Humboldt Bay Harbor, Recreation, and Conservation District

moffatt & nichol

Humboldt Redwood Marine Multipurpose Replacement Project

Sediment Investigation and Sediment Management

Shelly Anghera, PhD

Moffatt & Nichol

CMANC

May 15, 2025

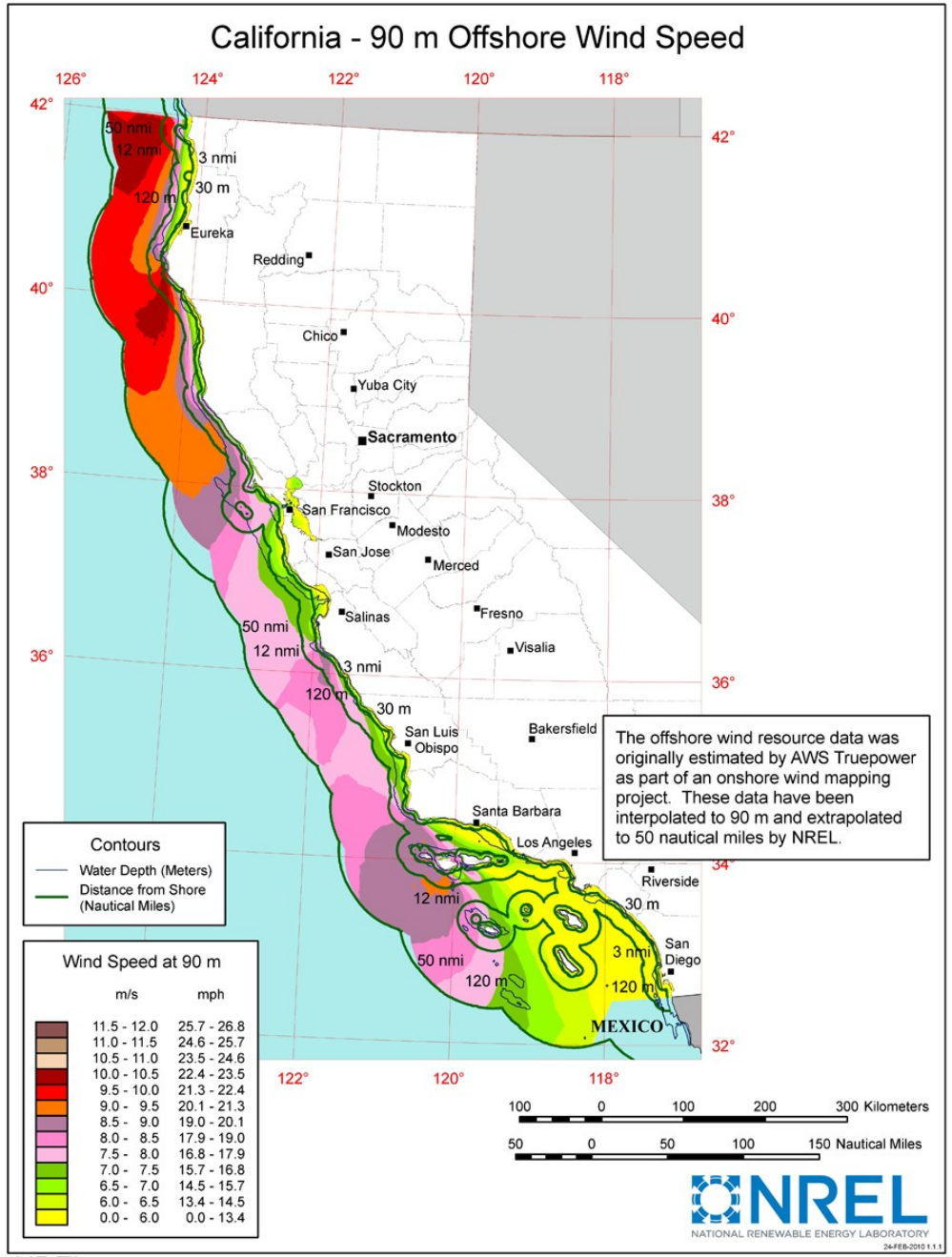
California OSW Deployment Targets

- **Governor Newsom's Letter to CARB (July 2022):**
  - 20 GW by 2045
- **CEC Updated AB 525 Report (August 2022):**
  - 2–5 GW by 2030
  - 25 GW by 2045

25 GW = ~1,250 x 20 MW WTGs

(wind turbine generators)

Principle Power



NREL

OSW Port Studies US West Coast

- **Bureau of Ocean Energy Management**
  - Port of Coos Bay, Port Infrastructure Assessment for OSW Development, BOEM 2022-073
  - California Floating OSW Regional Ports Assessment, BOEM 2023-010
  - California Floating OSW Regional Ports Feasibility Analysis, 2023
- **National Renewable Energy Laboratory**
  - West Coast Port Strategy Study, 2023
- **California State Lands Commission**
  - AB 525 Port Readiness Plan, 2023
  - Alternative Port Assessment to Support Offshore Wind, ,2023

Multi-Port Strategy to Achieve State Offshore Wind Planning Goals

Type of Site	Medium (25 GW)
S&I Sites	3
MF Site (Blade)	2
MF Site (Tower)	1
MF Site (Nacelle Assembly)	1
MF Site (Foundation Assembly)	2
SOV berths for O&M Activities	9 to 16
Mooring Line & Anchor Storage Sites	20 to 40 ac
Electrical Cable Laydown Sites	12 to 22 ac

- Need approximately 10 large port sites (>80 acres) and 10 small port or harbor sites (2-10 acres) to meet CA targets by 2045
- Strategizing the development of manufacturing port sites in California will maximize job creation and economic impact to the State
- California ports and harbors can be ready to support the OSW industry with adequate and timely investments

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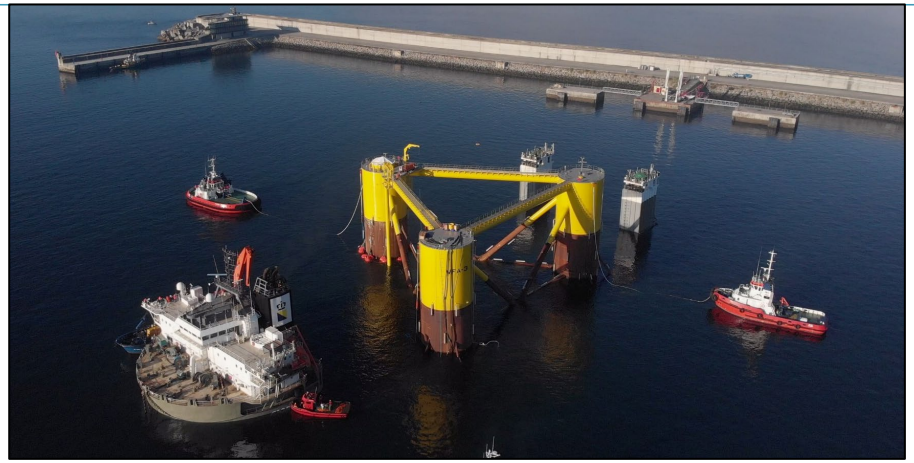
Floating OSW Wharf-side Assembly & Loadout

