Geotechnical Engineering Services Report
Revision 3

Port of Ilwaco, Marina Structures Replacement and Dredging, Engineering, and Permitting
1170 Howerton Avenue East
Ilwaco, Washington

File No. 21551-003-00

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Prepared for:

Moffatt & Nichol
600 University Street, Suite 610
Seattle, Washington 98101

Attention: Victoria R. England, LG

Prepared by:

GeoEngineers, Inc.
1101 South Fawcett Avenue, Suite 200
Tacoma, Washington 98402
253.383.4940

Levi S. Potter, EIT
Staff Geotechnical Engineer

Brett E. Larabee, PE
Geotechnical Engineer

Morgan McArthur, PE
Associate Geological Engineer

MORGAN McARTHUR
STATE OF WASHINGTON
46390
REGISTERED
PROFESSIONAL ENGINEER

10/4/23

LSP:BEL:MM:leh:mls:ch

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1.0 INTRODUCTION AND PROJECT UNDERSTANDING

GeoEngineers, Inc. (GeoEngineers) is pleased to submit this report presenting the results of our geotechnical engineering services for the proposed Port of Ilwaco, Marina Structures Replacement and Dredging, Engineering, and Permitting Upgrades project. This report summarizes our understanding of subsurface conditions in the project area and provides geotechnical recommendations and design criteria for the project. The project site is located at 1170 Howerton Avenue East, Ilwaco, Washington 98624, as shown on the Vicinity Map, Figure 1.

The project includes designing repairs and improvements to the existing wharf east bulkhead. The existing bulkhead consists of creosote treated timber piles, lagging, and walers. Wire strand tiebacks connected to the timber waler are presumed to connect to buried deadman anchors in the upland area. Three steel pipe piles are located along the face of the existing bulkhead and are assumed to be used for mooring of vessels. We understand that a replacement bulkhead consisting of a sheet pile wall embedded into the underlying siltstone will be constructed in front of the existing wharf east bulkhead. We understand tiebacks will be used to secure the top of the wall.

Improvements to shoreline areas surrounding the wharf east bulkhead are also planned. The majority of the improvements consist of slope armoring using rip rap. We understand that within the shoreline area northeast of the proposed bulkhead a relic timber wall on the shoreline slope will be removed, rip rap slope protection will be installed, and a small berm will be constructed at the top of the slope. The berm will be on the order of 1 foot tall and is being included to mitigate the effects of future sea-level rise. At the south end of the bulkhead we understand that existing concrete rubble slope armoring will be removed and replaced in-kind with riprap on the order of 18 inches thick.

2.0 PURPOSE AND SCOPE OF SERVICES

The purpose of our services is to provide design recommendations to support replacement of the Port of Ilwaco (POI) wharf east bulkhead and installation of slope protection on the shoreline slope to the northeast of the new bulkhead. Design recommendations included in this report are based on available existing subsurface information, our site explorations conducted on March 14 and March 19, 2022, and our experience in the project vicinity.

Our specific scope of services is presented in our Scope and Fee Estimate dated December 13, 2019 and Service Agreement with Moffatt & Nichol dated January 25, 2022.

3.0 SITE CONDITIONS

3.1. Surface Conditions

The site is located at the west end of the Ilwaco marina on a wharf currently occupied by multiple buildings associated with a fish processing facility. The existing bulkhead, which will be repaired as part of this project, delineates the eastern edge of the wharf. The buildings are generally located along the western edge of the wharf. The retained area between the bulkhead and buildings is approximately 27 feet wide. The shoreline at the north end of the bulkhead consists of gravel and grasses at the surface sloping down at approximately 2H:1V (horizontal to vertical) to the shoreline. At the south end of the bulkhead, the shoreline is sloped at approximately 1H:1V and consists of fill and riprap.

3.2. Site Geology

We reviewed the Geologic Map of Washington-Southwest Quadrant (Walsh, et al. 1987) to develop an understanding of the site geology. The surface geology of the project site is mapped as "Beach Deposits," and potentially underlain by bedrock mapped as "Oligocene to upper Eocene marine sedimentary rocks." The Beach Deposits are described as fine to coarse sand. The marine sedimentary bedrock is described as siltstone, and/or fine sandstone. Based on the site history and human modification, we also anticipate that fill material is present in the project vicinity.

3.3. Subsurface Exploration

We explored site subsurface conditions by completing two borings (B-1D and B-2A) at the approximate locations shown on the Site Plan Figure 2. The borings were advanced to depths of 65 and 70 feet below ground surface (bgs) using subcontracted track-mounted drilling equipment and vacuum trucks operated by drillers subcontracted to GeoEngineers. During our initial site exploration effort, six attempts were made to use a hollow stem auger drilling method to drill within the wharf footprint, but each attempt met practical refusal at depths of less than 5 feet. Attempted borings B-1, B-1A, B-1B, B-1C are also shown on the attached Site Plan Figure 2. We were able to complete boring B-2A just upland of the wharf footprint during this initial visit. We returned to site at a second time and were able to successfully complete boring B-1D in the same location as the original B1-D attempt using a sonic drill rig. Additional details of the exploration program and summary logs of the explorations are included in Appendix A, Field Explorations.

Soil samples obtained from the borings were taken to our geotechnical laboratory for further evaluation. Testing included moisture content determinations, percent fines determination and gradation analyses. A description of the laboratory test procedures and test results are presented in Appendix A and/or on the boring logs.

TABLE 1. UNSUCCESSFUL BORING ATTEMPTS

Boring	Depth of Termination (ft)	Reason for Termination	Observed Soils	Comment
B-1	3	Refusal on pipe	GP-GM	Corrugated Steel pipe at 3 feet bgs
B-1A	4	Refusal In cobbles	GP-GM	Yellow Plastic pipe (approx. 2-inch-diameter) Patch of clean sand fill approximately 6 inches around pipe
B-1B	3.5	Refusal In cobbles	GP-GM	
B-1C	3.6	Refusal In cobbles	GM	Layer of sandy silt with gravel and cobbles around 2 to 2½ feet
B-1D	3.6	Refusal In cobbles	GP-GM	
B-2	4.3	Refusal In cobbles	GP-GM	

3.4. Soil Conditions

Alluvial deposits in the site vicinity generally consist of soils with high silt content. The predominant soil types are sandy silt and silt, but these are often closely interbedded and may include lenses of variable thickness and/or inclined layers as well as regions of cleaner sands. Soils observed in our explorations generally consist of fill overlying native alluvial deposits overlying the regional bedrock, as described in the following paragraphs.

3.4.1. Fill

All borings and attempts except B2-A were advanced through asphalt pavement. Thickness of asphalt observed ranged from 3 to 6 inches. Boring B-2A encountered about 2 inches of silty sand topsoil. Starting below the asphalt (or below the topsoil in B2-A) to approximately 5 feet bgs, we observed brown fine to course gravel with silt and cobbles in a loose and moist condition. Occasional lenses of higher silt and sand content were observed as well.

3.4.2. Submerged Fill

Underlying the fill unit we generally observed brown silty fine to medium sand in a loose and wet condition, which we interpret to be a separate fill unit. For differentiation purposes, we have identified this fill unit as submerged fill. The top of the unit was observed at 5 feet bgs and the base varied from 12 feet bgs in B-1D and 15 feet bgs in B-2A.

3.4.3. Alluvial Deposits

Beneath the submerged fill unit, we interpret soils to consist of native alluvial deposits. Alluvial deposits generally consisted of interbedded layers of clay, silt with varying sand content, and silty sand. During drilling of boring B-2A we observed a transition in stiffness/density and based upon this observation, we divided the alluvial deposits into an upper and lower unit.

3.4.3.1. Upper Alluvial Deposit

The upper alluvial deposits were observed directly below the submerged fill unit and extending to about 30 feet in B-1D and 40 feet in B-2A. Soils observed in this unit were typically silts and clays with varying sand content. We also observed occasional interbeds of silty sand, typically 5 feet thick or less. The unit is generally soft/loose and wet. In addition, wood debris was consistently observed throughout the unit.

3.4.3.2. Lower Alluvial Deposit

Below the upper alluvial deposits, we observed lower alluvial deposits in boring B-2A, which extend to approximately 60 feet bgs. Soils observed generally consist of soft to medium stiff silt and brown fat clay. The unit is soft at the top and ranges to medium stiff at its base. Wood organic debris was observed in the upper 5 feet of the unit. Note that the lower alluvial deposits unit was not observed in boring B-1D.

3.4.4. Weathered Siltstone

Below the alluvial deposits, both borings encountered what we interpret to be weathered siltstone bedrock, extending to depths of 55 feet in B-1D and 65 feet in B-2A. The samples retrieved typically consisted of wet medium stiff to very stiff silt, but the material was observed to break into a blocky texture when cut with a soil knife.

The upper and lower boundaries of this unit were somewhat indistinct because the general soil type was very similar in the alluvial deposit and the more intact siltstone (described below). The extent of the weathered siltstone unit was delineated through changes in standard penetration test (SPT) blow counts and observed texture of the samples retrieved. The interpreted degree of weathering is relatively high, based on the consistency and the ability to drill through the material using hollow stem auger drilling and collect samples using standard penetration testing.

3.4.5. Siltstone

Below the weathered siltstone, we observed what we interpret to be more intact, less weathered siltstone, extending to the full depths explored. The samples retrieved typically consisted of hard, moist silt. As with the weathered siltstone described above, the material was observed to break into a blocky texture when cut with a soil knife, but also exhibited significantly higher resistance to the soil knife and drilling and sampling efforts.

3.5. Groundwater

At the time of our explorations, groundwater was encountered at approximately 5 feet bgs. Given the site's proximity to the tidal-influenced water, the water table should be expected to vary with tide level—but given the silt content of the upper most soils—saturated soils should be expected up to the high tide elevation.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1. Seismic Design Considerations

4.1.1. Seismic Design Approach

Based on our explorations and analysis, the project site is underlain by liquefiable soils. Liquefaction could result in surface settlements, soil strength loss and movement of the waterway slope (lateral spreading). The following sections provide additional information regarding liquefaction and associated effects. Based on our discussion with the design team, we understand that, in order to resist seismic loading and limit liquefaction risk, the bulkhead sheet pile wall will be driven into the underlying siltstone and tiebacks will be anchored in the siltstone as well.

4.1.2. Seismic Design Parameters

We understand that seismic consideration for this project fall under the *International Building Code* 2018 (IBC 2018) which references the 2016 *Minimum Design Loads for Buildings and Other Structures* (American Society of Civil Engineers [ASCE] 7-16).

As addressed in the sections below, our review of the existing data at the site indicates potentially liquefiable soils are present from the surface to the existing mudline (approximately Elevation -14 feet). In accordance with the design documents referenced above, sites with liquefiable soils shall be classified as Site Class F and a site-specific response analysis shall be performed. An exception is provided in Section 20.3.1 of ASCE 7-16, which states that for structures with a fundamental period of vibration less than or equal to 0.5 seconds, a site-specific seismic evaluation is not required. Our scope of services does not include site-specific response analysis.

As a basis for a simplified design and analysis we recommend using a response spectrum for Site Class D. Recommended Site Class D seismic design parameters are presented in Table 2 below.

TABLE 2. SEISMIC DESIGN CRITERIA

ASCE 7-16 Seismic Design Parameters[1]	
Site Class	F
Spectral Response Acceleration at Short Periods (S_S)	1.427g
Spectral Response Acceleration at 1-Second Periods (S_1)	0.738g
Short-Period Site Coefficient (F_a)	1.20
Long-Period Site Coefficient (F_v)	1.7
Design Spectral Response Acceleration at Short Periods ($S_{DS} = 2/3 * F_aS_S$)	1.142g
Design Spectral Response Acceleration at 1-Second Periods ($S_{D1} = 2/3 * F_vS_1$)	1.255g[2]
Design Peak Ground Acceleration (PGA_M)	0.798g

Notes:

[1] Parameters developed based on Latitude 46.3048196° and Longitude -124.0410238° using the ATC Hazards online tool.

[2] Per ASCE 7-16 Supplement 3 Section 11.4.8 item 1, parameter has been increased by 50 percent or has increased as a result of adjusted S_{m1} Value.

4.1.3. Liquefaction Potential

Liquefaction refers to the condition by which vibration or shaking of the ground, usually from earthquake forces, results in the development of excess pore pressures in saturated soils and the subsequent loss of strength in the affected soil deposit. In general, soils that are susceptible to liquefaction include very loose to medium dense clean to silty sands and some silts below the water table. Liquefaction effects on foundations can include a temporary loss of bearing capacity, settlement of the ground surface and downdrag loads on pile and shaft foundations.

We reviewed the "Liquefaction Susceptibility Map of Pacific County, Washington" (Palmer et al. 2004). According to the map, the potential for liquefaction at this site is high.

We evaluated the liquefaction potential of the site soil using simplified methods that utilize Atterberg limits to evaluate liquefaction potential (Idriss and Boulanger 2008 and Bray and Sancio 2006). These methods apply limits to liquefaction potential based on the plastic index and moisture content of the soil. Based on the results of our Atterberg limit testing and using the above methodology, the majority of native soils at the site are not expected to be liquefiable. There is, however, some potential for soil strength reduction due to seismic shaking. We have considered this reduction in development of our post-seismic design recommendations presented below.

The upper 15 feet (approximate Elevations 11 to -4 feet) consists of primarily fill and the upper portion of the alluvium shows interbedded silty sands and we consider this region to have some susceptibility to liquefaction.

Based on our review and analysis, it is our opinion potentially liquefiable soils are present at the site from the surface to 15 feet bgs (approximate Elevation -4 feet).

4.1.4. Liquefaction-Induced Settlement

Based on our explorations, lab data, and liquefaction susceptibility evaluation, we estimated liquefaction-induced settlement at the ground surface considering liquefaction to a depth of 15 feet. We

estimate liquefaction-induced settlement could range from about 1 to 2 inches at the ground surface as a result of the design level earthquake (Magnitude 9.08, PGA_M = 0.798g). Areas of liquefaction can be relatively discontinuous and separated by layers of non-liquefied soil. Due to the variability of soils in the upper 15 feet and the inherent unpredictability of seismic soil liquefaction, differential settlements could be as much as the total settlement.

4.1.5. Lateral Spreading Potential

Liquefaction-induced soil strength loss can also result in slope instability and lateral spreading. Lateral spreading related to seismic activity typically involves lateral displacement of large, surficial blocks of non-liquefied soil when an underlying soil layer loses strength during seismic shaking. Alternatively, when the majority of the soil profile loses strength a flow-type failure may occur. Lateral spreading usually develops in areas where sloping ground or large grade changes are present. Lateral spreading can induce significant lateral loads on embedded structures (kinematic loading).

Based on our understanding of the subsurface conditions, liquefaction risk and current site topography, it is our opinion there is a risk of lateral spreading during the design earthquake in regions not confined by the bulkhead.

4.1.6. Surface Rupture Potential

According to the Washington State Department of Natural Resources "Interactive Natural Hazards Map" (accessed online July 14, 2022), the nearest known major seismic feature is the Cascadia Subduction Zone (CSZ). The eastern most extent of this region is mapped approximately 11 miles west of the project site. In addition to the CSZ, there are two additional mapped faults approximately 8 miles from the site. The Willapa Bay Oblique-slip fault is located 8 miles north of the site and a strike-slip fault associated with the CSZ is located 8 miles southwest of the site. Based on this information it is our opinion the risk for seismic surface rupture at the site is low.

4.2. Soil Parameters

Based on our explorations and testing, we developed a generalized soil profile with associated parameters for use in engineering analysis completed as part of the project. Tables 3 and 4 below summarize our recommended design soil properties for static conditions and post-earthquake (liquefied) conditions. Elevation ranges for each soil unit are provided based on the explorations reviewed and are referenced to the elevation at the top of the existing pavement (approximate elevation 11 feet).

TABLE 3. RECOMMENDED STATIC SOIL PARAMETERS

Depth[1,2] (feet)	Soil Unit	USCS Soil Type	Total Unit Weight (pcf)[3]	Effective Unit Weight (pcf)[3]	Friction Angle (degrees)	Cohesion (pcf)[3]	Ka[4]	Kp[5]	Active Equivalent Fluid Density[6] (pcf)	Allowable Equivalent Fluid Density[7] (pcf)	Allowable Passive Pressure[8] (psf)
0 to 5	Fill	GP-GM	120	–	30	–	0.33	3.0	40.0	240	–
5 to 12	Submerged Fill	SM	120	58	28	–	0.36	2.75	21	107	–
12 to 35	Upper Alluvium	ML/CH	105	43	–	250	–	–	–	–	335
35 to 55	Lower Alluvium and weathered Siltstone	ML/CH	110	48	–	800	–	–	–	–	1,067
55 and below	Siltstone	Rx	120	58	42	–	–	5.04	–	194	–

Notes:

1 Depths are referenced to the top of pavement behind existing bulkhead.

2 Mudline in front of bulkhead assumed to be at 15 feet.

3 Groundwater is assumed to be at 5 feet below ground surface.

4 Ka = Active earth pressure coefficient.

5 Kp=Passive earth pressure coefficient (ultimate, does not include a factor of safety).

6 Active equivalent fluid density provided for soils retained by the bulkhead and do not include hydrostatic pressures.

7 Allowable passive equivalent fluid densities include a FOS of 1.5. These values do not include hydrostatic pressures.

8 Allowable passive pressures (rectangular distribution) provided for cohesive soils and include a FOS of 1.5.

TABLE 4. RECOMMENDED POST-SEISMIC CONDITIONS

Depth[1,2] (feet)	Soil Unit	USCS Soil Type	Total Unit Weight (pcf)[3]	Effective Unit Weight (pcf)[3]	Friction Angle (degrees)	Cohesion (pcf)[3]	Ka[4]	Kp[5]	Active Equivalent Fluid Density[6] (pcf)	Allowable Equivalent Fluid Density[7] (pcf)	Allowable Passive Pressure[8] (psf)
0 to 5	Fill	GP-GM	120	–	30	–	0.33	3.0	40.0	240	–
5 to 12	Liquified Fill	SM	120	58	22	–	0.45	2.2	26	107	–
12 to 35	Upper Alluvium (strain Softened)	ML/CH	105	43	–	200	–	–	–	–	335
35 to 55	Lower Alluvium and weathered siltstone (strain Softened)	ML/CH	110	48	–	640	–	–	–	–	1,067
55 and below	Siltstone	Rx	120	58	42	–	–	5.04	–	244	–

Notes:

1 Depths are referenced to the top of pavement behind existing bulkhead.

2 Mudline in front of bulkhead assumed to be at 15 feet.

3 Groundwater is assumed to be at 5 feet below ground surface.

4 Ka = Active earth pressure coefficient.

5 Kp=Passive earth pressure coefficient (ultimate, does not include a factor of safety).

6 Active equivalent fluid density provided for soils retained by the bulkhead and do not include hydrostatic pressures.

7 Allowable passive equivalent fluid densities include a FOS of 1.2. These values do not include hydrostatic pressures.

8 Allowable passive pressures (rectangular distribution) provided for cohesive soils and include a FOS of 1.2.

4.3. Geotechnical Pile Design Recommendations

4.3.1. Axial Pile Resistance

Based on our experience with driven piles in near shore environments, end bearing resistance can be highly variable, depending on the specific soil conditions at the tip of each pile. Therefore, we typically assume low end bearing resistance values for design if not driven into bedrock. However, it is our understanding that piles for this project will be driven into the underlying siltstone providing considerably more tip capacity than in alluvium sediment deposits. If it becomes desirable to drive piles to depths above the underlying siltstone we can provide further recommendations.

Based on our understanding of site conditions and planned development, we estimated axial resistance available for piles driven at the site, for static and post seismic conditions. Because pile sizes may need to vary, we provided estimated unit resistances for each soil layer. Estimated resistances are presented in Tables 5 and 6.

Mudline at the outboard edge of the existing bulkhead is currently at approximately Elevation -4 feet. We understand that the new mudline will be at approximate elevation -16 feet to account for future dredging activities. Skin friction above the planned future mudline should be disregarded when computing total pile capacities.

Because of the complex stratigraphy and variability of soils in the site vicinity, we anticipate that actual ultimate axial resistances may vary by as much as 20 to 25 percent. Allowable resistances should be used for designing the piles. Allowable static axial pile resistances presented in the table below include a factor of safety (FS) equal to 2 for end bearing, 3 for skin friction and 2.5 for uplift resistance. Allowable seismic axial pile resistances include a FS equal to 1.5 for end bearing, 3 for skin friction and 1.5 for uplift resistance.

TABLE 5. AXIAL PILE RESISTANCES (STATIC CONDITIONS)

Depth[1,2] (feet)	Soil Unit	USCS Soil Type	Allowable Unit Skin Resistance[3,4] (ksf)	Allowable Unit End Bearing Resistance[3,5] (ksf)	Allowable Unit Uplift Resistance[3,6] (ksf)
0 to 5	Fill	GP-GM	-	-	-
5 to 12	Submerged Fill	SM	-	-	-
12 to 35	Upper Alluvium	ML/CH	0.075	0.9	0.0625
35 to 55	Lower Alluvium and Siltstone	ML/CH	0.24	2.9	0.2
55 and below	Siltstone	RX	0.75	17	0.63

Notes:

1 Depths are referenced to the top of pavement behind existing bulkhead.

2 Mudline in front of bulkhead assumed to be at relative depth of 27 feet.

3 Resistances for fill not provided. Pile Resistance should be accounted for starting where pile becomes fully embedded (portion of pile below future mudline).

4 Includes a factor of safety of 2.5.

5 Includes a factor of safety of 2.5.

6 Includes a factor of safety of 3.0.

7 To calculate allowable skin and uplift resistance, multiply allowable skin/uplift resistance by the pile perimeter (ft) and the length of the pile embedded into the given layer.

8 To calculate allowable end bearing resistance, multiply unit end bearing resistance by pile tip area (sf) for the soil unit at the pile tip depth.

TABLE 6. AXIAL PILE RESISTANCES (POST SEISMIC CONDITIONS)

Depth[1,2] (feet)	Soil Unit	USCS Soil Type	Allowable Unit Skin Resistance[3,4] (ksf)	Allowable Unit End Bearing Resistance[3,5] (ksf)	Allowable Unit Uplift Resistance[3,6] (ksf)
0 to 5	Fill	GP-GM	-	-	-
5 to 12	Submerged Fill	SM	-	-	-
12 to 35	Upper Alluvium	ML/CH	0.075	0.9	0.0625
35 to 55	Lower Alluvium and Siltstone	ML/CH	0.24	2.9	0.19
55 and below	Siltstone	RX	0.75	17	0.63

Notes:

1 Depths are referenced to the top of pavement behind existing bulkhead.

2 Mudline in front of bulkhead assumed to be at relative depth of 27 feet.

3 Resistances for fill not provided. Pile Resistance should be accounted for starting where pile becomes fully embedded (portion of pile below future mudline).

4 Includes a factor of safety of 2.0.

5 Includes a factor of safety of 2.0.

6 Includes a factor of safety of 2.5.

7 To calculate allowable skin and uplift resistance, multiply allowable skin/uplift resistance by the pile perimeter (ft) and the length of the pile embedded into the given layer.

8 To calculate allowable end bearing resistance, multiply unit end bearing resistance by pile tip area (sf) for the soil unit at the pile tip depth.

4.3.2. Settlement

Based on our understanding of the project, soil profile and properties, and assuming the piles are embedded into the underlying siltstone unit, we anticipate settlement of piles should be on the order of 1 inch or less with differential settlement of ½ inch or less.

4.3.3. LPILE Soil Parameters

We understand that lateral load performance of the proposed piles will be evaluated using the computer software program LPILE produced by Ensoft, Inc. Our recommended LPILE soil parameters are presented in the tables below.

For the purpose of this report, we assume piles are spaced at least 5 diameters (5D) center to center in the direction of loading. If spacing is less than 5D, P multipliers will be required for the LPILE analysis and are available upon request.

TABLE 7. RECOMMENDED STATIC LPILE SOIL PARAMETERS (STATIC CONDITIONS)

					Lateral Analysis Parameters – Static Conditions				
Depth[1,2] (feet)	Soil Unit	USCS Soil Type	Friction Angle (degrees)	Undrained shear Strength/ Cohesion (psf)	P.Y Curve Model	Total Unit Weight3 (pcf)	Effective Unit Weight2 (pcf)	Soil Modulus K (pci)	Strain Factor e50
0 to 12	Fill[4]	GP-GM	-	-	-	-	-	-	-
12 to 35	Upper Alluvium	ML/CH	-	250	Soft Clay	105	43	-	0.02
35 to 55	Lower Alluvium and W. Siltstone	ML/CH	-	800	Soft Clay	110	48	-	0.02
55 and below	Siltstone	RX	42	-	Sand (Reese)	120	58	150	-

Notes:

1 Depths are referenced to the top of the pavement behind existing bulkhead.

2 Mudline in front of bulkhead assumed to be at relative depth of 27 feet.

3 Assume static groundwater levels at 5 feet below surface for design. Effective unit weights should be used for soil layers below the groundwater table.

4 Resistances for fill not provided. Pile Resistances should be accounted for starting where pile becomes fully embedded (portion of pile below mudline).

TABLE 8. RECOMMENDED STATIC LPILE SOIL PARAMETERS (POST SEISMIC CONDITIONS)

					Lateral Analysis Parameters – Static Conditions				
Depth[1,2] (feet)	Soil Unit	USCS Soil Type	Friction Angle (degrees)	Undrained shear Strength/ Cohesion (psf)	P.Y Curve Model	Total Unit Weight3 (pcf)	Effective Unit Weight2 (pcf)	Soil Modulus K (pci)	Strain Factor e50
0 to 12	Fill[4]	GP-GM	-	-	-	-	-	-	-
12 to 35	Upper Alluvium (strain softened)	ML/CH	-	200	Soft Clay	105	43	-	0.02
35 to 55	Lower Alluvium and W. Siltstone (strain softened)	ML/CH	-	640	Soft Clay	110	48	-	0.02
55 and below	Siltstone	RX	42	-	Sand (Reese)	120	58	150	-

Notes:

1 Depths are referenced to the top of pavement behind existing bulkhead.

2 Mudline in front of bulkhead assumed to be at relative depth of 27 feet.

3 Assume Static groundwater levels at 5 feet below ground surface for design. Effective unit weights should be used for soil layers below the groundwater table.

4 Resistances for fill not provided. Pile Resistance should be accounted for starting where pile becomes fully embedded (portion of pile below mudline).

4.3.4. Pile Installation Considerations

Provided subsurface conditions are as assumed, we anticipate conventional vibratory driving methods can be used to advance open-tip steel pipe piles through the overlying fill (if present at the mudline) and native alluvial deposits at the site. The reviewed explorations do not indicate the presence of gravel or other potential impediments to vibratory pile driving within the alluvial soils; however, very dense zones or other obstructions such as logs could be present. Vibratory pile driving equipment will need to be selected based on the pile size. If significant penetration into the siltstone unit is planned, impact driving is likely to be required. We recommend that project plans and specifications include selecting and providing an impact hammer of sufficient capacity to continue driving the pile if vibratory installation methods reach refusal before the design tip elevation.

We recommend that a GeoEngineers representative be present on site during pile installation, particularly if impact driving is used. Our representative can observe whether piles are installed in accordance with the project plans and specifications, check for consistency in pile resistance during vibratory installation and evaluate pile resistance during impact driving. We can also provide recommendations for sizing vibratory and impact hammers for installation, if requested.

4.4. Lateral Earth Pressures

We developed lateral earth pressure recommendations for use in design of the replacement sheet pile bulkhead. Recommended lateral earth pressures under static and post-seismic conditions are presented on Figures 3 to 8, respectively. Lateral earth pressures were developed for the purpose of the lateral loading analysis for the proposed sheet pile wall and are presented relative the proposed structures and their relationship with the site stratigraphy.

4.5. Tieback Anchors

Tieback anchors should extend far enough behind the wall to develop anchorage beyond the "no-load" zone (See Figures 3 through 8 for definition of the no-load zone) and within a stable soil mass. We recommend that spacing between tiebacks be at least five times the diameter of the anchor hole to minimize group interaction.

We understand that tieback anchors will be installed into the intact siltstone, which was encountered around 55 to 65 feet below ground surface. For tiebacks installed into siltstone we recommend using an ultimate bond strength of 50 psi for design. We recommend that tiebacks be designed using a factor of safety of at least 2.0 for static conditions, which can be reduced to 1.5 for seismic conditions. We recommend that tieback anchors have a minimum bond length of 10 feet.

4.6. Shoreline Slope Stability

4.6.1. General

We completed slope stability analyses to evaluate the proposed modifications to the shoreline slope to the northeast and south of the new bulkhead. Proposed slope modifications to the northeast of the bulkhead include removal of a relic timber wall, installation of rip rap and construction of a new berm at the top of the slope. We understand that the thickness of the rip rap armoring will be on the order of 18 inches. The proposed berm will be set back about 2 feet from the crest of the slope, will have a crest elevation of around 14 feet (about 1 foot above existing grade) and will be about 30 feet wide. The approximate location of the proposed berm and the area of slope armoring is shown on Figure 9.

No significant modifications to the existing slope geometry are proposed in the area to the south of the proposed bulkhead. We understand that concrete rubble on the slope will be removed, and new riprap slope armoring will be added. The riprap thickness is expected to be on the order of 18 inches. The approximate location of the proposed slope armoring area south of the bulkhead is shown in Figure 10.

Slope stability analyses were completed using the computer program SLOPE/W (GEO-SLOPE International, Ltd. 2020). SLOPE/W evaluates the stability of numerous trial shear surfaces using a vertical slice limit-equilibrium method. This method compares the ratio of forces and moments driving slope movement versus forces and moments resisting slope movement for each trial shear surface and presents the result as the factor of safety (FOS). The program then sorts the trial shear surfaces and identifies the surface with the lowest factor of safety, or the "critical" shear surface. We assumed a circular arc slip surface and used the Morgenstern-Price method to calculate the forces.

We did not consider pseudo-static (seismic) or post seismic (residual strength) conditions in our slope stability analyses because the considered slopes do not directly support the proposed bulkhead. Additionally, evaluating surrounding slopes for these conditions is beyond the scope of this project. Pseudo-static and post seismic slope stability will primarily be controlled by the magnitude of seismic inertial forces and the residual soil strength properties of the underlying soils. The proposed slope improvements will not impact either of these analysis inputs. In our opinion the existing slopes likely do not meet minimum seismic slope stability factor of safety values however, the proposed slope modifications are unlikely to significantly change the stability of the existing slope considering pseudo-static and post seismic conditions.

4.6.2. Slope Stability Results – Shoreline Slope Northeast of Bulkhead

The approximate location of the slope cross section considered in our stability analysis along with the analysis results are shown in Figure 9. Our slope stability analysis indicates that the proposed shoreline slope configuration meets target static factor of safety requirements presented in the Washington State Department of Transportation Geotechnical Design Manual (1.5 for static conditions). In our opinion the proposed slope modifications can be completed without destabilizing the shoreline slope.

4.6.3. Slope Stability Results – Shoreline Slope South of Bulkhead

The approximate location of the slope cross section considered in our stability analysis is shown in Figure 10. For our analysis of this slope, we considered static slope stability both before and after removal of the existing concrete rubble armoring and the installation of the riprap armoring. We limited our analysis to evaluating the impact that placing the riprap will have shallow surficial slope stability.

Slope stability analysis results for the existing and proposed shoreline slope configuration south of the bulkhead are shown on Figure 10. Our analysis results indicate that replacement of the slope protection with riprap armoring will not significantly change the existing slope factor of safety (FOS=1.2) with respect to shallow surficial slope stability. The calculated FOS is less than the typical target FOS for new construction. Based on our assessment, a FOS of 1.2 does not imply that the slope is inherently unstable or at immediate risk of shallow surficial movement. In our opinion the proposed slope armoring can be completed without destabilizing the shoreline slope or impacting the proposed bulkhead and upland structures.

We did not evaluate global stability of the shoreline slope, as improving global slope stability is beyond the intent of the repairs and, in our opinion, replacement of the existing armoring with riprap will not significantly

affect global slope stability. We also did not evaluate stability of the slope for the temporary condition after concrete rubble removal but prior to new riprap placement as this condition is not expected to present a risk to upland structures. Maintaining excavation stability during construction is the responsibility of the contractor performing the work. The contractor should follow best practices during construction and applicable guidelines for temporary excavations to maintain a stable excavation.

4.7. Pavement Design

4.7.1. General

We understand that existing asphalt pavements behind the bulkhead and along the wharf will be replaced as part of this project. The replacement pavement areas are primarily used by standard duty vehicles, 1.5-ton pneumatic tire forklifts, delivery trucks and occasional semi-trucks with trailers. Specific vehicle loading and frequency of use was not provided to us.

4.7.2. Design Parameters

We completed our pavement design following the methodology presented in the American Association of State Highway Transportation Officials (AASHTO) 1991 Flexible Pavement Design Standards and the 1993 AASHTO Guide for Design of Pavement Structures.

The recommended pavement section is based on a 20-year design life assuming an annual growth percentage of 0.1 percent. A 20-year design life for a pavement means that it is expected to be worn to the point of requiring a full replacement after 20 years. Some crack sealing and minor patching could be required before that time. Typically, full crack sealing (chip seal or resurfacing) is required after about 10 years of use, to prevent water instruction and accelerated deterioration.

The average daily traffic repetitions assumed in our analysis are summarized in Table 9 below. Other design input parameters necessary to complete the analysis such as reliability and serviceability index were selected based on our experience. We should be notified if specific traffic volumes or vehicle types should be considered as part of the pavement design.

TABLE 9. VEHICLE LOADING FREQUENCY

Vehicle Type	Assumed Daily Repetitions
Standard Duty Vehicle	30
1.5 Ton Pneumatic Tire Forklift	50
Delivery Truck *Single tandem axle box truck*	5
Semi-truck and trailer *100-ton gross vehicle weight, HS20-44 wheel configuration*	2

4.7.3. Recommended Pavement Section

Our recommended asphalt concrete pavement section is provided below. The recommended section is suitable for support of around 5,000,000 equivalent single axel loads (ESALs) over the assumed design life. In our opinion this is appropriate for a light industrial area. The provided pavement section may not be adequate for heavy construction traffic loads such as those imposed by concrete transit mixers, dump

trucks or cranes. Additional pavement thickness may be necessary to prevent pavement damage during construction if other loading types are planned.

Recommended Pavement Section

- 5 inches of hot mix asphalt, class ½ inch, PG 58-22
- 12 inches of compacted crushed surfacing base course (CSBC)
- Subgrade prepared as recommended in Section 4.7.4 below.

The top approximate 2 inches of the CSBC section may consist of crushed surfacing top course (CSTC) as a leveling layer and for more precise grade development. CSBC and CSTC should conform to applicable sections of 4-04 and 9-03.9(3) of the WSDOT Standard Specifications. Crushed surfacing materials should be moisture conditioned to near optimum moisture content and compacted to at least 95 percent of the theoretical MDD per ASTM D 1557.

Hot mix asphalt should conform to applicable sections of 5-04, 9-02 and 9-03 of the WSDOT Standard Specifications.

4.7.4. Subgrade Preparation

Subgrades for pavements should be thoroughly compacted to a uniformly firm and unyielding condition on completion of demolition/excavation and before placing structural fill. We recommend that subgrades be evaluated, as appropriate, to identify areas of yielding or soft soil. Probing with a steel probe rod or proof-rolling with a heavy piece of wheeled construction equipment are appropriate methods of evaluation.

If soft or otherwise unsuitable subgrade areas are revealed during evaluation that cannot be compacted to a stable and uniformly firm condition, we recommend that: (1) the unsuitable soils be scarified (e.g., with a ripper or farmer's disc), aerated and recompacted, if practical; or (2) the unsuitable soils be removed and replaced with compacted structural fill, as needed.

