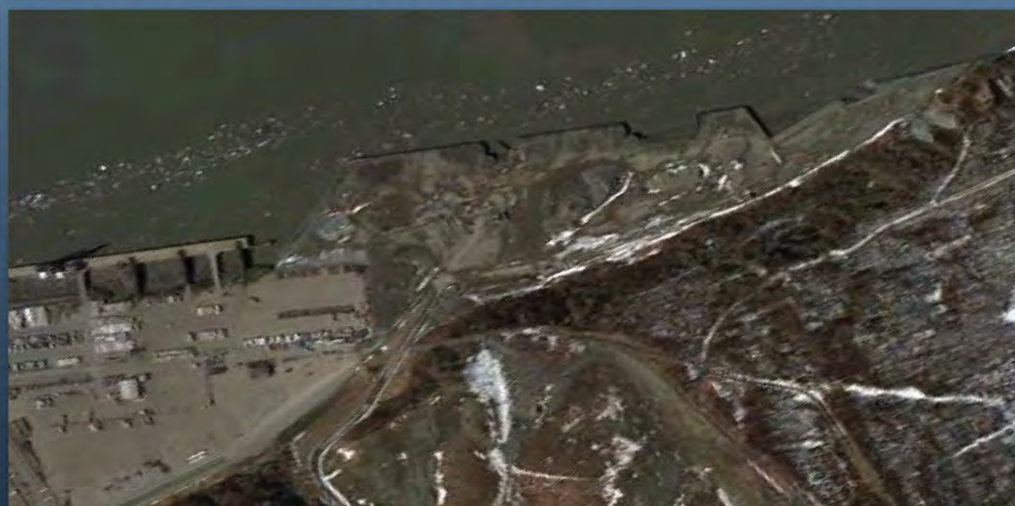


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15% Concept Plan
Option 5 - Existing