1) Fabrication

2) Loadout onto semi sub

3) Float off

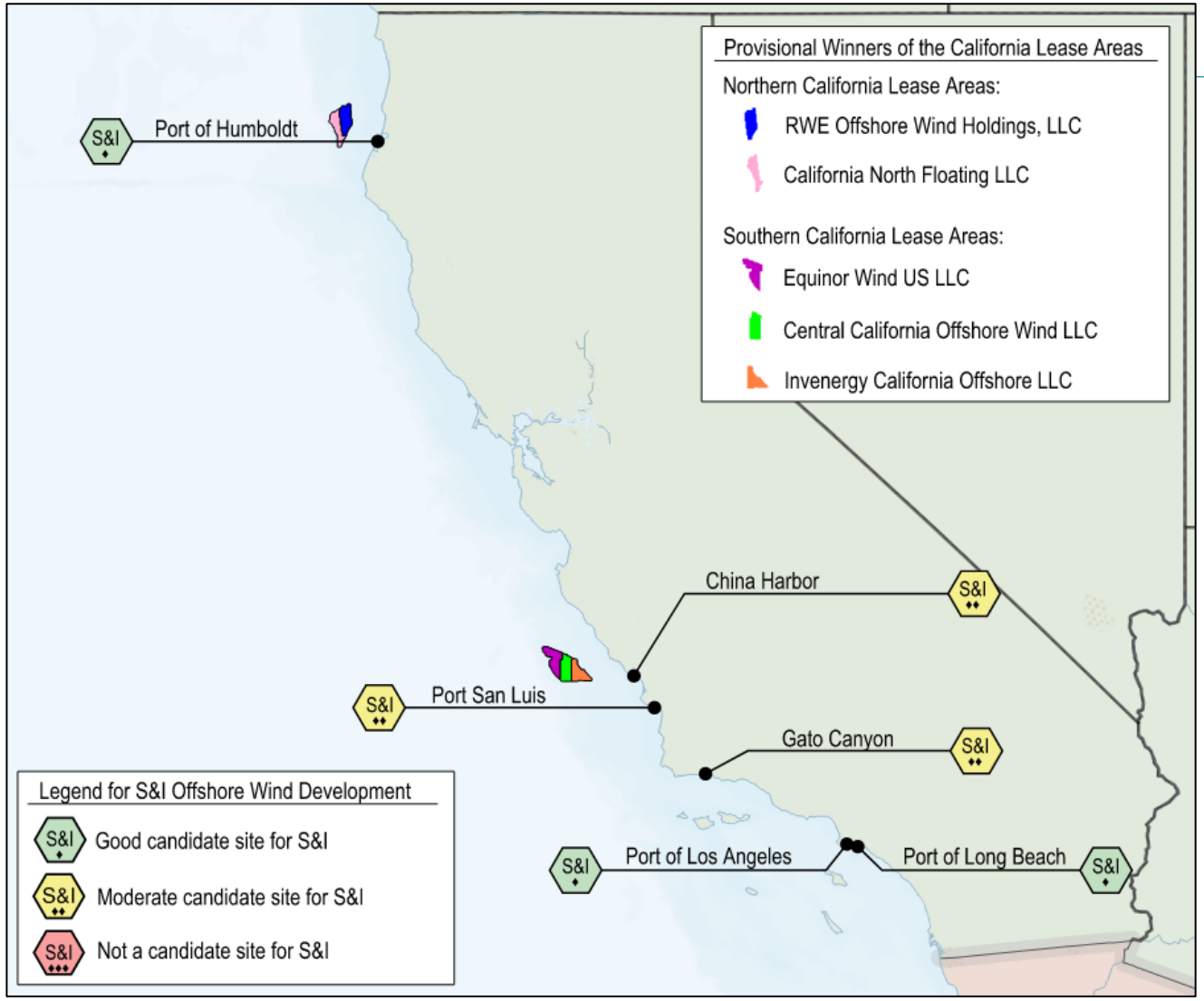


4) WTG Integration

5) Tow to Installation Site

Photo reference: 1, 2, 4, and 5 by Principle Power; 3 by EDP Renewables

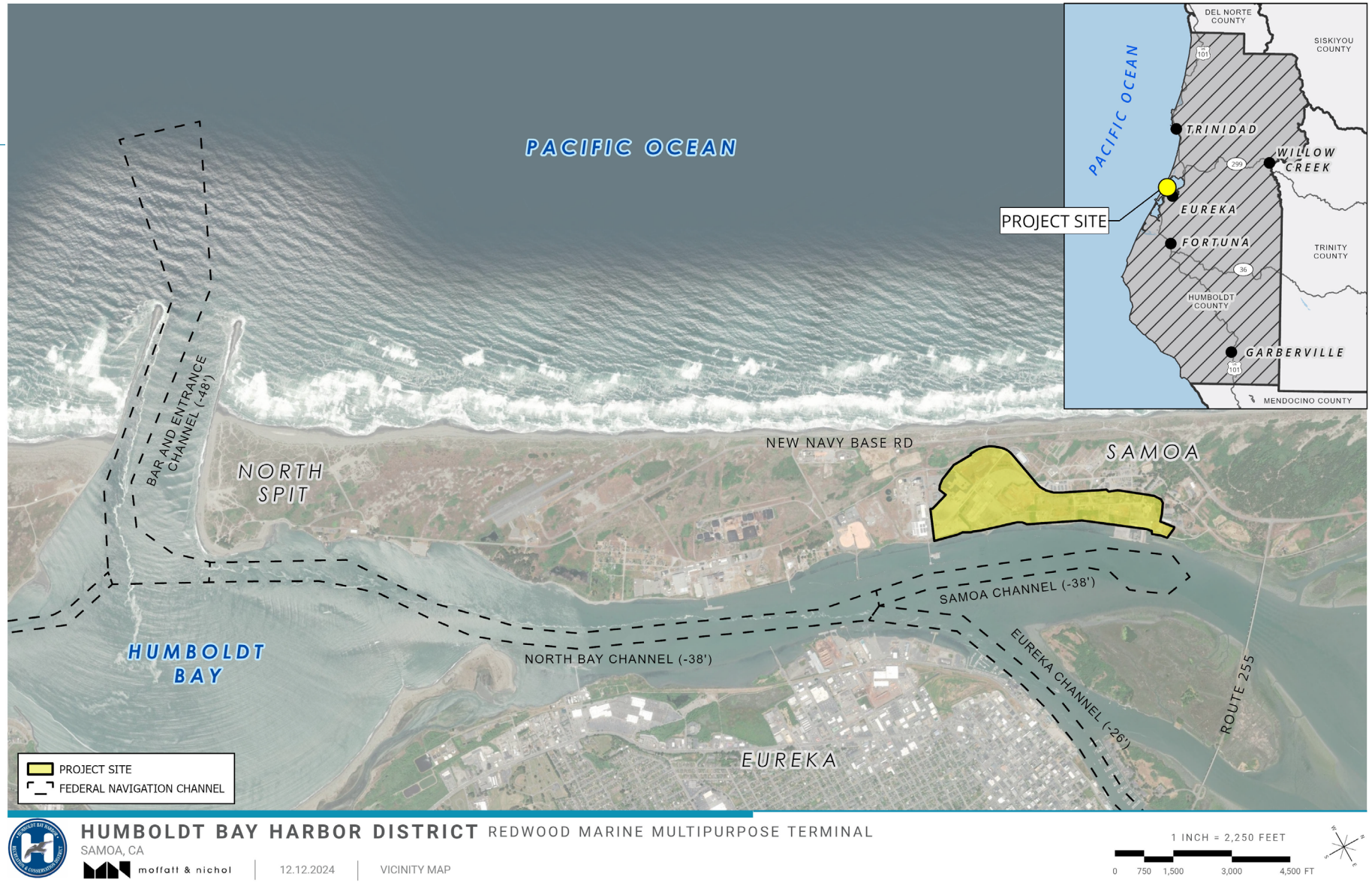
Best CA Port Sites – Staging & Integration



- Construction, Operations, and Maintenance of OSW farms requires Ports:
  - Sheltered harbor areas
  - Large laydown areas
  - Deep, navigable water
  - Heavy load capacity
- Without these type of sites, OSW development is not possible
- Port of Humboldt and Port of Long Beach have announced projects