Based on the current condition of the wharf pavements, we expect that the majority of the existing subgrade areas will not be suitable for pavement support in their current condition. We recommend that the project budget and schedule include contingencies for subgrade remediation. For preliminary estimating purposes we recommend assuming that 40 percent of the existing subgrade area will require up to 12 inches of overexcavation and replacement during remediation, 40 percent of the existing subgrade area will require up to 6 inches of overexcavation and replacement during remediation and 20 percent of the existing subgrade can be prepared to a suitable condition without overexcavation.

Based on our conversations with the project team and our observations while onsite, it appears likely that relic timber piles will be exposed within the subgrade area. We recommend that relic piles (or other remnant structural elements) be cut off at least 12 inches below the bottom of the design pavement section during subgrade preparation. Voids caused by removal of the timber piles should be backfilled with compacted structural fill.

4.7.5. Additional Considerations

Pavement design life and durability can be impacted by factors outside of vehicle repetitions including impact loading and use by special vehicles. These factors were not considered as part of developing the recommended pavement section.

Impact loading can cause surface damage and full depth pavement cracking. Cracks provide a pathway for moisture to enter the pavement section which can saturate the base course and subgrade materials, reducing the pavement design life. If cracks form in the pavement section, they should be sealed, or the damaged area should be replaced as soon as possible.

We anticipate that the pavement areas may occasionally be used by unusual or special use vehicles. An example of this would be a "warehouse" forklift with small hard rubber tires. While these types of vehicles are typically not heavy, they can produce high concentrated loads. Additionally, certain tire types can shove and rut pavements. If the pavement area is expected to be regularly used by solid tire forklifts or other special use vehicles a different pavement type or a thicker pavement section may need to be considered.

5.0 LIMITATIONS

We have prepared this report for the exclusive use of Moffatt & Nichol, the Port of Ilwaco, and their authorized agents. Moffatt & Nichol and the Port of Ilwaco may distribute copies of this report authorized agents and regulatory agencies as may be required for the project.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. The conclusions, recommendations, and opinions presented in this report are based on our professional knowledge, judgment, and experience. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix B titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

6.0 REFERENCES

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FIGURES

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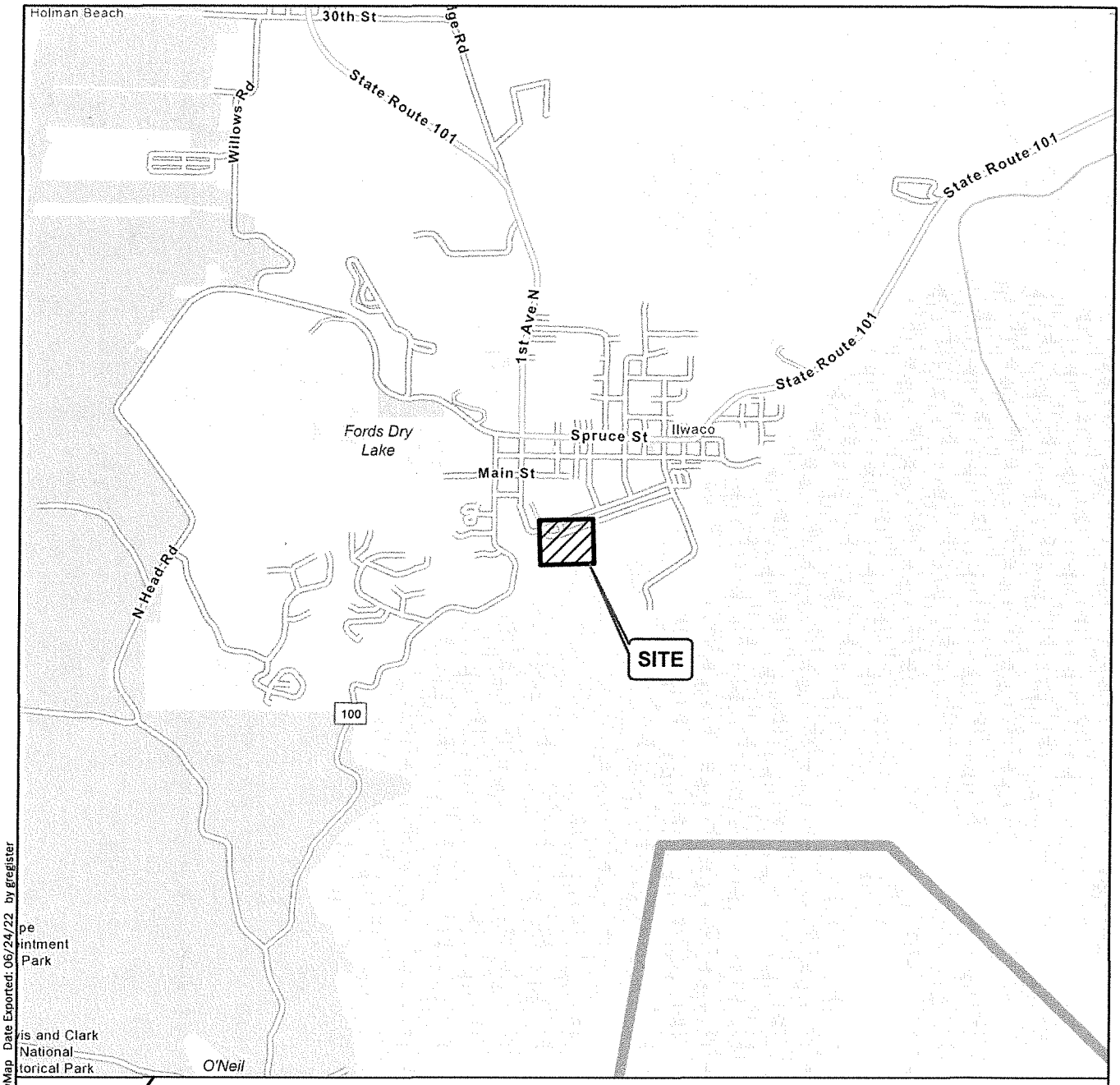

Notes:

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2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI

Projection: NAD 1983 UTM Zone 10N

N
W E
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Feet

Vicinity Map

Port Ilwaco Bulkhead Replacement
Ilwaco Washington
Pacific County

GeoEngineers

Figure 1

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Legend

B-1 ⊕ Boring by GeoEngineers, Inc., 2022

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Data Source: Aerial from Google Earth Pro dated 10/12/2018.

Projection: Washington State Plane, South Zone, NAD83, US Foot

N W E S

60 0 60
Feet

Site Plan

Port Ilwaco Bulkhead Replacement
Ilwaco, Washington
Pacific County

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Figure 2

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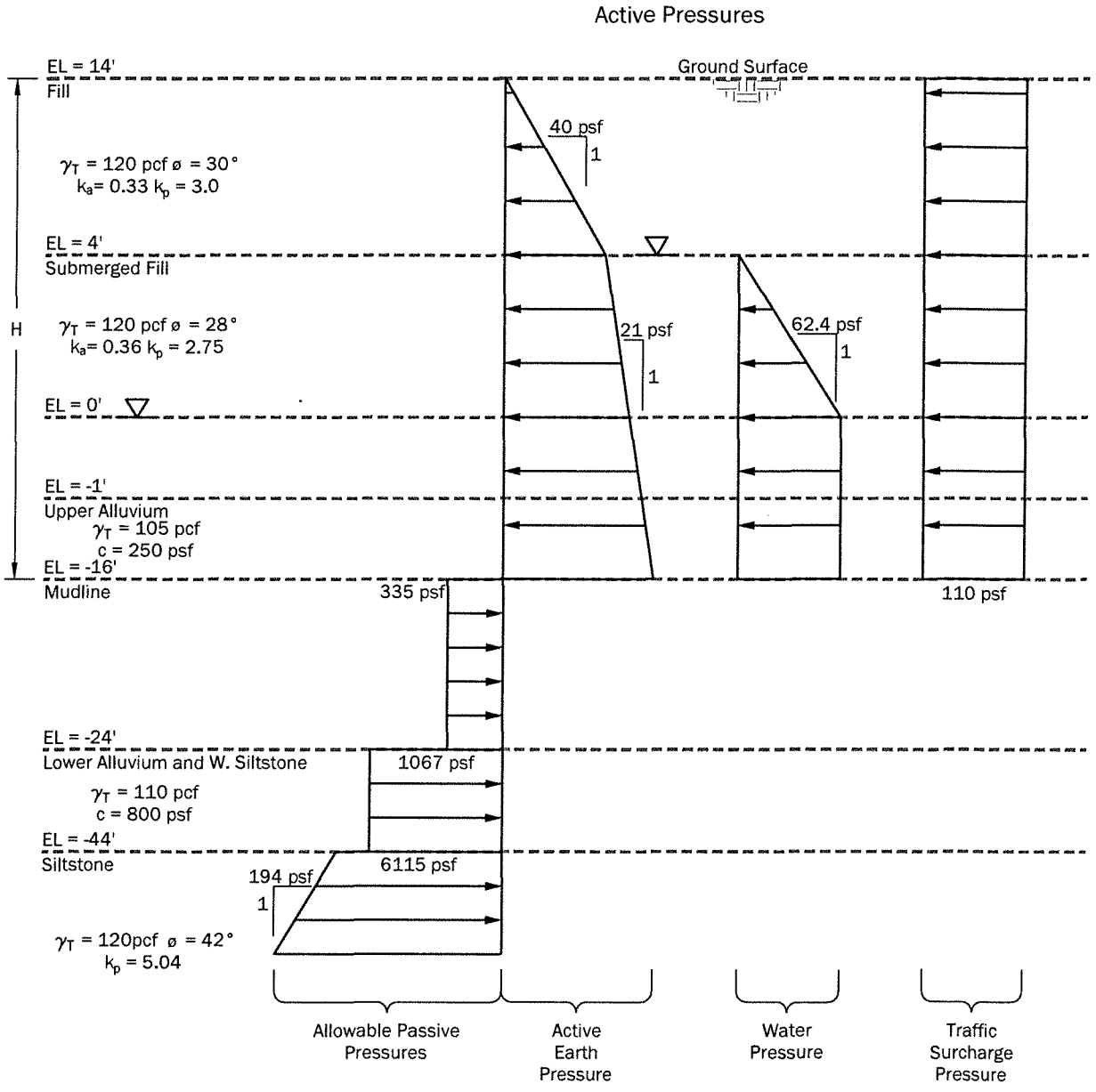
Static Conditions Cantilever Wall



Legend

H = Exposed Wall Height

Not To Scale

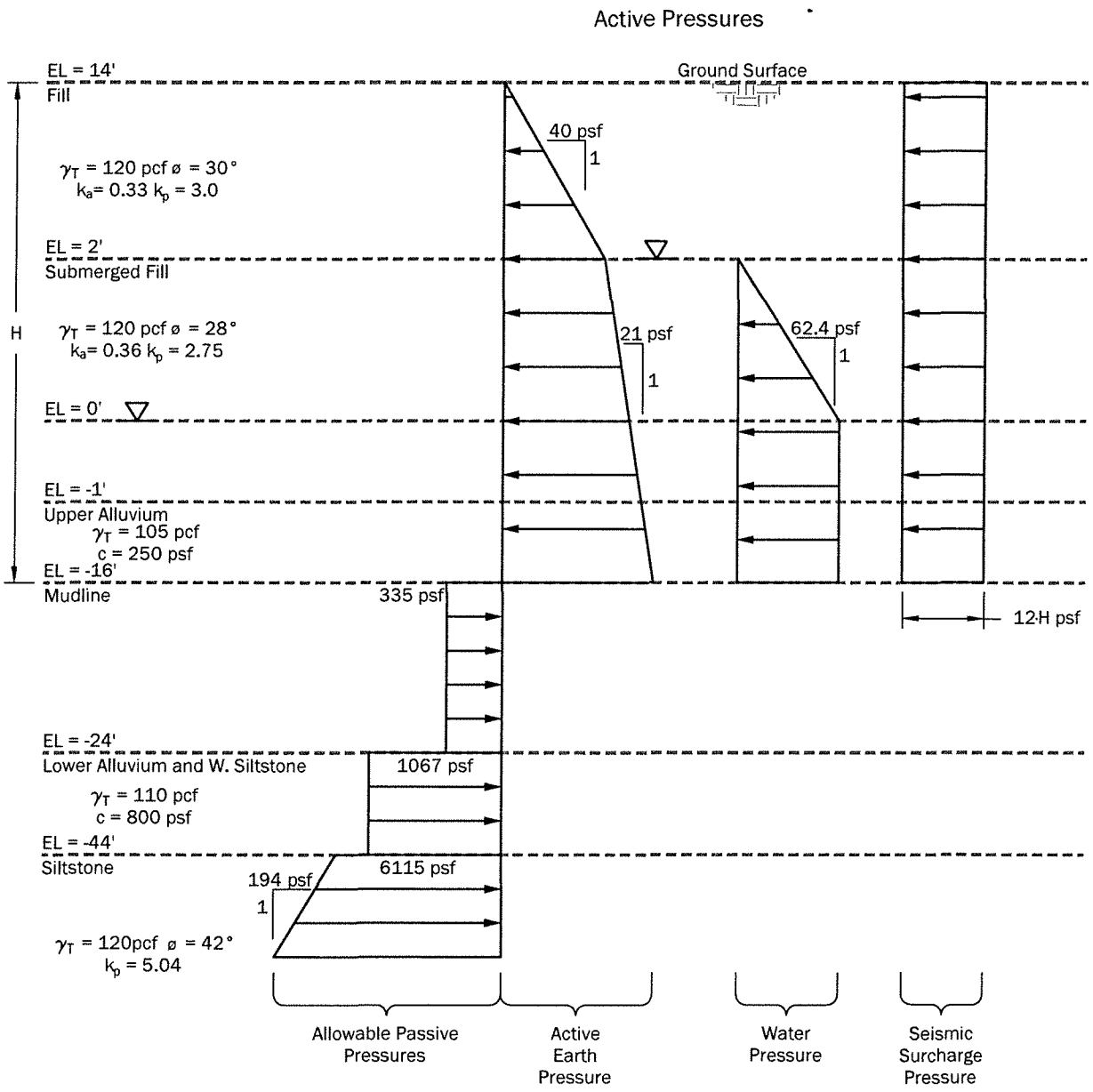
Earth Pressure Diagram
Static Conditions Cantilever Wall

Port Ilwaco Bulkhead Replacement
Ilwaco, Washington
Pacific County

GeoEngineers

Figure 3

Seismic Conditions Cantilever Wall



Legend

H = Exposed Wall Height

Not To Scale

Notes:

1. Apply uniform 110 psf lateral traffic surcharge over distance H.

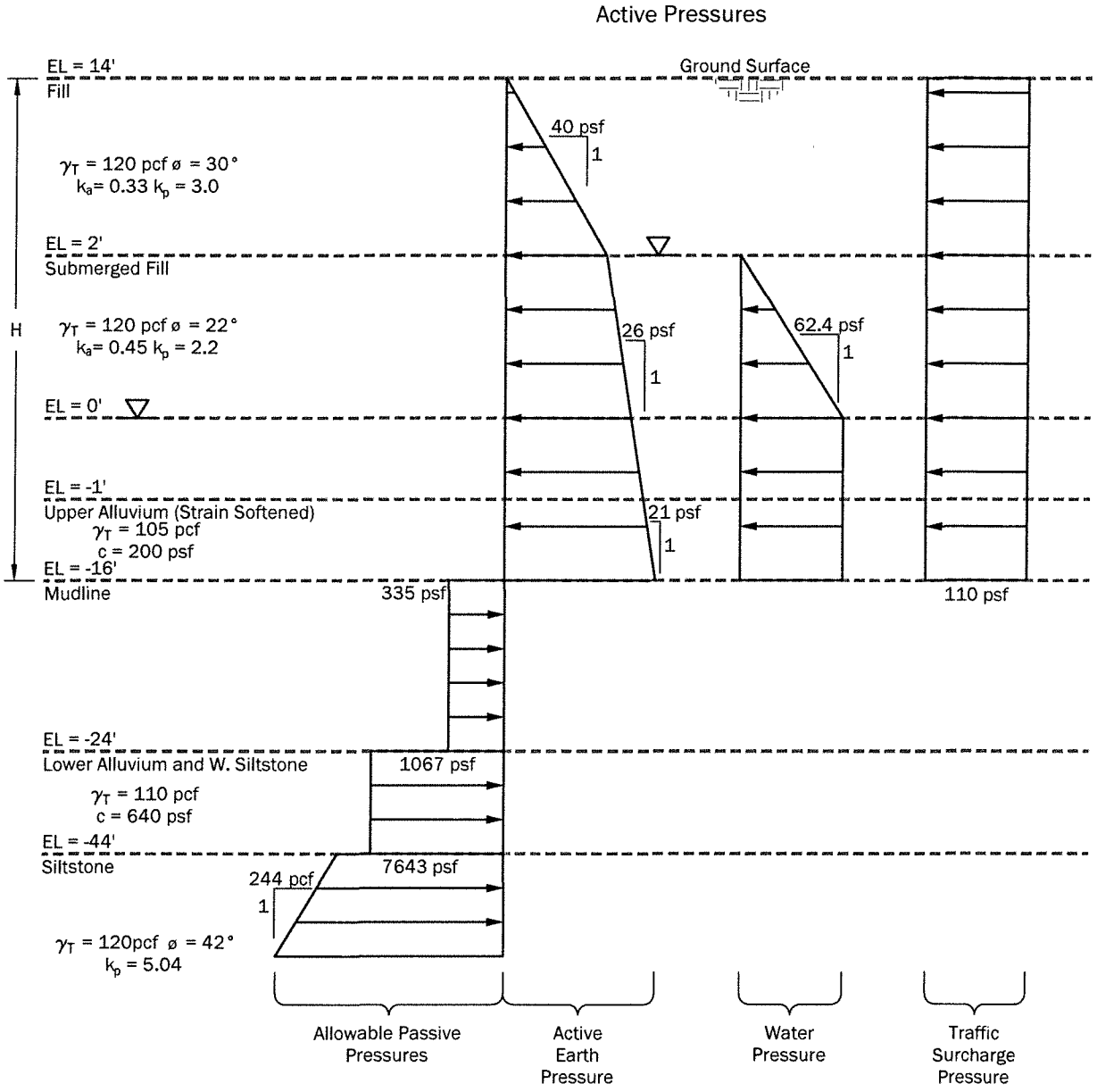
Earth Pressure Diagram
Seismic Conditions Cantilever Wall

Port Ilwaco Bulkhead Replacement
Ilwaco, Washington
Pacific County

GeoEngineers

Figure 4

Post-Seismic Conditions Cantilever Wall



Legend

H = Exposed Wall Height

Not To Scale

Earth Pressure Diagram
Post-Seismic Conditions Cantilever Wall

Port Ilwaco Bulkhead Replacement
Ilwaco, Washington
Pacific County

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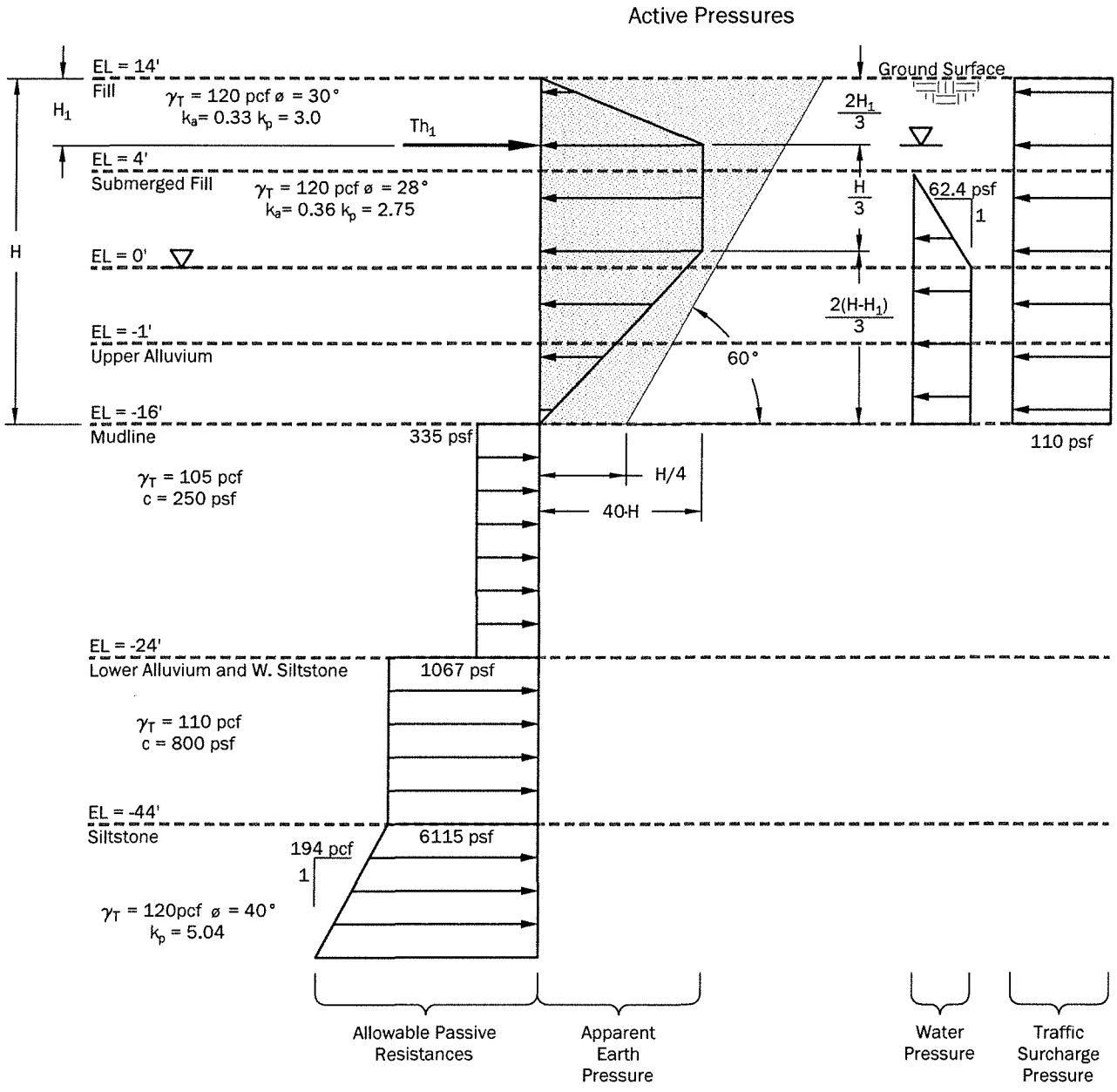
Figure 5

Static Conditions Wall with Tieback



Legend

- No Load Zone
- H = Exposed Wall Height
- H_1 = Distance from Ground Surface to Upper most Tieback
- Th_1 = Horizontal Load in Uppermost Ground Anchor

Not To Scale

Earth Pressure Diagram
Static Conditions Wall with Tieback

Port Ilwaco Bulkhead Replacement
Ilwaco, Washington
Pacific County

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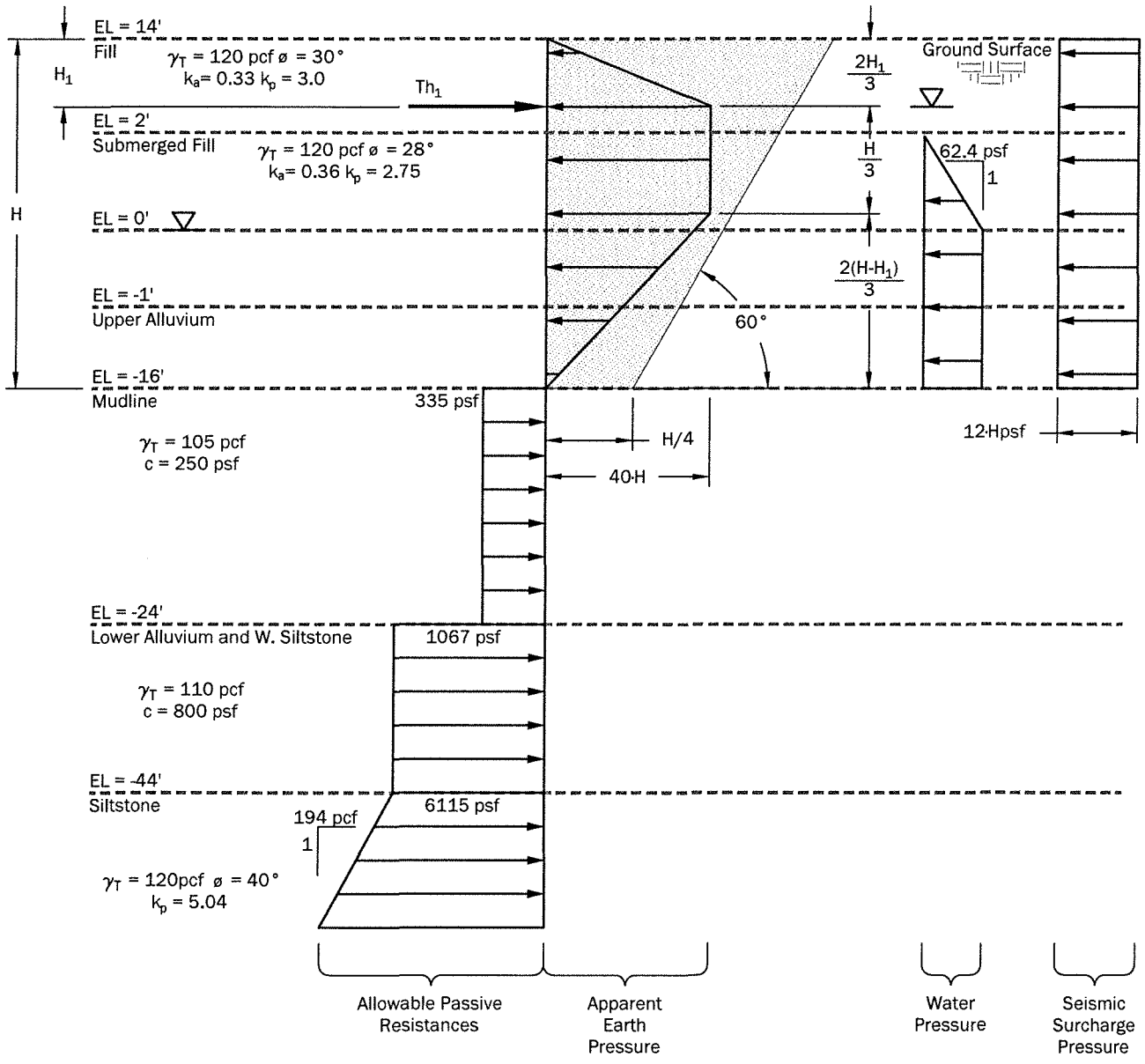
Figure 6

Seismic Conditions Wall with Tieback

Active Pressures



Legend

No Load Zone

H = Exposed Wall Height

H_1 = Distance from Ground Surface to Upper most Tieback

Th_1 = Horizontal Load in Uppermost Ground Anchor

Notes:

1. Apply uniform 110 psf lateral traffic surcharge over distance H.

Not To Scale

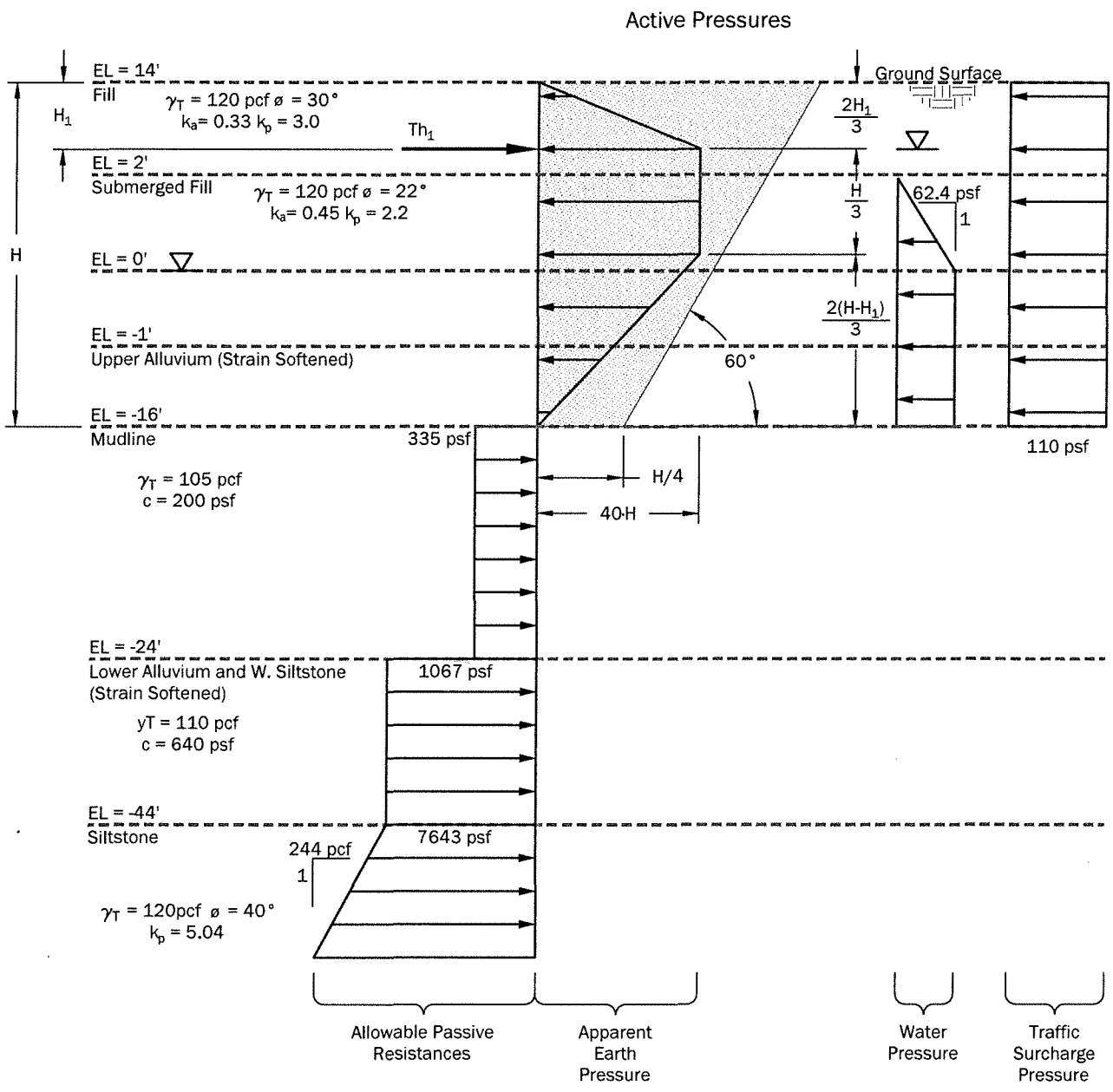
Earth Pressure Diagram
Seismic Conditions Wall with Tieback

Port Ilwaco Bulkhead Replacement
Ilwaco, Washington
Pacific County

GeoEngineers

Figure 7

Post-Seismic Conditions Wall with Tieback



Legend

- No Load Zone
- H = Exposed Wall Height
- H_1 = Distance from Ground Surface to Upper most Tieback
- Th_1 = Horizontal Load in Uppermost Ground Anchor

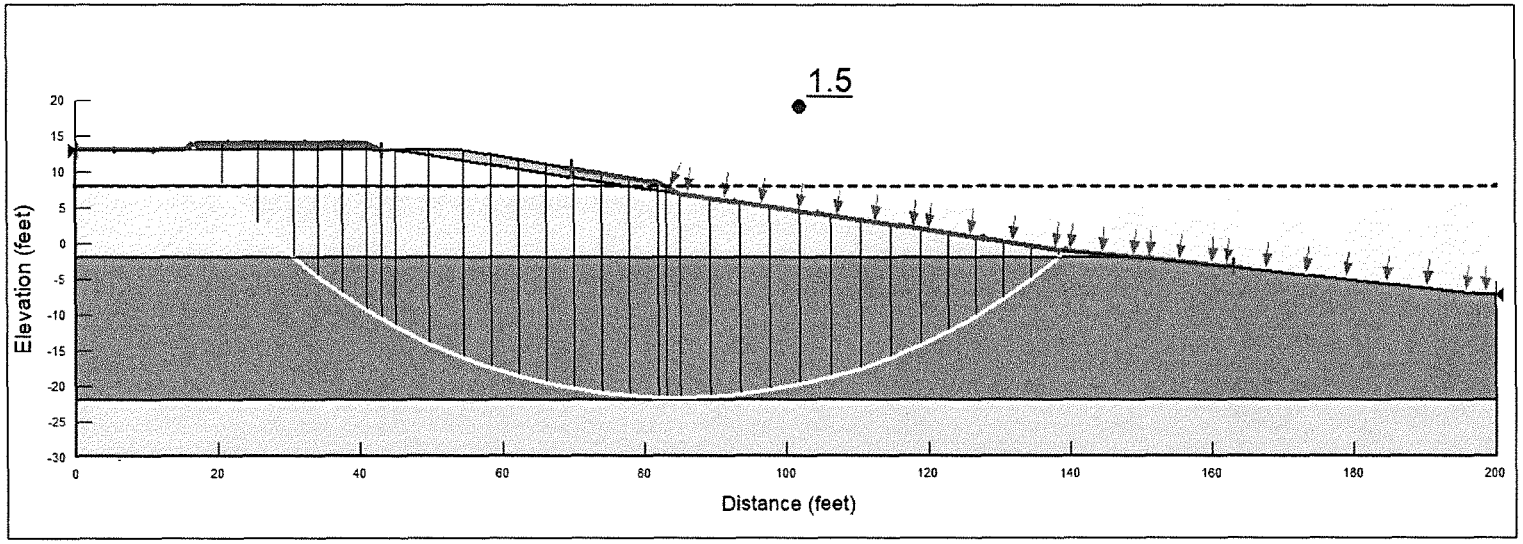
Not To Scale

Earth Pressure Diagram
Post-Seismic Conditions Wall with Tieback

Port Ilwaco Bulkhead Replacement
Ilwaco, Washington
Pacific County

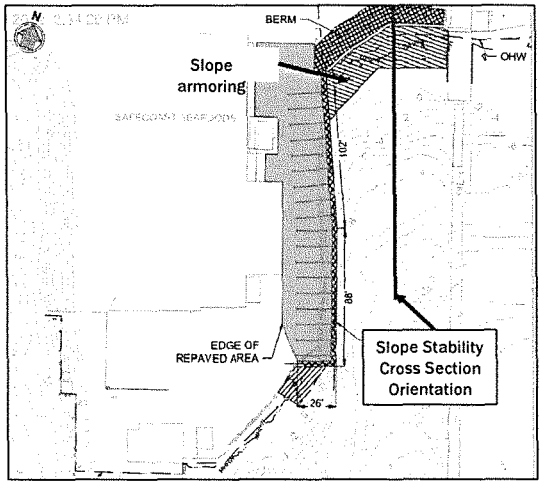
GeoEngineers

Figure 8



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Berm	120	0	38
	Fill	120	0	30
	Lower Alluvium	110	800	0
	Lower Fill	120	0	28
	Rip Rap	105	0	48
	Upper Aluvium	105	250	0

Soil Properties Used in Slope Stability Analyses



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Slope Stability Analysis Results
Slope Northeast of Bulkhead

Port of Ilwaco Bulkhead Replacement
Ilwaco, Washington

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Figure 9

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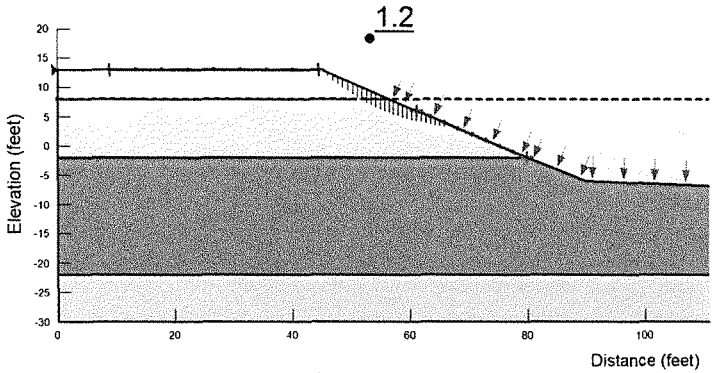
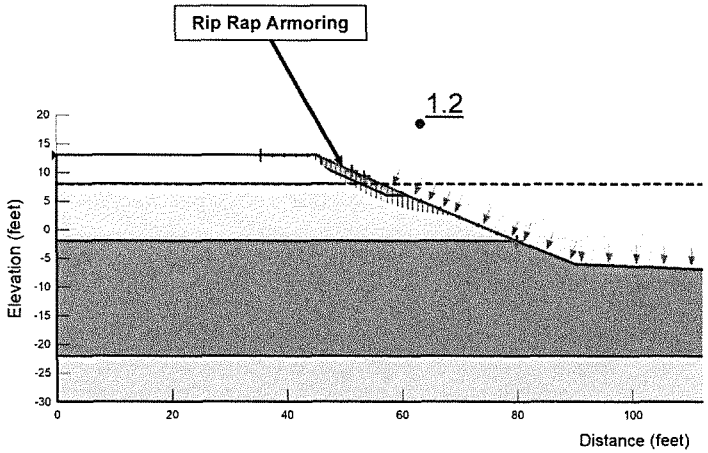


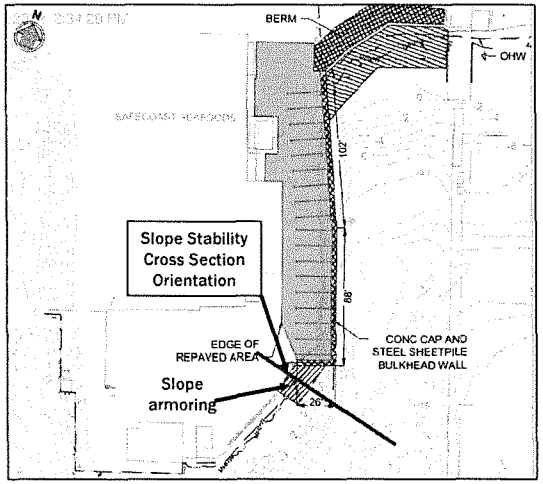
Existing Conditions



Proposed Conditions

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Berm	120	0	38
	Fill	120	0	30
	Lower Alluvium	110	800	0
	Lower Fill	120	0	28
	Rip Rap	105	0	48
	Upper Aluvium	105	250	0

Soil Properties Used in Slope Stability Analyses



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Slope Stability Analysis Results
Slope South of Bulkhead

Port of Ilwaco Bulkhead Replacement
Ilwaco, Washington

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Figure 10

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APPENDICES

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APPENDIX A
Subsurface Explorations and Laboratory Testing

APPENDIX A
SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

Subsurface Explorations

Soil and groundwater conditions at the site were explored by completing two borings on March 14, 2022 (B-2A) and May 19, 2022. Locations of the explorations are shown on Figure 2, Site Plan. Locations of the explorations were determined in the field using an electronic tablet with global positioning system (GPS) software. The locations and elevations of the explorations should be considered approximate.