15% Concept Plan
Option 5 - Step 1


15% Concept Plan
Option 5 - Step 2


15% Concept Plan
Option 5 - Step 3

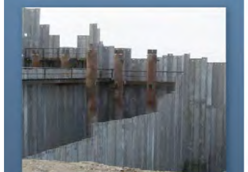

15% Concept Plan
Option 5 - Step 4

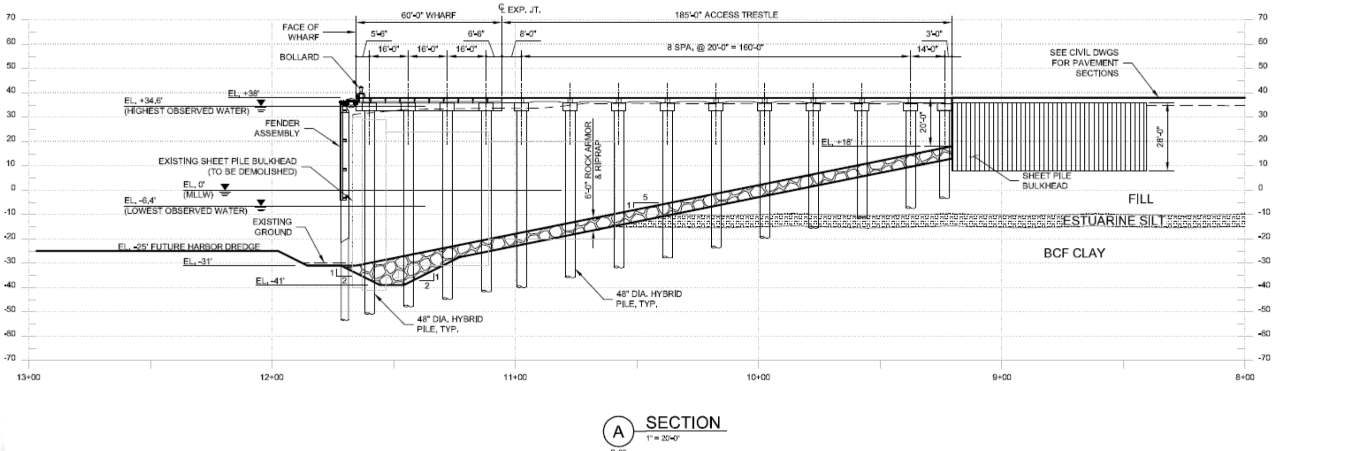

15% Concept Plan
Option 5 - Step 5

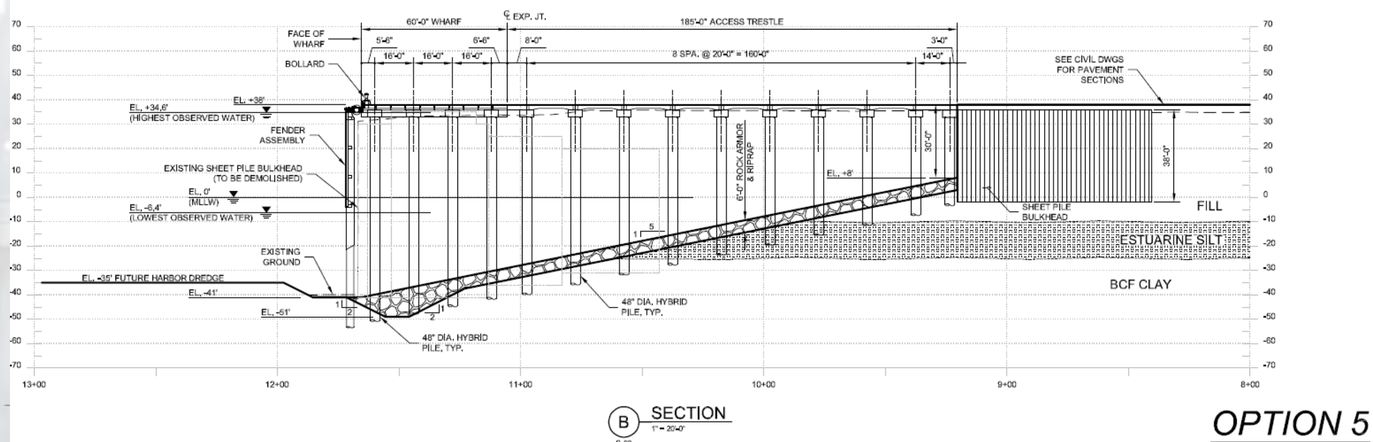

15% Concept Plan