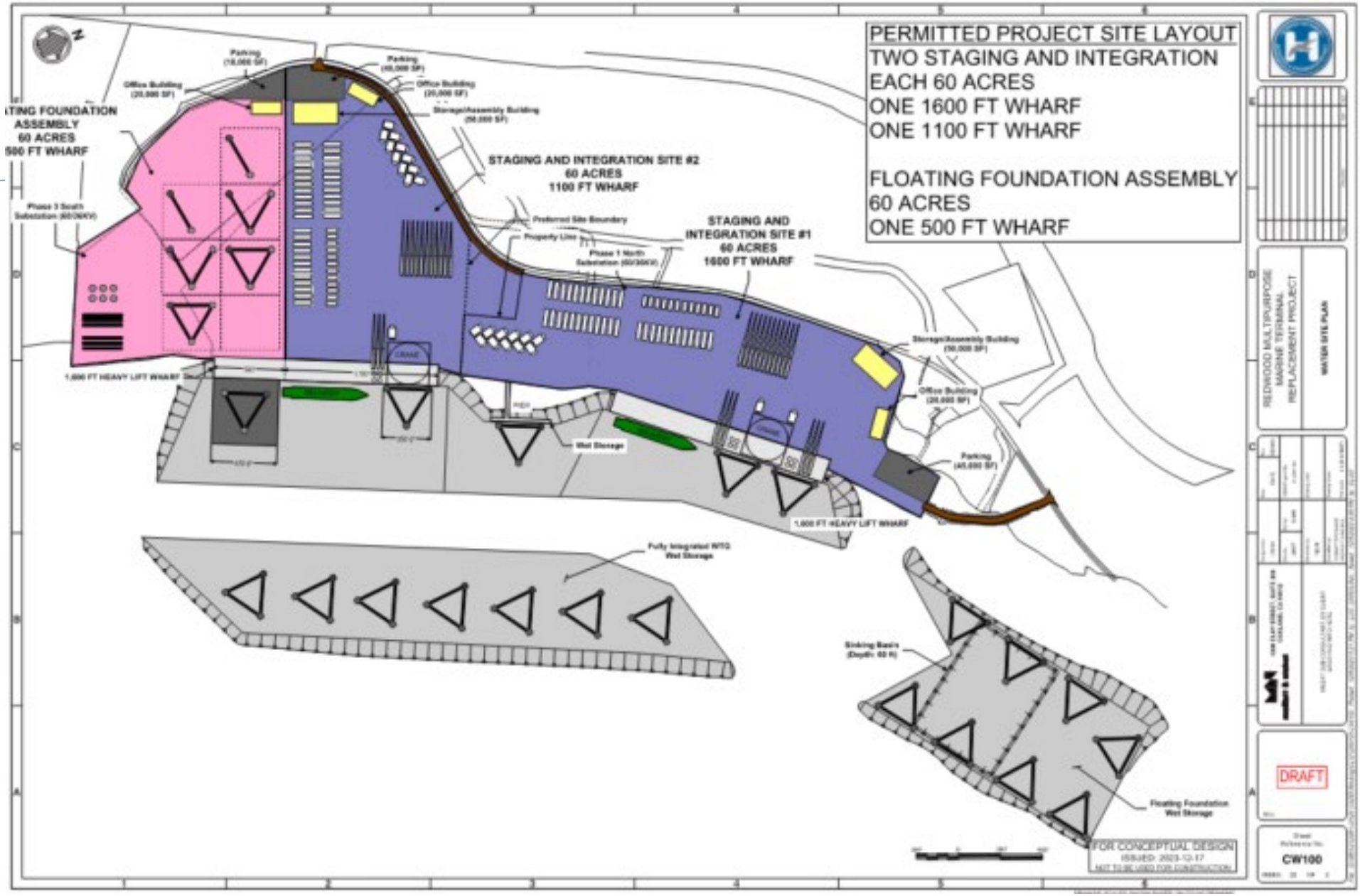
Port of Humboldt Project Location and Setting

- Samoa Peninsula in Humboldt Bay
- Project site situated in a developed industrial area of the Samoa Peninsula where timber processing, pulp mills, and other timber-related industrial operations historically occurred

