Attachment 14.C

Preliminary Engineering Design Report

West Bay Yards
Shoreline Restoration Design

Location:	Olympia, Washington
Client Name:	West Bay Development Group
M&N Project No.:	201839
Submittal Stage	DRAFT Preliminary (30%) Design
Issue Date:	March 2, 2022

Rev. #	Issue Date	Originated	Reviewed	Reviewed Date	Description
01	3/2/2022	KCL	YN/ETC	3/1/2022	DRAFT for Client Review
02	3/2/2022	VC	YN	3/2/2022	Revised Incorporating Client Comments

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1. Introduction

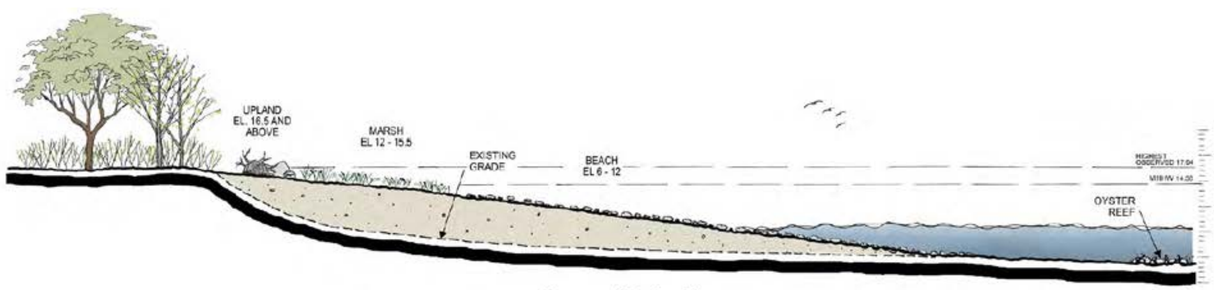
1.1. Study Purpose

The existing shoreline along the former Hardel Site includes a steep (1.5H:1V) and armored shoreline that is ecologically degraded with very limited public access.

West Bay Development Group (Client) intends to enhance/restore the ecologically degraded and armored shoreline at the former Hardel Site to a more natural condition as part of the West Bay Yards project (The Project). The restoration concept was developed as part of the 2016 West Bay Environmental Assessment conducted for the City of Olympia (CHE 2016). The 2016 study was reviewed by and received support from stakeholders including the City of Olympia (City), the Port of Olympia (Port), and the Squaxin Island Tribe (Tribe).

The identified restoration concept includes placement of fill comprised of more natural substrate (clean sand and gravel material) over and seaward of the existing armored shoreline and burial of riprap along the shoreline. The restored shoreline will provide riparian and saltmarsh habitat planting as well as improved public access, see Figure 1-1.

Moffatt & Nichol (M&N) was retained by Client to provide coastal engineering support for the West Bay Yards project shoreline enhancement by advancing the restoration concept to a preliminary level of design. This technical report presents the preliminary design report for the shoreline restoration.



Conceptual Section 17

Figure 1-1: Restoration Concept Developed for the Old Hardel Site by 2016 West Bay Environmental Assessment (CHE 2016)

2. Project Site Characteristics

2.1. Project Location

The Project site is located within the City of Olympia, in Thurston County, Washington on the west shoreline of Budd Inlet, at the southern-most extent of the Puget Sound. East of the Project Site is the West Bay and the Port of Olympia Marine Terminal. The site is bordered to the west by West Bay Drive and to the north and south by other former industrial properties. The site vicinity is shown in Figure 2-1. The street address is 1210 West Bay Drive NW.