During our site explorations on March 14, 2022 and our time on site during March 15, 2022, we used a vacuum truck to attempt an additional 6 boring locations on the wharf. Each boring met refusal, at depths varying from 3 to 4.3 feet, due to undocumented and abandoned utility lines, or large cobbles. Based on the presence of cobbles, the project team decided that continuing to attempt hollow-stem auger drilling within the wharf footprint was not effective. We therefore returned to the site on May 19, 2022 with a sonic drill rig capable of easily advancing through cobbles.

Boring B-1D was performed using a Terrasonic CC150 sonic track drill rig provided and operated by Holt Drilling, Inc. under subcontract to GeoEngineers. Boring B-2A was performed using a Diedrich D70 Turbo Track drill rig provided and operated by Holocene Drilling, Inc. under subcontract to GeoEngineers. Borings were advanced using hollow-stem auger and Sonic drilling methods to nominal depths of approximately 70 (B-2) and 65 (B-1) feet below surrounding grade. Standard Penetration Tests (SPT) were completed using a 1.475-inch inner-diameter split-barrel sampler driven into the soil using a 140-pound hammer free-falling a distance of 30 inches. The number of blows required to drive the sampler the last 12 inches or other indicated distance is recorded on the logs as the blow count. SPTs were advanced at 5-foot intervals. Continuous sonic sampling was also conducted between SPT Samples for B-1).

During the exploration program our field representative obtained soil samples, classified the soils, maintained a detailed log of each exploration, and observed groundwater conditions. Soils were classified visually in general accordance with ASTM International (ASTM) D 2488. Figure A-1 includes a Key to Exploration Logs. Summary logs of the explorations are included as Figures A-2 through A-3, Logs of Borings. The densities noted on the boring exploration logs are based on the blow counts produced in the SPT and our experience and judgment.

Borings were backfilled by the driller in accordance with Washington State Department of Ecology requirements.

Laboratory Test Results

Soil samples obtained from the explorations were retained in sealed plastic bags and transported to the GeoEngineers' laboratory. Representative soil samples were selected for laboratory tests to evaluate pertinent geotechnical engineering characteristics of the soils and refine our field classification, as necessary. The following paragraphs provide a description of the tests performed.

Atterberg Limits Testing

Atterberg Limits were performed on selected samples in general accordance with ASTM Test Method D4318. This test method determines the liquid limit, plastic limit, and plasticity index of soil particles passing the U.S. No. 40 sieve. Results for plastic soils are presented in Figure A-4, Atterberg Limits Test Results. The liquid limit and plasticity index are also presented on the exploration logs at the respective sample depths.

Moisture Content (MC)

The moisture content of selected samples was determined in general accordance with ASTM Test Method D 2216. Test results are presented on the exploration logs at the respective sample depths.

Percent Fines (%F)

Selected samples were "washed" through the U.S. No. 200 sieve to estimate the relative percentages of coarse- and fine-grained particles in the soil. The percent passing value represents the percentage by weight of the sample finer than the U.S. No. 200 sieve (fines). Tests were conducted in general accordance with ASTM D 1140. Test results are presented on the exploration logs at the respective sample depths.

Particle Size Gradation - Sieve Analysis (SA)

Sieve analyses were performed on selected samples in general accordance with ASTM Test Method D 6913. This test method covers the quantitative determination of the distribution of particle sizes in soils. Typically, the distribution of particle sizes larger than 75 micrometers (μm) is determined by sieving. The results of the tests were used to verify field soil classifications. Figures A-23 and A-24 present the results of our sieve analyses.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel / Dames & Moore (D&M)

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point lead test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
UU	Unconsolidated undrained triaxial compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	5/19/2022	5/19/2022	65.5	LSP	BEL	Holt Drilling, Inc.	Sonic

Surface Elevation (ft) / Vertical Datum	11 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop
Drilling Equipment	Terrasonic CC150		
Easting (X) / Northing (Y)	745863 374360	System Datum	See "Remarks" section for groundwater observed

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
10	0						AC	Approximately 3 inches of asphalt concrete			
							GP-GM	Brown fine to coarse gravel with silt, sand and cobbles (angular ballast rock) (loose, moist) (fill)			
5	5	6	6		1A			Becomes wet			Groundwater observed at 5 feet during drilling
		6			1B SA		SM	Brown silty fine to medium sand (loose, wet) (submerged fill)	24	24	Driller noted smoother drilling at 6 feet
0	10	16	2		2A %F		ML	Dark gray sandy silt (soft, wet)	59	69	
					2B %F		SM	Dark gray silty fine sand (very loose, wet)	39	46	
		12			3A AL		CH	Dark gray high plasticity clay with sand and occasional wood debris (very soft, wet) (upper alluvium)	55		AL (LL = 55; PI = 27)
							SM	Dark gray silty sand with occasional wood debris (very loose, wet)			
5	15	13	0		3B %F				39	39	
							MH	Gray elastic silt (very soft, wet)			
10	20	18	1		4 MC				50		
							MH	Gray sandy silt with occasional wood debris and shells (very soft, wet)			
15	25	18	1		5 MC		MH	Dark gray elastic silt (very soft, wet)	49		
							ML	Gray silt, wood debris (soft, wet) (lower alluvium)			
20	30	18	2		6 MC				69		
	35										

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on commercial grade GPS. Vertical approximated based on Google Earth.

Date:8/4/22 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\21\21551003\GINT\21551003GPJ DBLibrary/Library-GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEIB_GEOTECH_STANDARD_%F_NO_GW

Log of Boring B-1D

GeoEngineers

Project: Port of Ilwaco Marina Structure Replacement
Project Location: Ilwaco, Washington
Project Number: 21551-003-00

Figure A-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
-25	35											
		X	18	3		7						
-30	40	X	18	5		8A MC 8B MC		ML	Gray silt (medium stiff, moist) (weathered siltstone)	63 59		
-35	45	X	18	7		9			Becomes very stiff			
-40	50	X	18	26		10						Sample observed to crumble into semi-intact pieces of siltstone
-45	55	X	17	84		11		ML	Gray silt (hard, moist) (siltsone)			Siltstone pieces appeared more intact and distinct increase in density/consistency noted
-50	60	X	17	86		12						
	65	X	6	50/6"		13						

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Log of Boring B-1D (continued)

GeoEngineers

Project: Port of Ilwaco Marina Structure Replacement
Project Location: Ilwaco, Washington
Project Number: 21551-003-00

Figure A-2
Sheet 2 of 2

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	3/14/2022	3/14/2022	70.5	LSP	BEL	Holocene Drilling, Inc.	Mud Rotary

Surface Elevation (ft) Vertical Datum	11 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop
Drilling Equipment	Track-mounted Diedrich D70 Turbo		
Easting (X) Northing (Y)	745847 374488	System Datum	See "Remarks" section for groundwater observed

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
10	0						SM	Approximately 2 inches of dark brown silty fine sand (loose, moist)			Vac truck used to 5 feet bgs
							GP-GM	Brown fine to coarse gravel with silt and sand (medium dense, moist) (fill)			
5	5	9	5	1			SM	Gray silty fine to medium sand with gravel (loose, wet) (submerged fill)			Groundwater observed at 5 feet during drilling
		18	0	2	MC		ML	Gray silt with occasional sand (very soft, wet)	81		
0	10	10	5	3	%F		SM	Gray silty fine sand with occasional gravel (loose, wet)	39	38	
-5	15	10	0	4	AL		MH	Gray elastic silt with sand (very soft, wet) (upper alluvium)	58		AL (LL = 53; PI = 24)
-10	20	11	0	5	%F		SM	Gray silty fine sand (very loose, wet)	37	39	
							CL	Gray fat clay (very soft, wet)			
-15	25	18	1	6	AL				47		AL (LL = 51; PI = 23)
-20	30	18	0	7							
	35										

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on commercial grade GPS. Vertical approximated based on Google Earth.

Date:8/4/22 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\21\21551003\GINT\21551003OO.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEIB_GEOTECH_STANDARD_%F_NO_GW

Log of Boring B-2A

GeoEngineers

Project: Port of Ilwaco Marina Structure Replacement
Project Location: Ilwaco, Washington
Project Number: 21551-003-00

Figure A-3
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
-25	35	18	1		S MC				66		
-30	40	18	5		9 MC		CH	Grayish brown fat clay with occasional fibrous organic matter (wood fragments) (medium stiff, wet) (lower alluvium)	81		
-35	45	18	6		10 AL				54		AL (LL = 80; PI = 50)
-40	50	18	5		11A		SM	Brownish gray silty fine to medium sand with organic matter (loose, wet)			
					11B		MH	Gray elastic silt (medium stiff, wet)			
-45	55	18	2		12 MC			Becomes soft	48		
-50	60	14	25		13		ML	Gray silt (medium dense, moist) (weathered siltstone)			Driller noted harder drilling at 59 feet bgs Sample observed to crumble into semi-intact pieces of siltstone
-55	65	9	50/3"		14		ML	Gray silt (hard, moist) (siltsone)			Siltstone pieces appeared more intact and distinct increase in density/consistency noted
	70	4	50/4"		15						

Date:8/4/22 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\21\21551003\GINT\21551003300.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEIB_GEOTECH_STANDARD_%F_NO_GW

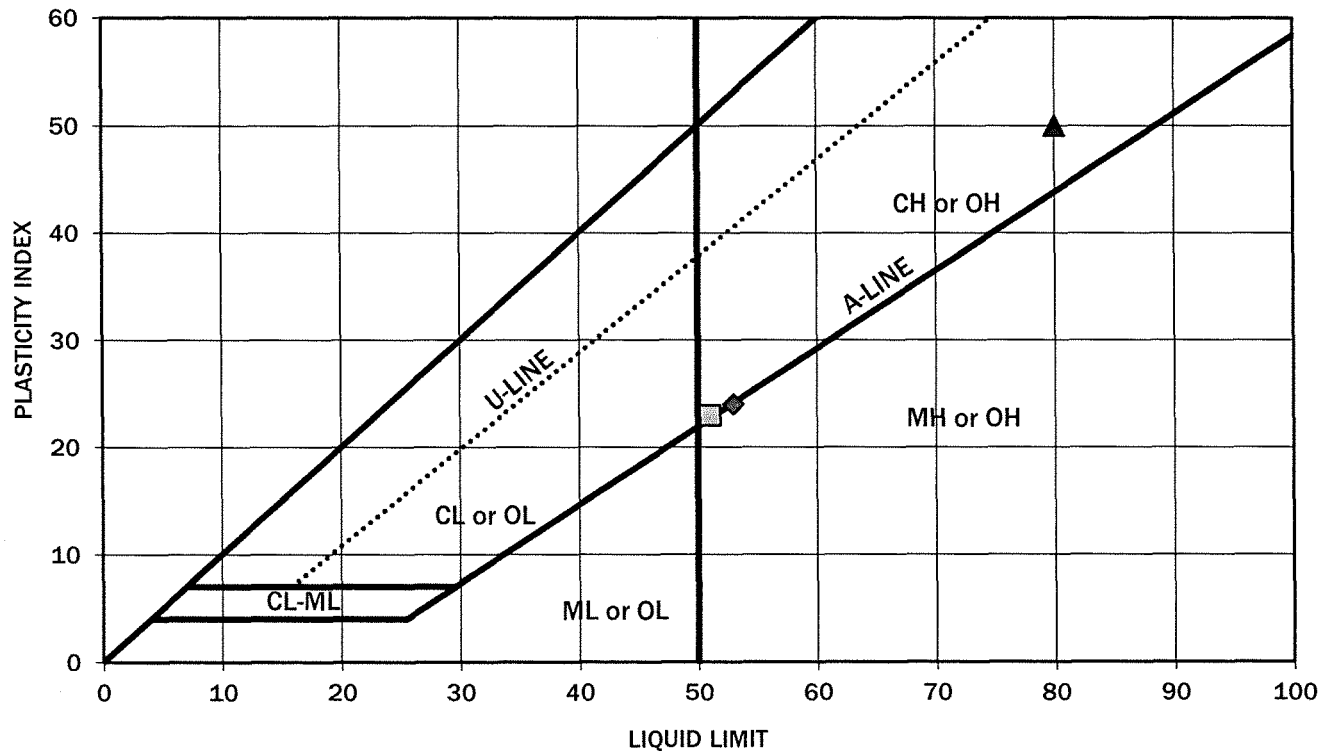
Log of Boring B-2A (continued)

GeoEngineers

Project: Port of Ilwaco Marina Structure Replacement
Project Location: Ilwaco, Washington
Project Number: 21551-003-00

Figure A-3
Sheet 2 of 2

PLASTICITY CHART



Symbol	Boring Number	Depth (feet)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Description
◆	B-2A	15	58	53	24	Elastic Silt (MH)
■	B-2A	25	47	51	23	Fat Clay (CH)
▲	B-2A	45	54	80	50	Fat clay (CH)

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Port of Ilwaco
Ilwaco, Washington

Atterberg Limits Test Results

Figure A-4

APPENDIX B
Report Limitations and Guidelines for Use

APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Read These Provisions Closely

It is important to recognize that the geoscience practices (geotechnical engineering, geology, and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to our services, GeoEngineers includes the following explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

Geotechnical Services are Performed for Specific Purposes, Persons and Projects

This report has been prepared for Moffatt & Nichol and for the Project specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with Moffatt & Nichol dated January 25, 2022 and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

A Geotechnical Engineering or Geologic Report is based on a Unique Set of Project-Specific Factors

This report has been prepared for the Port of Ilwaco, Marina Structures Replacement and Dredging, Engineering, and Permitting located in Ilwaco, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

- Not prepared for you,
- Not prepared for your project,
- Not prepared for the specific site explored, or
- Completed before important project changes were made.

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

For example, changes that can affect the applicability of this report include those that affect:

- The function of the proposed structure;
- Elevation, configuration, location, orientation, or weight of the proposed structure;
- Composition of the design team; or
- Project ownership.

If changes occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

Environmental Concerns are Not Covered

Unless environmental services were specifically included in our scope of services, this report does not provide any environmental findings, conclusions, or recommendations, including but not limited to, the likelihood of encountering underground storage tanks or regulated contaminants.

Information Provided by Others

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Geotechnical and Geologic Findings are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies the specific subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied its professional judgment to render an informed opinion about subsurface conditions at other locations. Actual subsurface conditions may differ, sometimes significantly, from the opinions presented in this report. Our report, conclusions and interpretations are not a warranty of the actual subsurface conditions.

Geotechnical Engineering Report Recommendations are Not Final

We have developed the following recommendations based on data gathered from subsurface investigation(s). These investigations sample just a small percentage of a site to create a snapshot of the subsurface conditions elsewhere on the site. Such sampling on its own cannot provide a complete and accurate view of subsurface conditions for the entire site. Therefore, the recommendations included in this report are preliminary and should not be considered final. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for the recommendations in this report if we do not perform construction observation.

We recommend that you allow sufficient monitoring, testing and consultation during construction by GeoEngineers to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes if the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective means of managing the risks associated with unanticipated conditions. If another party performs field observation and confirms our expectations, the other party must take full responsibility for both the observations and recommendations. Please note, however, that another party would lack our project-specific knowledge and resources.

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable, but separating logs from the report can create a risk of misinterpretation.

Give Contractors a Complete Report and Guidance

To help reduce the risk of problems associated with unanticipated subsurface conditions, GeoEngineers recommends giving contractors the complete geotechnical engineering or geologic report, including these "Report Limitations and Guidelines for Use." When providing the report, you should preface it with a clearly written letter of transmittal that:

- Advises contractors that the report was not prepared for purposes of bid development and that its accuracy is limited; and
- Encourages contractors to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer.

Contractors are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and adjacent properties.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.

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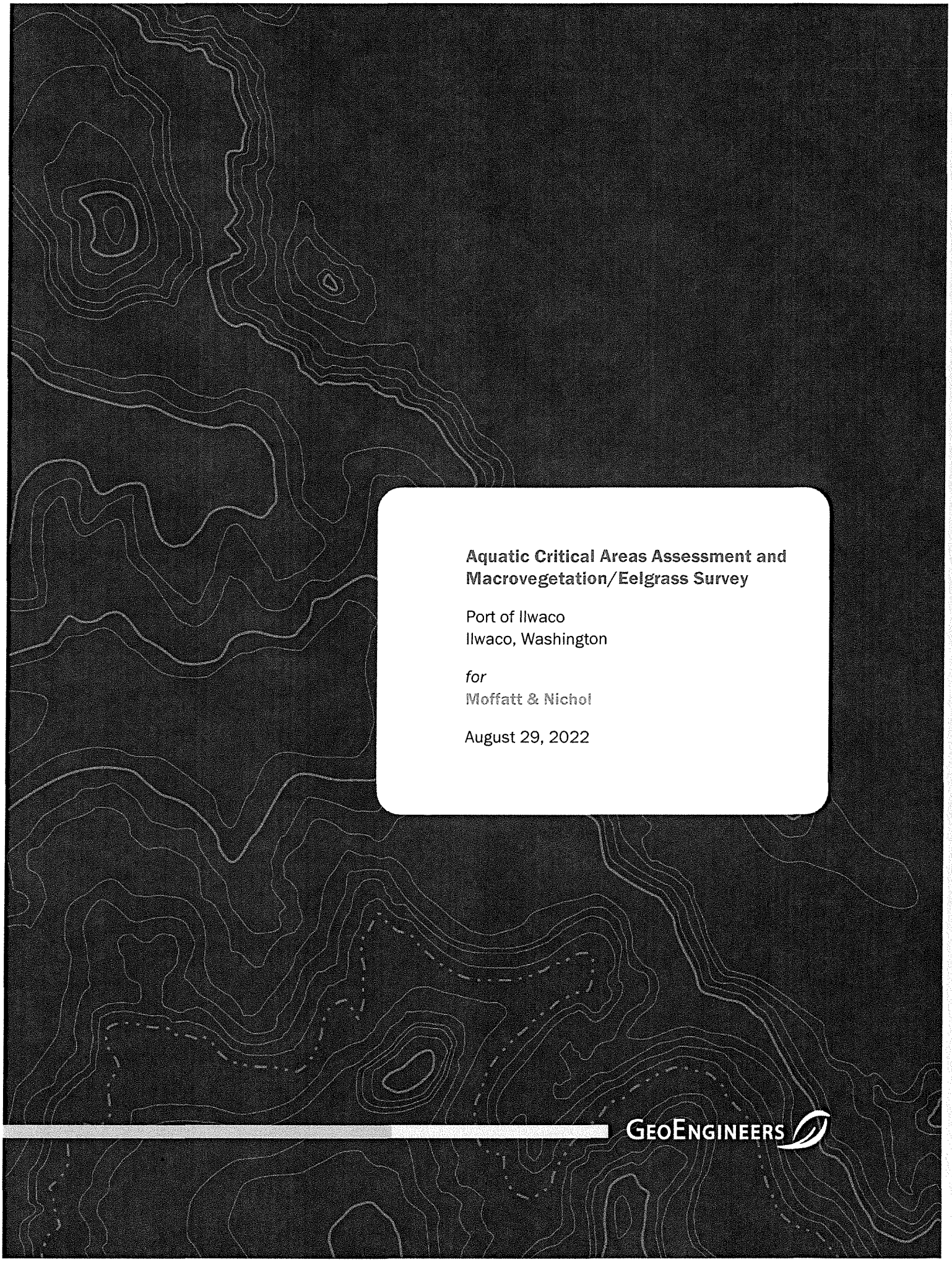


Aquatic Critical Areas Assessment and Macrovegetation/Eelgrass Survey

Port of Ilwaco
Ilwaco, Washington

for
Moffatt & Nichol

August 29, 2022

GeoEngineers

Aquatic Critical Areas Assessment and Macrovegetation/Eelgrass Survey

Port of Ilwaco
Ilwaco, Washington

for
Moffatt & Nichol

August 29, 2022

GeoEngineers, Inc.
17425 NE Union Hill Road, Suite 250
Redmond, Washington 98052
425-861-6000

Aquatic Critical Areas Assessment and Macrovegetation/Eelgrass Survey

Port of Ilwaco
Ilwaco, Washington

File No. 21551-003-01

August 29, 2022

Prepared for:

Moffat & Nichol
600 University Street, Suite 610
Seattle, WA 98101

Attention: Victoria England, LG

Prepared by:

GeoEngineers, Inc.
17425 NE Union Hill Road, Suite 250
Redmond, Washington 98052
425-861-6000

Jennifer L. Dadisman, PWS
Senior Biologist

Jason P. Stutes, PhD
Senior Marine Ecologist

Emily R. Hurn
Environmental Scientist

Fiona M. McNair, MRM, PWS
Associate Biologist and Wetland Scientist

JLD:JPS:ERH:FMM:tlm

Table of Contents

1.0 INTRODUCTION AND PROJECT UNDERSTANDING

GeoEngineers, Inc. (GeoEngineers) was contracted by Moffatt & Nichol on behalf of the Port of Ilwaco (Port) to perform wetland and stream delineation services and a macrovegetation/eelgrass survey for the Port of Ilwaco Dredging and Dredge Material Placement Project (project). The project and survey areas are located within Baker Bay, within and adjacent to the mouth of the Columbia River in Ilwaco, Washington (Figure 1, Vicinity Map). The Port of Ilwaco is proposing to dredge the marina basin as part of their ongoing maintenance to maintain marina operations, and potentially place dredge materials along the Baker Bay shoreline to the northeast of the marina.

This report has been prepared to summarize habitat surveys completed to document baseline habitat conditions (wetland, stream and estuarine macrovegetation) that may be affected by proposed project elements in accordance with Ilwaco Municipal Code (IMC) Chapter 15.18 (Critical Areas Ordinance) and according to the City of Ilwaco's Shoreline Master Program (SMP) (IMC Chapter 15.14). Per Washington Administrative Code (WAC) 220-110-250(3)(a,b), eelgrass and macroalgae are saltwater habitats of special concern and per IMC Chapter 15.14 they are critical saltwater habitats and therefore project proponents are required to document proximity of these habitats within the footprint and vicinity of the project. The habitat surveys included an eelgrass/macroalgae and wetland survey within the marina and within and adjacent to the proposed beneficial use site (proposed dredge disposal area). Both of these distinct survey areas are shown on Figure 1. The approximate marina dredge basin area is 62 acres, and the proposed beneficial use site encompasses a 78-acre area.

1.1. Project Location and Site Description

The project site is located at the Port of Ilwaco Marina at 165 Howerton Avenue, adjacent to the Columbia River (Figure 1). The proposed beneficial use site is located northeast of the marina on the Columbia River shoreline. The project area is bordered to the north by businesses, single-family homes and roadways and bordered to the south by the Columbia River. The project is located within Water Resources Inventory Area (WRIA) 24 (Willapa), and Section 34 of Township 10 North and Range 11 West of the Willamette Meridian (W.M.).

The general vicinity of the marina has been heavily influenced by development and recreational uses (marina and boating). Structures and development within the marina include docks, piers and riprap bulkheads.

2.0 DATA REVIEW

Environmental maps of the project area were collected and reviewed as part of a paper inventory. The United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) online mapper (USFWS 2022) depicts an estuarine wetland along the shoreline within the project area. The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey identifies the marina and proposed beneficial use site areas as located in water and there is no soil type listed (USDA-NRCS 2022). NWI and soil survey information are included in Appendix A, Published Data Review.

Additional information was obtained from the Washington State Department of Natural Resources (DNR) Forest Practices Application Mapping Tool (FPAMT) and Washington Department of Fish and Wildlife (WDFW) Priority Habitat and Species (PHS) data (DNR 2022; WDFW 2022). FPAMT depicts the marina as the Columbia River (a shoreline waterbody), maps a fish-bearing stream flowing into the northwest corner of the marina and maps another fish-bearing stream flowing into and through the proposed beneficial use site (DNR 2022). WDFW PHS data depicts the following priority species and habitats within ½-mile of the marina (WDFW 2022):

- Marbled murrelet (*Brachyramphus marmoratus*);
- Purple martin (*Progne subis*);
- Shorebird Concentrations;
- Waterfowl Concentrations;
- Wetlands;
- Estuarine and Marine wetlands;
- Freshwater Emergent Wetlands; and
- Freshwater Forested/Shrub Wetlands.

The U.S. Army Corps of Engineers (USACE) performed a comprehensive eelgrass survey of subtidal habitats within Baker Bay and Chinook in 2015 using BioSonics MX Aquatic Habitat Echosounder technologies. This survey documented a small population of eelgrass to the east of Sand Island (located approximately 2.6 miles southeast of the Ilwaco Marina) and larger beds to the west near Chinook (USACE 2015). The 2015 USACE survey did not include the marina or proposed beneficial use site but their findings document habitat in the vicinity of the project areas.

3.0 MACROVEGETATION/EELGRASS DELINEATION

The eelgrass/macrovegetation survey covered two survey areas: the footprint of the proposed dredge prism at the marina and the footprint of the proposed beneficial use site are located to the northeast. Surveys within these areas are necessary to document the potential effects of the proposed activities on eelgrass and macroalgal resources to help inform the design team and regional regulators. The following sections summarize the methods of the survey and the findings. Site photographs from the macrovegetation/eelgrass survey are provided in Appendix B, Site Photographs.

3.1. Eelgrass and Macrovegetation Survey Methods

The macrovegetation survey of this section of shoreline was conducted under the WDFW Eelgrass/Macroalgae Habitat Interim Survey Guidelines dated June 16, 2008 (WDFW 2008) and USACE4K Components of a Complete Eelgrass Delineation Report (USACE 2018). As per the protocols, the macrovegetation survey was initiated as a preliminary level survey (Tier 1 per USACE) using the geo-referenced hydroacoustic MX Aquatic Habitat Echosounder by BioSonics® aboard a vessel contracted with Gravity Marine. This system is comprised of a downward looking single beam transducer head that is georeferenced using a Trimble R2 Integrated GNSS Receiver System. A Sontek Castaway conductivity, temperature and depth (CTD) was used to profile density (i.e., salinity) of the water column to determine

the speed of sound for the survey site. In addition to the echosounder, an Outland technology 4K towed video system was used to ground truth/field verify echosounder data and to document fish and invertebrate resources associated with various habitat types encountered. An eelgrass biologist was onboard during the survey to document the extent of subtidal eelgrass (namely *Zostera marina*) and macroalgae in the proposed project area along with other observations about habitat quality and species diversity. Geospatial data was postprocessed for eelgrass and macroalgae coverage using ESRI software to compile a geospatial (geographic information system [GIS]) database.

Within both the marina and proposed beneficial use site, BioSonics® equipment was used to survey transects across the entire dredge and proposed beneficial use footprints. BioSonics® transects completed in these areas are shown on Figure 2, Survey Area Effort – Ilwaco Marina and Figure 3, Survey Area Effort – Ilwaco Proposed Beneficial Use Site, respectively. To confirm presence/absence of macrovegetation, field verification was performed using underwater video camera equipment within the proposed dredge prism and beneficial use area (Figures 2 and 3).

In addition to the vessel-based survey methods described above, a foot-based survey was completed to assess the habitat conditions within the upper elevations of the proposed beneficial use site as these areas were not accessible with the vessel due to shallow water/low tide conditions. In order to have complete survey coverage of the proposed beneficial use site, any areas not directly surveyed by the boat-based survey, or the foot-based survey were verified visually (either from the upland or from the water side) to be devoid of macrovegetation during low tide. Figure 3 illustrates the extent of the nearshore foot-based survey, and the vessel transects completed with the BioSonics® equipment.

3.2. Eelgrass and Macrovegetation Survey Results

The project site was surveyed on June 15, 2022. Conditions were calm with light and variable wind with overcast skies. Tides ranged from -2.06 feet mean lower low water (MLLW) to +6.8 feet MLLW during the survey. Water column visibility during field verification performed with underwater video was low during the survey with approximately 2 to 5 feet of visibility. A summary of survey findings is provided below.

3.2.1. Marina

The preliminary survey results identified one main bed of eelgrass within the marina with smaller adjacent patches. The mapped eelgrass is distributed in shallow subtidal areas between approximate elevations -7 to -10 feet (North American Vertical Datum of 1988 [NAVD 88] vertical datum). The survey identified the eelgrass distribution primarily within the center of the marina, adjacent to the "G Dock" with smaller patches scattered to the south and east (Figure 4, Eelgrass Coverage – Ilwaco Marina). This survey documented approximately 0.02 acres (983 square feet) of native eelgrass habitat within the marina (Figure 3).

Photographs of the macrovegetation portion of the site visit are provided in Appendix B, Figures B-5 and B-6.

3.2.2. Proposed Beneficial Use Area/Dredge Disposal Area

The preliminary survey results identified one patch of non-native eelgrass (*Zostera japonica*) and patchy rockweed (*Fucus distichus*) within the survey area associated with the proposed beneficial use site. No native eelgrass (*Zostera marina*) was identified in the proposed beneficial use site. The distribution of

these patches of submerged vegetation are shown on Figure 5, Macrovegetation Coverage – Ilwaco Proposed Beneficial Use Site and occurred between the approximate elevations +1 and +3 feet NAVD88. Our survey documented approximately 4.6 acres (200,080 square feet) of patchy non-native (*Z. japonica*) eelgrass and 2.9 acres (126,750 square feet) of patchy rockweed habitat within the proposed beneficial use site (Figure 5). Rockweed encountered was always associated with shallow low elevation rocky outcrops (e.g., Appendix B, Figure B-3; Photograph 6). No kelp species were noted in either survey area. Photographs of the macrovegetation portion of the site visit are provided in Appendix B, Figures B-3 and B-4.

3.2.3. Invertebrate and Vertebrate Fauna

As underwater video was limited to field verification of BioSonics® flagged macrovegetation and visibility was generally reduced within the Columbia River estuary, large mobile invertebrates and vertebrates were not documented. However, lack of video documentation does not suggest these species are not present at the site. Eelgrass and macroalgal habitat provide cover and foraging habitat for crab and fish species and likely numerous species occupy the documented habitat.

3.2.4. Anthropogenic Elements

Throughout the marina portion of the survey area, derelict boats, petroleum sheen on the water surface and other garbage on the water surface was noted. In contrast, the proposed beneficial use site was predominantly absent of anthropogenic materials such as concrete, and derelict fishing gear; however, some tires and wood debris were observed. The majority of the documented habitat in the vicinity of the proposed beneficial use site was unimpacted by human development or activities.

3.3. Summary

Native eelgrass was documented within the proposed dredge footprint at the Port of Ilwaco marina. The presence of eelgrass habitat within the marina likely occurs due to sediment deposition from the Columbia River raising elevations within the marina dredge basin so they are suitable for eelgrass as it has been an extended period of time since the last marina-wide dredging event. The Port has completed maintenance dredging in small, targeted areas where deposition and prop wash have created high spots over the last several years. A marina-wide maintenance dredging episode has not been completed for many years. The survey also documented non-native eelgrass and macroalgae habitat (rockweed) within the proposed beneficial use/dredge disposal area. The native eelgrass and rockweed habitats are considered protected as Essential Fish Habitat (EFH) for both marine and anadromous fish under the Magnuson Stevens Fishery Conservation and Management Act (PFMC 1998 and PFMC 1999). These saltwater habitats are also protected under WACs 220-110-250(3)(a,b) and per IMC Chapter 15.14 (Shoreline Master Program).

4.0 WETLANDS AND STREAMS FIELD INVESTIGATION

GeoEngineers' biologist conducted a field assessment on June 15, 2022, to characterize wetland and stream features within the project area. The survey area for wetlands and streams focused on the approximately 2,000 feet of shoreline located northeast of the marina, landward of and along the northwest edge of the proposed beneficial use site. One estuarine wetland (Wetland A) and no streams were identified during the field investigation. The wetland delineation focused on the waterward side of the wetland boundary. The landward boundary was delineated due to private property ownership. The

ordinary high water mark (OHWM) of the Columbia River was determined during the previous geodetic survey. Representative photographs of the site have been included in Appendix B.