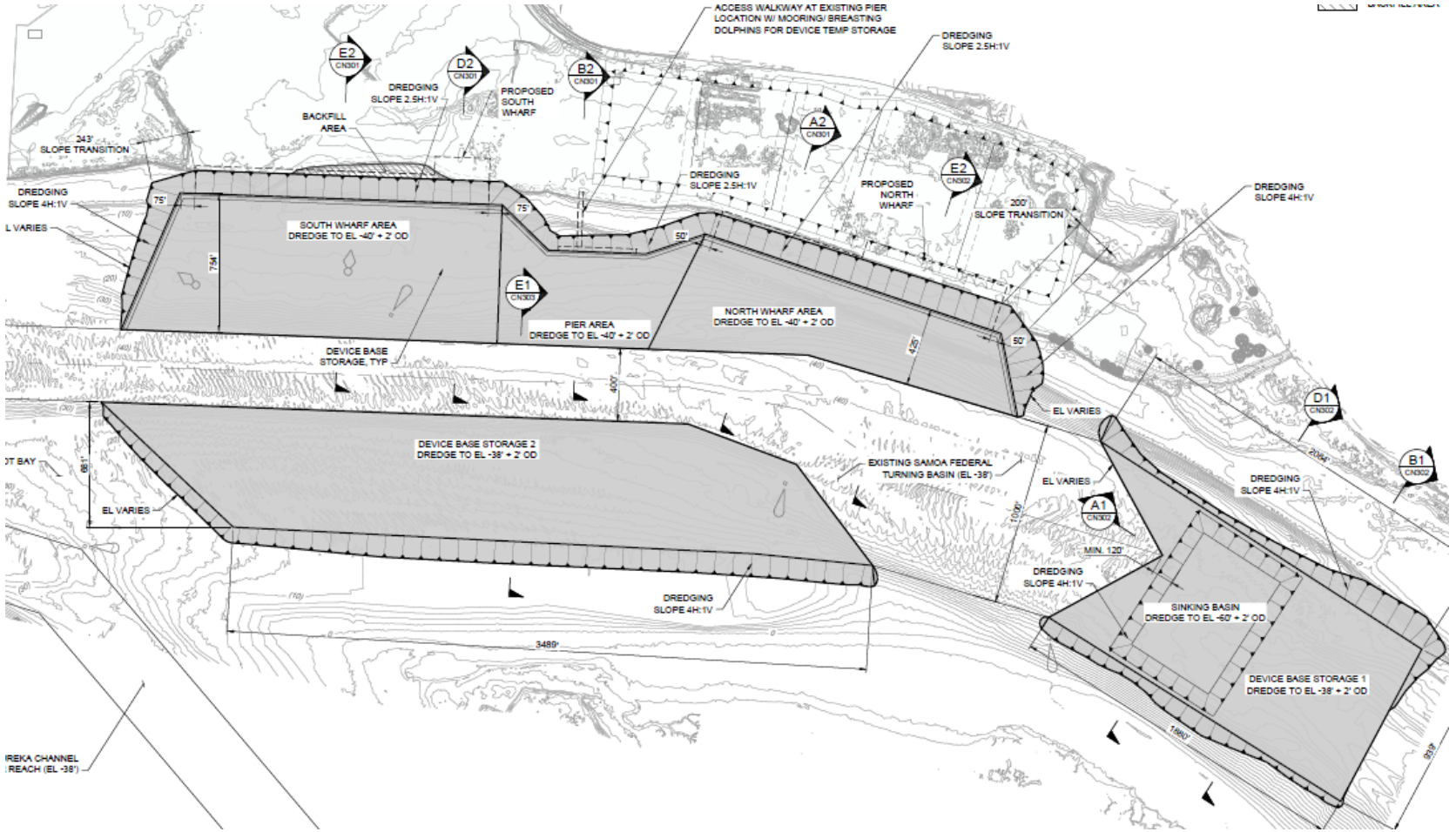


Humboldt Redwood Marine Multipurpose Replacement Project - Background

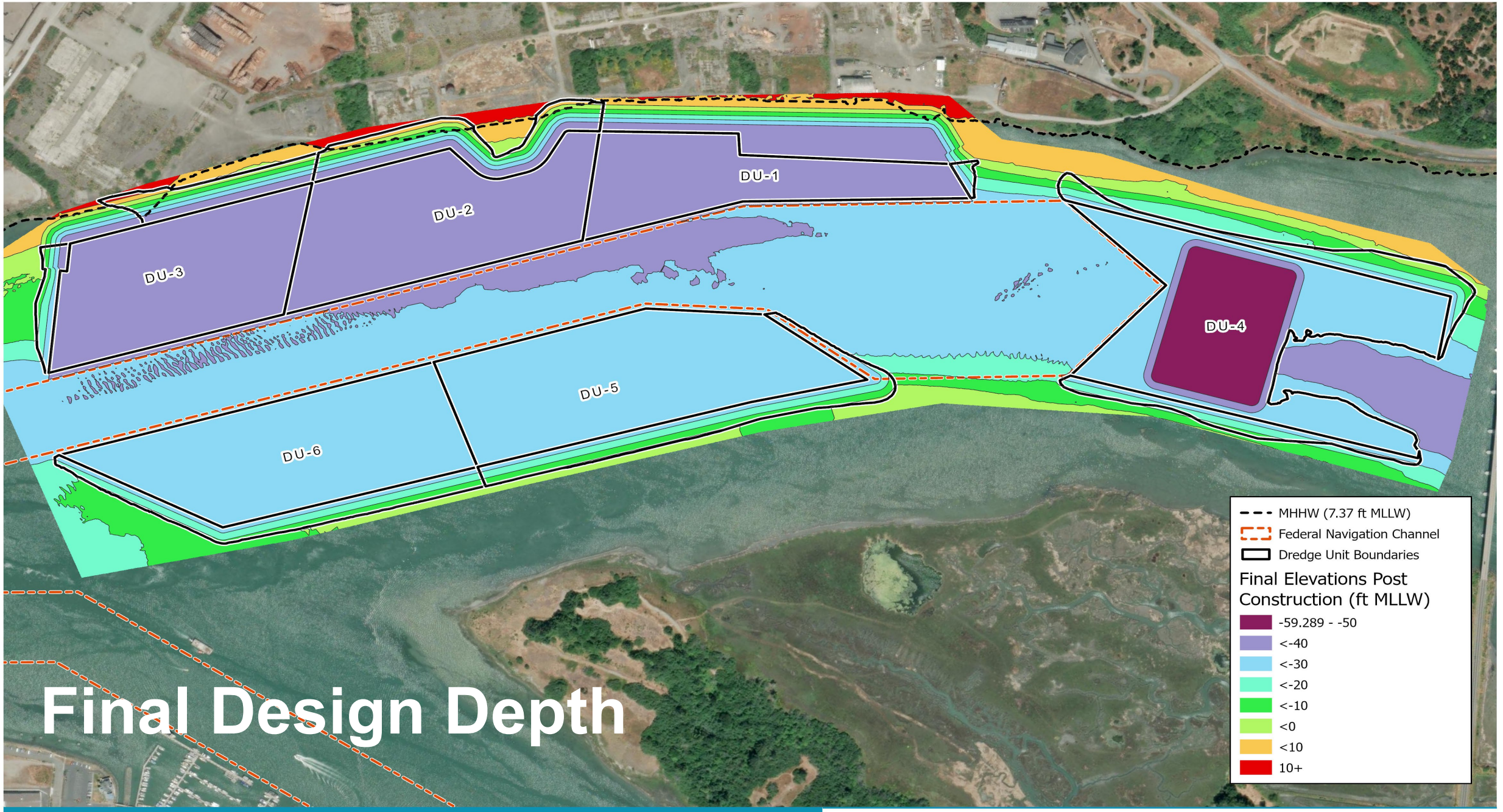
- Redevelop a marine terminal on approximately 180-acre site at the Port of Humboldt Bay
- Project will provide new multipurpose, heavy-lift marine terminal facility to support offshore wind industry
- Can be designed to create 2 staging and integration sites



15% Dredge Design



- Design depths
- -40 ft depth at wharf
- 2.5H:1V slope at wharf with new rock revetment
- -38 ft depth floating storage area
- -60 ft depth sinking basin
- 4H:1V slope in storage area
- -38 ft depth floating storage area
- 4H:1V slope in storage area



Final Design Depth

HUMBOLDT BAY HARBOR DISTRICT REDWOOD MARINE MULTIPURPOSE TERMINAL

SAMOA, CA

moffatt & nichol | 05.02.2025 | PROPOSED DREDGE DESIGN

1 INCH = 500 FEET

0 250 500 1,000 1,500 FT

Dredged Material Characterization Areas

- Toral Dredge Volume of 5,641,000 cubic yards (cy)
- ~1,000,000 cy per dredge unit
- All dredged material characterized for unconfined open water placement (HOODS)
  - This will allow for the broadest of beneficial use applications
  - Will provide the most time for alignment of beneficial reuse options
  - If suitable beneficial use option cannot be found, then the program can proceed with placement at HOODS

Parameter	Area (acres)	Average Existing Depth (ft MLLW)	Design Dredge Elevation (ft MLLW)	Estimated Cut Quantity to New Project Depth (cy)	Estimated Quantity for 2ft Overdepth(cy)	Total Dredge Volume (cy)
DU-1 (North Wharf)	16.4	-23	-40	409,000	52,000	461,000
DU-2 (Pier)	29.9	-17	-40	1,087,000	76,000	1,163,000
DU-3 (South Wharf)	26.7	-15	-40	1,008,000	70,000	1,078,000
DU-4 (Device Storage 1 & Sinking Basin)	37.8	-33	-38 (Device Storage)	713,000	97,000	810,000
		-33	-60 (Sinking Basin)			
DU-5 (Device Storage 2)	34.8	-19	-38	975,000	91,000	1,066,000
DU-6 (Device Storage 2)	31.2	-16	-38	979,000	84,000	1,063,000
Total	173.6	--	--	5,171,000	470,000	5,641,000

Beneficial Reuse Considerations

- Potential beneficial reuse opportunities for clean materials will be prioritized over ocean disposal when possible
  - Beach nourishment
  - Nearshore nourishment
  - Salt marsh/wetland enhancements – to be independently permitted, not part of this project description
  - From discussions with others, we have heard there is a need for material to support jetty and discharge pipe repairs near beaches
- Potential beneficial reuse for impacted materials
  - Upland fill and/or surcharge

Additional Beneficial Reuse Considerations

Future investigations may include establishing grain size envelopes for potential placement areas

Material Suitable for Unconfined Disposal

- Sand content >80% = beach nourishment
- Sand content similar to nearshore = nearshore
- High concentration of fines = permitted to receive sediment in areas in adjacent wetlands, habitat improvement area
- Port fill / upland fill to meet grading needs
- No permitted area to receive material = HOODS

Material Not Suitable for Unconfined Disposal

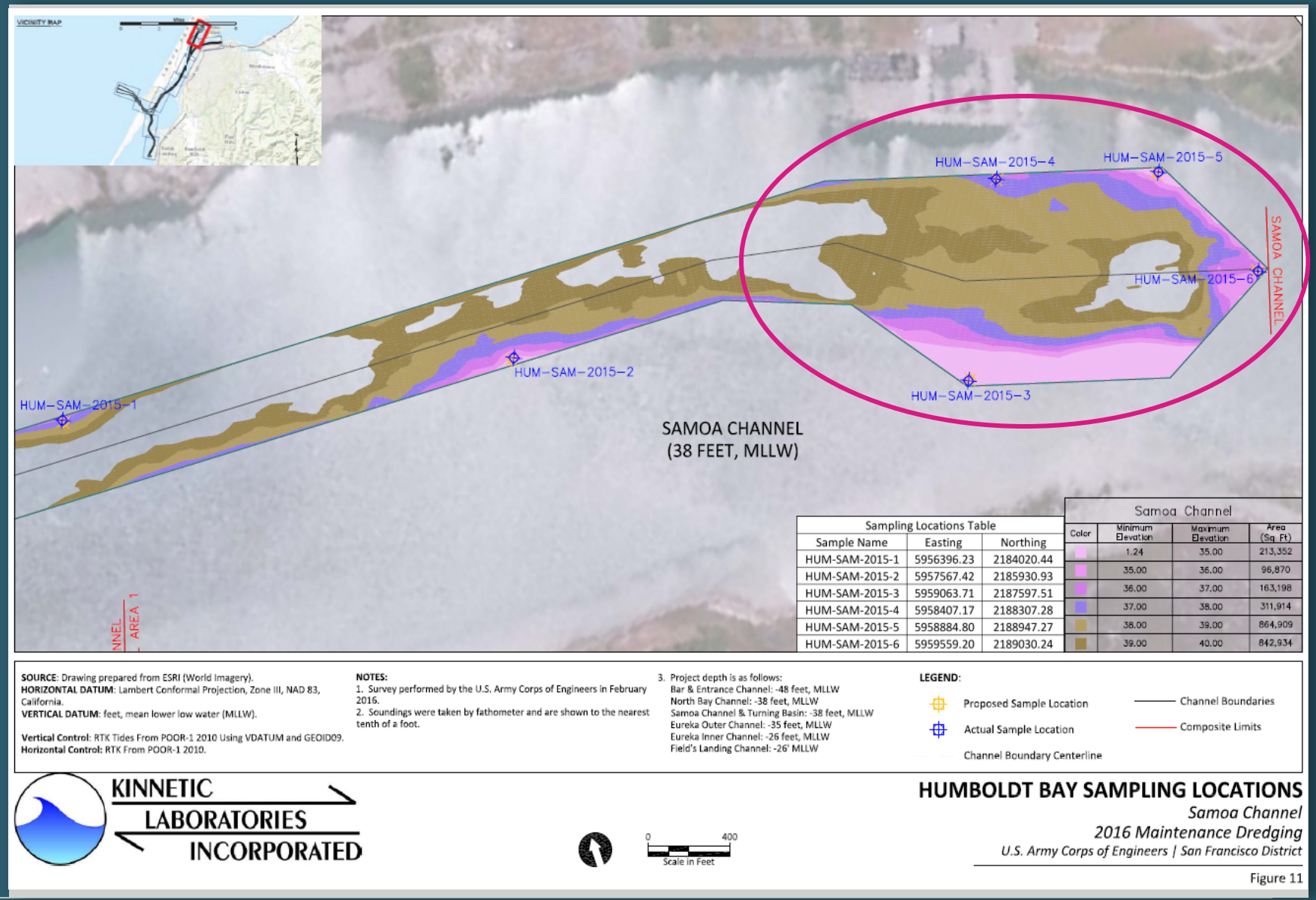
- Port fill / upland fill to meet grading needs
- Containment in a permitted confined aquatic disposal facility
- Upland disposal in landfill – daily cover