Option 5 - Step 6

15% Concept Plan
Option 5 - Final

Option 5 – 15% Typical Sections (s-03)







OPTION 5

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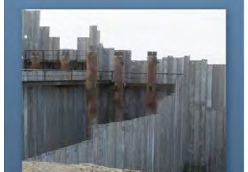
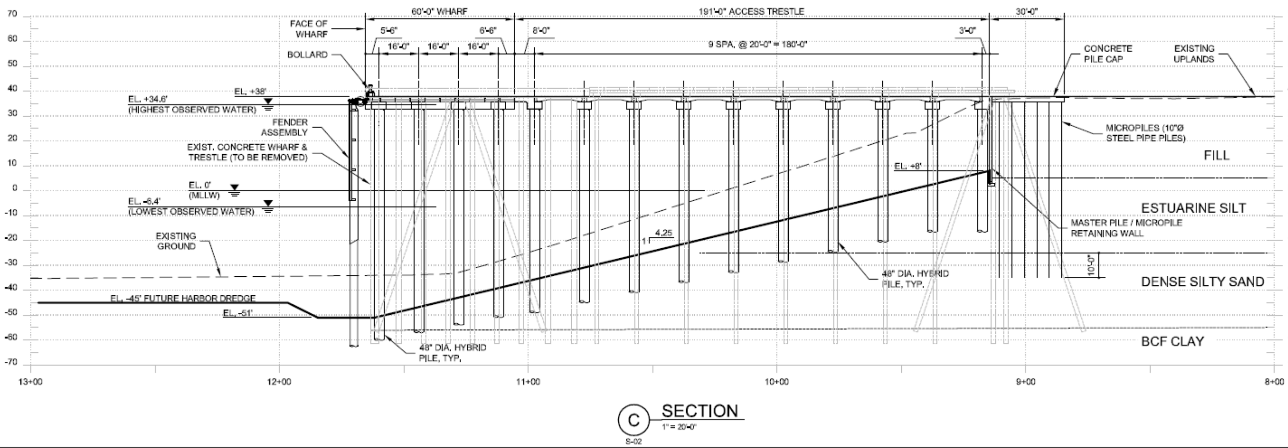
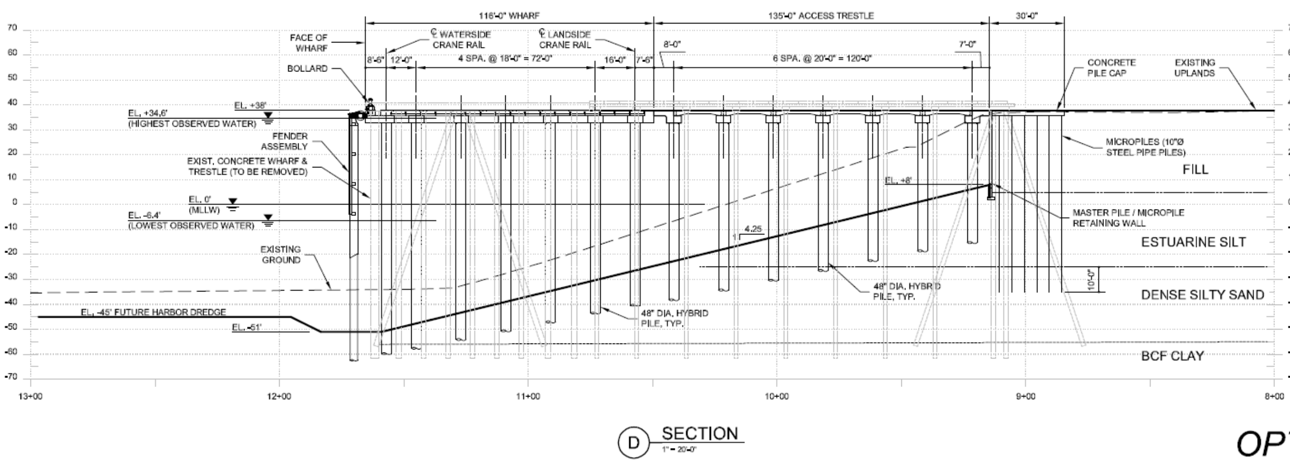
Option 5 – 15% Typical Sections (s-04)