4.1. Methods

The delineation of aquatic critical areas (wetlands and streams) was conducted in accordance with guidelines presented in IMC, Chapter 15.18 Critical Areas and the Shoreline Master Program (IMC Chapter 15.14). The wetland delineation was also conducted with the use of the *USACE Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (USACE 2010). The OHWM of potential streams was evaluated by examining breaks in the topography, drift lines, shifts in vegetation and signs of water marks, according to USACE protocol as referenced from Regulatory Guidance Letter (No. 05-05), Ordinary High-Water Mark Identification, December 7, 2005 (Riley 2005) and according to the Washington State Department of Ecology (Ecology) 2016 guidance (Anderson et al. 2016).

GeoEngineers collected geographic coordinates of the wetland boundaries and sample plots using a hand-held global positioning system (GPS) device. Survey flags were not placed because identified wetland habitat was below the shoreline OHWM, where flags could be washed away. A total of two sample plots were established within the project area as part of the wetland assessment. Sample plot data forms are presented in Appendix C, Sample Plot Data Forms. The delineated wetland was categorized using the 2014 Washington State Wetland Rating System for Western Washington (Hruby 2014). The rating system is intended for use primarily with vegetated, freshwater, wetlands as identified using the federal wetland delineation manual and the appropriate regional supplements. The rating system categorizes estuarine wetlands but does not rate their functions. The wetland rating form is included in Appendix D, Ecology Wetland Rating Form.

The wetland was categorized, and the regulatory wetland buffer was identified according to the Shoreline Master Program (IMC Chapter 15.14) based on the wetland habitat characteristics, Ecology wetland rating, and the intensity of proposed land use. For the purposes of this report, it is assumed that the site will have a high-intensity land use based on the project plans. The City of Ilwaco will make the final determination of buffer widths.

4.2. Results

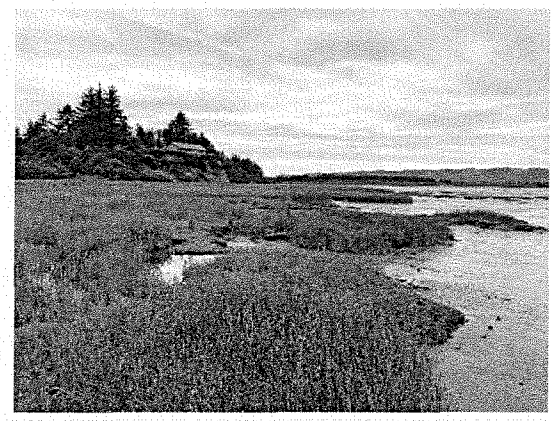
Within the marina there was some limited upland vegetation growing on fill materials above the riprap bulkhead. Upland vegetation included clover species (*Trifolium species*), Japanese knotweed (*Polygonum cuspidatum*), various grasses, dandelion (*Taraxacum officinale*) and creeping buttercup (*Ranunculus repens*). No wetlands were noted in or around the marina.

Outside of the marina in the vicinity of the proposed beneficial use site, one estuarine wetland was identified below the eastern marina riprap bulkhead extending east adjacent to the proposed beneficial use site; dominant vegetation identified within the estuarine wetland during the site visit included Lyngbye's sedge (*Carex lyngbyei*), three-square (*Schoenplectus pungens*) and silverweed (*Potenitilla anserina*). In addition to the estuarine wetland, the Columbia River estuary was documented. No streams were identified along the shoreline of Baker Bay within and adjacent to the proposed beneficial use site.

The field assessment mapping results are presented in Figure 6, Wetland Survey Findings – Ilwaco Proposed Beneficial Use Site. Tables 1 and 2 on the following pages summarizes the wetland and Baker Bay features documented on the site and provides additional information regarding baseline conditions, rating details and regulatory requirements.

TABLE 1. WETLAND A SUMMARY

Shoreline Wetland – Information	
Location	Shoreline along proposed beneficial use site; northeast of existing marina
WRIA	24 – Willapa
Local Jurisdiction	Ilwaco
Buffer Width[1]	200 feet
Washington Ecology Categorization[2]	Category I
Size	More than 2 acres
Cowardin Class	Estuarine Emergent



Description Summary	
Dominant Vegetation	**Herbaceous:** Lyngbye's sedge (*Carex lyngbyei*); three-square (*Schoenplectus pungens*); silverweed (*Potenitilla anserina*) **Shrub:** None **Tree:** None
Soils	Meets criteria for hydric soil indicator sandy redox (S5) and hydrogen sulfide (A4).
Hydrology	**Indicators:** Saturated, geomorphic position and facultative (FAC)-Neutral Test **Source:** Direct precipitation, runoff and tidal influences
Wetland Functions Summary	
Water Quality	Moderate water quality functions because it is dominated by emergent vegetation. The wetland also has adjacent development with adjacent paved roads (i.e. sources of pollution). However, the wetland is directly adjacent to the marine influenced waters of the Columbia River with a direct outlet.
Hydrologic	Moderate level for hydrologic functions due to vegetation coverage, and ability to slow water flow discharge and protect the shoreline from erosion.
Habitat	Moderate to high level of habitat functions due to having direct connections to Columbia River, no vegetated connections to other upland or wetland areas, there is only one vegetation class (emergent) and special habitat features such as large woody debris.
Buffer Condition	The wetland buffer is impacted and consists in part of paved roadways and single-family residences. There is direct observations and evidence of human uses within the buffer and portions of the buffer are dominated by invasives. In addition, boat use in the Columbia River disturbs the waterward side of the buffer.

Notes:

1. According to IMC 15.18.030.G. Buffer width was identified according to the Ecology rating and a high intensity land use impact. The final buffer width is subject to approval by the jurisdictional authority.
2. Wetland category based on the Washington State Wetlands Rating System for Western Washington, (Hruby revised 2014). The wetland is greater than 1-acre in size, is relatively undisturbed and has tidal channels and depressions.

TABLE 2. BAKER BAY SUMMARY

Baker Bay – Information	
Location	Shoreline along proposed beneficial use site; east of marina
WRIA	24 – Willapa
Local Jurisdiction	Ilwaco
DNR Stream Type[1]	S – Shoreline of the State
Shoreline Type[2]	High Intensity A (adjacent to the marina) Shoreline Residential A (NE area of the investigation)
Buffer Width[3]	Adjacent to High Intensity A: No buffer, and 50-foot structure setback. Adjacent to Shoreline Residential A: 100-foot buffer and 15-foot structure setback
Average Channel Width[4]	5 to 6 miles wide in the lower reach (from the mouth to approximately 25 miles upstream)
Gradient	Less than 5 percent
Duration	Perennial and Tidally Influenced

Description Summary	
Documented Fish Use[5]	Steelhead (*Oncorhynchus mykiss*), Bull Trout (*Salvelinus confluentus*), Coho Salmon (*Oncorhynchus kisutch*), Pink Salmon (*Oncorhynchus gorbuscha*), Chum Salmon (*Oncorhynchus keta*), Chinook Salmon (*Oncorhynchus tshawytscha*), Sockeye (*Oncorhynchus nerka*), Residential Coastal Cutthroat (*Oncorhynchus clarki*), White Sturgeon (*Acipenser transmontanus*), Green Sturgeon (*Acipenser medirostris*)
Connectivity	Discharges to the Pacific Ocean
Channel Description	5- to 6-mile-wide estuarine channel, 3.5 miles from the Pacific Ocean. Sand substrate.
Buffer Condition	Riparian buffer within the project site consists of steeps slopes and native vegetation. Downstream from the project site the buffer contains rural residential development, landscape and native vegetation.

Notes:

1. DNR FPAMT (DNR 2022).
2. City of Ilwaco Official Shorelines Map (IMC Chapter 15.14)
3. According to IMC Chapter 15.14, Appendix B, Table B3-1. The final buffer width is subject to approval by the jurisdictional authority.
4. Average Channel Width derived from estimates during the field investigation, aerial photographs and Light Detection and Ranging (LiDAR) data.
5. WDFW Priority Habitat and Species mapping application (WDFW 2022).

5.0 SUMMARY

GeoEngineers performed aquatic critical areas (wetlands and streams) assessment and a macrovegetation/eelgrass survey for the Port of Ilwaco Dredging and Dredge Material Placement Project. One estuarine wetland (Wetland A) was identified and delineated along the shoreline of the Columbia River. The wetland meets the characteristics to be a Category I estuarine system. According to Ilwaco Shoreline Master Program, the wetland will require a 200-foot buffer based on being an estuarine wetland with a high intensity of proposed adjacent land use. Native eelgrass (0.02 acres) was documented within the marina dredge prism. The eelgrass likely occurs within the marina due to an extended period of deposition from the Columbia River based on the lack of regular marina-wide dredging creating suitable growing conditions (depth) for the species to occur. Large, patchy areas of non-native eelgrass and brown algae were found in the upper elevations of the proposed beneficial use site.

6.0 LIMITATIONS

GeoEngineers has prepared this report in general accordance with the scope and limitations of our proposal. Within the limitations of scope, schedule and budget, our services have been executed in accordance with the generally accepted practices for wetland delineation and macro vegetation surveys in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

This report has been prepared for the exclusive use of Moffatt & Nichol, authorized agents and regulatory agencies following the described methods and information available at the time of the work. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. The information contained herein should not be applied for any purpose or project except the one originally contemplated.

The applicant is advised to contact all appropriate regulatory agencies (local, state and federal) prior to design or construction of any development to obtain necessary permits and approvals.

7.0 REFERENCES

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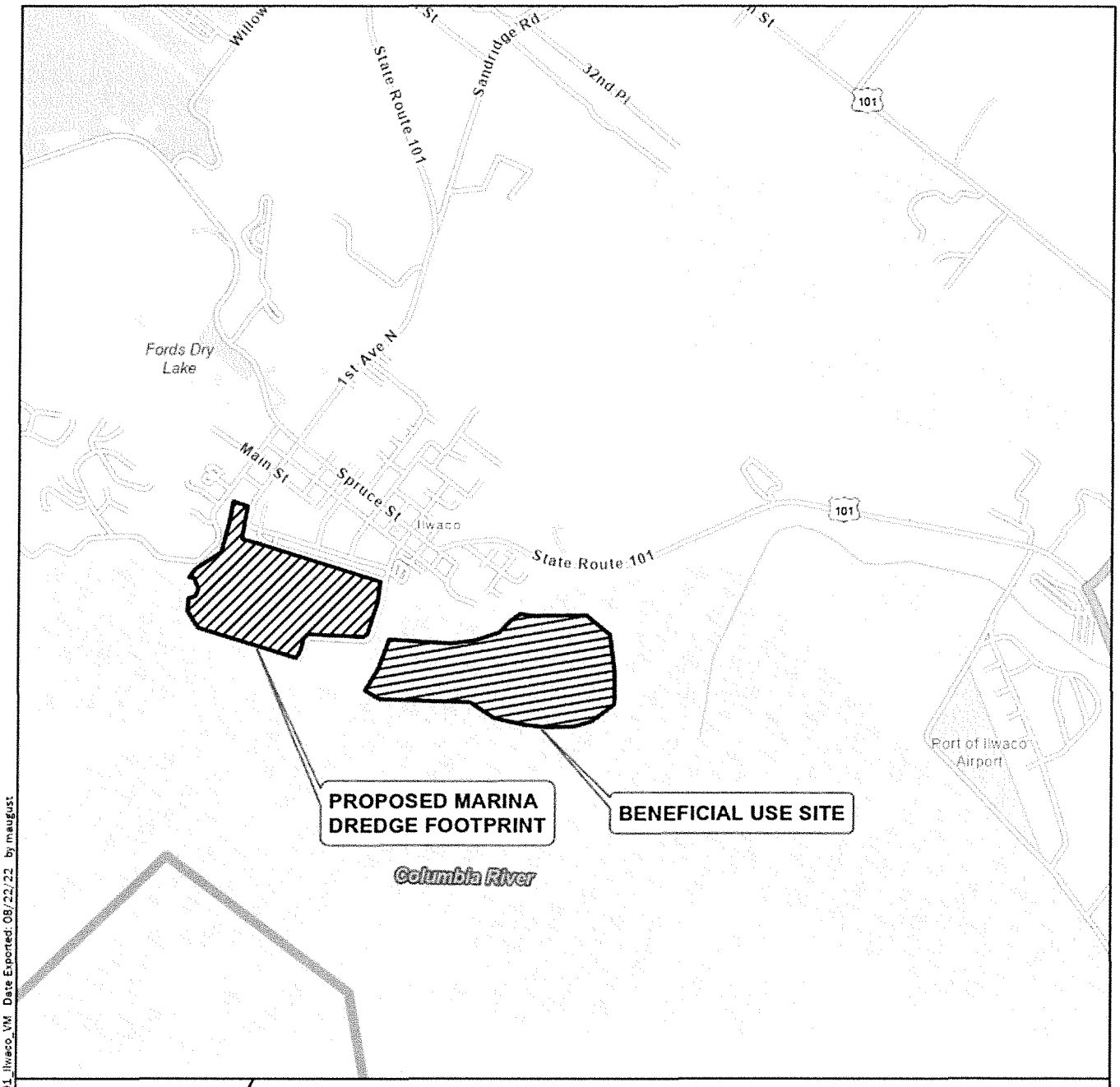
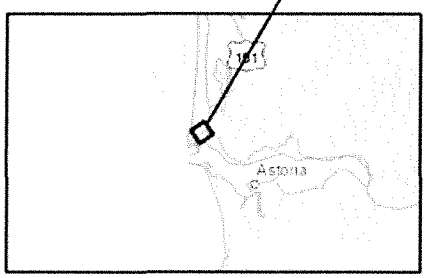
FIGURES

GeoEngineers





2,000 0 2,000

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Vicinity Map

Port of Ilwaco Dredging and Dredge Material Placement Project
Ilwaco, Washington

GeoEngineers

Figure 1

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Legend

- BioSonics Transect
- Field Verification Area (Underwater camera)

Data Source: Data Source: Bing Aerial Imagery

N W E S

200 0 200

Feet

Survey Area Effort – Ilwaco Marina

Port of Ilwaco Dredging and
Dredge Material Placement Project
Ilwaco, Washington

GeoEngineers

Figure 2

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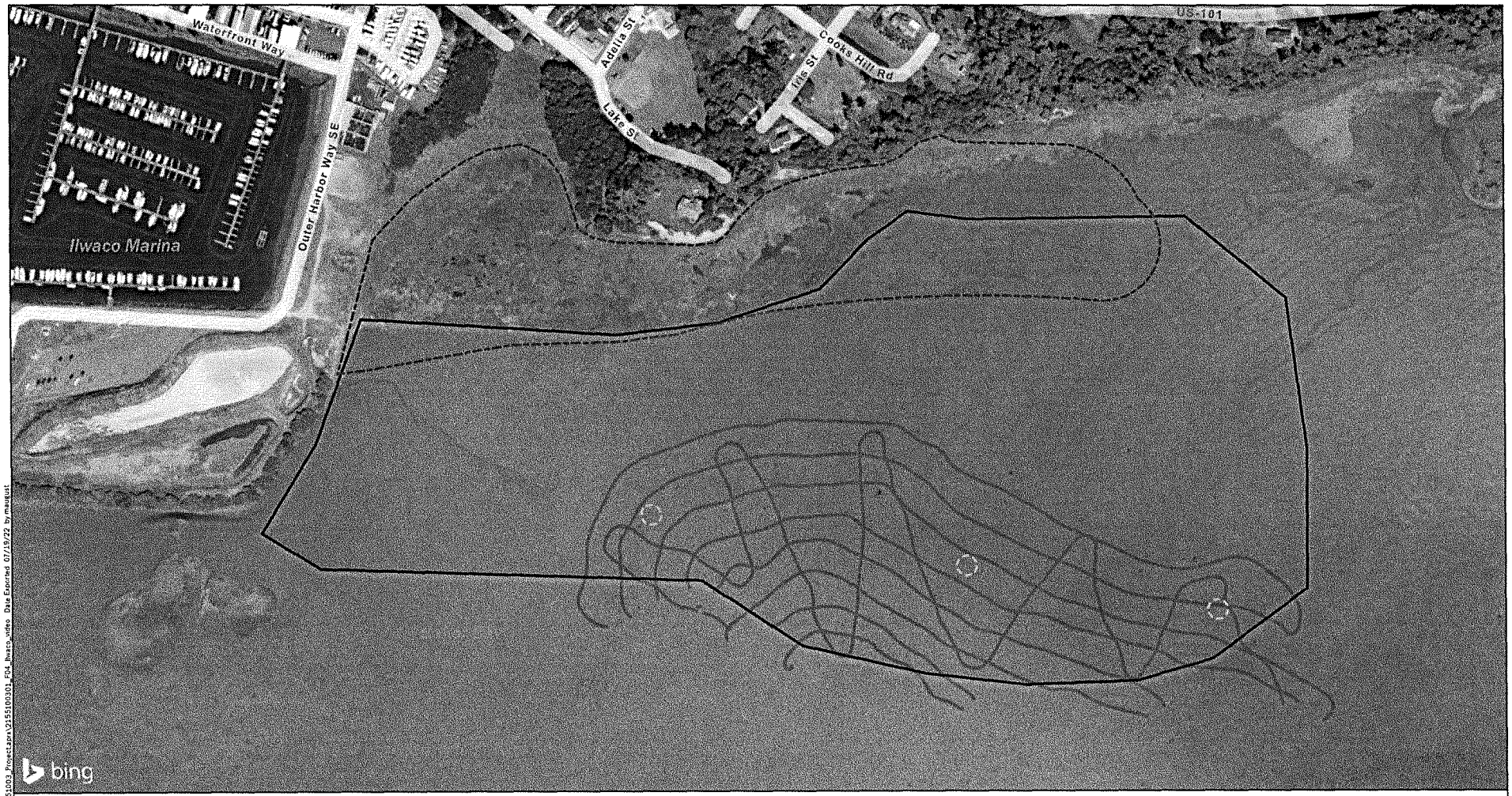
LOGS:



Legend

- BioSonics Transect
- Field Verification Area (underwater camera)
- Wetland and Stream Assessment Area and Nearshore Macrovegetation/Eelgrass Survey Area
- Ilwaco Beneficial Use Site

Data Source: Bing Aerial Imagery

300 0 300
Feet

Survey Area Effort –Ilwaco
Proposed Beneficial Use Site

Port of Ilwaco Dredging and
Dredge Material Placement Project
Ilwaco, Washington

GeoEngineers

Figure 3

P:\21\21553003\GIS\21553003_Project\21553003_F04_Ilwaco_video Date Exported: 07/19/22 by maxgust

Edits:

Legend

Native Eelgrass Presence

Data Source: Bing Aerial Imagery.

200 0 200

Feet

Eelgrass Coverage – Ilwaco Marina

Port of Ilwaco Dredging and
Dredge Material Placement Project
Ilwaco, Washington

GeoEngineers

Figure 4

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Figure 3:

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend
- Ilwaco Beneficial Use Site
- Non-Native Eelgrass
- *Fucus distichus*

300 0 300
Feet

Macrovegetation Coverage – Ilwaco Proposed Beneficial Use Site

Port of Ilwaco Dredging and Dredge Material Placement Project
Ilwaco, Washington

GeoEngineers

Figure 5

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1200

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Legend

- Sample Point
- Delineated Wetland Boundary
- Wetland
- Ilwaco Beneficial Use Site

Data Source:

300 0 300
Feet

Wetland Survey Findings - Ilwaco Proposed Beneficial Use Site

Port of Ilwaco Dredging and Dredge Material Placement Project
Ilwaco, Washington

GeoEngineers

Figure 6

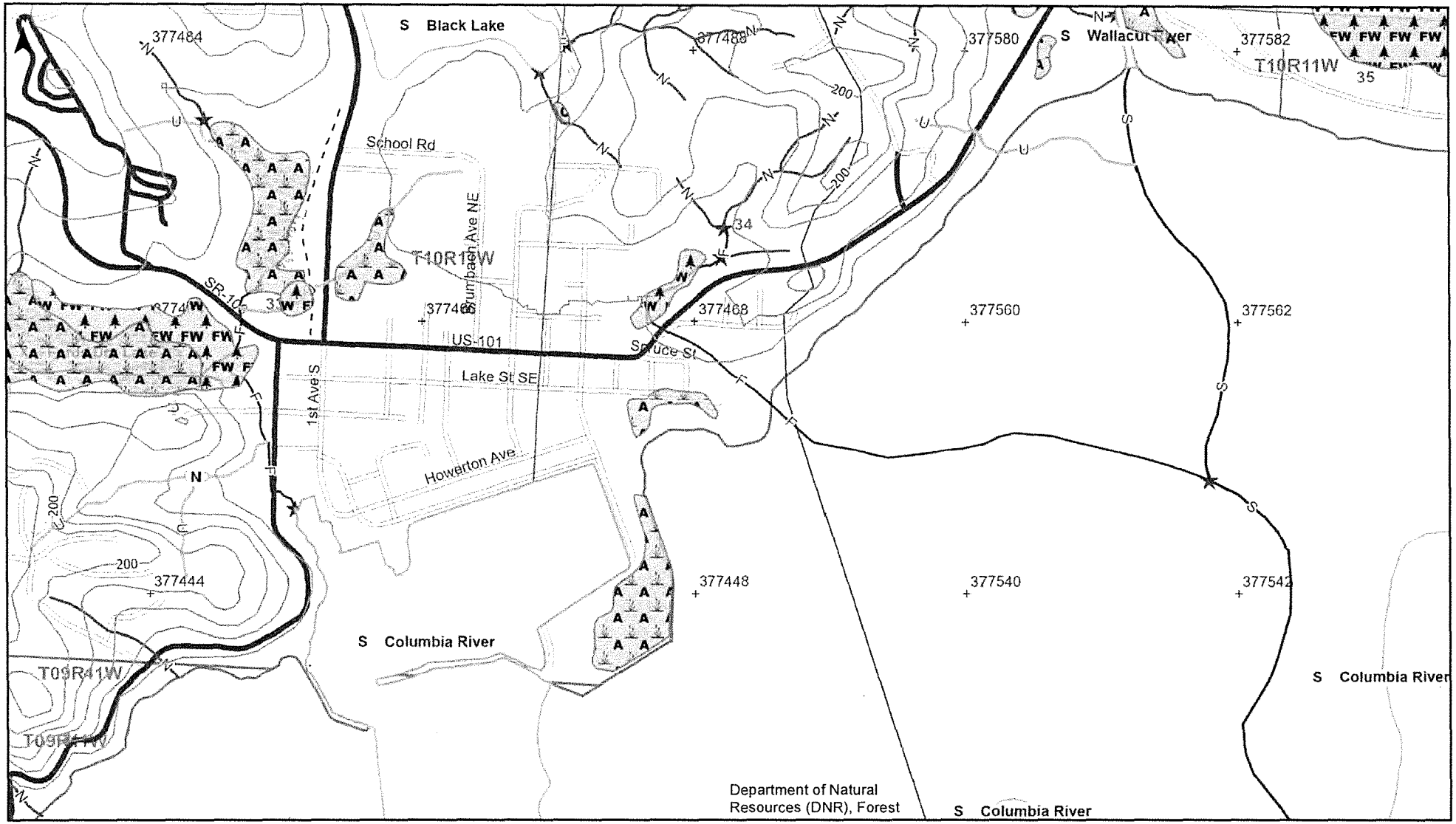
Notes:

APPENDICES

GeoEngineers

APPENDIX A
Published Data Review

Forest Practices Water Type Map



Map Symbols

- New Stream
- Proposed Water Type
- Stream Removal
- Break between water types
- Start and End Point of Surveyed Reach
- Natural Fish Barrier
- Manmade Barrier
- End of Fish or Last Fish

Additional Information

Legal Description

S35 T10.0N R11.0W, S33 T10.0N R11.0W
S03 T09.0N R11.0W, S04 T09.0N R11.0W
S34 T10.0N R11.0W

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

Extreme care was used during the compilation of this map to ensure its accuracy. However, due to changes in data and the need to rely on outside information, the Department of Natural Resources cannot accept responsibility for errors or omissions, and therefore, there are no warranties that accompany this material.

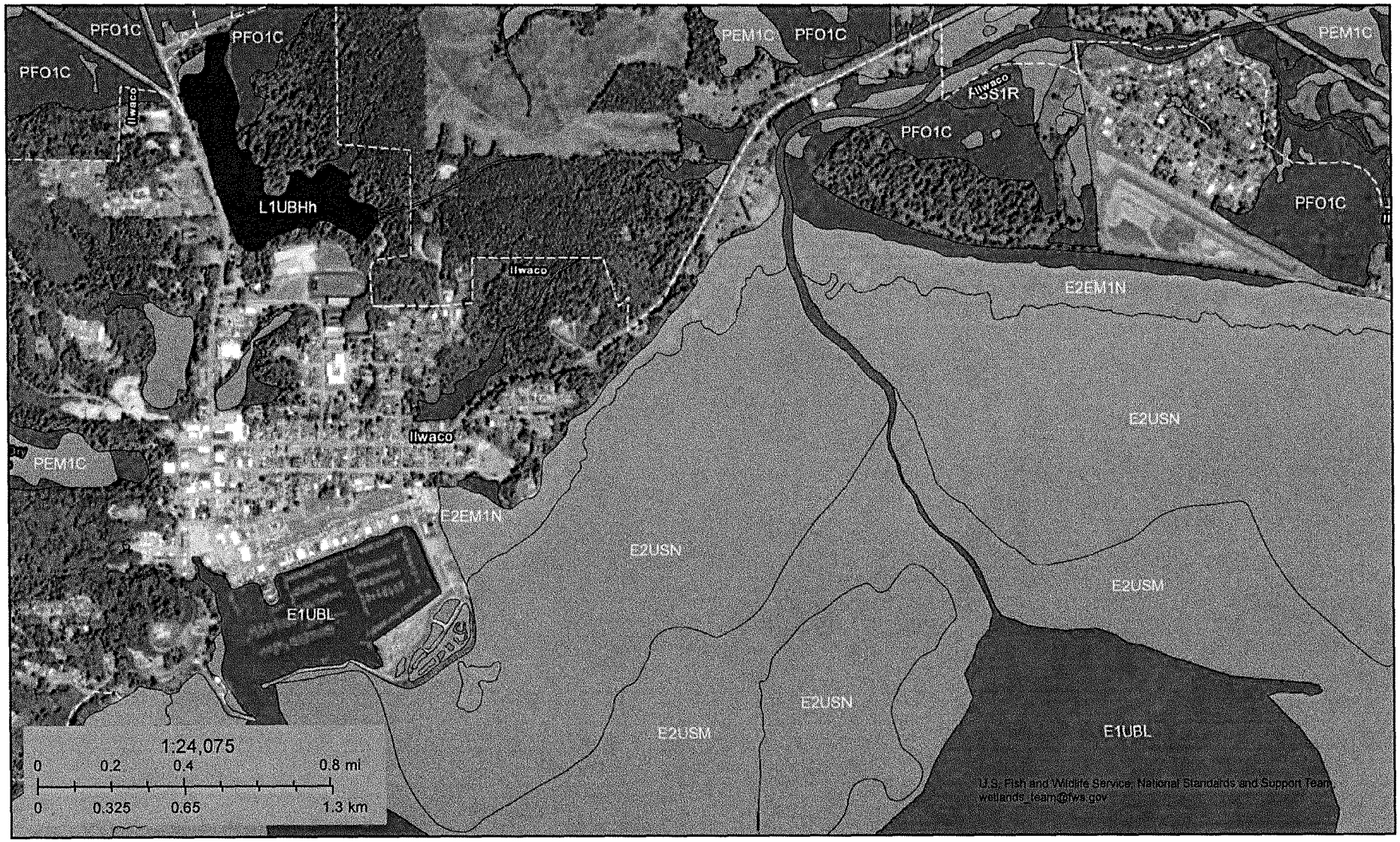
0 0.25 Miles

Date: 8/18/2022 Time: 6:21:47 PM

U.S. Fish and Wildlife Service

National Wetlands Inventory

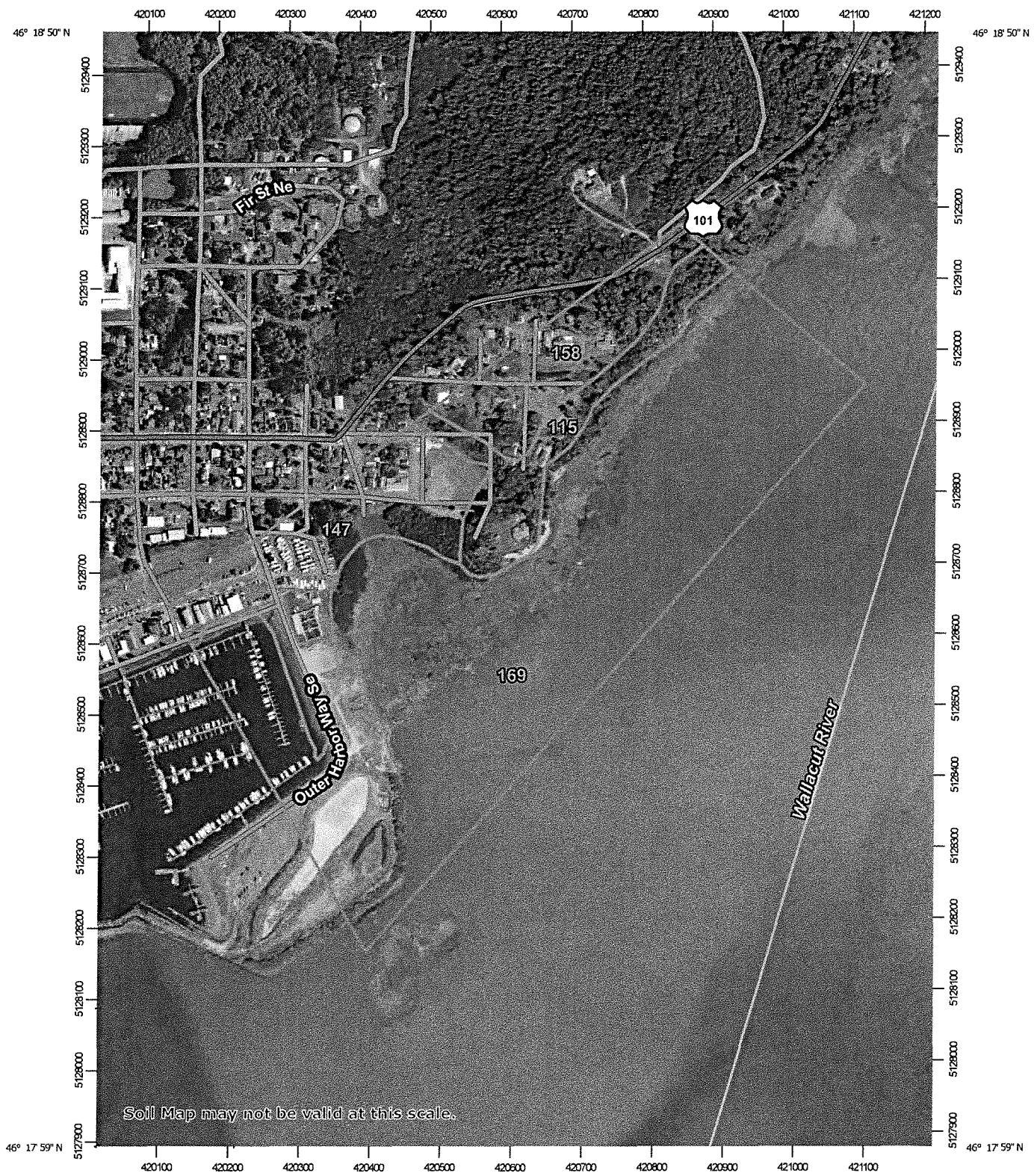
Wetlands



June 29, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine



Map Scale: 1:7,640 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Grays Harbor County Area, Pacific and Wahkiakum Counties, Washington
Survey Area Data: Version 20, Aug 23, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

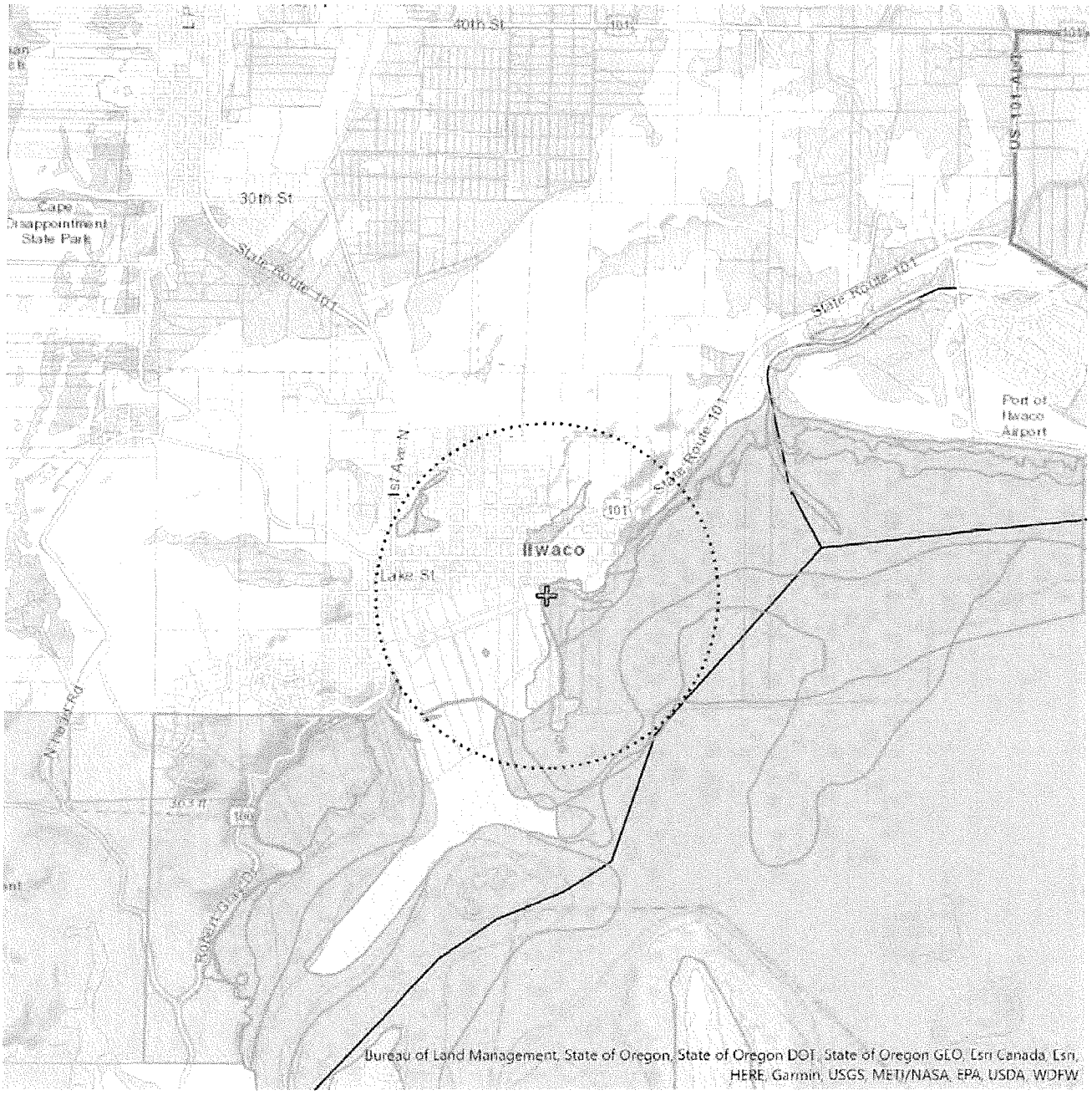
Date(s) aerial images were photographed: Jul 26, 2020—Jul 27, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
115	Palix silt loam, cool, 30 to 65 percent slopes	8.5	7.9%
147	Udorthents, level	15.9	14.7%
158	Willapa silt loam, cool, 1 to 8 percent slopes	9.6	8.9%
169	Water	74.0	68.5%
Totals for Area of Interest		**108.0**	**100.0%**