Anticipated Material Quality

- New dredging, assumed cuts will be made into native material with little to no exposure to anthropogenic pollutants
- Material is likely layered with sand and finer muds
- 9 maintenance dredging evaluations in the last 20 years – all material suitable for unconfined open water disposal
- USACE 2015 maintenance dredging in channel found minimal elevated contaminants – table is summary of all contaminants that were elevated above reference or applicable guidelines
  - Nickel is naturally elevated in this region

Valid Analyte Name		Reference Sediments		Ecological Screening[1]	
	Samoa Channel HUM-SAM-3,4,5 Comp	Historic HOODS (HOODS-REF)	New HOODS (HOODS-NEW)	Salt ERL	Salt ERM
METALS (mg/kg dry)					
Chromium		66.2	74.4	81	370
Copper		16.5	19.8	34	270
Lead		6.19	6.85	46.7	218
Mercury		0.0344	0.0446	0.15	0.71
Nickel	**87**	**77.3**	**90.8**	20.9	51.6
Selenium	0.22	0.09	0.12		
Silver	0.0925J	0.0466J	0.0525J	1	3.7
Zinc		57.8	69.4	150	410
PAH's (µg/kg dry)					
Fluorene	**28**	13J	17	19	540
Total Low Weight PAHs		185	246	552	3160
Total High Weight PAHs	282	67.5	81.2	1700	9600
Total PAHs	637	253	327	4022	44792
OC PESTICIDES					
Total DDT		ND	ND	1.58	46.1
PCB CONGENERS (µg/kg					
Total PCB Congeners		ND	ND	22.7	180
DIOXINS (ng/kg dry)					
Total TEQ	1.35	0.397	0.323		

Last Dredge Characterizations

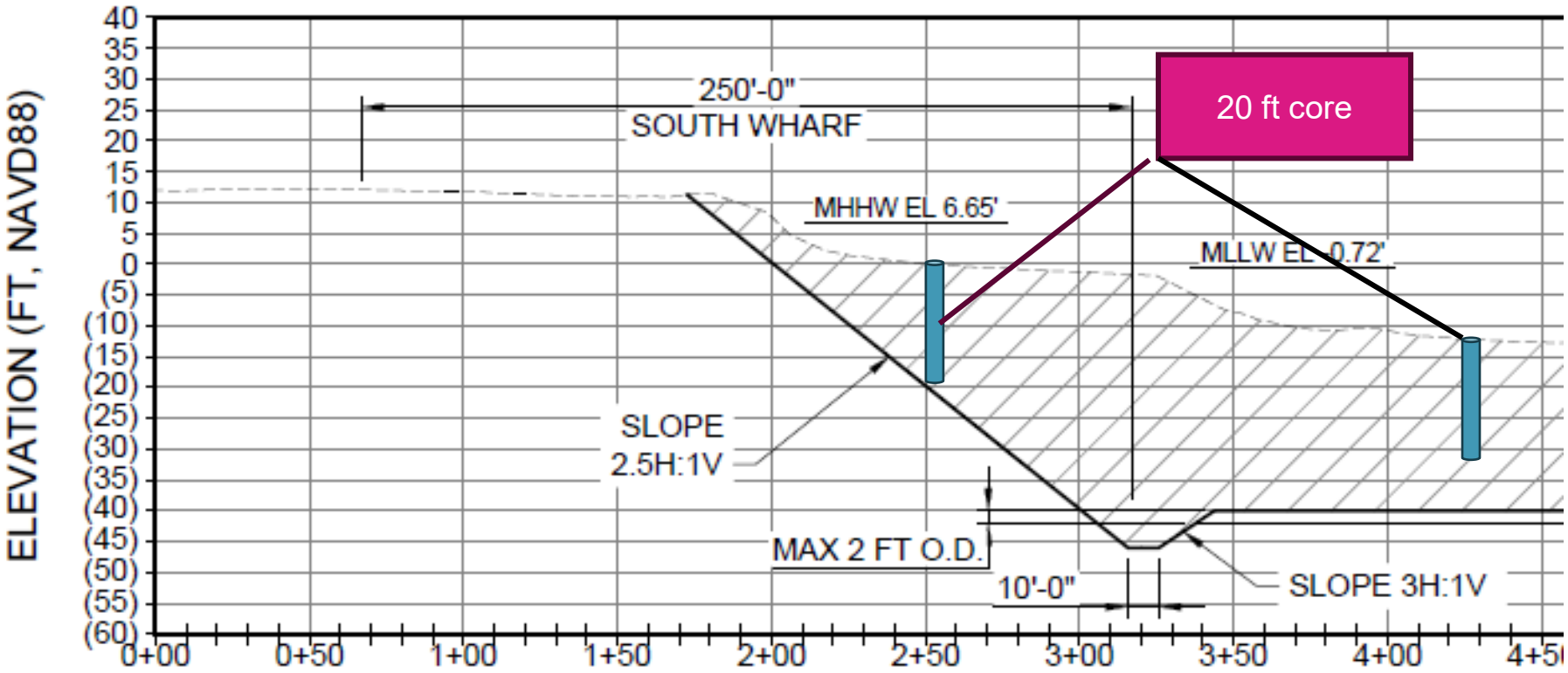


- Samoa Channel and Turning Basin
- Tier III testing conducted in 2015 at 3, 4, 5 composite due to high fine content (~50%)
- No toxicity observed
- Tissues analyzed for Cr, PAHs, and dioxins
- Concentrations were not significantly different from reference material
- 2021 sampling showed similar grain size and chemistry results, but biological testing was not deemed necessary

Sampling Considerations

- Maximum depth of core attempt is 20 feet into native material
  - Many cuts are deeper, but want to confirm that deeper uncharacterized material is inferred to be similar to overlying tested layer
    - Borings in support of geotechnical evaluation can provide missing information, if needed
      - Confirmation the geology is similar in deeper unsampled areas
      - Select specific elevations to test for specific analytes to confirm mateiral is similar to overlying material
  - In addition, collection of z-layer samples
    - Bottom 6 inches of core is achieved and tested if needed