OPTION 5

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Option 5-1 Hybrid - Visualizations

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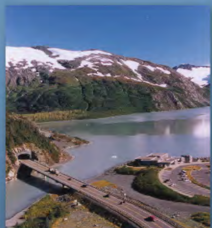

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15% Concept Plan
Option 5-1 Hybrid - Existing


15% Concept Plan
Option 5-1 Hybrid - Step 1


15% Concept Plan
Option 5-1 Hybrid - Step 2

15% Concept Plan
Option 5-1 Hybrid - Step 3

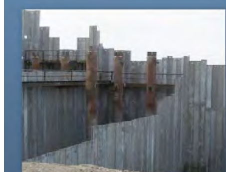

15% Concept Plan
Option 5-1 Hybrid - Step 4

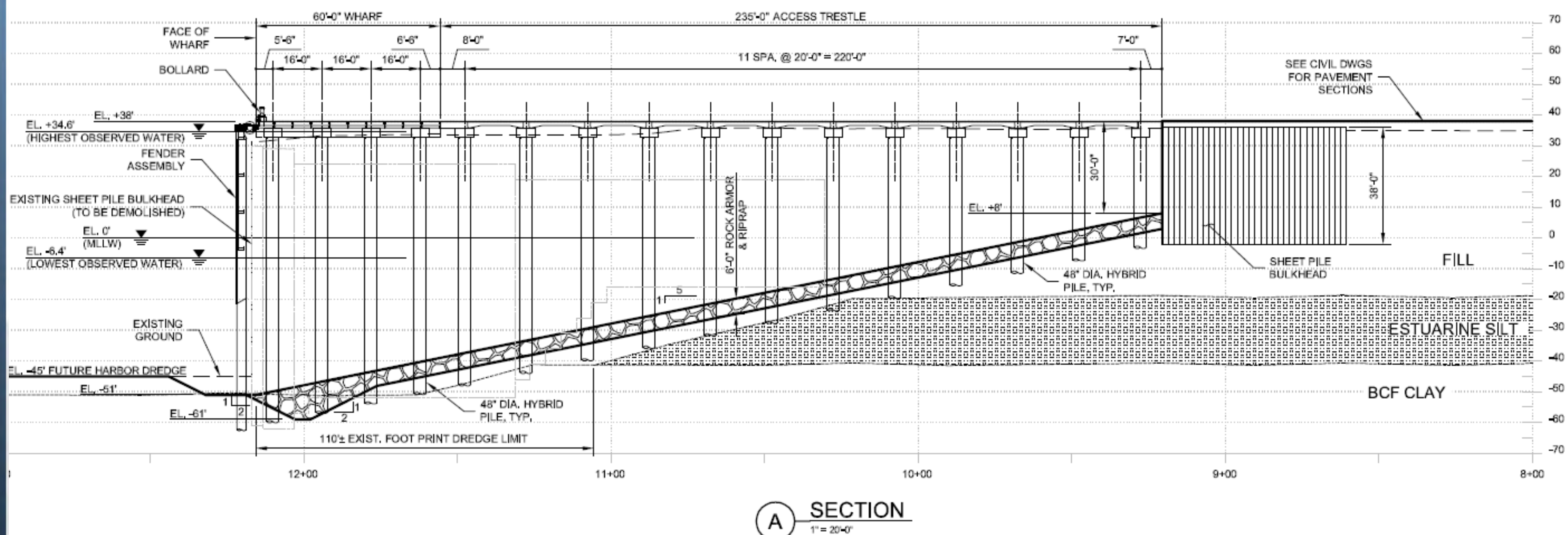

15% Concept Plan
Option 5-1 Hybrid - Step 5

15% Concept Plan
Option 5-1 Hybrid - Step 6


15% Concept Plan
Option 5-1 Hybrid - Final

Option 5-1 Hybrid – 15% Typical Section (s-03)





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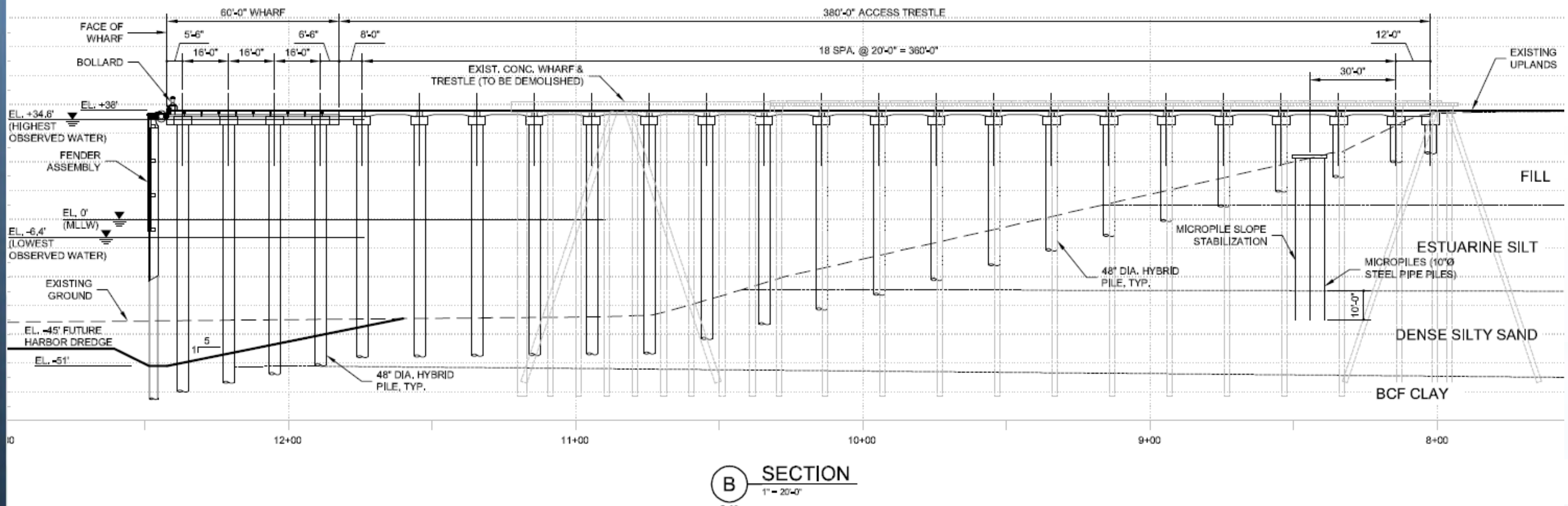
Option 5-1 Hybrid – 15% Typical Section (s-04)