Priority Habitats and Species on the Web



Buffer radius: 0.5 Miles

Report Date: 06/29/2022

PHS Species/Habitats Overview:

Occurence Name	Federal Status	State Status	Sensitive Location
Marbled murrelet	Threatened	Endangered	No
Shorebird Concentrations	N/A	N/A	No
Waterfowl Concentrations	N/A	N/A	No
Wetlands	N/A	N/A	No
Purple martin	N/A	N/A	No
Estuarine and Marine Wetland	N/A	N/A	No
Freshwater Emergent Wetland	N/A	N/A	No
Freshwater Forested/Shrub Wetland	N/A	N/A	No

PHS Species/Habitats Details:

Marbled murrelet	
Scientific Name	*Brachyramphus marmoratus*
Priority Area	Breeding Survey
Site Name	T9-0N R11-0W S04
Accuracy	NA
Notes	Detection Status: 3
Source Dataset	WS_MMDetSect
Source Name	Not Given
Source Entity	WDFW Wildlife Program
Federal Status	Threatened
State Status	Endangered
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026
Geometry Type	Polygons

Shorebird Concentrations	
Priority Area	Regular Concentration
Site Name	BAKER BAY
Notes	SHOREBIRD CONCENTRATION AREAS
Source Record	904452
Source Dataset	PHSREGION
Source Name	SKRILETZ, JEFF
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026
Geometry Type	Polygons

Waterfowl Concentrations	
Priority Area	Regular Concentration
Site Name	BAKER BAY
Accuracy	1/4 mile (Quarter Section)
Notes	WATERFOWL WINTERING CONCENTRATION AREA.
Source Record	902356
Source Dataset	PHSREGION
Source Name	SCHIRATO, GREG
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026
Geometry Type	Polygons

Wetlands	
Priority Area	Aquatic Habitat
Site Name	REGION 6 SALTWATER WETLANDS
Accuracy	1/4 mile (Quarter Section)
Notes	COASTAL SALT MARSHES SALT MEADOWS AND BRACKISH MARSHES
Source Record	904451
Source Dataset	PHSREGION
Source Name	GUFLER DAVE
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Purple martin	
Scientific Name	*Progne subis*
Priority Area	Breeding Area
Site Name	ILWACO MARINA
Accuracy	GPS
Notes	NESTIN IN TOP OF ROTTEN PILINGS AT MARINA.
Source Record	4592
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	SCHMIDT, T/WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2EM1N
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2EM1N
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2EM1N
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2RSPr
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2USM
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1As
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1Ch
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2EM1N
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2EM1N
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

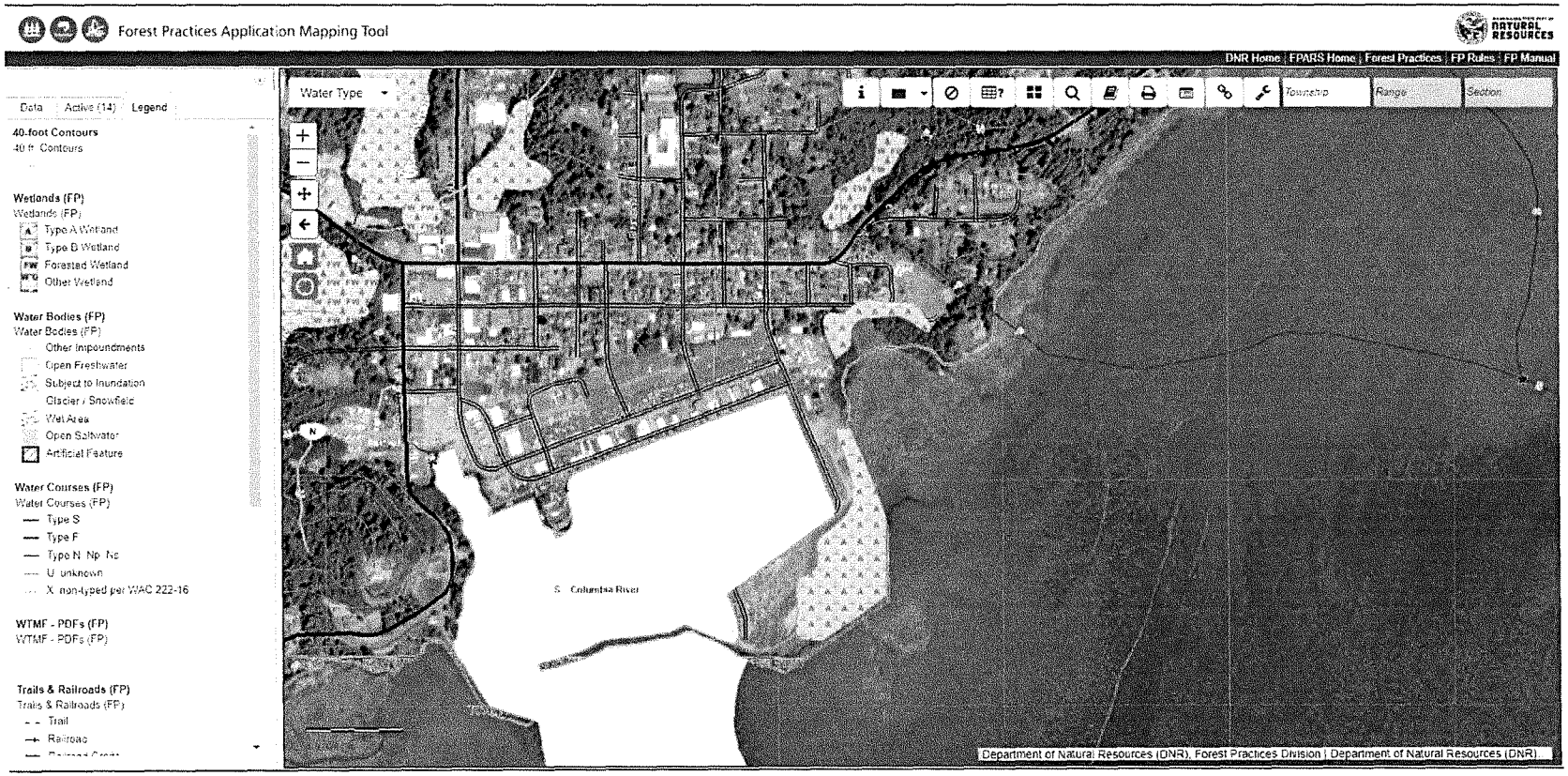
Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1S
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSR
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSR
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

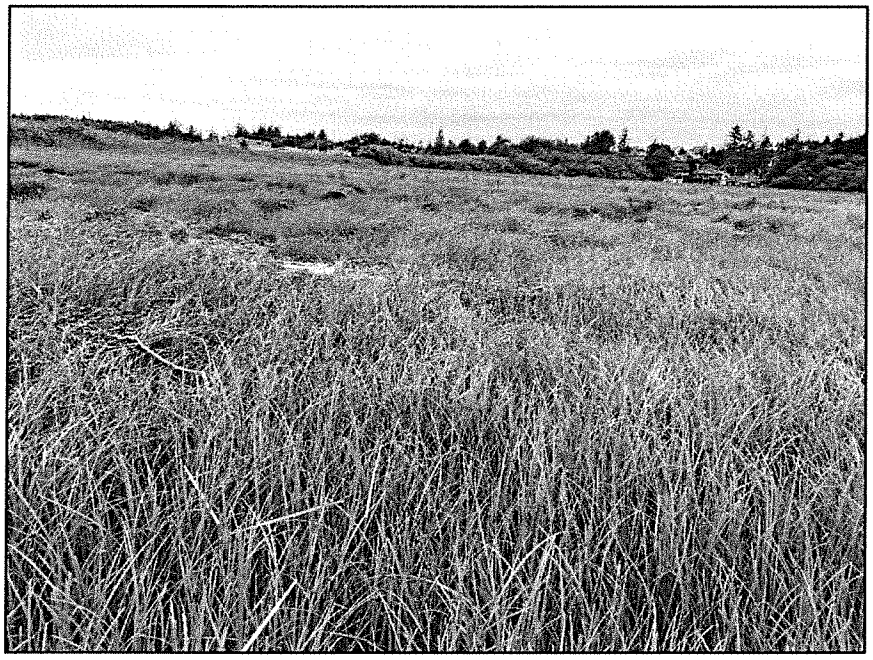
Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Washington Department of Natural Resources Forest Practicies Application Mapping Tool (FPARS).



APPENDIX B
Site Photographs

Photograph 1. Looking north just east of the marina. A riprap bulkhead protects the access road to the boat launch at the marina. (June 15, 2022)



Photograph 2. Looking north over the estuarine wetland (Wetland A). (June 15, 2022)

Site Photographs – Wetland Survey	
Port of Ilwaco Dredging and Dredge Material Placement Project Ilwaco, Washington	
GeoEngineers	Figure B-1

21551-003-01 Date Exported: July 5, 2022

Photograph 3. Tidal channels and areas of open water were identified in the wetland. (June 15, 2022)

Photograph 4. Estuarine Wetland A near the eastern portion of the investigation area. (June 15, 2022)

Site Photographs – Wetland Survey

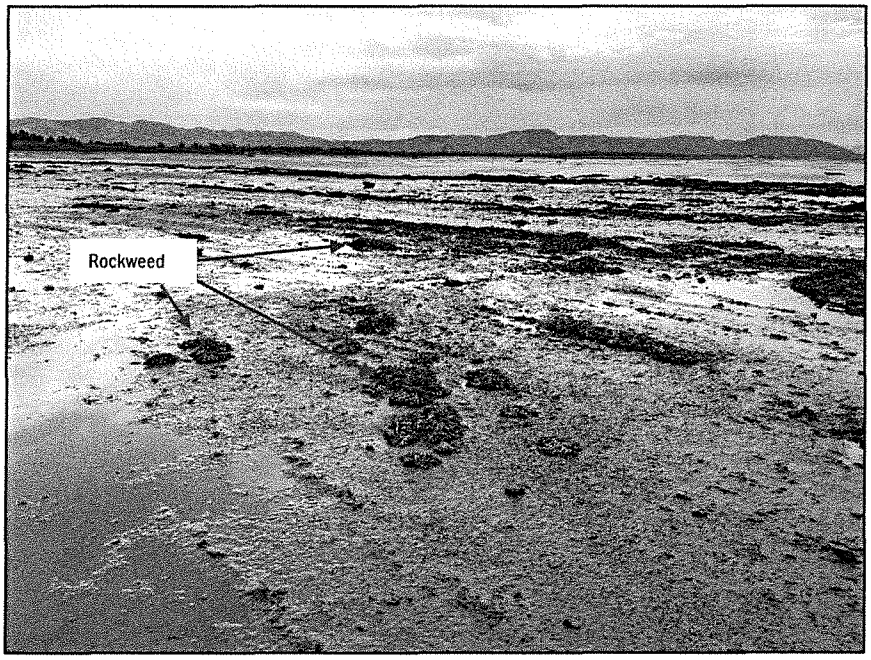
Port of Ilwaco Dredging and Dredge Material Placement Project
Ilwaco, Washington

GeoEngineers

Figure B-2

0422-148-01 Date Exported: June 22, 2020

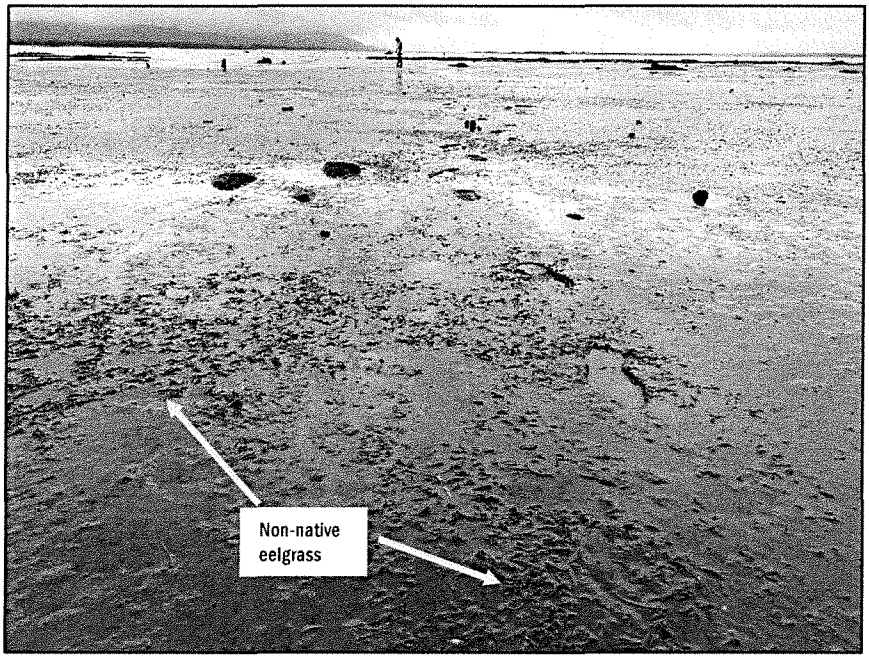
Photograph 5. Columbia River adjacent to the estuarine wetland and investigation area. (June 15, 2022)



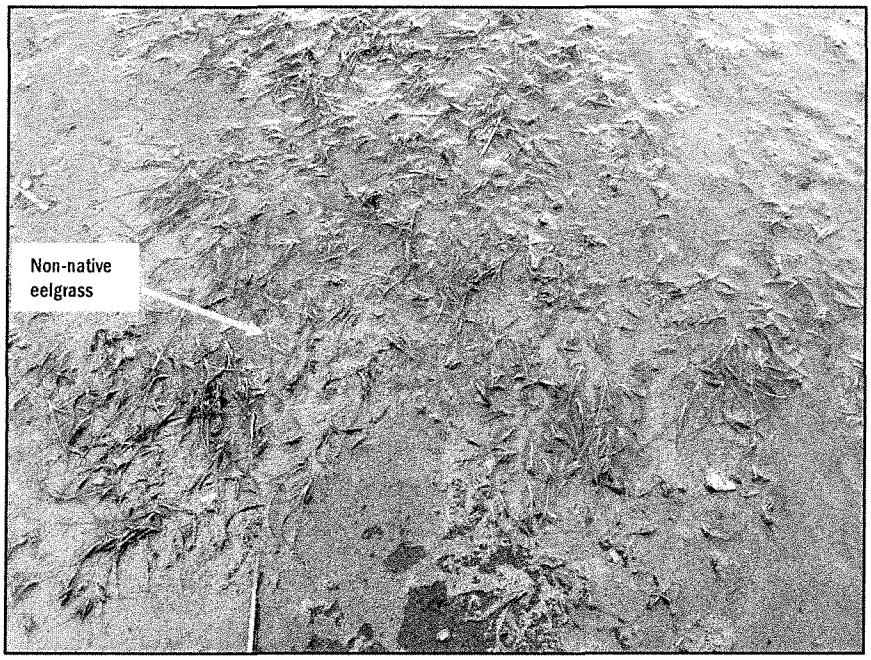
Photograph 6. Rockweed patchy area near the western side of the investigation area within the Columbia River. (June 15, 2022)

Site Photographs – Macrovegetation Survey	
Port of Ilwaco Dredging and Dredge Material Placement Project Ilwaco, Washington	
GeoEngineers	Figure B-3

0422-148-01 Date Exported: June 22, 2020



Photograph 7. Non-native eelgrass (*Zostera japonica*) on the east side of the investigation area. (June 15, 2022)



Photograph 8. Non-native eelgrass on the east side of the investigation area. (June 15, 2022)

Site Photographs – Macrovegetation Survey	
Port of Ilwaco Dredging and Dredge Material Placement Project Ilwaco, Washington	
GeoEngineers	Figure B-4

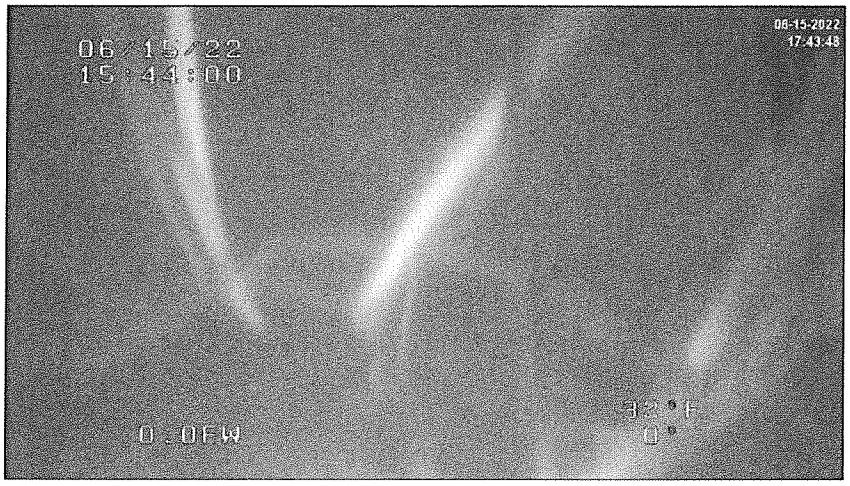
0422-148-01 Date Exported: June 22, 2020

Photograph 9. Ilwaco marina surface conditions. Breakwater shown in the background. (June 15, 2022)

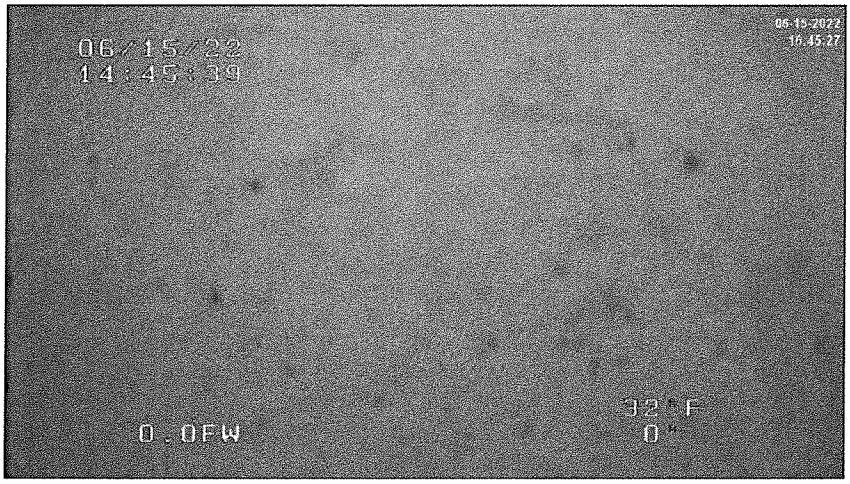
Photograph 10. Vessel for completing the macrovegetation surveys shown with towed underwater camera on deck of vessel. (June 15, 2022)

Site Photographs – Macrovegetation Survey	
Port of Ilwaco Dredging and Dredge Material Placement Project Ilwaco, Washington	
GeoEngineers	Figure B-5

0422-148-01 Date Exported: June 22, 2020



Photograph 11. Native eelgrass (*Zostera marina*) field verified during the survey within the Ilwaco marina. (June 15, 2022)



Photograph 12. Soft, mud bottom substrate conditions within the footprint of the proposed beneficial use area for the dredge material. No eelgrass was observed in this area. Siphon holes from clams visible in photo. (June 15, 2022)

Site Photographs – Macrovegetation Survey	
Port of Ilwaco Dredging and Dredge Material Placement Project Ilwaco, Washington	
GeoEngineers	Figure B-6

0422-148-01 Date Exported: June 22, 2020

APPENDIX C
Sample Plot Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Port of Ilwaco Wharf Bulkhead and Gangeway Access City/County: Ilwaco Sampling Date: 6.15.22

Applicant/Owner: Port of Ilwaco State: WA Sampling Point: SP-1

Investigator(s): J. Dadisman Section, Township, Range: Section 34, Township 10 North, Range 11 West

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): <5

Subregion (LRR): A Lat: Long: Datum:

Soil Map Unit Name: Water NWI Classification: EEM

Are climatic / hydrologic conditions on the site typical for this time of year? (●) Yes ( ) No (If no, explain in Remarks.)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? (●) Yes ( ) No

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	(●) Yes	( ) No	**Is the Sampled Area within a Wetland?**	(●) Yes ( ) No
Hydric Soil Present?	(●) Yes	( ) No		
Wetland Hydrology Present?	(●) Yes	( ) No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30ft x 30ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1.				
2.				
3.				
4.				
	= Total Cover			
Sapling/Shrub Stratum (Plot size: 5ft x 5ft)				
1.				
2.				
3.				
4.				
5.				
	= Total Cover			
Herb Stratum (Plot size: 5ft x 5ft)				
1. *Carex lyngbyei*	50	Y	45.5	OBL
2. *Schoenoplectus pungens*	40	Y	36.4	OBL
3. *Potentilla anserina*	20	N	18.2	OBL
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	110 = Total Cover			
Woody Vine Stratum (Plot size: 30ft x 30ft)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	110	x 1 =	110
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	110 (A)		110 (B)

Prevalence Index = B/A = 1.000

Hydrophytic Vegetation Indicators:

- [✓] 1 - Rapid Test for Hydrophytic Vegetation
- [✓] 2 - Dominance Test is >50%
- [✓] 3 - Prevalence Index is ≤3.0[1]
- [ ] 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] 5 - Wetland Non-Vascular Plants[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? (●) Yes ( ) No

Remarks:

SOIL

Sampling Point: SP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-13	2.5Y 4/1	95	5YR 4/4	5	C	M	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☑ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? ◉ Yes ○ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☑ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	○ Yes	◉ No	Depth (inches):
Water Table Present?	◉ Yes	○ No	Depth (inches): 11
Saturation Present? (includes capillary fringe)	◉ Yes	○ No	Depth (inches): 0

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Port of Ilwaco Wharf Bulkhead and Gangeway Access City/County: Ilwaco Sampling Date: 6.15.22

Applicant/Owner: Port of Ilwaco State: WA Sampling Point: SP-2

Investigator(s): J. Dadisman Section, Township, Range: Section 34, Township 10 North, Range 11 West

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): <5

Subregion (LRR): A Lat: Long: Datum:

Soil Map Unit Name: Water NWI Classification: EEM

Are climatic / hydrologic conditions on the site typical for this time of year? (●) Yes ( ) No (If no, explain in Remarks.)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? (●) Yes ( ) No

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	(●) Yes	( ) No	**Is the Sampled Area within a Wetland?**	(●) Yes ( ) No
Hydric Soil Present?	(●) Yes	( ) No		
Wetland Hydrology Present?	(●) Yes	( ) No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30ft x 30ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1.				
2.				
3.				
4.				
	= Total Cover			
Sapling/Shrub Stratum (Plot size: 5ft x 5ft)				
1.				
2.				
3.				
4.				
5.				
	= Total Cover			
Herb Stratum (Plot size: 5ft x 5ft)				
1. *Carex lyngbyei*	100	Y	100.0	OBL
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	100 = Total Cover			
Woody Vine Stratum (Plot size: 30ft x 30ft)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		100 (B)

Prevalence Index = B/A = 1.000

Hydrophytic Vegetation Indicators:

- [✓] 1 - Rapid Test for Hydrophytic Vegetation
- [✓] 2 - Dominance Test is >50%
- [✓] 3 - Prevalence Index is ≤3.0[1]
- [ ] 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] 5 - Wetland Non-Vascular Plants[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? (●) Yes ( ) No

Remarks:

SOIL

Sampling Point: SP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	5Y 3/1	100					Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☑ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Rock

Depth (inches): 10

Hydric Soil Present? ◉ Yes ○ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☑ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ◉ Yes ○ No Depth (inches): 0

Saturation Present? (includes capillary fringe) ◉ Yes ○ No Depth (inches): 0

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX D
Ecology Wetland Rating Form

Wetland name or number A

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland A Date of site visit: 6/15/22

Rated by J. Dadisman Trained by Ecology? X Yes ___No Date of training 6/2014

HGM Class used for rating Estuarine Wetland has multiple HGM classes? ___Y ____N

NOTE: Form is not complete without the figures requested *(figures can be combined).*

Source of base aerial photo/map ArcMap (see delineation figure in report)

OVERALL WETLAND CATEGORY I (based on functions___ or special characteristics X)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 - 27

_____**Category II** – Total score = 20 - 22

_____**Category III** – Total score = 16 - 19

_____**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality			Hydrologic			Habitat			
	Circle the appropriate ratings									
Site Potential	H	M	L	H	M	L	H	M	L	
Landscape Potential	H	M	L	H	M	L	H	M	L	
Value	H	M	L	H	M	L	H	M	L	TOTAL
Score Based on Ratings										

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	(I) II
Wetland of High Conservation Value	I
Bog	I
Mature Forest	I
Old Growth Forest	I
Coastal Lagoon	I II
Interdunal	I II III IV
None of the above	

Wetland name or number A___

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	
Hydroperiods	D 1.4, H 1.2	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 4.3, D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number A___

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

   NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

   1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

   NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
   *If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

   NO – go to 3 **YES** – The wetland class is **Flats**
   *If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
   ___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
   ___At least 30% of the open water area is deeper than 6.6 ft (2 m).

   NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,
   ___The water leaves the wetland **without being impounded**.

   NO – go to 5 **YES –** The wetland class is **Slope**

   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
   ___The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   ___The overbank flooding occurs at least once every 2 years.

Wetland name or number A___

NO – go to 6 **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number A___

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? ~~X~~ The dominant water regime is tidal, ~~X~~ Vegetated, and ~~X~~ With a salinity greater than 0.5 ppt Yes –Go to **SC 1.1** No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? Yes = **Category I** No - Go to **SC 1.2**	**Cat. I**
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ~~X~~ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un- X mowed grassland. — The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? Yes – Go to **SC 2.2** No – Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? Yes = **Category I** No = **Not a WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf Yes – **Contact WNHP/WDNR and go to SC 2.4** No = **Not a WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? Yes = **Category I** No = **Not a WHCV**	**Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? Yes – Go to **SC 3.3** No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? Yes – Go to **SC 3.3** No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? Yes = **Is a Category I bog** No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? Yes = **Is a Category I bog** No = **Is not a bog**	**Cat. I**

Wetland name or number A

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.*** — **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more. — **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm). Yes = **Category I** No = **Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? — The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks — The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* Yes – Go to **SC 5.1** No = **Not a wetland in a coastal lagoon** SC 5.1. Does the wetland meet all of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100). — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2) Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal Wetlands Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.*** In practical terms that means the following geographic areas: — Long Beach Peninsula: Lands west of SR 103 — Grayland-Westport: Lands west of SR 105 — Ocean Shores-Copalis: Lands west of SR 115 and SR 109 Yes – Go to **SC 6.1** No = **not an interdunal wetland for rating** SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? Yes = **Category I** No – Go to **SC 6.2** SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? Yes = **Category II** No – Go to **SC 6.3** SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = **Category III** No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	

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GeoEngineers

WASHINGTON STATE
Joint Aquatic Resources Permit Application (JARPA) Form[1,2] [help]

US Army Corps of Engineers
Seattle District

USE BLACK OR BLUE INK TO ENTER ANSWERS IN THE WHITE SPACES BELOW.

AGENCY USE ONLY

Date received:

Agency reference #: _____

Tax Parcel #(s): _____

_____

Part 1–Project Identification

1. Project Name (A name for your Project that you create. Examples: Smith's Dock or Seabrook Lane Development) [help]
Port of Ilwaco East Bulkhead Resilience Project (Project)

Part 2–Applicant

The person and/or organization responsible for the Project. [help]

2a. Name (Last, First, Middle)			
Lofstrom, Tracy (Port Manager)			
2b. Organization (If applicable)			
Port of Ilwaco			
2c. Mailing Address (Street or PO Box)			
PO Box 307			
2d. City, State, Zip			
Ilwaco, WA 98624			
2e. Phone (1)	**2f.** Phone (2)	**2g.** Fax	**2h.** E-mail
(360) 642-3143		(360)642-3148	tlofstrom@portofilwaco.org

[1]Additional forms may be required for the following permits:
- If your project may qualify for Department of the Army authorization through a Regional General Permit (RGP), contact the U.S. Army Corps of Engineers for application information (206) 764-3495.
- Not all cities and counties accept the JARPA for their local Shoreline permits. If you need a Shoreline permit, contact the appropriate city or county government to make sure they accept the JARPA.

[2]To access an online JARPA form with [help] screens, go to http://www.epermitting.wa.gov/site/alias__resourcecenter/jarpa_jarpa_form/9984/jarpa_form.aspx.

For other help, contact the Governor's Office for Regulatory Innovation and Assistance at (800) 917-0043 or help@oria.wa.gov.

Part 3–Authorized Agent or Contact

Person authorized to represent the applicant about the Project. (Note: Authorized agent(s) must sign 11b of this application.) [help]

3a. Name (Last, First, Middle)			
England, Victoria Renee			
3b. Organization (If applicable)			
Moffatt & Nichol			
3c. Mailing Address (Street or PO Box)			
600 University Street, Suite 610			
3d. City, State, Zip			
Seattle, WA, 98101			
3e. Phone (1)	**3f.** Phone (2)	**3g.** Fax	**3h.** E-mail
(206) 622-0222			vengland@moffattnichol.com

Part 4–Property Owner(s)

Contact information for people or organizations owning the property(ies) where the Project will occur. Consider both **upland and aquatic** ownership because the upland owners may not own the adjacent aquatic land. [help]

☒ Same as applicant. (Skip to Part 5.)

☐ Repair or maintenance activities on existing rights-of-way or easements. (Skip to Part 5.)

☐ There are multiple upland property owners. Complete the section below and fill out JARPA Attachment A for each additional property owner.

☒ Your Project is on Department of Natural Resources (DNR)-managed aquatic lands. If you don't know, contact the DNR at (360) 902-1100 to determine aquatic land ownership. If yes, complete JARPA Attachment E to apply for the Aquatic Use Authorization.

4a. Name (Last, First, Middle)			
4b. Organization (If applicable)			
4c. Mailing Address (Street or PO Box)			
4d. City, State, Zip			
4e. Phone (1)	**4f.** Phone (2)	**4g.** Fax	**4h.** E-mail

Part 5–Project Location(s)

Identifying information about the property or properties where the Project will occur. [help]

☐ There are multiple Project locations (e.g. linear Projects). Complete the section below and use JARPA Attachment B for each additional Project location.

5a. Indicate the type of ownership of the property. (Check all that apply.) [help]

☐ Private
☐ Federal
☒ Publicly owned (state, county, city, special districts like schools, ports, etc.)
☐ Tribal
☒ Department of Natural Resources (DNR) – managed aquatic lands (Complete JARPA Attachment E)

5b. Street Address (Cannot be a PO Box. If there is no address, provide other location information in 5p.) [help]

117 Howerton Avenue Southeast

5c. City, State, Zip (If the Project is not in a city or town, provide the name of the nearest city or town.) [help]

Ilwaco, WA 98624

5d. County [help]

Pacific County

5e. Provide the section, township, and range for the Project location. [help]

¼ Section	Section	Township	Range
	33/34	10N	11W

5f. Provide the latitude and longitude of the Project location. [help]

- Example: 47.03922 N lat. / -122.89142 W long. (Use decimal degrees - NAD 83)

46.30442 N Lat. / -124.03852 W long.

5g. List the tax parcel number(s) for the Project location. [help]

- The local county assessor's office can provide this information.

Owner	Parcel Number(s)
Port of Ilwaco	73048003011, 73048003009
State of Washington	73031013000

5h. Contact information for all adjoining property owners. (If you need more space, use JARPA Attachment C.) [help]

Name	Mailing Address	Tax Parcel # (if known)
Port of Ilwaco	PO Box 307 Ilwaco, WA 98624	7304803011, 7303104000, 73031011001, 73048003114

5i. List all wetlands on or adjacent to the Project location. [help]

Not applicable

5j. List all waterbodies (other than wetlands) on or adjacent to the Project location. [help]

Baker Bay

5k. Is any part of the Project area within a 100-year floodplain? [help]

☒ Yes ☐ No ☐ Don't know

5l. Briefly describe the vegetation and habitat conditions on the property. [help]

Vegetation and terrestrial habitat conditions are limited within the Project area. The site is in an industrial area within an active marina that serves recreational boating and commercial fishing vessels and is largely devoid of terrestrial vegetation. The Project would occur on an existing wharf and associated bulkhead wall, retaining wall, and rip rap shoreline. Little to no terrestrial and riparian habitat occurs here. The mudline at the base of the existing bulkhead is largely unvegetated and consists of a silty sand, sandy silt slope with rip rap extending on the shore slope to the north and south of the bulkhead. The upland adjacent to the bulkhead is a paved driveway servicing the Safe Coast Seafood facility. Existing vegetation consists of short-statured ruderal species behind the existing bulkhead wall and in viable spaces along the rip rap shoreline. Upland vegetation observed along the shoreline during a 2022 site survey included clover species (*Trifolium species*), Japanese knotweed (*Polygonum cuspidatum*), varios grasses, dandelion (*tatxasum officinale*), and creeping buttercup (*Ranunculus repens*) (GeoEngineers 2022). There is no eelgrass on or adjacent to the Project site (GeoEngineers, 2022).

A creosote timber revetment wall is located along the toe of the north slip slope and derelict creosote piles and cross members are located within the slip adjacent to the bulkhead. The marina is periodically dredged for maintenance to maintain operational draft for the vessels using the marina. The marina dredging is permitted under a separate permit.

5m. Describe how the property is currently used. [help]

The Project vicinity generally consists of a marina used for year-round moorage of recreational and commercial fishing vessels, upland commercial buildings, and a boatyard. The Project site occurs at a commercial fishing wharf (herein referred to as 'wharf') (Figure 1, Sheets 1 and 2) located within the active Port of Ilwaco Marina (marina). The marina is mostly enclosed by upland to the north, east and southeast, a rubble breakwater to the south, and upland and a jetty to the west and southwest. The jetty and breakwater bound the entrance to the marina (Figure 1, Sheet 1). The wharf is an earth filled structure on the east side and pile supported on the west side. The wharf is protected by a creosote-treated timber bulkhead (to be replaced) along the eastern limits of the wharf (Figure 1, Sheets 1 through 4). The Port of Ilwaco Marina is located waterward of the existing bulkhead. To the north of the bulkhead wall, the shoreline is protected by a low timber retaining wall and large log (Figure 1). To the south of the bulkhead wall, shoreline protection consists of rip rap and concrete rubble (Figure 1). The Safe Coast Seafoods buildings are located on the wharf (Figure 1).

Figure 1. Project Location Aerial

5n. Describe how the adjacent properties are currently used. [help]

The operating Ilwaco Marina is located to the waterside of the bulkhead. The marina is home to commercial and recreational fishing vessels and other recreational vessels. The marina is a busy and important destination for commercial fisheries as it is the first port of call from the mouth of the Columbia River. Safe Coast Seafood facilities and entrance driveway are located to the west and upland of the bulkhead. Waterfront Way and commercial storefronts are located on the upland to the north.

5o. Describe the structures (above and below ground) on the property, including their purpose(s) and current condition. [help]

The Project site is currently occupied by a creosote-treated timber and steel cable tieback bulkhead that is in disrepair and leaning waterward, at risk of falling into the Ilwaco Marina slip to the east of the bulkhead (Figure 2). Monitoring for continued movement of the bulkhead was initiated in November 2022. Subsequent monthly monitoring events have recorded continued movement of the bulkhead face waterward by as much as ¼ inch in one month at one measuring station along the bulkhead. The failure of the bulkhead would undermine the foundations of the adjacent Safe Coast Seafood buildings, risking potential structural damage and worker/marina user safety if bulkhead failure occurs before it can be replaced. The existing wharf floods during king tides and storm events and is susceptible to sea level rise (Figure 3). There is a rip rap shoreline (Figure 4) to the south of the bulkhead wall and a timber retaining wall (Figure 5) to the north of the bulkhead wall. The retaining wall to the north of the bulkhead consists of creosote-treated timber pilings and horizontal features and is non-functional in its current state due to a gap behind the wall.