Samling Considerations



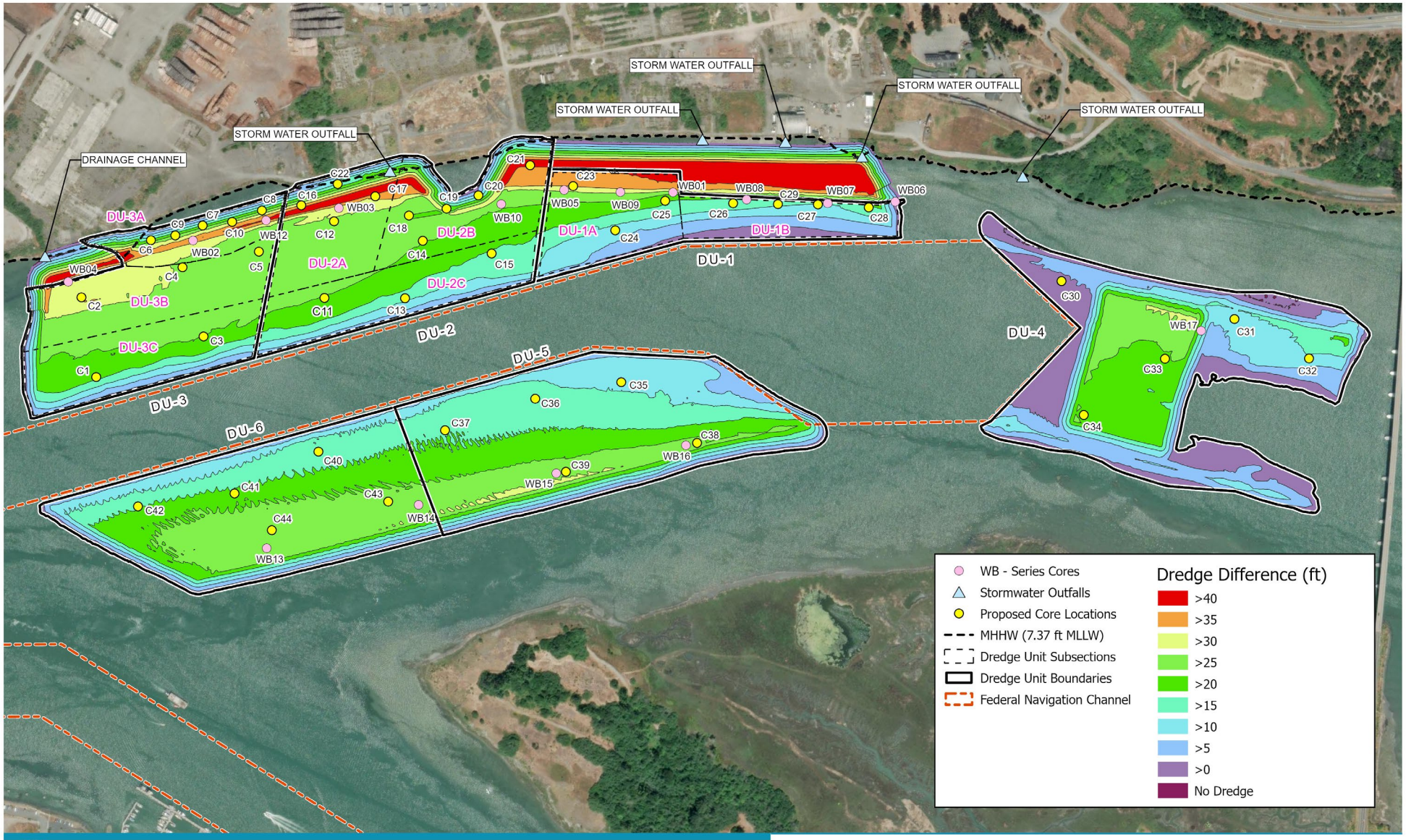
- Place cores to allow them to represent the entire cut
- Where not possible, look to align with Geotech borings
- Geotech borings will be needed for wharf design and slope stability in storage area

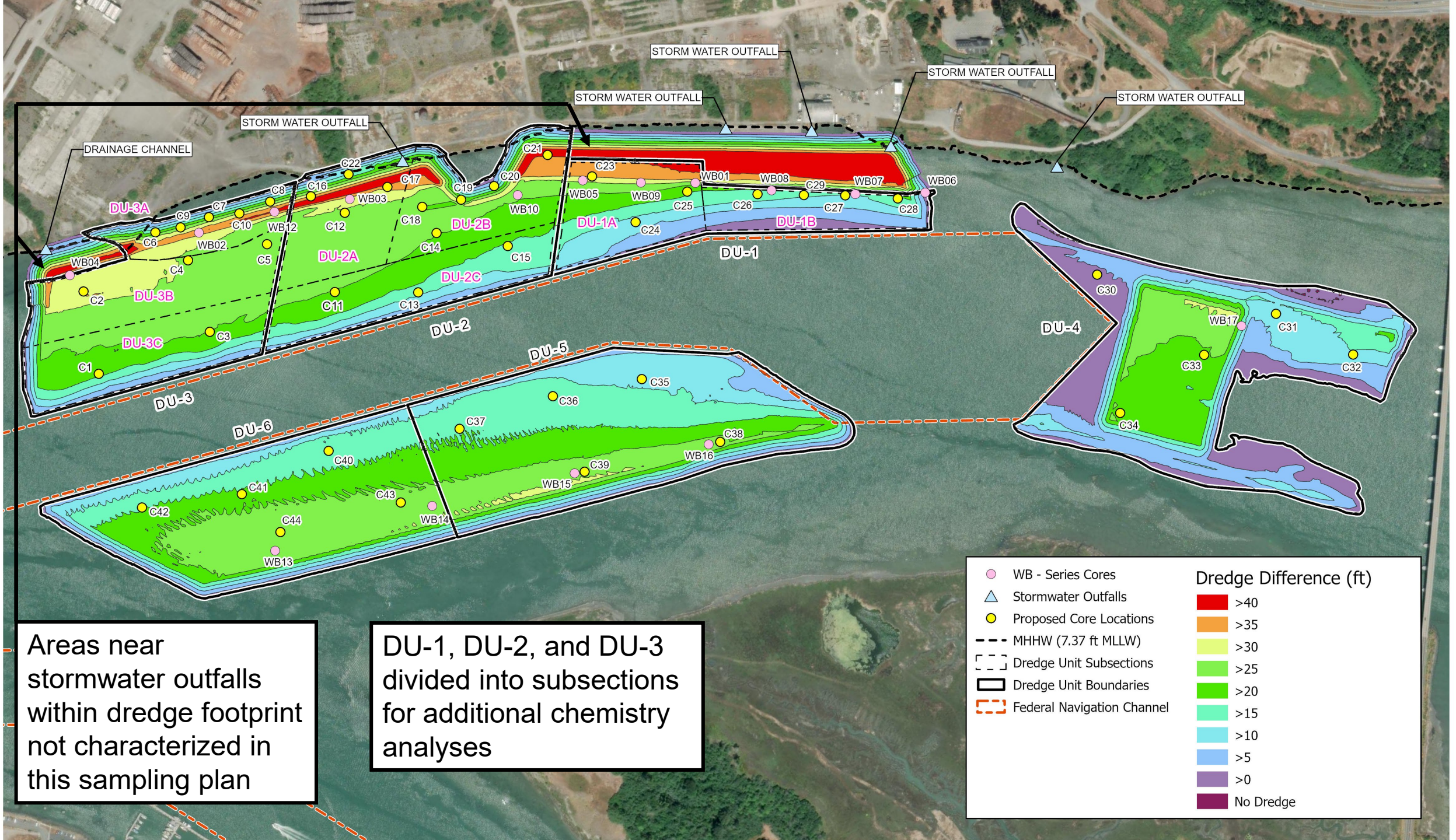
Sampling Approach Updates

- Sampling approach has been updated many times since SAP initially submitted to agencies with an emphasis on DUs closest to shore
  - ~15 samples have been added
  - DU-1, DU-2, and DU-3 has been split into subsections for further chemistry analyses
  - Areas nearest stormwater outfalls have been removed from the sampling plan and will be further investigated with a later sampling plan
    - ~600,000 cubic yards will not be characterized in current sampling plan

Sampling Plan

- 6 Dredge Units
  - 8 additional subsections
- 60 Samples
  - 44 vibracores from DUs for ocean testing
  - 16 geotechnical borings to be collected in summer to supplement chemical characterization
  - Reference sediment will be collected from HOODS reference site