B SECTION
1" = 20'-0"

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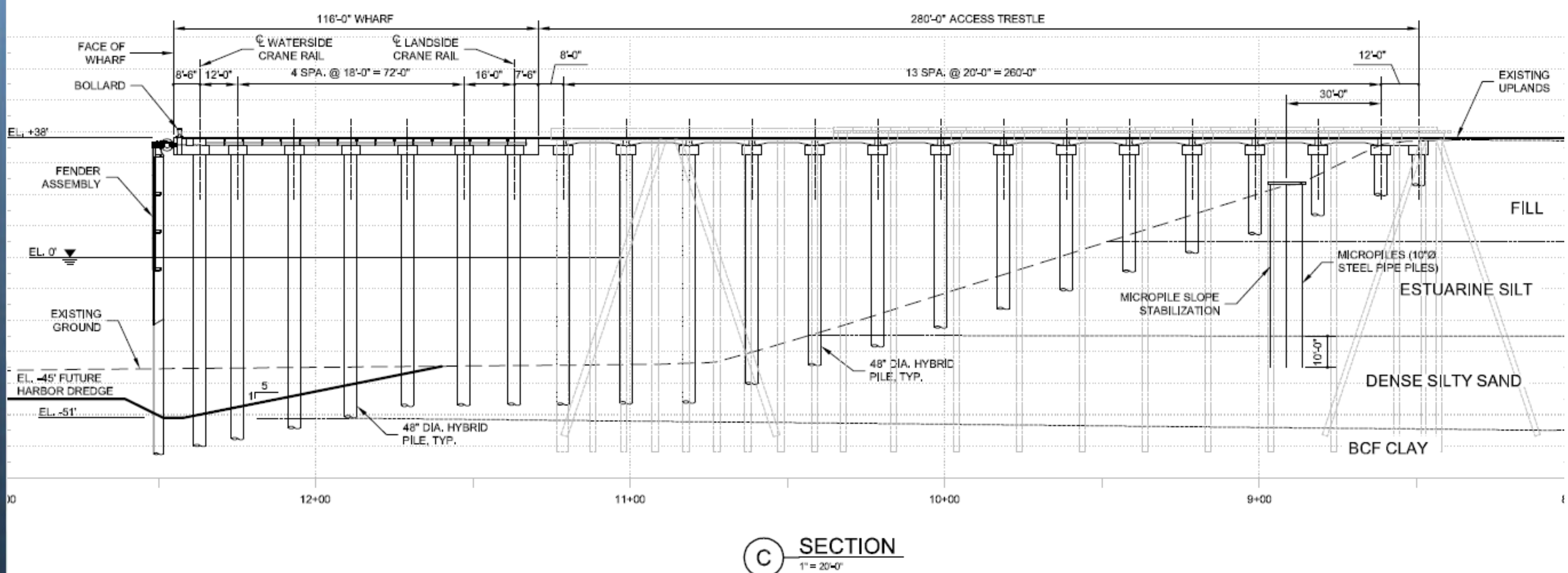
Option 5-1 Hybrid – 15% Typical Section (s-04)



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Cost and Schedule Risk Assessment (CSRA)

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Cost and Schedule Risk Assessment

- Typical deterministic method estimates costs then adds contingency (e.g. 20%)

- Benefits of the CSRA
  - Identifies high risk items to cost and schedule
  - Provides leadership contingency information for scheduling and budgeting
  - Allows management of risks through a formal process throughout the design process.
  - Provides a proven structure for communicating project costs with stakeholders.

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Cost Estimates

	60% Confidence	80% Confidence	100% Confidence
Option 1	$363M	$377M	$447M
Option 5	$618M	$642M	$763M
Option 5-1 Hybrid	$582M	$602M	$735M

Notes:

1. All options assume construction start 2015, with construction midpoint 2017
2. All options use surplus sheet piling
3. All berths designed to MCE level earthquake

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15% Concept Plan
Option 1


15% Concept Plan
Option 5


15% Concept Plan
Option 5-1 Hybrid

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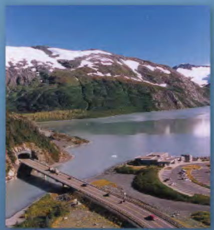
Selection Criteria and Scoring



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Qualitative Scoring Factors

- The evaluation team consisted of members from the POA, MARAD, MOA, USACE, and CH2M HILL.