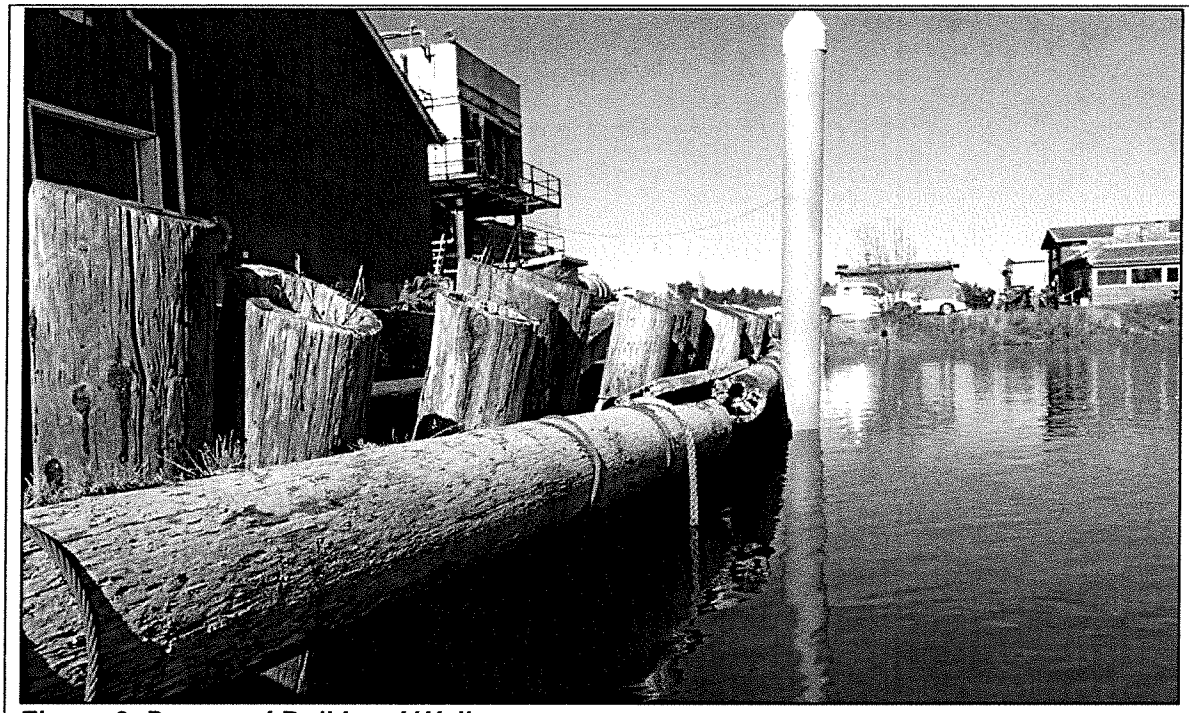


Figure 2. Damaged Bulkhead Wall

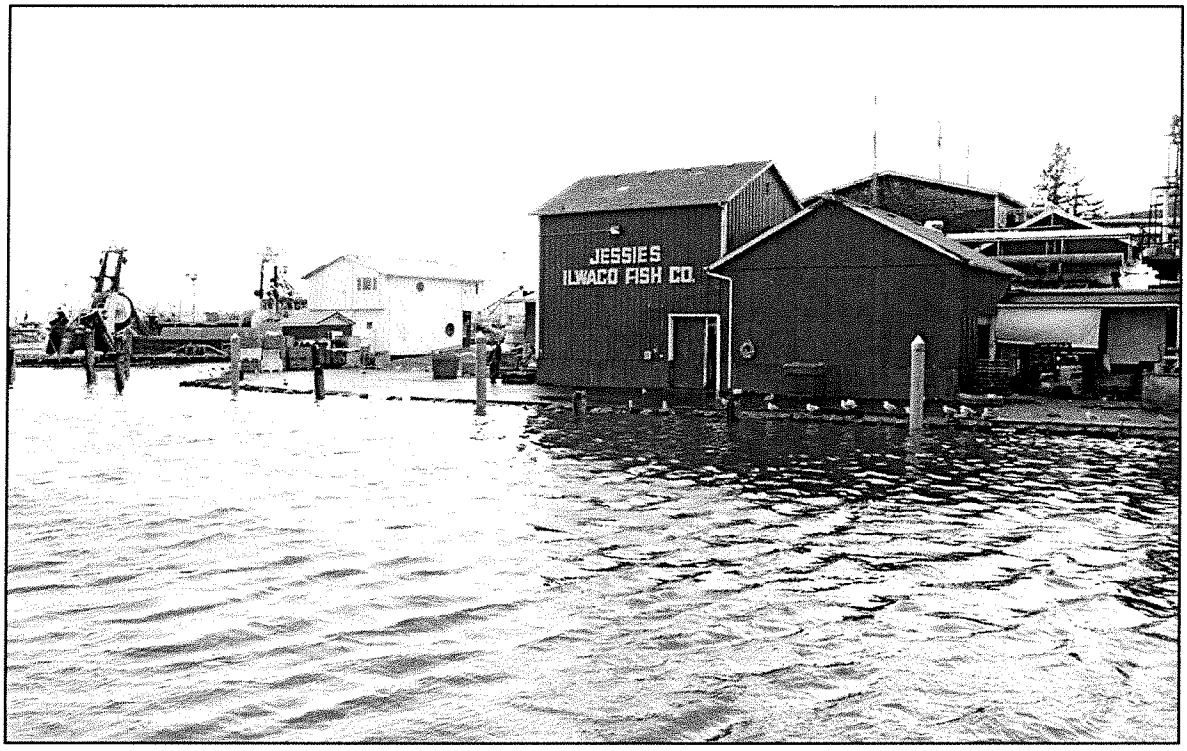


Figure 3. Typical Flooding During Storms and King Tides

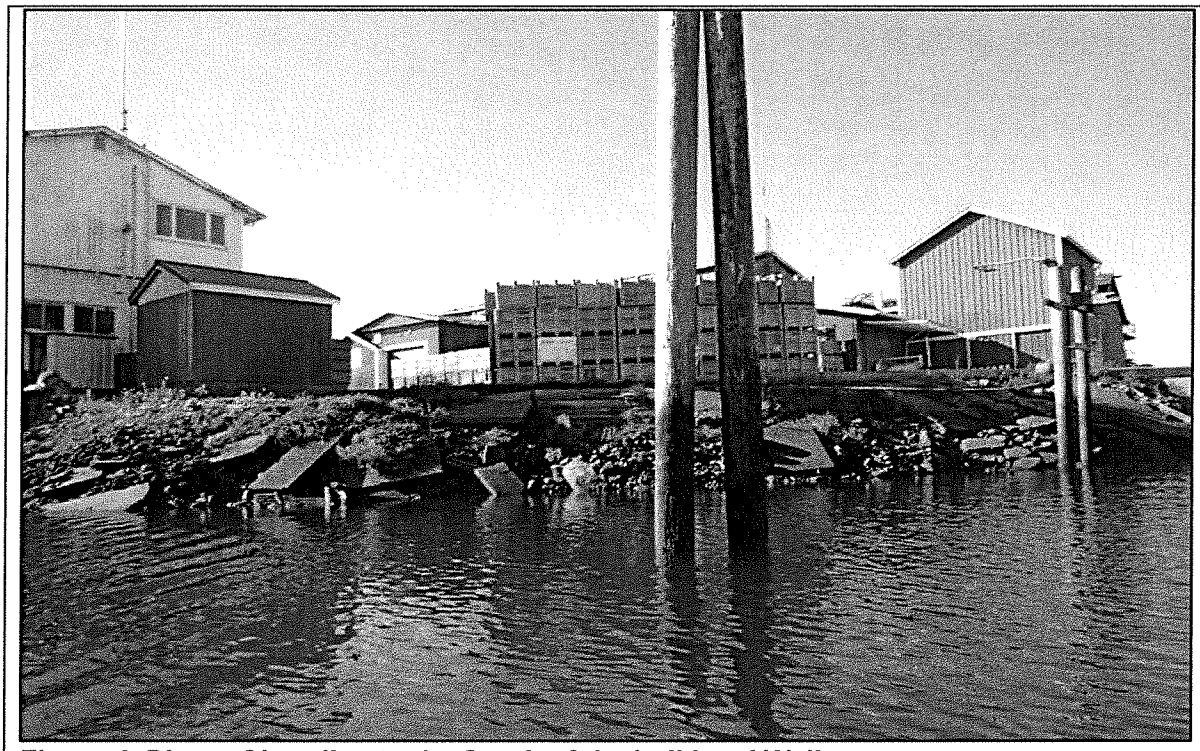


Figure 4. Riprap Shoreline to the South of the bulkhead Wall

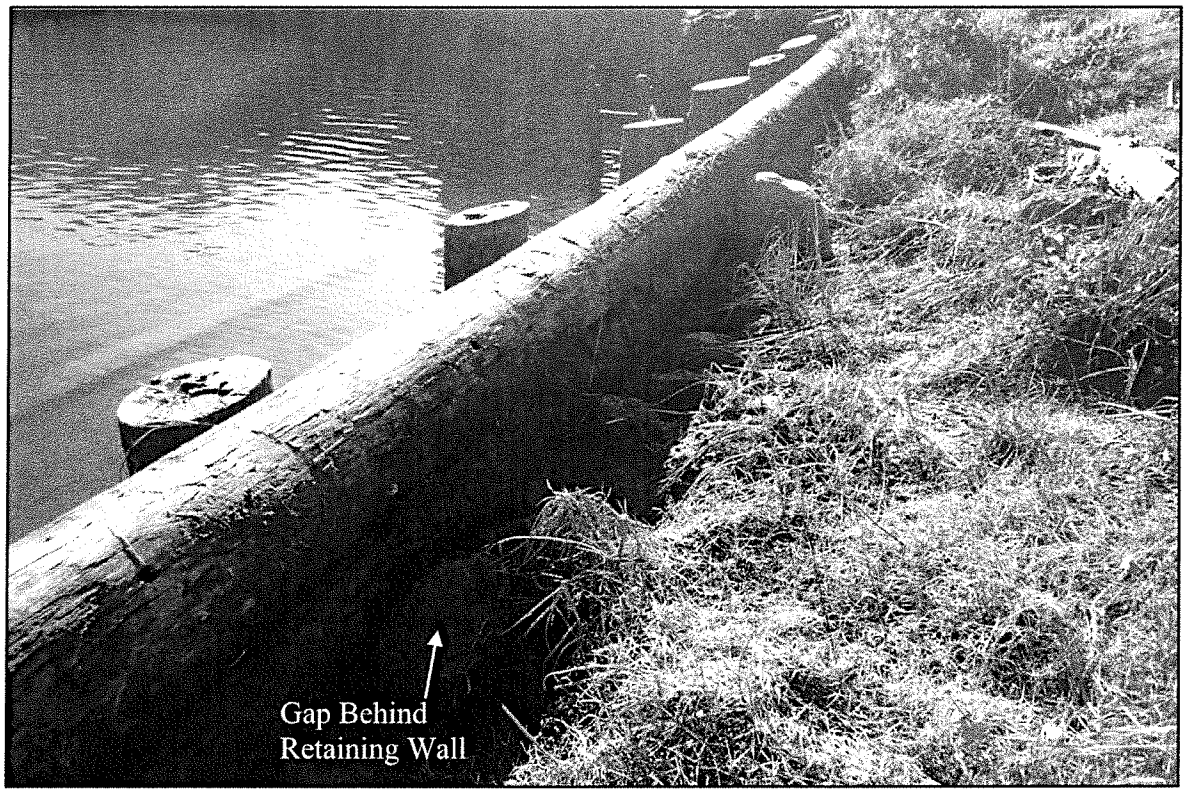


Figure 5. Retaining Wall to the North of the Bulkhead Wall

The driveway adjacent to the bulkhead is currently closed for all but pedestrian access due to recommended load limitations based on observed movement of the bulkhead and roadway settlement resulting from the bulkhead moving waterward. This roadway was a secondary access for loading and unloading of equipment and cargo when it was operational. Closure of this access to all but pedestrian use negatively impacts the operations of the seafood facilities.

5p. Provide driving directions from the closest highway to the Project location, and attach a map. [help]

- From US 101 North traveling to the west
- In Ilwaco, turn left onto Elizabeth Ave SE
- Turn right onto Howerton Ave SE
- The site is located to the south of the intersection of Howerton Ave SE and Waterfront Way.

Part 6–Project Description

6a. Briefly summarize the overall Project. You can provide more detail in 6b. [help]

The proposed Port of Ilwaco East Bulkhead Resilience Project (herein referred to as the 'Project') would consist of three primary elements;

1. Replacing the failing east bulkhead with an anchored steel sheetpile bulkhead (Preferred Alternative)
2. Repairing slope protection north and south of the bulkhead an raising top of slope at the head of the slip approximately 1.5 feet to accommodate future sea level rise resilience.
3. Paving and regrading the upland wharf area (access driveway) directly landward of the bulkhead to mitigate the effects of sea level rise.

As part of the above elements, creosote-treated timber that configures the external wall of the existing bulkhead and retaining wall will be removed along with select derelict creosote-treated piles next to the bulkhead. Additional derelict creosote piles and cross members will be removed from the slip adjacent to the bulkhead as mitigation for Project impacts resulting from drainage rock fill placement between the existing bulkhead and the new bulkhead necessary to maintain water pressure equilibrium on both sides of the bulkhead. The removal of creosote from the marine environment will also mitigate for impacts associated with the riprap shoreline protection that is proposed to replace the derelict creosote treated timber revetment/retaining wall and associated elements. A fish mix gravel layer will be placed between HTL and the toe of the riprap on the surface of the rip rap slope protection at the head of the slip to provide beach nourishment and habitat improvements for fish passing through the marina as mitigation for Project impacts. Additionally, an approximately 2,510 sf area of derelict timber floats floating timber debris will be removed from the south portion of the marina as mitigation for Project impacts.

Several alternatives were considered prior to identifying the preferred alternative. The following is a summary of the alternatives considered and how they were evaluated as the Project was developed.

- **No Action**
  - The existing creosote treated timber bulkhead is actively failing with observed movement of up to 0.3 inch since monitoring began in November 2022.
  - Left as-is, the bulkhead will eventually fail, which will result in:
    - Permanent access removal by permanently blocking the access driveway adjacent to the bulkhead,
    - Potential damage to buildings/building foundations,
    - Life/safety issue for Safe Coast Seafood workers and marina tenants,
    - Inability for Safe Coast Seafood to maintain operations resulting in loss of income and revenue for this small community.
    - Obstructing a portion of marina (adjacent slip) and making it unusable.
- **Removal of bulkhead prior to construction of new bulkhead wall**
  - No bulkhead as-builts are available to identify how the existing bulkhead was constructed. Associated unknowns increase the risk of removing the structure prior to replacement.

  - Removing the existing structure prior to replacement poses a high risk of slope failure and damage to:
    - the access drive,
    - Safe Coast building foundations, and
    - adjacent marina slip (including obstructing access to parts of the marina and potential damage to float structures).
  - Bulkhead failure would pose unacceptable risks to life/safety for Safe Coast Seafood workers and marina tenants.
- **Sheetpile bulkhead placement behind existing bulkhead**
  - No as-builts: The bulkhead appears to be supported by cable tie backs, possibly anchored to deadman piles behind/shoreward of the bulkhead. There is a potential for:
    - Increased risk of failure if sheet piles were driven behind the existing wall, severing the support provided by the cable tiebacks.
    - Unknown obstructions that could damage or impede sheetpile installation, increasing cost, delays and potential risk of existing slope failure.
  - The Project area is restricted by the continued business need for the adjacent access drive and the close proximity of the facility buildings and infrastructure. Space limitations also pose constructability challenges relative to pile and cap placement for a new bulkhead.
- **Cantilever bulkhead waterward of the existing bulkhead**
  - The cantilever option placed waterward of the existing bulkhead would have essentially the same impacts to marine habitat as the Preferred Alternative and would also require placement of filter rock backfill in the space between the new and the existing bulkhead.
  - The placement of the cantilever and Preferred Alternative is dictated by the profile of the existing bulkhead which is leaning waterward by as much as 10 degrees in places and the need for a usable temporary berth area to replace the berth area rendered unusable by the deteriorated and unstable nature of the existing bulkhead.
  - The cantilever option would require more steel as the bulkhead sheetpiles would be both longer and thicker to provide the necessary slope support at the site. The requirement for more steel will result in a higher cost to the Port.
- **Preferred Alternative – Anchored Sheetpile Bulkhead**
  - The Preferred Alternative will result in commensurate environmental impacts (approximately the same footprint, backfill volume, etc.) as the cantilever bulkhead alternative, but will be a more economical solution for the Port.
  - The proposed placement of the bulkhead is controlled by the waterward lean of the existing bulkhead face and Safe Coast's need to replace the existing unusable temporary berth area with a usable temporary berth to support the facility's operations.
  - The size of the space/void between existing and replacement bulkheads results from the way the bulkhead leans waterward and the need for a usable berth area to replace existing one for Safe Coast Seafood operations.

The Project also includes increasing the top of slope elevation of the shoreline adjacent to the bulkhead to the north by approximately 1.5 feet to elevation +14 feet MLLW. As part of that work, the existing creosote treated timber revetment that provides limited shore protection to that slop will be removed and replaced with a layer of riprap under a layer fish mix rock as shore protection. Alternatives considered include the following.

- **No Action –** This would leave deteriorating creosote treated timber features in the marine environment and would not provide any preparation for future sea level rise protections.
- **Replacement with a stone or concrete revetment** – Placement of a new revetment would likely result in additional benthic/shoreline impacts as the structure would likely occupy a larger footprint.
- **Nature based shoreline protection/slope modification –** This alternative could not be accommodated while still maintaining access and operations in both the marina slip and the temporary berthing area along the Safe Coast bulkhead as the regraded slope required would limit marina slip access significantly.
- **Preferred Alternative** – The preferred alternative incorporates an increase to the top of slope elevation as part of sea level rise resilience planning and continued operation of the marina slip and accommodates the replacement of the temporary berthing area along the replacement bulkhead. Rip

rap shore protection will be placed with a fish mix cover layer that is beneficial to fish passing through the marina.

6b. Describe the purpose of the Project and why you want or need to perform it. [help]

The proposed Project is required for improved the safety, efficiency, and reliable use of the wharf. The Port is a key hub for commercial fishing, seafood and aquaculture processing, and recreation activities that greatly benefit the regional economy. The commercial fishing wharf, operated by Safe Coast Seafoods, is one of the most active in the state, landing roughly $14 million in commercial seafood each year. Repair of the bulkhead wall is critical to ongoing operations at Safe Coast Seafoods. In its current condition, the bulkhead is in serious structural condition and at risk of failing. Recent biweekly and monthly measurements have been completed to monitor ongoing movement of the bulkhead. The monitoring has recorded movement along 13 monitoring points along the face of the bulkhead ranging from approximately 0.06 inch to up to 0.31 inch waterward i since monitoring began in November 2022. The monitoring indicates that the bulkhead is the process of active failure. Frequent flooding due to high water levels from "king tides" and severe winter storm surges further threaten the structural capacity of the bulkhead.

Bulkhead failure would shut down cargo operations at the Port and negatively impact a wide variety of businesses in maritime and non-maritime sectors including Safe Coast Seafoods. The shutdown of the Safe Coast site due to failure of the bulkhead would lead to a series of economic impacts for many more workers and businesses and the region. Bulkhead failure would also adversely affect the Port of Ilwaco Marina operations, likely fully blocking at least one slip from use and potentially causing damage to adjacent float structures and tenant vessels. Until this Project is completed, the facility is capacity-limited and at risk. The main access driveway to Safe Coast Seafoods has been blocked based on recommended load limitations in an effort to minimize vibration and load resulting from vehicles and machinery using the driveway located adjacent to the failing bulkhead. Without the Project, the eventual closure of the wharf will have cascading negative transportation and economic impacts for the region.

The Project would also serve the following purposes and provide the following benefits:

- The replacement bulkhead will serve as the initial phase to increase the facility's climate change/sea level rise resiliency and will help protect wharf facilities from flooding. The bulkhead will be designed to accommodate the planned increase to wharf/Safe Coast facility ground floor elevations in the future.
- The top of the embankment elevation to the north of the bulkhead will be raised to approximately +14 feet (mean lower low water) MLLW and the existing creosote-treated retaining wall will be replaced with rip rap to improve shoreline protection. The increase to top of bank elevation will mitigate sea level rise impacts between the bulkhead and the marina access pier to the east.
- Re-grading and re-paving of the upland area behind the bulkhead wall will facilitate positive drainage away from the Safe Coast Seafoods buildings and help protect the facilities during flood events.
- The bulkhead replacement would prevent the shoreline from failing into a portion of the active Port of Ilwaco Marina, which would impact operations in the marina and potentially damage adjacent float structures and tenant vessels, if any, present at the time of failure.
- The new bulkhead will be designed to accommodate the temporary mooring of fishing vessels which will allow vessels to unload/load equipment and product and improve efficiencies at the Safe Coast Seafoods facility. Under existing conditions, the timber bulkhead is used for temporary mooring but cannot currently be used for loading/unloading of vessels due to its existing poor, unstable, deteriorating condition.
- The Project will allow trucks to drive safely on the bulkhead again, which will improve the efficiency of cargo transfer operations and improve the port's competitiveness. The adjacent roadway has been closed to vehicle access due to load limitations recommended based on the poor condition of the

existing bulkhead, including measurements exhibiting ongoing movement of the failing bulkhead waterward as observed during monitoring episodes from November 2022 to the present.

- The removal of creosote-treated wood (north slip revetment, derelict piles and cross members, and portions of the existing bulkhead as safely able) from the marine environment will provide water quality benefits.
- Removal of derelict timber floats and other timber debris present in the south portion of the marina as part of project mitigation. This will remove approximately 2,510 SF of existing overwater coverage from the marina.
- Placement of a layer of fish mix gravel over the rip rap shoreline protection to be placed on the slope at the head of the adjacent slip.

6c. Indicate the Project category. (Check all that apply) [help]

☒ Commercial ☐ Residential ☐ Institutional ☐ Transportation ☐ Recreational

☒ Maintenance ☐ Environmental Enhancement

6d. Indicate the major elements of your Project. (Check all that apply) [help]

☐ Aquaculture	☐ Culvert	☐ Float	☐ Retaining Wall (upland)
☒ Bank Stabilization	☐ Dam / Weir	☐ Floating Home	☒ Road
☐ Boat House	☐ Dike / Levee / Jetty	☐ Geotechnical Survey	☐ Scientific Measurement Device
☐ Boat Launch	☐ Ditch	☐ Land Clearing	☐ Stairs
☐ Boat Lift	☐ Dock / Pier	☒ Marina / Moorage	☐ Stormwater facility
☐ Bridge	☐ Dredging	☐ Mining	☐ Swimming Pool
☒ Bulkhead	☐ Fence	☐ Outfall Structure	☐ Utility Line
☐ Buoy	☐ Ferry Terminal	☒ Piling/Dolphin	
☐ Channel Modification	☐ Fishway	☐ Raft	

☐ Other:

6e. Describe how you plan to construct each Project element checked in 6d. Include specific construction methods and equipment to be used. [help]

- Identify where each element will occur in relation to the nearest waterbody.
- Indicate which activities are within the 100-year floodplain.

The work will occur within the Ilwaco Marina basin, located along the northeast shoreline in Baker Bay, and along the adjacent shoreline at the Safe Coast Seafoods facility (Sheets 1 through 3, attached).

Bulkhead Replacement

Construction sequencing for the proposed bulkhead replacement will likely be as follows:

- Localized demolition of the existing bulkhead wall (Sheet 4)
- Installation of the new steel sheet pile wall just waterward off the existing bulkhead. (Sheet 5)
- Placement of drainage rock between the existing bulkhead wall and new bulkhead wall (Sheet 7)

The majority of the existing timber bulkhead will be abandoned in place behind the replacement bulkhead in order to protect the existing buildings at the Safe Coast Seafoods facility, as complete removal of the existing timber bulkhead will undermine the stability of the soil behind the bulkhead and the adjacent building foundations threatening Safe Coast buildings, infrastructure, and operations. Portions of the existing creosote-treated bulkhead will be removed as feasible. Localized bulkhead demolition will likely consist of removal of the rotten top several feet of the existing creosote-treated timber piles above the timber wale location. This local demolition will take place above mean higher high water (MHHW). In addition, there may be localized notching of the bulkhead wall to accommodate the installation of the new tie-back ground anchors. Approximately twelve (12) 12-inch diameter creosote treated timber piles and three (3) 12-inch diameter steel pipe piles that are located directly waterward of the existing timber bulkhead will be removed. These piles will be removed by either pulling them out directly using a chain or with a vibratory hammer depending on the Contractors preferred means and methods. The piles will be cut at the mudline if complete removal is not possible or the piles break. Upland demolition will consist of removal of the existing pavement and surface features. (Sheets 1 through 4)

Post-localized demolition, a new steel sheet pile bulkhead wall will be installed in front of the existing timber bulkhead. The bulkhead wall will not increase in length. The top elevation of the new bulkhead wall will be approximately three feet (ft) higher than the existing top of bulkhead to accommodate for high tides and sea level rise. It is anticipated that the steel sheet piles will be driven using a vibratory hammer. The option for impact proofing will also be included in the event that difficult driving conditions are encountered. The sheet pile wall will be approximately 225 linear feet (lf) and the sheet pile tip elevation will be approximately -40 to -50 feet MLLW. The top of the bulkhead pile cap will be set at an elevation of +14.0 feet MLLW. (Sheet 5 through 7)

The replacement bulkhead will include approximately 20 grouted ground anchors extending from the cast-in-place concrete pile caps down to the bedrock layer below the site. The grouted ground anchors will be either high strength steel strands or steel bars that are connected to the pile caps and driven at an approximately 1:1 angle to elevation -70 to -80 feet MLLW. The anchor tie backs will be grouted for a minimum of 25 feet into the underlying siltstone unit (top elevation approximately -57 feet MLLW). The ground anchors will be installed using either land-based equipment or from a barge depending on the Contractors preferred means and methods. The anchor holes will be drilled with a full-length casing. All drill spoils will be contained and prevented from entering marine waters. The anchor holes will be filled with grout using a tremie tube and then pressure grouted after the anchor tendons are installed. The anchors will be tensioned after all anchors have been installed and have reached the required grout and concrete strengths. The cast-in-place concrete pile

cap will then be completed. The pile caps will be cast-in place in the dry and uncured concrete will not be allowed to come in contact with waters of Baker Bay. (Sheet 7)

The sheet pile placement in front of the existing bulkhead will result in an approximately 2- to 5-foot space between the existing bulkhead and the new bulkhead sheet piles (Sheet 7). The area between the existing structure and the new bulkhead will be backfilled with drainage rock to allow for water to flow in and out of the soil supporting the Safe Coast Seafood facility. It is anticipated that approximately 450 cubic yards of free draining drainage rock backfill will be placed between the existing timber bulkhead and the replacement bulkhead (Table 1). The drainage rock will likely be placed using a clamshell operating from a barge. The clean drainage rock will be obtained from a commercial supplier. This placement will minimize the risk of slope failure that removing the existing structure would exacerbate. The drainage rock placement in the space between the existing and replacement bulkhead structures will minimize additional pressure from trapped groundwater behind the new bulkhead.

The new bulkhead (including drain rock installation area) and pile cap will have a footprint of approximately 1,400 square feet (sf) in marine waters (measured below the high tide line [HTL]) (Table 1). Of the overall footprint in marine waters, 1,000 sf will come into contact with the bottom substrate and have benthic habitat impacts.

Slope Protection

Approximately 350 sf (approximately 14 cubic yards [cy]) of concrete debris shore protection from the shoreline to the south of the bulkhead wall will be removed to accommodate the bulkhead wall replacement (Sheet 4 and 5, Table 1). Approximately sixteen (16) 12-inch diameter creosote timber piles associated with the existing timber retaining wall will be removed from the shoreline along the north end of the bulkhead wall. The existing creosote-treated timber retaining wall to the north of the bulkhead will be completely removed. The associated piles will be removed by either pulling them out using a chain or with a vibratory hammer depending on the Contractors preferred means and methods. The piles will be cut at the mudline if complete removal is not possible or the piles break during removal.

The small area of concrete rubble shore protection (350 sf, 14 cy) that will be removed from the south portion of the Project to accommodate installation of the new bulkhead will be replaced with approximately 35 cy of riprap in the same 350 sf area to maintain slope stability (Table 1). Of the 35 cy placed along the shoreline, 30 cy will be placed below the HTL (Table 1).

One hundred ninety-eight (198) cy (2,200 sf) of riprap, 172 cy (1850 sf) of which occurs below the HTL, will be placed on the embankment to the north of the new bulkhead to replace the existing creosote treated timber retaining wall and provide shore protection (Sheets 4 through 6, Sheet 8, Table 1). The rip rap slope protection will serve as grade transitions from the vertical bulkhead structure to the adjacent sloped shorelines to the north and south. A layer of fish mix rock will be placed over the riprap located below HTL to provide fish habitat. The embankment height will be increased to an elevation of approximately +14.0 feet, MLLW between the bulkhead and the marina access pier to the east. The purpose of the increased embankment height is to mitigate the effects of sea level rise.

Paving and Grading

Upland paving and grading will be completed behind the bulkhead wall to mitigate sea level rise following construction of the new bulkhead (Sheet 6). The driveway will be regraded and repaved with structural fill base course and asphalt pavement. This will consist of 8,000 sf of asphalt repaving. The upland area will be re-graded and re-paved to maintain positive drainage away from the Safe Coast Seafoods buildings. The

bulkhead will be outfitted with scuppers to allow rainwater to flow into the marina rather than pooling along the driveway or draining toward the Safe Coast facilities.

Fill Impacts, Derelict Structure and Creosote Removal

Approximately twenty eight (28) creosote-treated timber piles (12-inch diameter) and three (3) steel piles (12-inch diameter) will be removed adjacent to the existing bulkhead and as part of the north shoreline rehabilitation. In addition, the Port proposes to remove approximately thirty-six (36) 12-inch diameter derelict creosote- treated timber piles and 3 creosote-treated timber pile caps as mitigation for the fill and benthic habitat impacts created by the placement of the new bulkhead wall in front of the existing structure. This will result in approximately 64 total creosote-treated timber piles and 3 steel piles being removed along with approximately 70 lf of creosote treated timber retaining wall, and 40 lf of creosote treated timber pile caps. (Sheets 3 and 4).

A derelict timber structure approximately 2,510 sf in area will be removed as part of the mitigation for Project impacts. This will result in decreasing overwater coverage in the south portion of the marina at the location of the existing derelict timber structure. (Sheet 9)

Approximately 1,400 sf of fill below the HTL will result from the placement of the new bulkhead and drainage rock backfill (Table 1). Of the overall footprint, 1,000 sf will come into contact with the bottom substrate and result in benthic habitat impacts.

North shoreline riprap placement will occur in a 2,200 sf area, 1,850 sf of which occurs below the HTL and would result in benthic habitat impacts (Table 1). Approximately 750 sf of this will occur waterward of the existing retaining wall. A 6-inch layer of fish mix gravel will be placed below HTL to provide beach nourishment and improved habitat for fish passing through the marina.

South shoreline riprap placement will not result in any additional benthic habitat impacts (Table 1). The removal of approximately sixty-four (64) 12-inch creosote-treated timber piles, three (3) 12-inch steel piles, 70 lf of timber retaining wall, and 40 lf of derelict creosote-treated timber pile caps, will restore approximately 165 sf of benthic habitat (Table 1) and remove approximately 34 tons of creosote from the marine environment.

Table 1. Approximate Fill Impacts

Activity	Fill below HTL (sf)	Fill below HTL (cy)	Fill above HTL (sf)	Fill above HTL (cy)
Bulkhead wall and shoreline protection installation				
Sheetpile installation	400 sf	80 cy	0 sf	0 cy
Bulkhead drainage rock placement	1,000 sf	450 cy	0 sf	0 cy
Rip-rap shore protection and Fish Mix placement (north shoreline)	1,850 sf	172 cy	350 sf	26 cy
Concrete rubble removal (south shoreline)	-350 sf	-14 cy	-50 sf	-2 cy
Rip-rap replacement (south shoreline)	350 sf	30 cy	50 sf	5 cy
Subtotal	*3,250 sf*	*718 cy*	*350 sf*	*29 cy*
Structure removal				
Pile removal adjacent to existing bulkhead	-12 sf	-6 cy	0 sf	0 cy
North shoreline- retaining wall removal	-85 sf	-12 cy	0 sf	0 cy
Derelict pile/timber removal	-68 sf	-12 cy	0 sf	0 cy
Derelict Timber Structure/Debris Removal -South Marina	-2,510 sf	-350 cy	0 sf	0 cy
Subtotal	*-2,675 sf*	*-380 cy*	*0 sf*	*0 cy*
Creosote removal from the Environment	*34 tons*			

6f. What are the anticipated start and end dates for Project construction? (Month/Year) [help]

- If the Project will be constructed in phases or stages, use JARPA Attachment D to list the start and end dates of each phase or stage.

Start Date: November 2024 End Date: February 2025 ☐ See JARPA Attachment D

6g. Fair market value of the Project, including materials, labor, machine rentals, etc. [help]

$3.5 million

6h. Will any portion of the Project receive federal funding? [help]

- **If yes**, list each agency providing funds.

☒ Yes ☐ No ☐ Don't know MARAD PIDP grant funding

Part 7–Wetlands: Impacts and Mitigation

☐ Check here if there are wetlands or wetland buffers on or adjacent to the Project area. (If there are none, skip to Part 8.) [help]

No wetlands within the Project area (GeoEngineers 2022). This section is not applicable

7a. Describe how the Project has been designed to avoid and minimize adverse impacts to wetlands. [help]

☐ Not applicable

7b. Will the Project impact wetlands? [help]

☐ Yes ☐ No ☐ Don't know

7c. Will the Project impact wetland buffers? [help]

☐ Yes ☐ No ☐ Don't know

7d. Has a wetland delineation report been prepared? [help]

- **If Yes**, submit the report, including data sheets, with the JARPA package.

☐ Yes ☐ No

7e. Have the wetlands been rated using the Western Washington or Eastern Washington Wetland Rating System? [help]

- **If Yes**, submit the wetland rating forms and figures with the JARPA package.

☐ Yes ☐ No ☐ Don't know

7f. Have you prepared a mitigation plan to compensate for any adverse impacts to wetlands? [help]

- **If Yes**, submit the plan with the JARPA package and answer 7g.
- **If No, or Not applicable**, explain below why a mitigation plan should not be required.

☐ Yes ☐ No ☐ Don't know

7g. Summarize what the mitigation plan is meant to accomplish, and describe how a watershed approach was used to design the plan. [help]

7h. Use the table below to list the type and rating of each wetland impacted, the extent and duration of the impact, and the type and amount of mitigation proposed. Or if you are submitting a mitigation plan with a similar table, you can state (below) where we can find this information in the plan. [help]

Activity (fill, drain, excavate, flood, etc.)	Wetland Name[1]	Wetland type and rating category[2]	Impact area (sq. ft. or Acres)	Duration of impact[3]	Proposed mitigation type[4]	Wetland mitigation area (sq. ft. or acres)

[1] If no official name for the wetland exists, create a unique name (such as "Wetland 1"). The name should be consistent with other Project documents, such as a wetland delineation report.
[2] Ecology wetland category based on current Western Washington or Eastern Washington Wetland Rating System. Provide the wetland rating forms with the JARPA package.
[3] Indicate the days, months or years the wetland will be measurably impacted by the activity. Enter "permanent" if applicable.
[4] Creation (C), Re-establishment/Rehabilitation (R), Enhancement (E), Preservation (P), Mitigation Bank/In-lieu fee (B)

Page number(s) for similar information in the mitigation plan, if available: _____

7i. For all filling activities identified in 7h, describe the source and nature of the fill material, the amount in cubic yards that will be used, and how and where it will be placed into the wetland. [help]

7j. For all excavating activities identified in 7h, describe the excavation method, type and amount of material in cubic yards you will remove, and where the material will be disposed. [help]

Part 8–Waterbodies (other than wetlands): Impacts and Mitigation

In Part 8, "waterbodies" refers to non-wetland waterbodies. (See Part 7 for information related to wetlands.) [help]

☒ Check here if there are waterbodies on or adjacent to the Project area. (If there are none, skip to Part 9.)