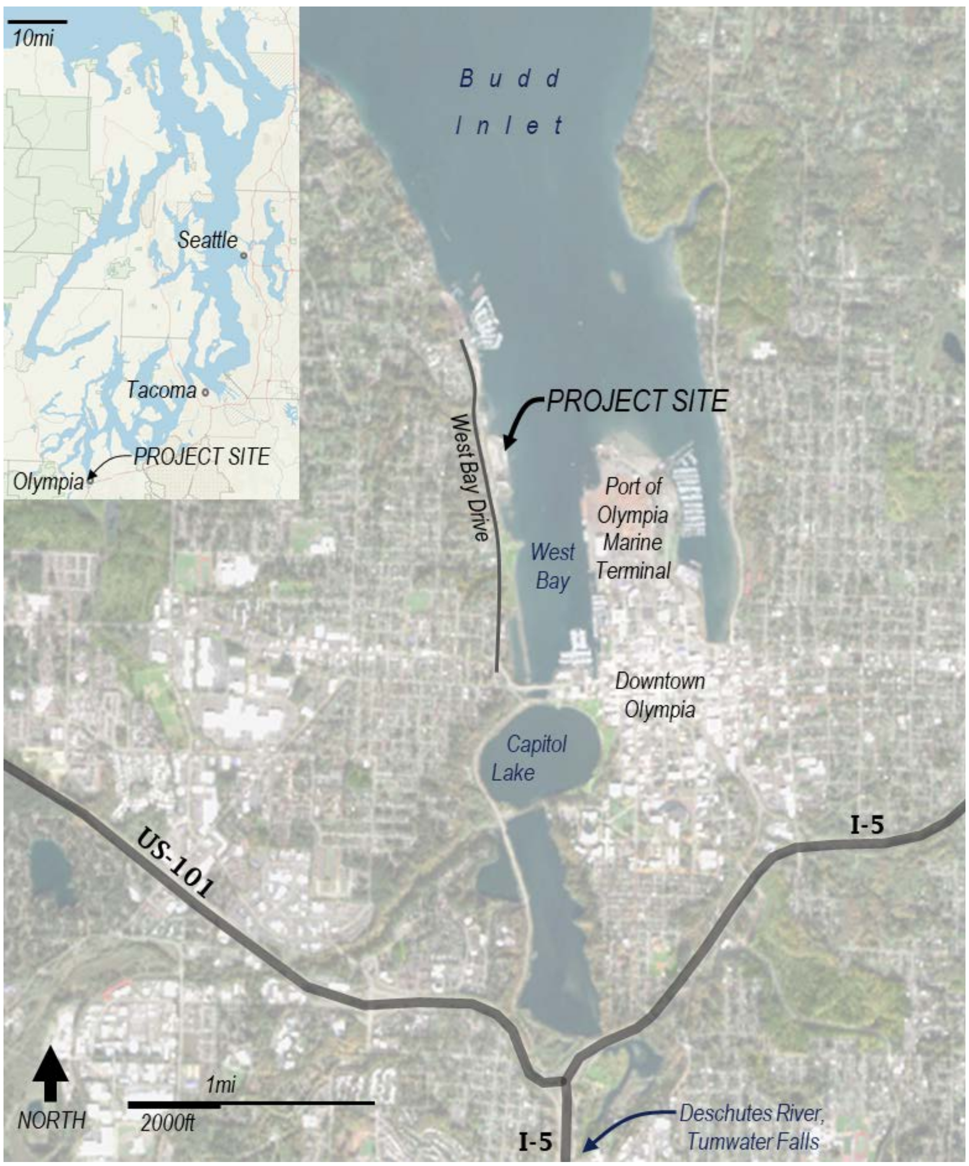


Figure 2-1: Vicinity map of the Project Site shown. The inset shows the location of the Site with respect to Puget Sound and the Olympia region.

2.1.1. Historic Conditions

The Project Site property had been home to logging/lumber related business as early as 1924 with operations ceasing in 1996, after a fire destroyed the plywood mill. Figure 2-2 shows the site prior to construction of the modern mill with rafts of log and a pier or rail trestle extending into Budd Inlet. The upland area does not appear as expansive, nor does it appear to be armored. The site appears to have been built up with imported soil and shore protection when a new plywood mill was constructed in the late 1970s with the upland area expanded and armored sometime in the 1980s. Figure 2-3 shows the Hardel Plywood mill circa 1990 prior to the fire in 1996. A site clean-up was completed in 2012.

Figure 2-2: 1970 oblique aerial showing Project Site (WA State Archives 2022).

Figure 2-3: Hardel Plywood Mill circa 1990.