STORM WATER OUTFALL
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DRAINAGE CHANNEL
DU-3A
DU-3B
DU-3C
DU-2A
DU-2B
DU-2C
DU-1A
DU-1B
DU-1
DU-2
DU-3
DU-4
DU-5
DU-6
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
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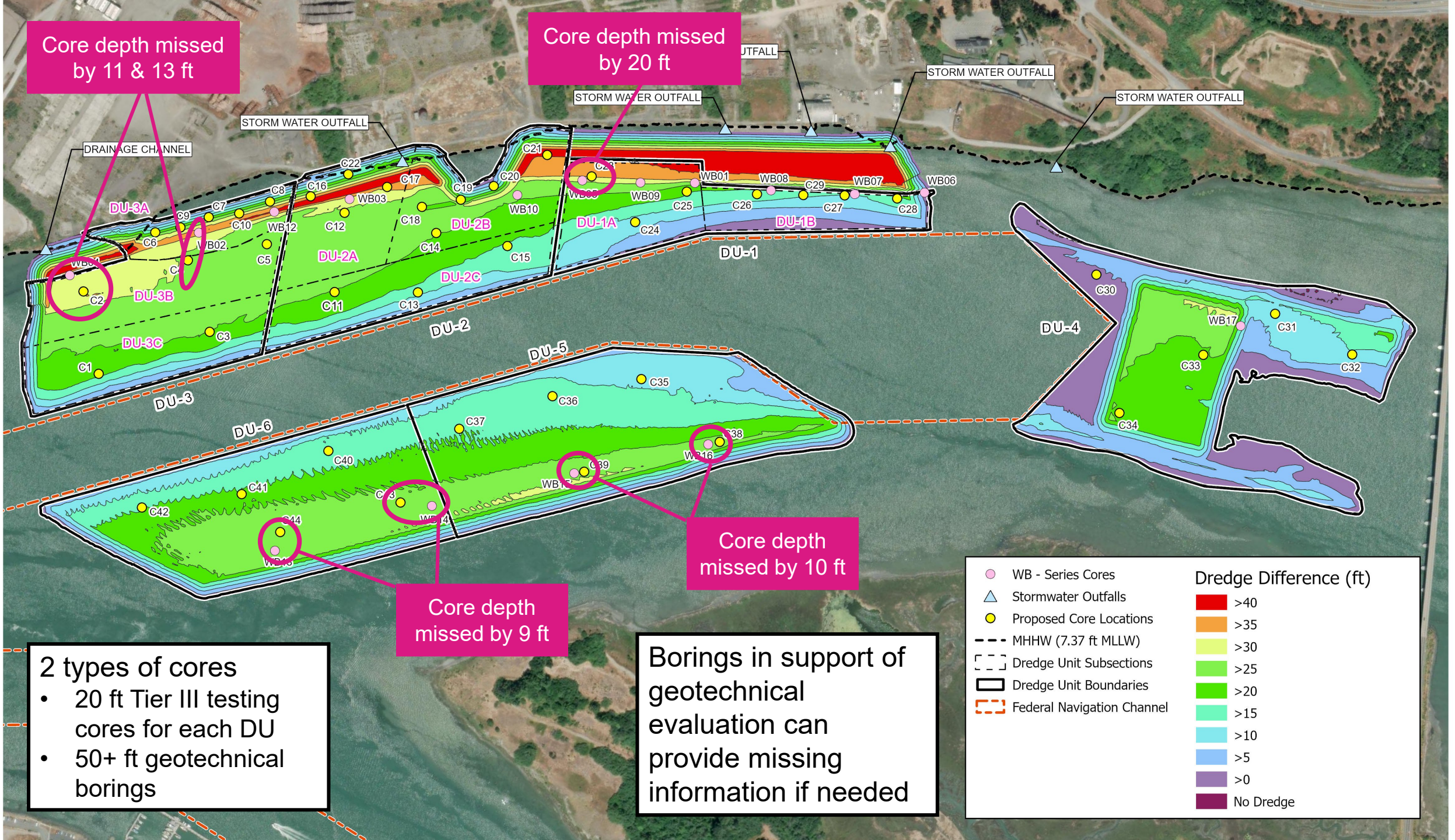
C36
C37
C38
C39
C40
C41
C42
C43
C44
WB01
WB02
WB03
WB04
WB05
WB06
WB07
WB08
WB09
WB10
WB12
WB13
WB14
WB15
WB16
WB17
Areas near stormwater outfalls within dredge footprint not characterized in this sampling plan
DU-1, DU-2, and DU-3 divided into subsections for additional chemistry analyses
WB - Series Cores
Stormwater Outfalls
Proposed Core Locations
MHHW (7.37 ft MLLW)
Dredge Unit Subsections
Dredge Unit Boundaries
Federal Navigation Channel
Dredge Difference (ft)
>40
>35
>30
>25
>20
>15
>10
>5
>0
No Dredge



2 types of cores

- 20 ft Tier III testing cores for each DU
- 50+ ft geotechnical borings

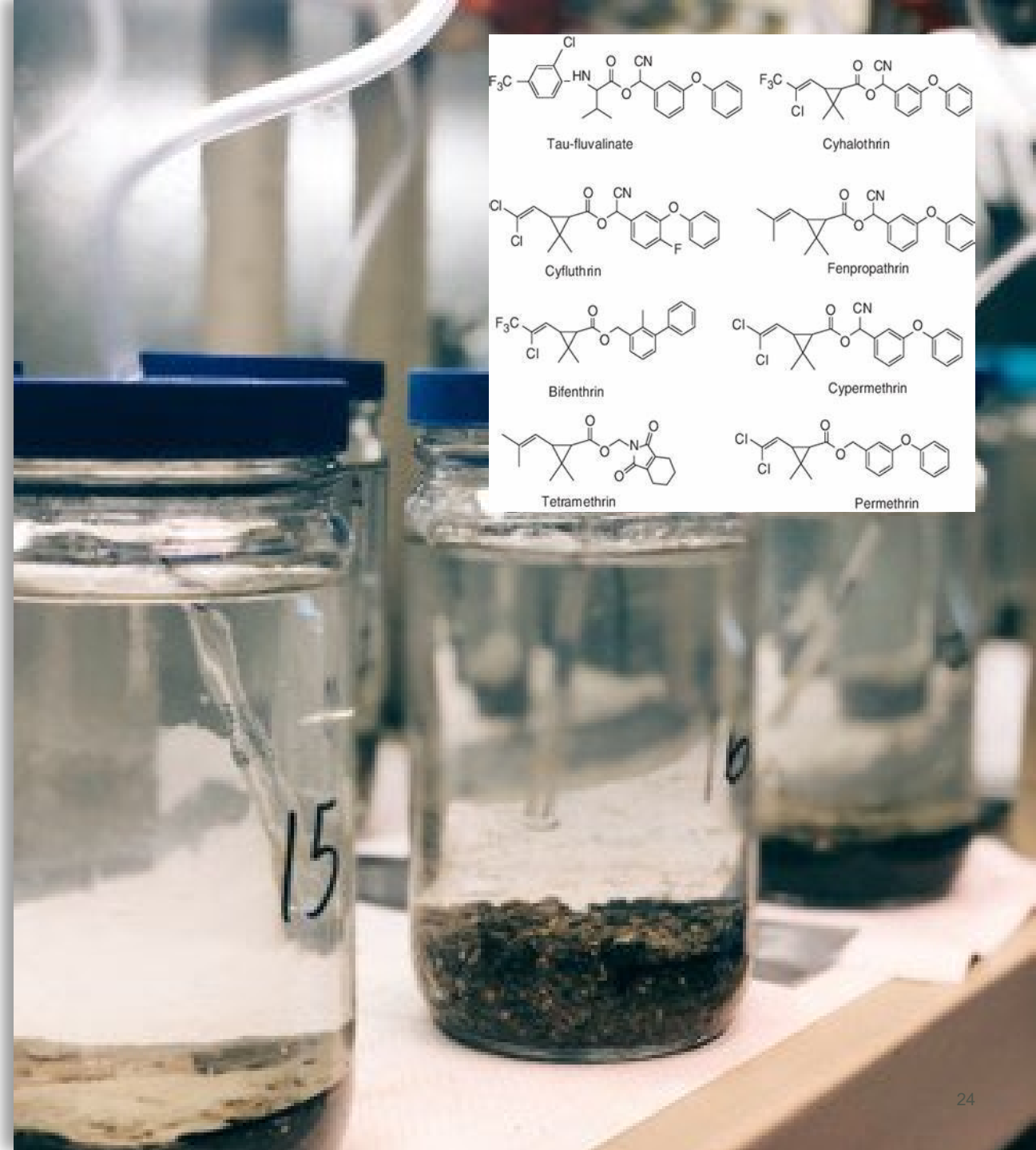
Borings in support of geotechnical evaluation can provide missing information if needed

Other Sampling Considerations

- Comments received from 7 stakeholders
  - USEPA
  - RWQCB
  - NOAA
  - CCC
  - CDFW
  - CDPH
  - Waterkeeper
- Requests for additional sampling locations (incorporated in previous maps)
- Requests for additional chemical analyses
- Clarification on eelgrass avoidance measures
- Clarification on methods to prevent discharge of sediment during sampling
- Comments related to water quality concerns related to resuspension of resting algal cysts