  - 1.0 Outstanding
  - 0.8 Excellent
  - 0.6 Good
  - 0.4 Fair
  - 0.2 Poor
  - 0.0 Unsatisfactory

Selection Criteria and Recommended Option

#	Objective	Measure	Weight	Option 1 Score	Option 1 Weighted Score	Option 5 Score	Option 5 Weighted Score	Option 5-1 Hybrid Score	Option 5-1 Hybrid Weighted Score
Opportunity for New Business									
1	Provides the opportunity to attract new business to the port with new berths	Length, width, depth, backlands of new berth(s)	0.20	0.4	0.08	0.8	0.16	1	0.2
Impact to Existing Customer's Costs									
2	Provide the least long term cost impacts to existing tenants	Operational cost of increased transit times, berthing and line handling	0.15	0.4	0.06	0.4	0.06	0.6	0.09
Expandability									
3	Can the alternative be expanded in future phases	Are there any restrictions created by the project that hinder expansion	0.10	0.2	0.02	0.4	0.04	0.6	0.06
Maintenance Dredging									
4	Minimize future maintenance dredging	Least amount of dredging / which alternative is located in the deepest water and fastest current	0.05	0.4	0.02	0.6	0.03	0.8	0.04
Life Cycle Cost									
5	Minimize life cycle costs	Lowest calculated life cycle cost	0.15	0.2	0.03	0.6	0.09	0.8	0.12
Investment Cost per linear foot of new berth									
6	Lowest investment cost per linear foot	Lowest investment cost per linear foot	0.20	0.6	0.12	0.4	0.08	0.8	0.16
Seismic Capacity									
7	Most berths built to current seismic codes	Number of berths built to current seismic codes	0.15	0.8	0.12	1	0.15	1	0.15
		TOTAL WEIGHTED SCORE	1.00		**0.45**		**0.61**		**0.82**

NOTES:
1. Weights and scores are only guides to assist in the evaluation of alternatives; they do not mandate automatic selection of any particular alternative.
2. At this time, none of the considered options offer a distinct advantage with respect to environmental considerations; therefore, this criteria has not been included.

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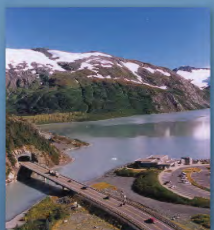
Recommended Option Attributes



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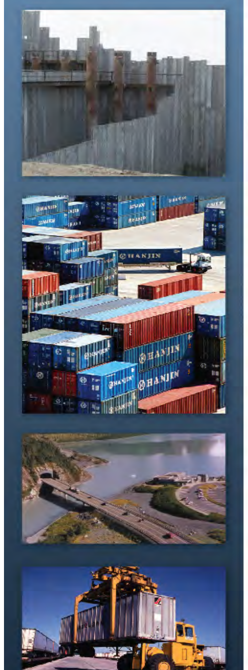
Option 5-1 Hybrid Attributes



- Has the lowest initial investment cost
  - Phase 1 $327M (North End Hybrid Berth)
  - Phase 2 $275M (Terminal 2 and 3)
  - Total $602M
- Hybrid Berth serves both barge and deep draft customers
- Retains most backlands at North End (32 acres)
- Allows for expansion to the south in the future
- Less maintenance dredging anticipated
- Improved vessel approach


15% Concept Plan
Option 5-1 Hybrid


15% Concept Plan
Option 5-1 Hybrid

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Recommended Pile Test Program