8a. Describe how the Project is designed to avoid and minimize adverse impacts to the aquatic environment. [help]

☐ Not applicable

The Project will take place in the water and along the shoreline in the west portion of the Port of Ilwaco Marina which is located along the northeast shore of Baker Bay in Ilwaco, Washington.

The paving and regrading portions of the Project will all occur at the top of the shoreline in the dry. The bulkhead sheetpile wall caps will be cast in place and uncured concrete will not be allowed to come into contact with surface waters. The shoreline rip rap replacement will be placed in the dry to the extent practicable. The bulkhead demolition, placement of the new bulkhead, and appurtenances will be accomplished using equipment operated from a barge(s).

The following best management practices (BMP's) will be implemented for this Project:

General BMPs

1. Containment booms will be used to surround in-water work areas or separate embankment work from surface water. The booms will serve to contain and collect any oily material and/or floating debris potentially released during construction. Oil-absorbent materials will be employed immediately if visible product is observed. Accumulated debris will be collected daily and disposed of at a permitted upland site approved by the owner.

2. Hydraulic water jets will not be used to install piles.

3. Water quality standards and procedures that limit the impact of pollutants will be observed.

4. Land-based staging areas for activities, such as storage of machinery, equipment, materials, and stockpiled soils will be established landward of the top of bank. A silt fence will be installed around the perimeter of the upland work areas and locations where machinery, materials, and stockpiled soils are situated. Any temporary stockpiles will be covered and bermed when not in use.

5. All permit requirements will be followed during demolition and construction activities.

In, Over, and Near Water BMPs

1. In-water construction activities will comply with the in-water construction window (anticipated to be November 1 through February 28)

2. Typical construction BMPs for working in, over, and near water will be applied, including activities such as the following.

    a. Checking equipment for leaks and other problems that could result in the discharge of petroleum-based products or other material into waters of Baker Bay.

    b. Corrective actions will be taken in the event of any discharge of oil, fuel, or chemicals into the water, including

        i. Containment and cleanup efforts will begin immediately upon discovery of the spill and will be completed in an expeditious manner in accordance with all local, state, and federal regulations. Cleanup will include proper disposal of any spilled material and used cleanup material.

        ii. The cause of the spill will be ascertained, and appropriate actions taken to prevent further incidents or environmental damage.

iii. Spills will be reported to Ecology Southwest Regional Spill Response Office pursuant to WAC 173-303-145 and WAC 173-182-260.

3. Work barges will not be allowed to ground out.

4. Excess or waste materials will not be disposed of or abandoned waterward of ordinary high water or allowed to enter waters of the state. Waste materials will be disposed of in an appropriate manner consistent with applicable local, state, and federal regulations.

5. Demolition and construction materials will not be stored where wave action or upland runoff can cause materials to enter surface waters.

6. Oil-absorbent materials will be present on site for use in the event of a spill or if any oil product is observed in the water.

Pile Removal and Installation BMPs

Pile removal BMPs will be applied, including activities such as the following:

1. Removal of creosote-treated piles will be conducted consistent with the BMPs established in EPA Region 10, Best Management Practices for Piling Removal and Placement in Washington State, dated February 18, 2016 (EPA 2016).

2. While creosote-treated piles are being removed, a containment boom will surround the work area to contain and collect any floating debris and sheen. Debris will be retrieved and disposed of properly.

3. The piles will be dislodged with a vibratory hammer when possible and will not be intentionally broken by twisting or bending.

4. The piles will be removed in a single, slow, and continuous motion in order to minimize sediment disturbance and turbidity in the water column.

5. If a pile breaks above or below the mudline, it will be cut or pushed in the sediment consistent with agency-approved BMPs (USACE, DNR, Ecology and EPA).

6. Removed piles, stubs, and associated sediments (if any) will be contained on a barge. If piles are placed directly on the barge and not in a container, the storage area will consist of a row of hay or straw bales, filter fabric, or similar material placed around the perimeter of the barge.

7. All creosote-treated material, pile stubs, and associated sediments (if any) will be disposed of by the contractor in a landfill approved to accept those types of materials.

8. Steel piling will be installed with a vibratory hammer when possible. Impact hammering will start with light tapping, then increase to full force gradually.

9. A bubble curtain and one or more other noise attenuation methods will be used during impact installation or proofing of all steel piling.

10. Pile-driving will commence with a soft start procedure (ramping up) in order to alert nearby wildlife, allowing them to move out of the area prior to construction activities. For impact pile driving, contractors will be required to provide an initial set of strikes from the hammer at reduced percent energy, each

strike followed by no less than a 30-second waiting period. This procedure will be conducted a total of two times before impact pile driving begins.

11. Use of a wood cushion block or other sound-reducing method shall be implemented if impact pile driving is to be employed. The use of wood cushion blocks during construction will result in a reduction in underwater noise.

12. To avoid impacts to marine mammals, an exclusion zone will be monitored during and immediately before pile driving activities. The exclusion zone will include the entire marina area shoreward of the breakwaters. Although ESA-listed species, including Southern Resident killer whales and humpback whales are not anticipated to occur within the marina where noise impacts could occur, this avoidance measure would provide further protections against potential noise impacts to these species.

13. During pile driving activities a qualified observer will monitor the exclusion zone, if any marine mammals are observed within the exclusion zone, all in-water Project activities shall cease. Project activities shall not commence or continue until the marine mammal has either been observed having left the exclusion zone, or at least 15 minutes have passed since the last sighting whereby it is assumed the marine mammal has voluntarily left the exclusion zone.

Overwater Concrete Placement Minimization and Concrete Placement BMPs

The Project has been designed to minimize the placement of concrete overwater. Where possible, pre-cast concrete elements will be used. On-site concrete placement, where needed, will follow appropriate BMPs, including the following:

1. Wet concrete will not contact surface waters.

2. Forms for any concrete structure will be constructed to prevent leaching of wet concrete.

3. Concrete process water will not be allowed to enter the water. Any process water/contact water will be routed to a contained area for treatment and will be disposed of at an upland location.

8b. Will your Project impact a waterbody or the area around a waterbody? [help]

☒ Yes ☐ No

8c. Have you prepared a mitigation plan to compensate for the Project's adverse impacts to non-wetland waterbodies? [help]

- **If Yes**, submit the plan with the JARPA package and answer 8d.
- **If No, or Not applicable,** explain below why a mitigation plan should not be required.

☒ Yes ☐ No ☐ Don't know

The Project site has limited habitat function and value in its current condition due to the site's location in the busy Port of Ilwaco marina and its use as a temporary berth area by Safe Coast Seafoods. Additionally, the marina, including the Project site, is periodically dredged (under a separate permit) to maintain draft for the vessels using the marina and there are derelict creosote-treated timber piles and structures remaining in the slip adjacent to the existing bulkhead and a creosote-treated timber revetment at the head of the north slope (toe of slope). As such, the site should be considered disturbed in its existing condition.

The proposed Project will have localized impacts that will be minimized to the extent practicable with the BMPs summarized in 8a. Installation of the bulkhead wall, drainage rock, and rip rap will result in approximately 3,250 sf and 718 cy of fill in marine waters (measured below the HTL) (See Table under 8e). Approximately 3,250 sf of the fill in marine waters would come into contact with the bottom substrate and result in benthic habitat impacts. Impacts to the marine environment have been limited to the extent practicable through avoidance, minimization and reduction of impacts and the remaining impacts are mitigated through compensatory mitigation included in the Project action.

Avoidance and Minimization

The Project proposes to avoid and minimize impacts to habitat to the extent practicable by removing targeted piles (including creosote treated timber) and existing bulkhead features to accommodate placement of the bulkhead as close as possible to the existing bulkhead, minimizing new over water coverage, drainage rock fill placement volume, and benthic impacts to the extent practicable.

The BMPs summarized in 8a will be implemented during Project demolition and construction activities to avoid and minimize environmental impacts from the Project work. All permit requirements will be followed.

Compensatory Mitigation

Derelict creosote piles and structures present in the adjacent slip will be removed, restoring 165 sf of benthic habitat and removing approximately 34 tons of creosote from the marine environment which will improve the habitat conditions of the marina and lift its value from current conditions. The creosote treated timber revetment and debris present at the head of the adjacent slip will be removed and riprap will be placed as shore protection associated with raising the elevation of the top of the slope as part of sea level rise resilience. The north slip riprap area will be surfaced with fish mix rock to improve the habitat over the area of new riprap placed from the HTL down.

Additionally, floating timber debris will be removed from the south portion of the marina as part of the Project mitigation. This will remove approximately 2,510 sf of overwater coverage currently present in that portion of the marina.

Fill and benthic habitat impacts are anticipated to be offset by the removal of steel piles, and creosote-treated wood (piles, structures, and revetment), and floating debris from the marine environment and placement of a layer of fish mix over the riprap shore protection to be placed at the head of the slip as beach nourishment. The removal of approximately sixty-four (64) 12-inch creosote timber piles, three (3) 12-inch steel piles, 70 lf of timber retaining wall, 2,510 sf of floating timber debris and 40 lf of derelict timber pile caps, will restore approximately 2,675 sf of benthic habitat and remove approximately = 34 tons of creosote from the marine

environment (Table 8e). The removal of creosote-treated wood is anticipated to provide both water quality and benthic habitat improvements. A layer of fish mix rock/gravel (approximately 34 cy) will be placed over the portion of riprap placed below the HTL at the head of the slip to improve habitat and provide beach nourishment to that portion of shoreline. A Mitigation Sequencing and No Net Loss Narrative are included in this permit submittal.

8d. Summarize what the mitigation plan is meant to accomplish. Describe how a watershed approach was used to design the plan.

- If you already completed 7g you do not need to restate your answer here. [help]

See response to 8c. The Project site should be considered disturbed habitat in its present state as it is periodically dredged (under a separate permit) for marina maintenance and creosote treated timber piles and features are present in the slip adjacent to the bulkhead and the head of the slip. Additional mitigation will be provided with removal of the derelict floats and timber from the south portion of the marina and placement of a layer of fish mix over the slope stabilization riprap at the head of the bulkhead slip. The proposed mitigation will lift the habitat value and function at the Project site through removal of creosote and overwater coverage from the marine environment and placement of fish mix along the slope at the head of the slip as beach nourishment.

The removal of creosote-treated wood would result in water quality and benthic habitat improvements that would be anticipated to offset potential adverse Project impacts. No additional mitigation is anticipated to be required.

8e. Summarize impact(s) to each waterbody in the table below. [help]

Activity (clear, dredge, fill, pile drive, etc.)	Waterbody name[1]	Impact location[2]	Duration of impact[3]	Amount of material (cubic yards) to be placed in or removed from waterbody	Area (sq. ft. or linear ft.) of waterbody directly affected
Creosote-treated timber pile removal/demolition for bulkhead replacement	Ilwaco Marina/Baker Bay	In-water, benthic habitat	Permanent	-6	-12
Creosote-treated timber retaining wall removal	Ilwaco Marina/Baker Bay	In-water, benthic habitat	Permanent	-12	-85
Derelict creosote treated timber pile/timber removal	Ilwaco Marina/Baker Bay	In-water, benthic habitat	Permanent	-12	-68
Floating timber debris removal	Ilwaco Marina/Baker Bay	In-water, overwater coverage	Permanent	-350	-2,510
Sheetpile installation	Ilwaco Marina/Baker Bay	In-water, benthic habitat	Permanent	80	400
Drainage Rock (behind bulkhead)			Permanent	450	1,00
Rip-rap replacement & fish mix (north shoreline)	Ilwaco Marina/Baker Bay	in-water, benthic habitat	Permanent	172	1,850
Rip-rap replacement (south shoreline)	Ilwaco Marina/Baker Bay	In-water, benthic habitat	Permanent	30	350
Rubble/rip-rap removal (south shoreline)			Permanent	-14	-350

[1] If no official name for the waterbody exists, create a unique name (such as "Stream 1") The name should be consistent with other documents provided.
[2] Indicate whether the impact will occur in or adjacent to the waterbody. If adjacent, provide the distance between the impact and the waterbody and indicate whether the impact will occur within the 100-year flood plain.
[3] Indicate the days, months or years the waterbody will be measurably impacted by the work. Enter "permanent" if applicable.

8f. For all activities identified in 8e, describe the source and nature of the fill material, amount (in cubic yards) you will use, and how and where it will be placed into the waterbody. [help]
450 cy of clean structural fill and base coarse material will be used to repave and regrade the driveway adjacent to the bulkhead will be obtained from a commercial supplier. All of the repaving/regrading work will be completed onshore of the wharf and will not come into contact with waters of the marina/Baker Bay. The clean, free draining gravel backfill (450 cy) that would be placed in the space created between the new bulkhead sheet piles and the existing bulkhead will be obtained from a commercial supplier. Similarly, the angular rip rap material to replace the slope protection to the north and south of the bulkhead will be obtained from a commercial supplier. Approximately 172 cy of rip rap slope protection will replace the creosote treated timber revetment at the head of the slip and clean fish mix sand and gravel would be placed below HTL in an approximately 6-inch layer over the riprap. This material will be obtained from a commercial supplier.
8g. For all excavating or dredging activities identified in 8e, describe the method for excavating or dredging, type and amount of material you will remove, and where the material will be disposed. [help]
-NA-

Part 9–Additional Information

Any additional information you can provide helps the reviewer(s) understand your Project. Complete as much of this section as you can. It is ok if you cannot answer a question.

9a. If you have already worked with any government agencies on this Project, list them below. [help]

Agency Name	Contact Name	Phone	Most Recent Date of Contact
USACE	Brad Johnson	(503) 808-4383	September 7, 2022
USACE	Kate Mott	(360)480-6921	November 10, 2022
USACE	Kinsey Friesen	(503)808-4378	May 5 2023
MARAD	Kristine Gilson	(202) 366-1939	June 7, 2023
WDFW	Lauren Bauernschmidt	(360) 480-2558	June 8, 2023
EPA	Sarah Burgess		January 23, 2023
Ecology	Zach Meyer	(360)481-9885	April 13, 2023
City of Ilwaco	Holly Beller	(360) 642-3145	April 14, 2023
USFWS	Mitch Dennis	(564)-669-0716	May 23, 2023
NOAA	Tom Hausman		March 15, 2023

9b. Are any of the wetlands or waterbodies identified in Part 7 or Part 8 of this JARPA on the Washington Department of Ecology's 303(d) List? [help]

- **If Yes,** list the parameter(s) below.
- If you don't know, use Washington Department of Ecology's Water Quality Assessment tools at: https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d.

☒ Yes ☐ No

The Ilwaco Marina waters (Baker Bay) are listed as a Category 5 Water for Fecal Coliform.

9c. What U.S. Geological Survey Hydrological Unit Code (HUC) is the Project in? [help]

- Go to http://cfpub.epa.gov/surf/locate/index.cfm to help identify the HUC.

1708000605

9d. What Water Resource Inventory Area Number (WRIA #) is the Project in? [help]

- Go to https://ecology.wa.gov/Water-Shorelines/Water-supply/Water-availability/Watershed-look-up to find the WRIA #.

24 - Willapa

9e. Will the in-water construction work comply with the State of Washington water quality standards for turbidity? [help]

- Go to https://ecology.wa.gov/Water-Shorelines/Water-quality/Freshwater/Surface-water-quality-standards/Criteria for the standards.

☒ Yes ☐ No ☐ Not applicable

9f. If the Project is within the jurisdiction of the Shoreline Management Act, what is the local shoreline environment designation? [help]

- If you don't know, contact the local planning department.
- For more information, go to: https://ecology.wa.gov/Water-Shorelines/Shoreline-coastal-management/Shoreline-coastal-planning/Shoreline-laws-rules-and-cases.

☐ Urban ☐ Natural ☐ Aquatic ☐ Conservancy ☒ Other: High Intensity

9g. What is the Washington Department of Natural Resources Water Type? [help]

- Go to http://www.dnr.wa.gov/forest-practices-water-typing for the Forest Practices Water Typing System.

☒ Shoreline ☐ Fish ☐ Non-Fish Perennial ☐ Non-Fish Seasonal

9h. Will this Project be designed to meet the Washington Department of Ecology's most current stormwater manual? [help]

- **If No**, provide the name of the manual your Project is designed to meet.

☒ Yes ☐ No

Name of manual: _____

9i. Does the Project site have known contaminated sediment? [help]

- **If Yes**, please describe below.

☐ Yes ☒ No

9j. If you know what the property was used for in the past, describe below. [help]

The Ilwaco marina area has been used for commercial and recreation fishing for more than 100 years. The Safe Coast "peninsula" was originally occupied by a dock that accommodated a train track for timber shipping. Safe Coast Seafood was previously operated by Jessie's Ilwaco Fish Company and historically occupied by a cannery.

9k. Has a cultural resource (archaeological) survey been performed on the Project area? [help]

- **If Yes**, attach it to your JARPA package.

☒ Yes ☐ No

9l. Name each species listed under the federal Endangered Species Act that occurs in the vicinity of the Project area or might be affected by the proposed work. [help]

The species in the table below have the potential to occur within the Project vicinity. See the attached Biological Evaluation for additional information.

ESA-Listed Species with Potential to Occur Within the Project Action Area

Species	ESU/DPS	Scientific Name	Agency	Federal Status	Critical Habitat
Chinook Salmon	Lower Columbia River ESU	*Oncorhynchus tshawytcha*	NMFS	Threatened	Occurs in Project Area
	Snake River fall-run ESU			Threatened	
	Snake River spring/summer-run ESU			Threatened	
	Upper Columbia River spring-run ESU			Endangered	
	Upper Willamette River ESU			Threatened	
Chum Salmon	Columbia River ESU	*O. keta*	NMFS	Threatened	Occurs in Project Area
Coho Salmon	Lower Columbia River ESU	*O. kisutch*	NMFS	Threatened	Occurs in Project Area
Sockeye Salmon	Snake River ESU	*O. nerka*	NMFS	Endangered	Occurs in Project Area
Steelhead	Lower Columbia River DPS	*Onocorhynchus myskiss*	NMFS	Threatened	Occurs in Project Area
	Middle Columbia River DPS			Threatened	
	Snake River Basin DPS			Threatened	
	Upper Columbia River DPS			Threatened	
	Upper Willamette River DPS			Threatened	
Green sturgeon	Southern DPS	*Acipenser medirostris*	NMFS	Threatened	Occurs in Project Area
Eulachon	Southern DPS	*Thaleichthys pacificus*	NMFS	Threatened	Occurs in Project Area
Sea turtles	Leatherback	*Dermochelys coriacea*	NMFS	Endangered	None in Project Area
Killer Whale	Southern Resident	*Orcincus orca*	NMFS	Endangered	None in Project Area
Humpback Whale	Central America DPS	*Megaptera novaeangliae*	NMFS	Endangered	None in Project Area
	Mexico DPS			Threatened	None in Project Area
Bull Trout	N/A	*Salvelinus confluentus*	USFWS	Threatened	None in Project Area
Western Snowy Plover	N/A	*Charadrius nivosus nivosus*	USFWS	Threatened	None in Project Area
Marbled Murrelet	N/A	*Brachyramphus marmoratus*	USFWS	Threatened	None in Project Area
Streaked Horned Lark	N/A	*Eremophila alpestris strigata*	USFWS	Threatened	None in Project Area

9m. Name each species or habitat on the Washington Department of Fish and Wildlife's Priority Habitats and Species List that might be affected by the proposed work. [help]

The following Washington Department of Fish and Wildlife Priority Habitats and Species could occur in the Project vicinity.

- Coho Salmon (*Oncorhynchus kisutch*)
- Winter Steelhead (*Oncorhynchus mykiss*)
- Fall Chum (*Oncorhynchus keta*)
- Fall Chinook (*Oncorhynchus tshawytscha*)
- Marbled Murrelet (*Brachyramphus marmoratus*)
- Shorebird concentrations
- Waterfowl concentrations
- Wetlands
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Purple martin (*Progne subis*)

Part 10–SEPA Compliance and Permits

Use the resources and checklist below to identify the permits you are applying for.

- Online Project Questionnaire at http://apps.oria.wa.gov/opas/.
- Governor's Office for Regulatory Innovation and Assistance at (800) 917-0043 or help@oria.wa.gov.
- For a list of addresses to send your JARPA to, click on agency addresses for completed JARPA.

10a. Compliance with the State Environmental Policy Act (SEPA). (Check all that apply.) [help]

- For more information about SEPA, go to https://ecology.wa.gov/regulations-permits/SEPA-environmental-review.

☐ A copy of the SEPA determination or letter of exemption is included with this application.

☒ A SEPA determination is pending with City of Ilwaco (lead agency). The expected decision date is .

☐ I am applying for a Fish Habitat Enhancement Exemption. (Check the box below in 10b.) [help]

☐ This Project is exempt (choose type of exemption below).

☐ Categorical Exemption. Under what section of the SEPA administrative code (WAC) is it exempt?

☐ Other: _____

_____

☐ SEPA is pre-empted by federal law.

10b. Indicate the permits you are applying for. (Check all that apply.) [help]

LOCAL GOVERNMENT

Local Government Shoreline permits:

☐ Substantial Development ☒ Conditional Use ☐ Variance

☐ Shoreline Exemption Type (explain): _____

Other City/County permits:

☐ Floodplain Development Permit ☒ Critical Areas Ordinance

STATE GOVERNMENT

Washington Department of Fish and Wildlife:

☒ Hydraulic Project Approval (HPA) ☐ Fish Habitat Enhancement Exemption – Attach Exemption Form

Washington Department of Natural Resources:

☐ Aquatic Use Authorization

Complete JARPA Attachment E and submit a check for $25 payable to the Washington Department of Natural Resources. **Do not send cash.**

Washington Department of Ecology:

☒ Section 401 Water Quality Certification ☐ Non-Federally Regulated Waters

FEDERAL AND TRIBAL GOVERNMENT

United States Department of the Army (U.S. Army Corps of Engineers):

☒ Section 404 (discharges into waters of the U.S.) ☒ Section 10 (work in navigable waters)

United States Coast Guard:

For Projects or bridges over waters of the United States, contact the U.S. Coast Guard at: d13-pf-d13bridges@uscg.mil

☐ Bridge Permit ☐ Private Aids to Navigation (or other non-bridge permits)

United States Environmental Protection Agency:

☒ Section 401 Water Quality Certification (discharges into waters of the U.S.) on tribal lands where tribes do not have treatment as a state (TAS)

Tribal Permits: (Check with the tribe to see if there are other tribal permits, e.g., Tribal Environmental Protection Act, Shoreline Permits, Hydraulic Project Permits, or other in addition to CWA Section 401 WQC)

☒ Section 401 Water Quality Certification (discharges into waters of the U.S.) where the tribe has treatment as a state (TAS).

Part 11–Authorizing Signatures

Signatures are required before submitting the JARPA package. The JARPA package includes the JARPA form, Project plans, photos, etc. [help]

11a. Applicant Signature (required) [help]

I certify that to the best of my knowledge and belief, the information provided in this application is true, complete, and accurate. I also certify that I have the authority to carry out the proposed activities, and I agree to start work only after I have received all necessary permits.

I hereby authorize the agent named in Part 3 of this application to act on my behalf in matters related to this application. _____ (initial)

By initialing here, I state that I have the authority to grant access to the property. I also give my consent to the permitting agencies entering the property where the Project is located to inspect the Project site or any work related to the Project. _____ (initial)

Tracy Lofstrom		6/30/23
Applicant Printed Name	Applicant Signature	Date

11b. Authorized Agent Signature [help]

I certify that to the best of my knowledge and belief, the information provided in this application is true, complete, and accurate. I also certify that I have the authority to carry out the proposed activities and I agree to start work only after all necessary permits have been issued.

Victoria England		July 3, 2023
Authorized Agent Printed Name	Authorized Agent Signature	Date

11c. Property Owner Signature (if not applicant) [help]

Not required if Project is on existing rights-of-way or easements (provide copy of easement with JARPA).

I consent to the permitting agencies entering the property where the Project is located to inspect the Project site or any work. These inspections shall occur at reasonable times and, if practical, with prior notice to the landowner.

Property Owner Printed Name	Property Owner Signature	Date

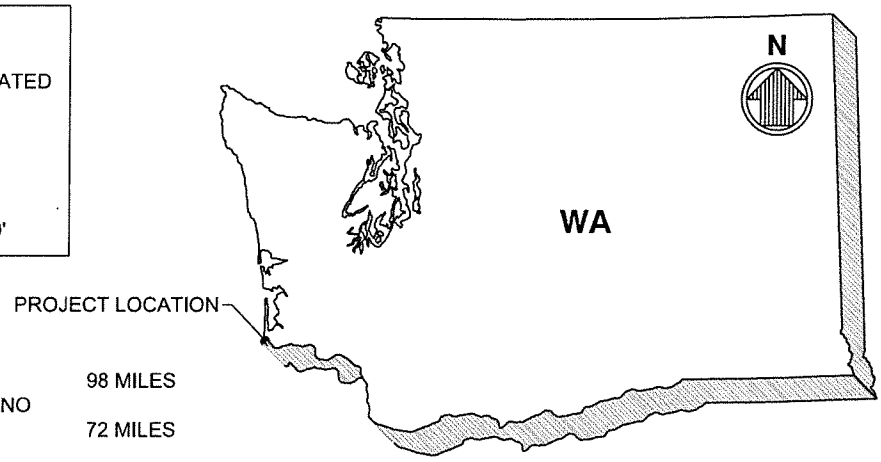
18 U.S.C §1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious, or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious, or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than 5 years or both.

If you require this document in another format, contact the Governor's Office for Regulatory Innovation and Assistance (ORIA) at (800) 917-0043. People with hearing loss can call 711 for Washington Relay Service. People with a speech disability can call (877) 833-6341. ORIA publication number: ORIA-16-011 rev. 09/2018

TIDAL DATUM:
BASED ON NOAA TIDAL STATION NO. 9440581, IN US FEET. HTL/OHW DELINEATED BY GEOENGINEERS DECEMBER, 2022.

LEVELS:

MHHW: +8.07'	MHW: +7.37'
MLW: 1.35'	MLLW: +0.00'
OHW (DELINEATED):	APPROX. +11.50'

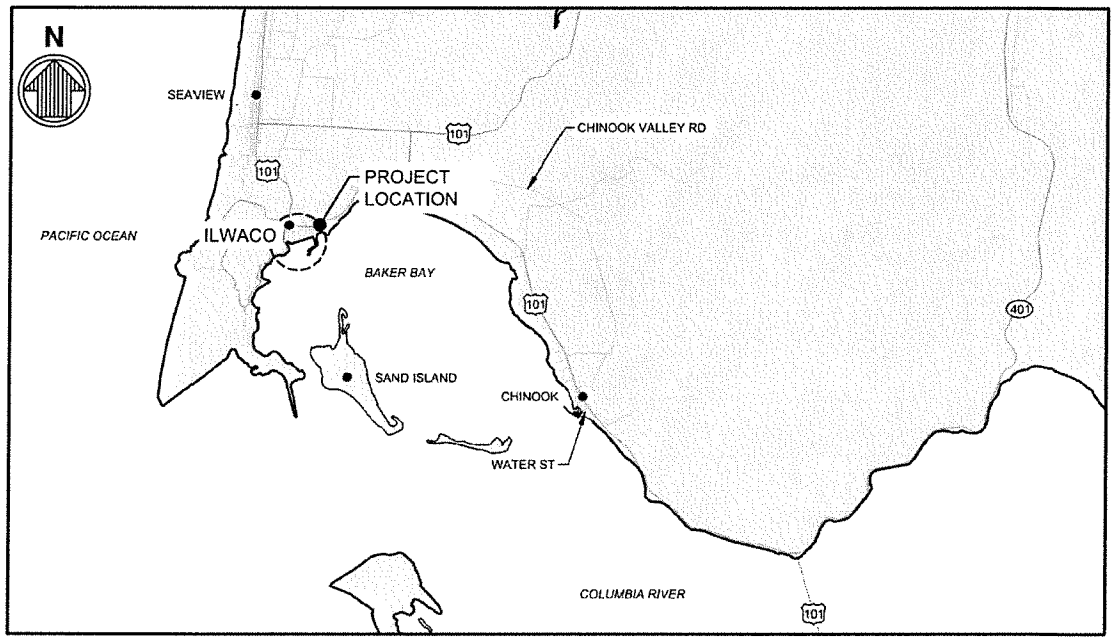


VICINITY MAP
SCALE: NTS

DIRECTIONS TO SITE FROM SEATTLE:

1. I-5 S, US-101, WA-8 AND US-12 TO WA-107 S/S MAIN ST IN MONTESANO — 98 MILES
2. TAKE US-101 TO ILWACO — 72 MILES
3. ARRIVE AT PROJECT SITE

PROJECT ADDRESS:
PORT OF ILWACO
117 HOWERTON AVE SE
ILWACO, WA 98624



LOCATION MAP
SCALE: NTS

APPLICANT: PORT OF ILWACO ADJACENT PROPERTY OWNERS: 1) PORT OF ILWACO	LOCATION: PORT OF ILWACO 117 HOWERTON AVE SE ILWACO, WA 98624 LAT/LONG: 46.30442 N, -124.03852 W DATUM: MLLW SHEET: 1 OF 9 DATE: JUNE 2023	PROPOSED PROJECT: PORT OF ILWACO EAST BULKHEAD RESILIENCE PROJECT IN: BAKER BAY NEAR/AT: ILWACO COUNTY: PACIFIC STATE: WA SEC: 33/34 T: 10 N R: 11 W

PURPOSE: PORT OF ILWACO BULKHEAD REPLACEMENT AND SEA LEVEL RISE RESILIENCE .

DATUM: MLLW

ADJACENT PROPERTY OWNERS:

1. CITY OF ILWACO
2. STATE OF WASHINGTON
3. STARLIGHT ONE LLC.

Port of Ilwaco East Bulkhead Resilience Project

Parcel Map

APPLICATION BY:
Port of Ilwaco

PROPOSED: DERELICT ILWACO E. BULKHEAD REPLACEMENT, DRIVEWAY REGRADING/ REPAVING, & SHORE PROTECTION REPLACEMENT

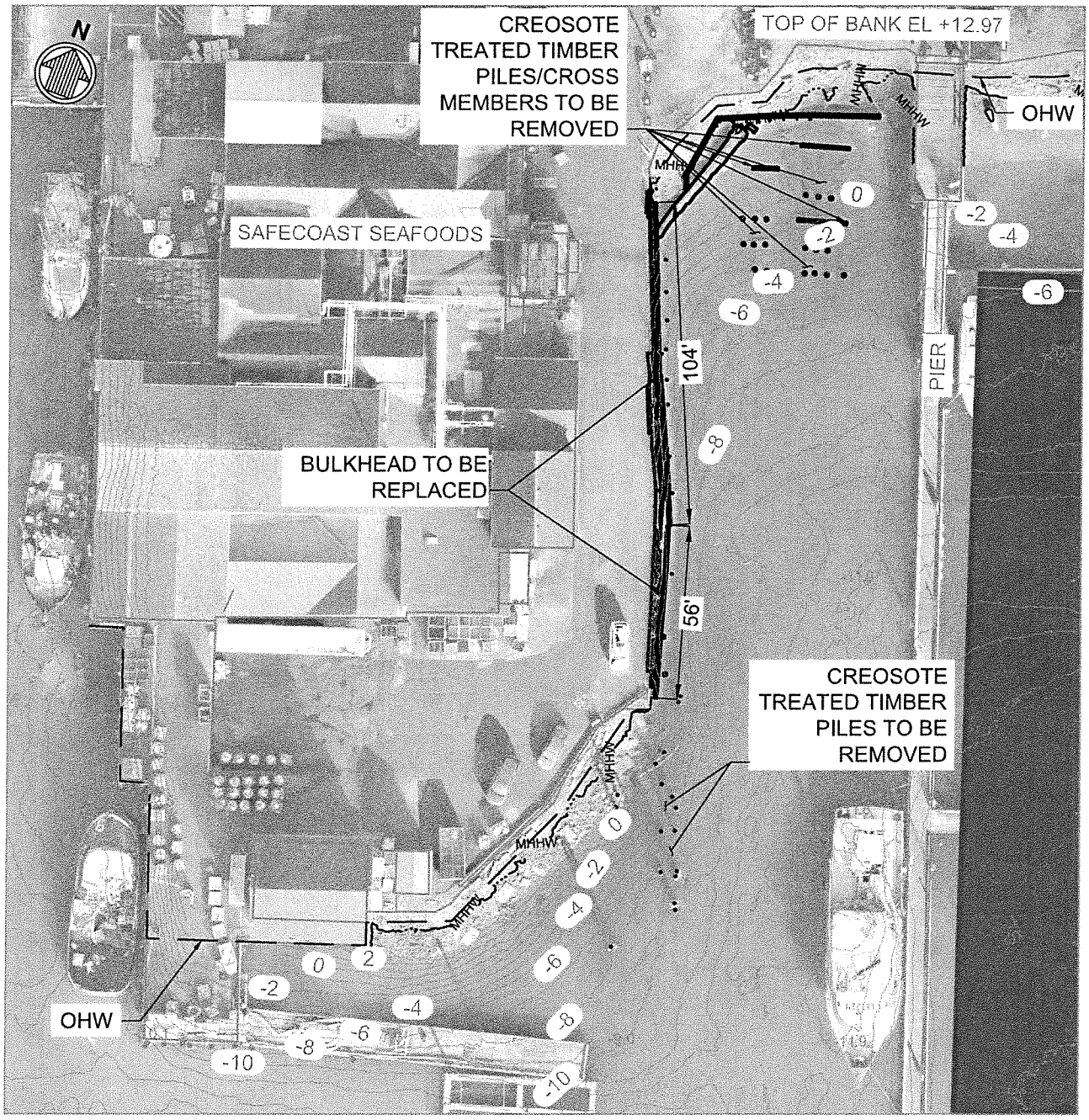
IN: BAKER BAY

AT: ILWACO

COUNTY: PACIFIC

SHEET 2 OF 9

DATE: JUNE 2023



LEGEND

- PILES
- CREOSOTE-TREATED REVETMENT (TO BE REMOVED)
- CREOSOTE-TREATED LOG (TO BE REMOVED)
- BULKHEAD (TO BE REMOVED)

A/2 PLAN - EXISTING CONDITIONS
SCALE: 1" = 50'

LEVELS:	
MHHW: +8.07'	MHW: +7.37'
MLW: 1.35'	MLLW: +0.00'
OHW (DELINEATED):	APPROX. +11.50'

50' 0' 50' 100'

SCALE: 1"=50'