Requests for Additional Chemical Analyses

- Phenols
- Pyrethroids
- Chlorinated phenols
  - 2,3,4,6-Tetrachlorophenol (TCP)
  - Pentachlorophenol (PCP)
- z-layer samples in nearshore area analyzed upfront



Eelgrass Avoidance

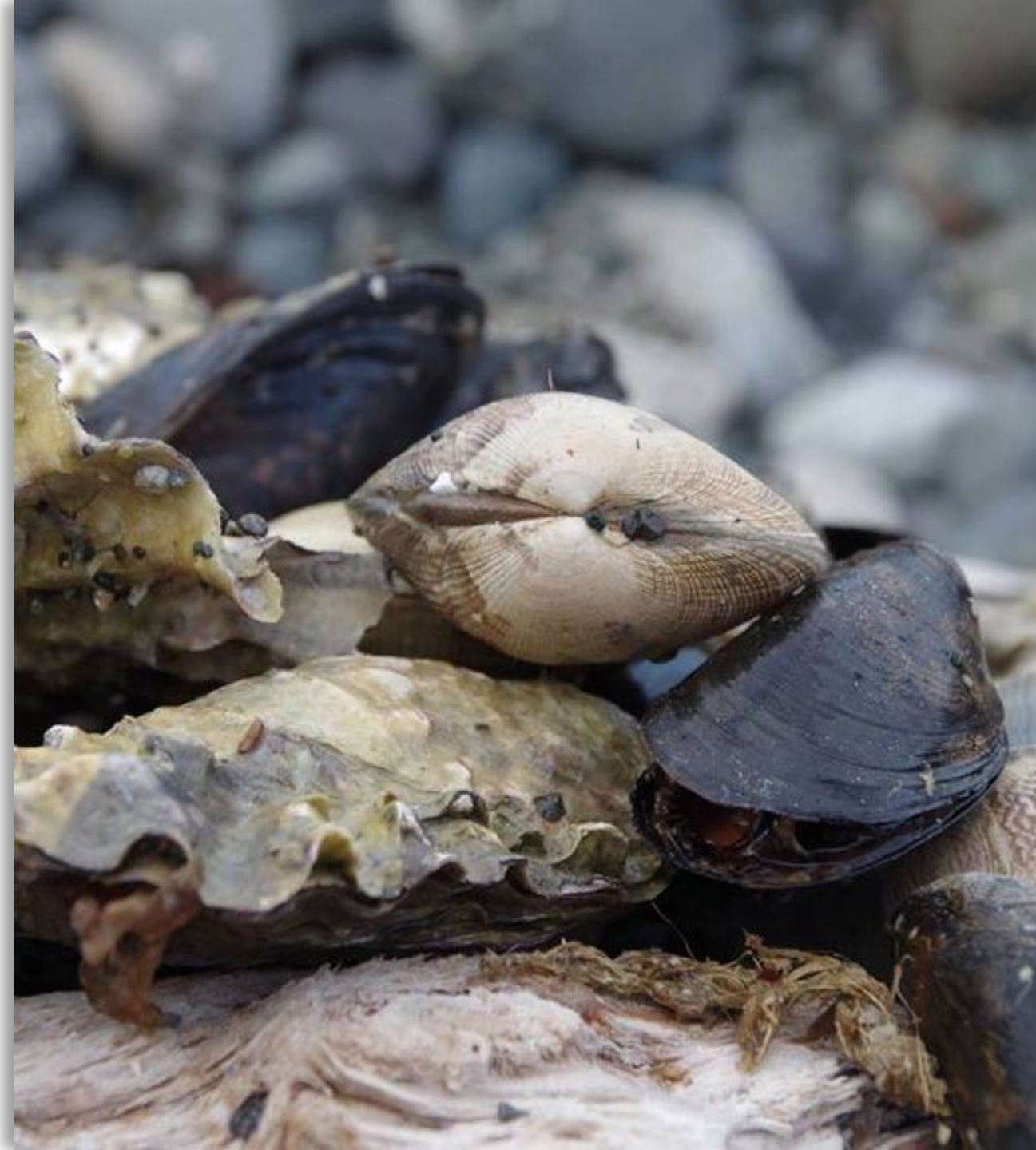
- Considerations for sampling sites that occur within/near eelgrass habitat
  - Sampling will occur during high tide
  - Vessel can be position using poles and no anchoring will occur on eelgrass
  - Observations will occur during sampling to avoid eelgrass, and sampling can occur within 50 ft of original location when eelgrass is present

Discharge During Sampling Activities

- All sediment will be retained in a 55-gal drum for disposal or sent to the laboratories for analyses
- Sediment will NOT be discharged back into the Bay

Shellfish Growers and HABs

- Humboldt Bay is the largest shellfish producing bay in California
- CDPH and shellfish growers in the area have expressed concerns about the resuspension of harmful algal blooms (HABs) during dredging
- Team is currently working with growers through the EIR process to address these concerns



Preparing for Field Investigation

- Response to most recent comments submitted in early May
- Waiting on CCC, RWQCB, and USACE sampling permits
- Sampling for both geotechnical boring and sediment quality expected this summer

California Energy Commission: Offshore Wind Energy Waterfront Facility Improvement Program Grant

Catergory II - Offshore Wind Energy Waterfront Facility Improvement Program

Proposed Award						
Rank Number	**Project Applicant**	**Title**	**CEC Funds Requested**	**CEC Funds Recommended**	**Score**	**Award Status**
1	City of Long Beach Harbor Department	Port Offshore Wind Equity and Readiness (POWER)	$20,000,000	$20,000,000	90.80	Awardee
2	Humboldt Bay Harbor, Recreation, and Conservation District	The Humboldt Bay Offshore Wind Heavy Lift Marine Terminal - Advanced Design and Public Engagement Project	$19,926,437	$18,250,000	87.00	Awardee
3	BlueLift LLC	BlueLift S&I Facility at Port of Los Angeles	$7,500,000	$0	72.92	
4	Port of San Francisco	Pier 94-96 Offshore Wind Site Preparation for Manufacturing & Fabrication	$9,500,000	$0	72.43	
Total Funding Recommended				**$38,250,000**		

https://www.energy.ca.gov/sites/default/files/2025-03/GFO-24-701_NOPA_Results_Table_2025-03-07_ada.pdf

Questions

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Additional Slides

Chemical and Biological Testing

- Sediment chemistry:
  - Total solids, grain size, TOC, TPHs, metals, PAHs, PCB congeners, OC pesticides, organotins, dioxins/furans, phthalates, phenols, VOCs
- Biological Testing
- Tissue Chemistry
  - Lipids
  - Bioaccumulative contaminants found at elevated concentrations, in consultation with USEPA and USF&W

Test Type	Species	Method	End Points
Suspended Particulate Phase:			
Mysid Shrimp	*Mysidopsis bahia*	USACE/USEPA 1991, 1998	4-day survival
Inland silverside fish	*Menidia beryllina*	USACE/USEPA 1998	4-day survival
Bivalve larvae	*Mytilus galloprovincialis*	USACE/USEPA 1998	48 hour
Solid Phase:			
Amphipod	*E. eohastuaius*	ASTM E1367–14, USEPA 1994	10-day survival
Polychaete	*Neanthes arenaceodentata*	ASTM E1611-00(2013)	10-day survival
Bioaccumulation Phase:			
Clam	*Macoma nasuta***	ASTM E1688-00a	28-day survival and bioaccumulation
Polychaete	*Nereis virens*		

Offshore Wind Requires Ports

- What is needed for Offshore Wind?
  - Wind Resource
  - Electrical Grid
  - Ports and Port Terminals
- Construction, Operations, and Maintenance of OSW farms requires Ports:
  - Sheltered harbor areas
  - Large laydown areas
  - Deep, navigable water
  - Heavy load capacity
- There are no existing port terminals on the US West Coast that can currently support OSW
  - Requires significant investment and development
  - Requires a multi-port strategy
  - Adding a new maritime industry without displacing or replacing existing maritime uses

Photo Reference: Principle Power

Sampling Approach

- Larger dredge units for native materials.
- Deep cuts require fewer samples to provide representation.
- Density of cores similar to other dredge designs for assessment of native materials.
- Material anticipated to homogeneous from a chemical exposure perspective.
- However, there is potential for COPC exposure from stormwater runoff along North Wharf. Therefore, program includes samples along historically industrialized bank to confirm if COPCs are present. In addition, sediment surface (5 ft) archives will be collected.