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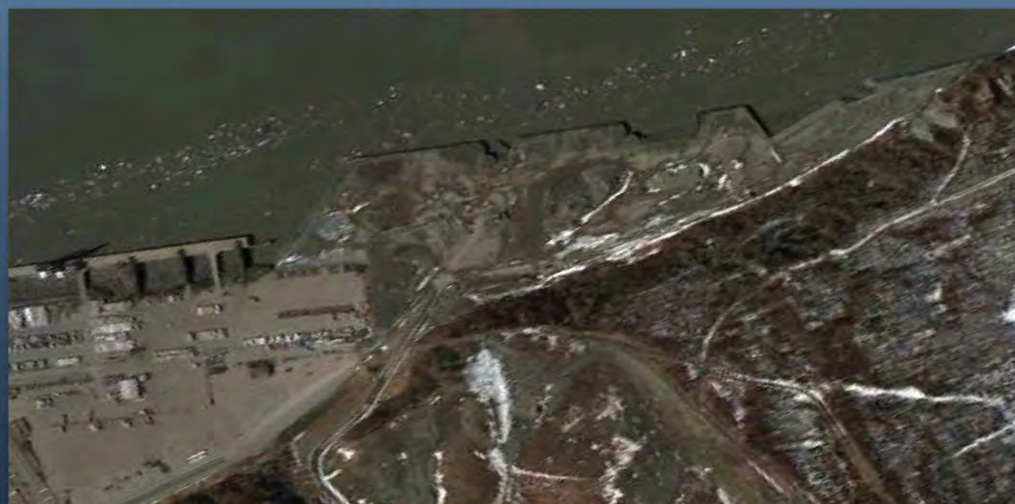


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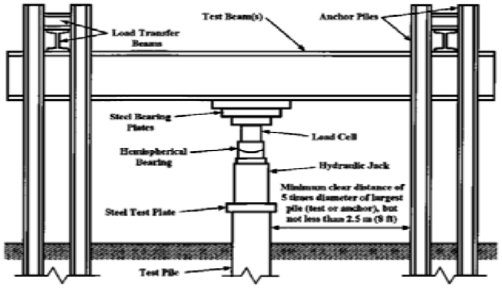
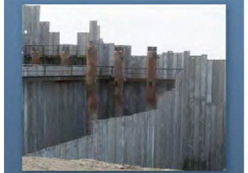
Pile-Load Testing

- Objectives
  - Evaluate installation methods
  - Determine capacity & load displacement
  - Assess plug development and setup
- Scope
  - 1 to 2 top down capacity tests
    - Fully instrumented
    - Follow ASTM D 1143
  - Indicator pile tests
    - Pile installation
    - 10 to 15
    - Noise and vibrations



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Key Considerations for Pile-Load Test

- Testing Questions
  - Conduct behind existing OCSP® before removal
    - Overburden effects
    - Noise and vibrations
  - Tests at both existing terminal and in North Extension
  - What pile diameter
    - Full diameter at higher costs -- BEST
    - Smaller diameter and use unit side friction and toe resistance for design
  - How to develop reaction => probably reaction piles and kentledge
- Interpretation of Results
  - Does pile need to be driven to till to meet capacity requirements
    - Function as friction pile
    - Settlement
  - How does plug function during driving
    - Need for driving shoe
    - Long-term setup
    - Plugged vs unplugged capacity
  - What is optimum driving method
    - Size of hammer
    - Driving stresses

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Questions

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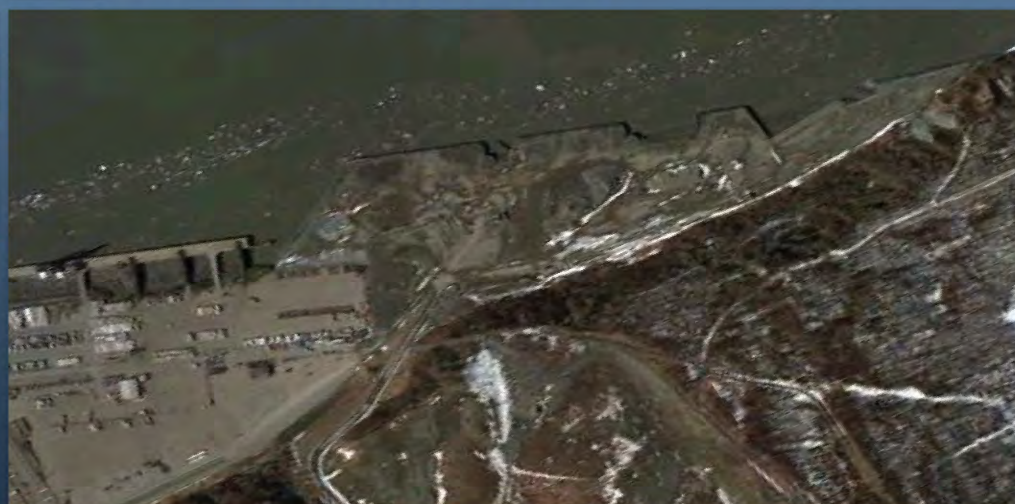

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