APPLICANT:
PORT OF ILWACO

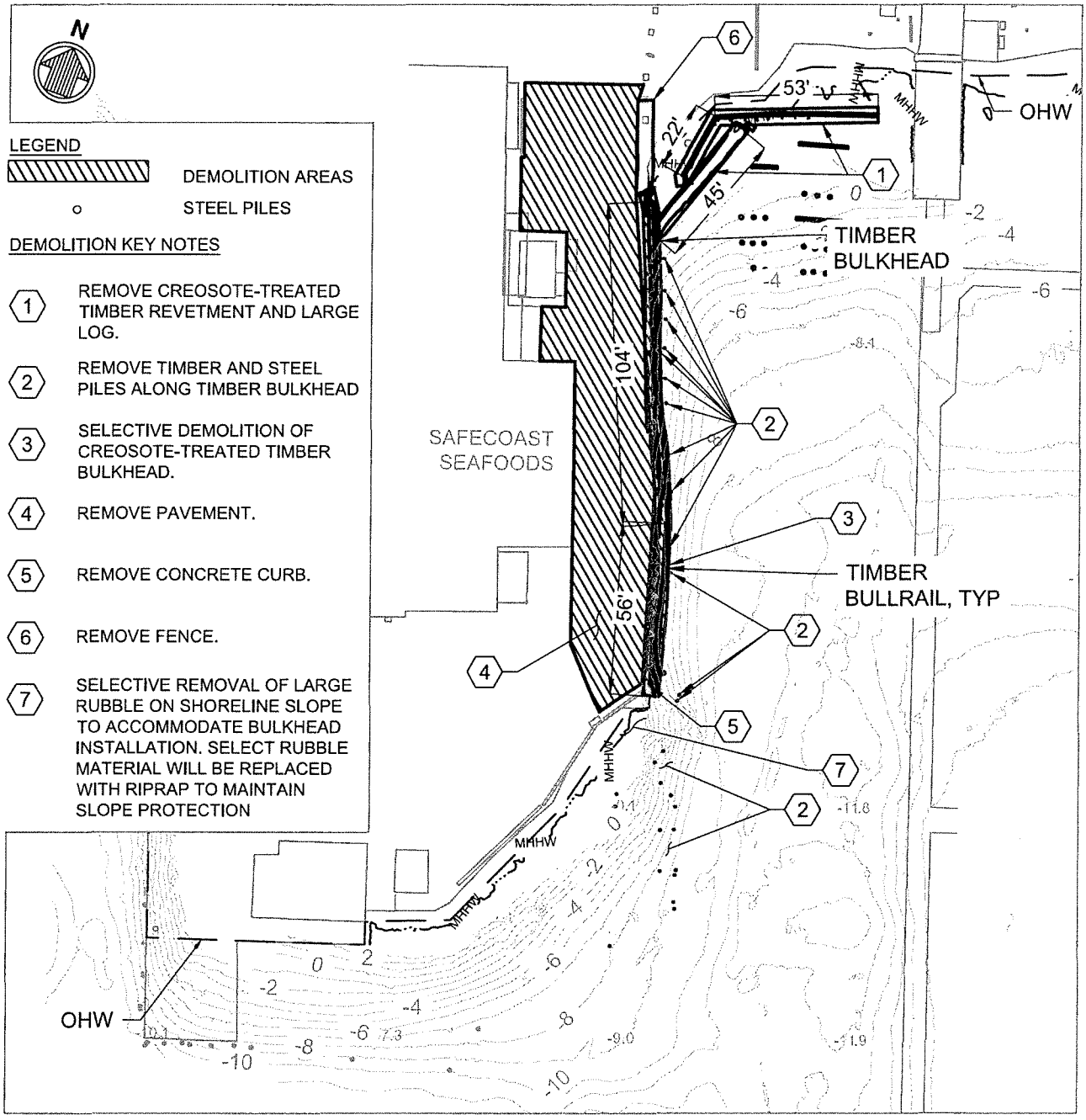
ADJACENT PROPERTY OWNERS:
1) PORT OF ILWACO

LOCATION: PORT OF ILWACO
117 HOWERTON AVE SE
ILWACO, WA 98624
LAT/LONG: 46.30442 N, -124.03852 W

DATUM: MLLW
SHEET: 3 OF 9 DATE: JUNE 2023

PROPOSED PROJECT: PORT OF ILWACO
EAST BULKHEAD RESILIENCE PROJECT

IN: BAKER BAY
NEAR/AT: ILWACO
COUNTY: PACIFIC STATE: WA
SEC: 33/34 T: 10 N R: 11 W

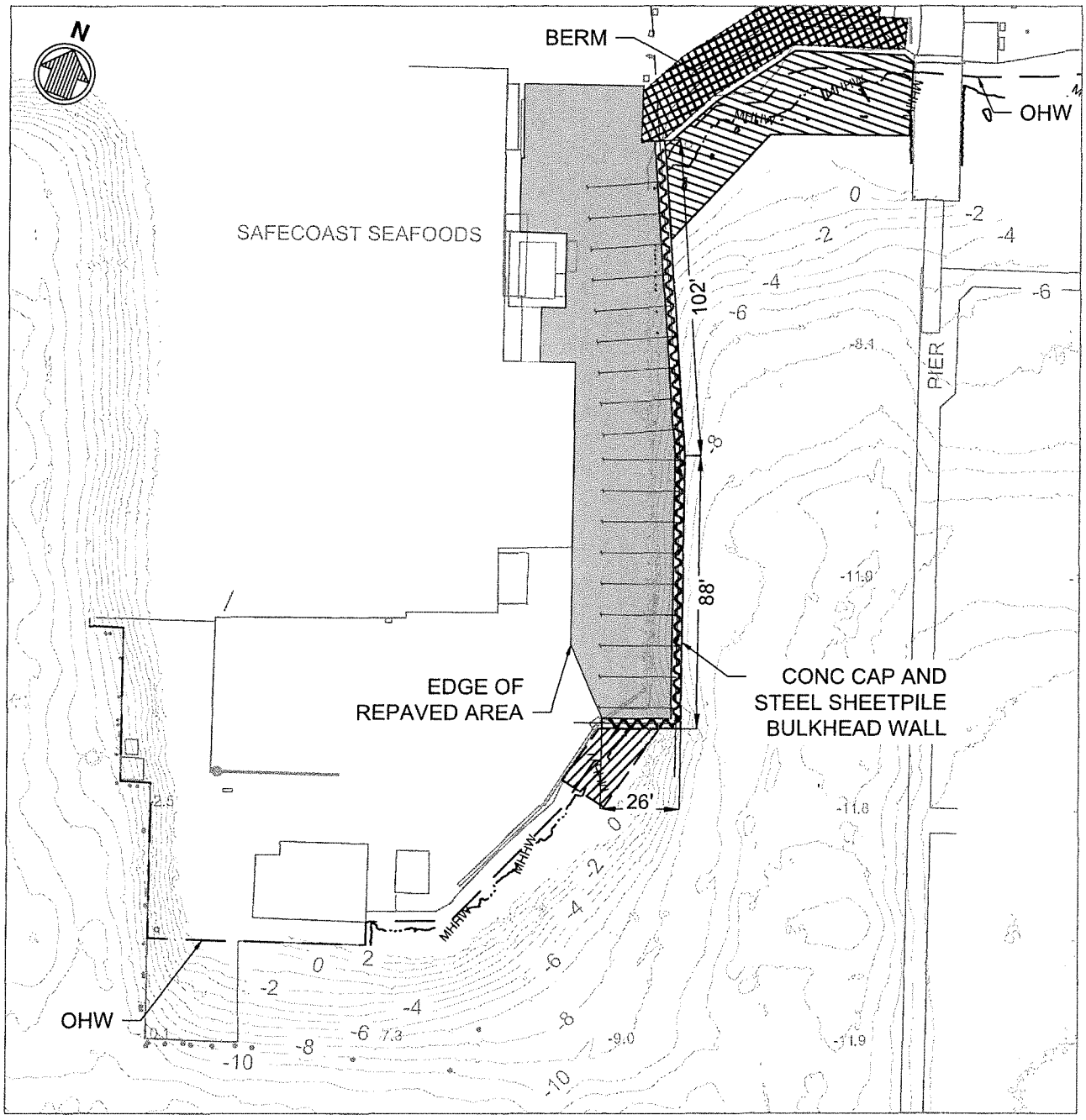


A/3 PLAN - DEMOLITION
SCALE: 1" = 50'

LEVELS:	
MHHW: +8.07'	MHW: +7.37'
MLW: 1.35'	MLLW: +0.00'
OHW (DELINEATED):	APPROX. +11.50'

50' 0' 50' 100'
SCALE: 1"=50'

APPLICANT: PORT OF ILWACO ADJACENT PROPERTY OWNERS: 1) PORT OF ILWACO	LOCATION: PORT OF ILWACO 117 HOWERTON AVE SE ILWACO, WA 98624 LAT/LONG: 46.30442 N, -124.03852 W DATUM: MLLW SHEET: 4 OF 9 DATE: JUNE 2023	PROPOSED PROJECT: PORT OF ILWACO EAST BULKHEAD RESILIENCE PROJECT IN: BAKER BAY NEAR/AT: ILWACO COUNTY: PACIFIC STATE: WA SEC: 33/34 T: 10 N R: 11 W



LEGEND

- PAVING AREA LIMITS
- BERM CONSTRUCTION
- SLOPE PROTECTION
- APPROXIMATE AREA OF SLOPE PROTECTION REPLACEMENT
- TIEBACKS
- PROPOSED BULKHEAD
- PILES

A/4 PLAN - PROPOSED
SCALE: 1" = 50'

LEVELS:	
MHHW: +8.07'	MHW: +7.37'
MLW: 1.35'	MLLW: +0.00'
OHW (DELINEATED):	APPROX. +11.50'

50' 0' 50' 100'

SCALE: 1"=50'

APPLICANT:
PORT OF ILWACO

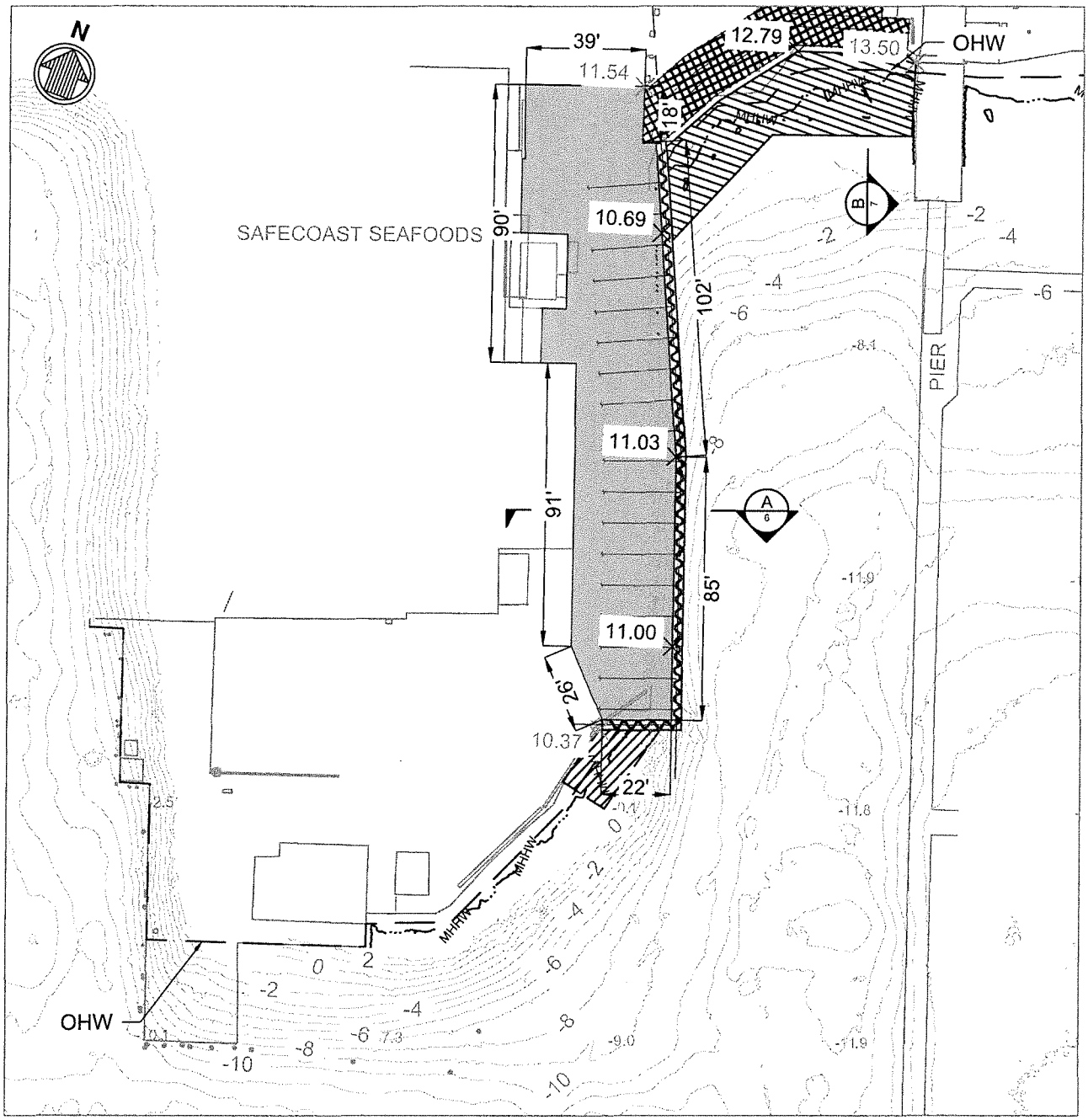
ADJACENT PROPERTY OWNERS:
1) PORT OF ILWACO

LOCATION: PORT OF ILWACO
117 HOWERTON AVE SE
ILWACO, WA 98624
LAT/LONG: 46.30442 N, -124.03852 W

DATUM: MLLW
SHEET: 5 OF 9 DATE: JUNE 2023

PROPOSED PROJECT: PORT OF ILWACO
EAST BULKHEAD RESILIENCE PROJECT

IN: BAKER BAY
NEAR/AT: ILWACO
COUNTY: PACIFIC STATE: WA
SEC: 33/34 T: 10 N R: 11 W



LEGEND

- PAVING AREA LIMITS
- BERM CONSTRUCTION
- SLOPE PROTECTION
- APPROXIMATE AREA OF SLOPE PROTECTION REPLACEMENT
- TIEBACKS
- PROPOSED BULKHEAD
- STEEL PILES
- 0.00 X EXISTING ELEVATION
- 0.00 X PROPOSED ELEVATION

A/5 PLAN - GRADING
SCALE: 1" = 50'

LEVELS:

MHHW: +8.07'	MHW: +7.37'
MLW: 1.35'	MLLW: +0.00'
OHW (DELINEATED):	APPROX. +11.50'

50' 0' 50' 100'

SCALE: 1"=50'

APPLICANT:
PORT OF ILWACO

ADJACENT PROPERTY OWNERS:
1) PORT OF ILWACO

LOCATION: PORT OF ILWACO
117 HOWERTON AVE SE
ILWACO, WA 98624

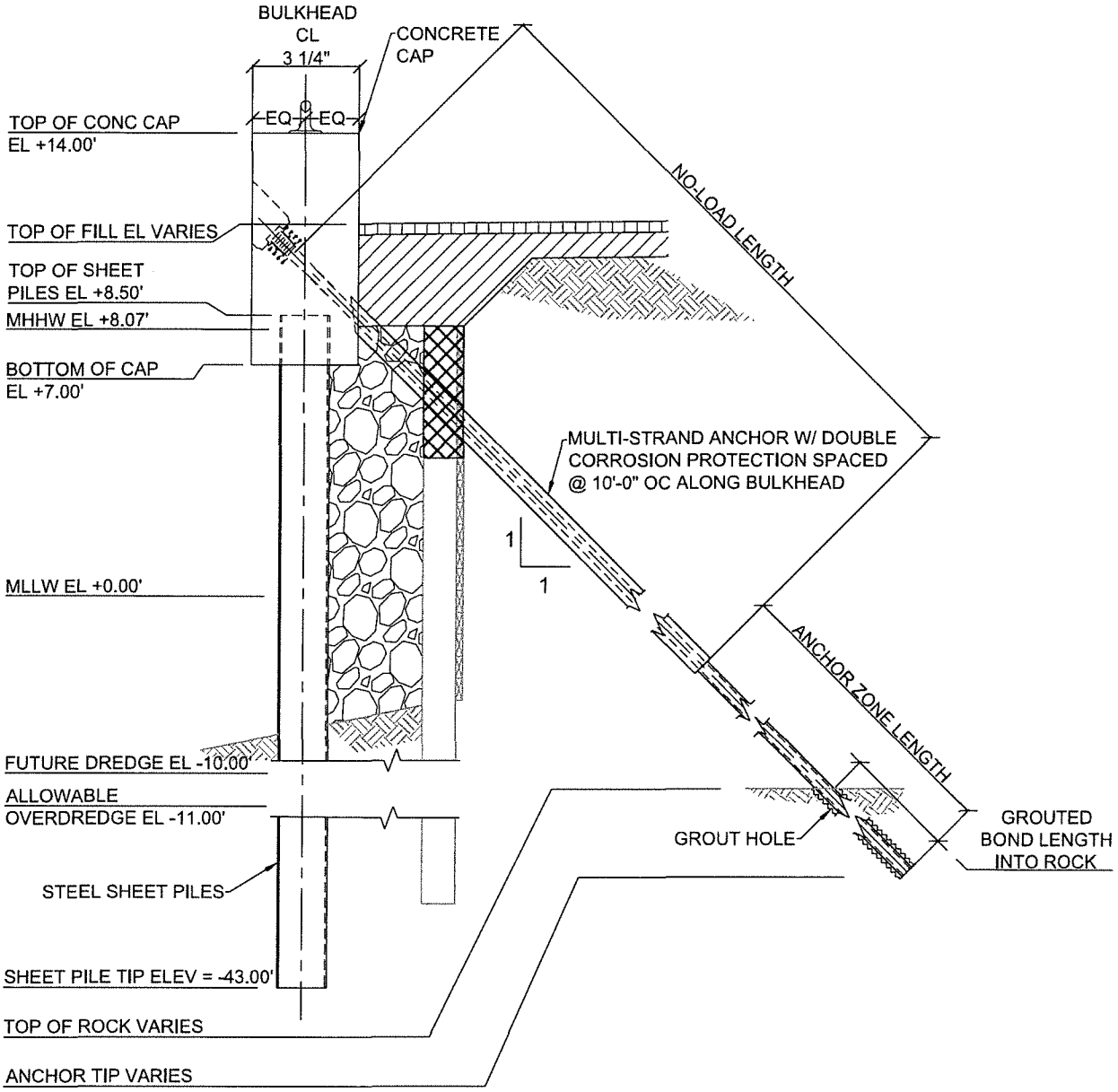
LAT/LONG: 46.30442 N, -124.03852 W

DATUM: MLLW

SHEET: 6 OF 9 DATE: JUNE 2023

PROPOSED PROJECT: PORT OF ILWACO
EAST BULKHEAD RESILIENCE PROJECT

IN: BAKER BAY
NEAR/AT: ILWACO
COUNTY: PACIFIC STATE: WA
SEC: 33/34 T: 10 N R: 11 W

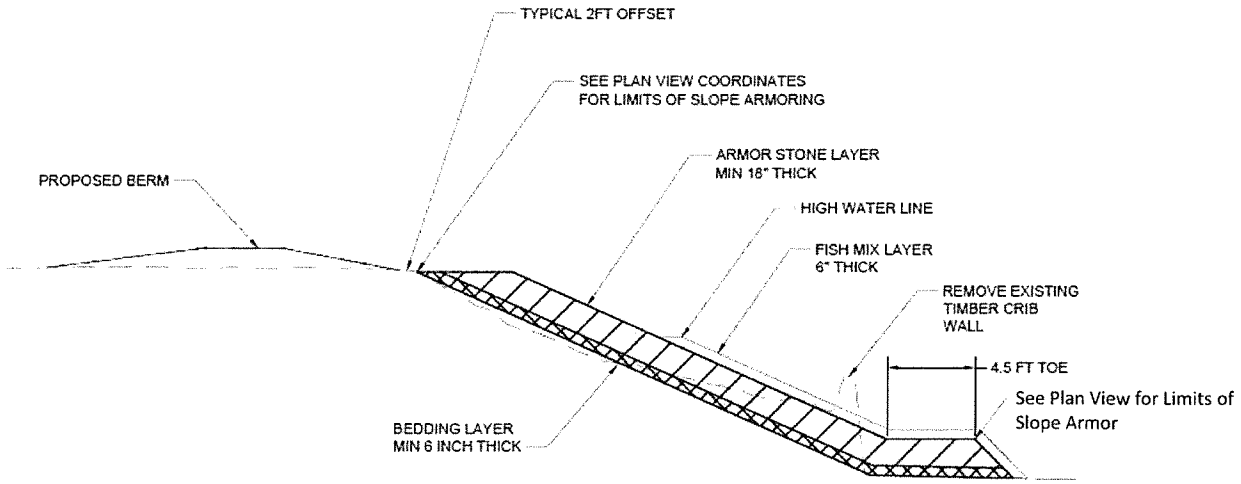


A/6 SECTION - TYP BULKHEAD
SCALE: NTS

LEGEND

- CLEAT
- EXISTING CREOSOTE-TREATED TIMBER BULKHEAD, LAGGING TO REMAIN
- DRAIN ROCK BACKFILL
- ASPHALT PAVING
- STRUCTURAL FILL
- LOCAL DEMOLITION/REMOVAL OF CREOSOTE-TREATED TIMBER BULKHEAD FOR INSTALLATION OF GROUND ANCHORS

APPLICANT: PORT OF ILWACO ADJACENT PROPERTY OWNERS: 1) PORT OF ILWACO	LOCATION: PORT OF ILWACO 117 HOWERTON AVE SE ILWACO, WA 98624 LAT/LONG: 46.30442 N, -124.03852 W DATUM: MLLW SHEET: 7 OF 9 DATE: JUNE 2023	PROPOSED PROJECT: PORT OF ILWACO EAST BULKHEAD RESILIENCE PROJECT IN: BAKER BAY NEAR/AT: ILWACO COUNTY: PACIFIC STATE: WA SEC: 33/34 T: 10 N R: 11 W



C1 / C-110 SLOPE ARMOR SECTION 2

SCALE:

APPLICANT: PORT OF ILWACO ADJACENT PROPERTY OWNERS: 1) PORT OF ILWACO	LOCATION: PORT OF ILWACO 117 HOWERTON AVE SE ILWACO, WA 98624 LAT/LONG: 46.30442 N, -124.03852 W DATUM: MLLW SHEET: 8 OF 9 DATE: JUNE 2023	PROPOSED PROJECT: PORT OF ILWACO EAST BULKHEAD RESILIENCE PROJECT IN: BAKER BAY NEAR/AT: ILWACO COUNTY: PACIFIC STATE: WA SEC: 33/34 T: 10 N R: 11 W

APPLICANT:
PORT OF ILWACO

ADJACNET PROPERTY OWNERS:
1) PORT OF ILWACO

LOCATION: PORT OF ILWACO
117 HOWERTON AVE SE
ILWACO, WA, 98624

LAT/LONG: 46.20442 N, -124.03852 W

DATUM: MLLW

SHEET: 9 OF 9 DATE: JUNE, 2023

PROPOSED: PORT OF ILWACO EAST BULKHEAD RESILIENCE PROJECT

IN: BAKER BAY
NEAR/AT: PORT OF ILWACO
COUNTY: PACIFIC
STATE: WA
SEC: 33/34 T: 10 N R: 11 W

WASHINGTON STATE
Joint Aquatic Resources Permit Application (JARPA) [help]

US Army Corps of Engineers
Seattle Distnct

AGENCY USE ONLY

Date received:_____; ☐ **Town**
☐ **Application Fee Received;** ☐ **Fee N/A**
☐ **New Application;** ☐ **Renewal Application**
Type/Prefix #:____; **NaturE Use Code:**____
LM Initials & BP#:_____
RE Assets Finance BP#:_____
New Application Number:_____
Trust(s):_____; **County:**_____
AQR Plate #(s):_____
Gov Lot #(s):_____
Tax Parcel #(s):_____

Attachment E:
Aquatic Use Authorization on Department of Natural Resources (DNR)-managed aquatic lands [help]

Complete this attachment and submit it with the completed JARPA form only if you are applying for an Aquatic Use Authorization with DNR. Call (360) 902-1100 or visit http://www.dnr.wa.gov/programs-and-services/aquatics/leasing-and-land-transactions for more information.

- DNR recommends you discuss your proposal with a DNR land manager before applying for regulatory permits. Contact your regional land manager for more information on potential permit and survey requirements. You can find your regional land manager by calling (360) 902-1100 or going to http://www.dnr.wa.gov/programs-and-services/aquatics/aquatic-districts-and-land-managers-map. [help]
- The applicant may not begin work on DNR-managed aquatic lands until DNR grants an Aquatic Use Authorization.
- Include a $25 non-refundable application processing fee, payable to the "Washington Department of Natural Resources." (Contact your Land Manager to determine if and when you are required to pay this fee.) [help]

DNR may reject the application at any time prior to issuing the applicant an Aquatic Use Authorization. [help]

Use black or blue ink to enter answers in white spaces below.

1. Applicant Name (Last, First, Middle)

Lofstrom, Tracy

2. Project Name (A name for your project that you create. Examples: Smith's Dock or Seabrook Lane Development) [help]

Port of Ilwaco East Bulkhead Resilience Project (Project)

3. Phone Number and Email

(360) 642-3143, tlofstrom@portofilwaco.org

4. Which of the following applies to Applicant? Check one and, if applicable, attach the written authority – bylaws, power of attorney, etc. [help]

☐ Corporation	☐ Individual
☐ Limited Partnership	☐ Marital Community (Identify spouse):
☐ General Partnership	_____
☐ Limited Liability Company	☒ Government Agency
Home State of Registration:	☐ Other (Please Explain):
_____	_____

5. Washington UBI (Unified Business Identifier) number, if applicable: [help]
6. Are you aware of any existing or previously expired Aquatic Use Authorizations at the project location?
☐ Yes ☒ No ☐ Don't know If Yes, Authorization number(s): _____
7. Do you intend to sublease the property to someone else?
☐ Yes ☒ No If Yes, contact your Land Manager to discuss subleasing.
8. If fill material was used previously on DNR-managed aquatic lands, describe below the type of fill material and the purpose for using it. [help]
In 1968, the filling in of the former tidelands made the former Pioneer Packing Company cannery platform into a peninsula at the northwest corner of the mooring basin (USC&GS 1968;USGS 1969). The former Pioneer Packing Company cannery became Jessie's Ilwaco Fish Company in 1961, and the property is now home to Safe Coast Seafoods.

To be completed by DNR and a copy returned to the applicant.

Signature for projects on DNR-managed aquatic lands:

Applicant must obtain the signature of DNR Aquatics District Manager OR Assistant Division Manager if the project is located on DNR-managed aquatic lands.

I, a designated representative of the Dept. of Natural Resources, am aware that the project is being proposed on Dept. of Natural Resources-managed aquatic lands and agree that the applicant or his/her representative may pursue the necessary regulatory permits. My signature does not authorize the use of DNR-managed aquatic lands for this project.

Printed Name	**Signature**	**Date**
Dept. of Natural Resources District Manager or Assistant Division Manager	Dept. of Natural Resources District Manager or Assistant Division Manager	

If you require this document in another format, contact the Governor's Office for Regulatory Innovation and Assistance (ORIA) at (800) 917-0043. People with hearing loss can call 711 for Washington Relay Service. People with a speech disability can call (877) 833-6341. ORIA Publication ORIA-16-016 rev. 10/2016

moffatt & nichol

600 University Street, Suite 610
Seattle, WA 98101

(206) 622-0222
www.moffattnichol.com

MEMORANDUM

To:	City of Ilwaco
From:	Moffatt & Nichol on Behalf of Port of Ilwaco
Date:	June 2023
Subject:	**Port of Ilwaco East Bulkhead Resilience Project** **Mitigation Sequencing and No Net Loss Narrative**
M&N Job No.:	213282

Introduction

The City of Ilwaco (City), Washington's Shoreline Master Plan (SMP) section 6.3(1) requires that projects protect the critical area at a project site so that project actions result in no net loss of critical area functions and values. The proposed Port of Ilwaco Bulkhead Resilience Project will meet the no net loss objective through avoidance, minimization and compensatory mitigation for environmental impacts from the project action. This memorandum summarizes a Mitigation Sequence Analysis as required by the City [SMP6.3(3)] in their pre-application meeting comment letter dated 2 May 2023 (attached).

Existing Conditions

The project site is located on the east side of the Safe Coast Seafood wharf in the northwest portion of the Port of Ilwaco Marina in Ilwaco, Washington. The marine, benthic, and shoreline habitat are disturbed habitat based on the use and maintenance of the marina as described below. Eelgrass is not present at the project site based on the eelgrass survey completed in 2022 (GeoEngineers 2022).

The existing bulkhead, to be replaced as part of the project, consists of a creosote treated timber pile and pile cap bulkhead apparently tied back with cable tie backs to deadman piles near the seafood facility buildings. The existing bulkhead is leaning waterward as much as 10 degrees in places and is in poor condition. Bulkhead movement waterward has been observed since monitoring began in November 2022.

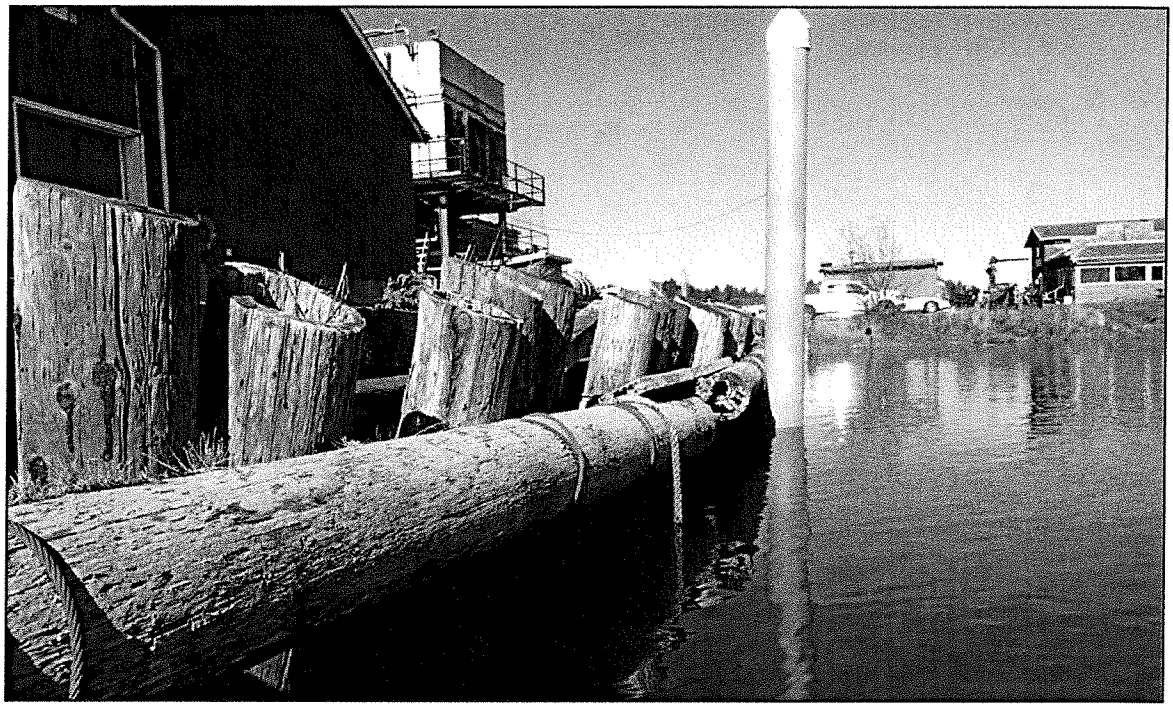


Figure 1. Damaged Bulkhead Wall

The paved driveway west of the bulkhead, to be regraded and repaved as part of the project, shows signs of settlement and damage from piles protruding through the pavement and represents additional indication of bulkhead movement and associated settlement behind the bulkhead. The head of the adjacent slip is occupied by a creosote treated timber revetment and various logs at the toe of the slope and grasses and low vegetation are located along the top of the slope.

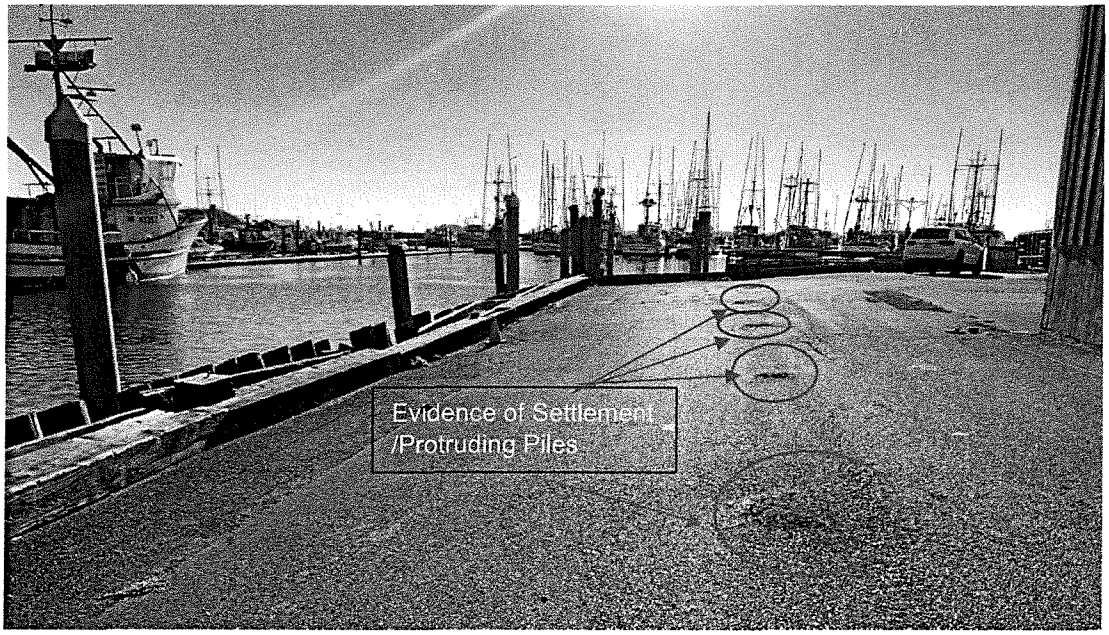


Figure 2. Drive Settlement

Various creosote-treated timber piles and features are located within the adjacent marina slip. The slip is part of the busy Ilwaco Marina that is actively used by tenants (including vessels accessing Safe Coast Seafoods) and visiting vessels and is periodically dredged to maintain permitted depth to accommodate the draft of the vessels using the marina. The disturbed habitat in the marina provides lower function and value as habitat to marine species based on the baseline conditions and use of the facility.

Proposed Project

The proposed Project is required for improved the safety, efficiency, and reliable use of the wharf. The Port is a key hub for commercial fishing, seafood and aquaculture processing, and recreation activities that greatly benefit the regional economy. The commercial fishing wharf, operated by Safe Coast Seafoods, is one of the most active in the state, landing roughly $14 million in commercial seafood each year. Repair of the bulkhead wall is critical to ongoing operations at Safe Coast Seafoods. In its current condition, the bulkhead is in serious structural condition and at risk of failing. Recent biweekly and monthly measurements have been completed to monitor ongoing movement of the bulkhead. The monitoring has recorded movement along 13 monitoring points along the face of the bulkhead ranging from approximately 0.06 inch to up to 0.31 inch waterward since monitoring began in November 2022. The monitoring indicates that the bulkhead is the process of active failure. Frequent flooding due to high water levels from "king tides" and severe winter storm surges further threaten the structural capacity of the bulkhead.

Bulkhead failure would shut down cargo operations at the Port and negatively impact a wide variety of businesses in maritime and non-maritime sectors including Safe Coast Seafoods. The shutdown of the Safe Coast site due to failure of the bulkhead would lead to a series of economic impacts for many more