2.1.2. Current Conditions

The existing site is typical of previous industrial or commercial sites that have been leveled. The site is mostly old pavement, gravel, and with about a dozen light poles. The average upland elevation is around +15 feet, NAVD88 (North American Vertical Datum of 1988). Figure 2-4 shows the site from above and from the east and Figure 2-5 show the site from the ground and from the south side of the property.

Several relic waterfront structures consisting of cut-off treated timber piles and concrete foundations are present along the project shoreline. Figure 2-6 shows an oblique aerial of the site's shoreline. The site's shoreline primarily runs north-south, with a westerly return towards West Bay Drive at the north end of the site. The shoreline is armored with a riprap revetment and its slope is generally 1.5:1 (horizontal:vertical) on the upper slope with a flatter lower slope beginning between 0 and +5 NAVD88.

Offshore of the armoring the ground is much flatter at about 30:1 to 70:1. The ground is elevated around the site of the relic trestle structure. Along the north-south reach of the site's revetment, the mean lower low water line contour (-4 feet, NAVD88), is generally between 80-120 feet offshore, with the exception of the area around the relic trestle where the substrate has built up. The site map with existing contours is shown in Figure 2-7.

Figure 2-4: 2016 oblique aerial showing the Project Site (WA DOE 2022).

Figure 2-5: A June 2019 Google Street view of the property from the south end looking northeast.

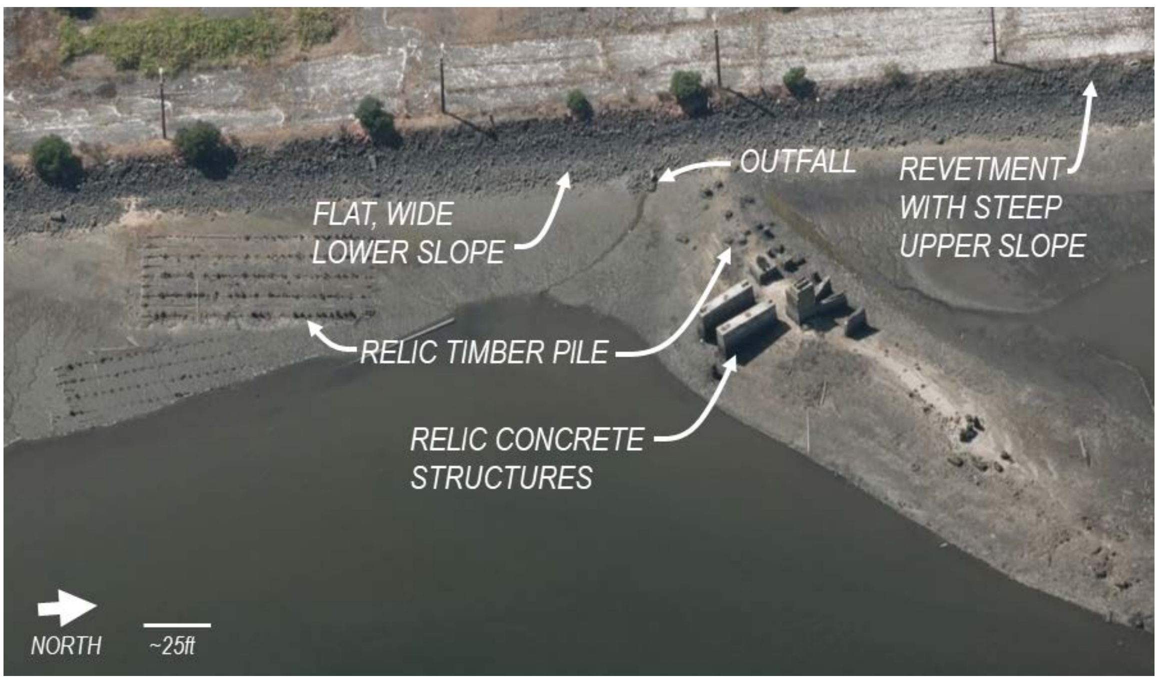


Figure 2-6: Oblique aerial view of the Project Site shoreline (Vexcel Imaging 2020 via Bing Maps).

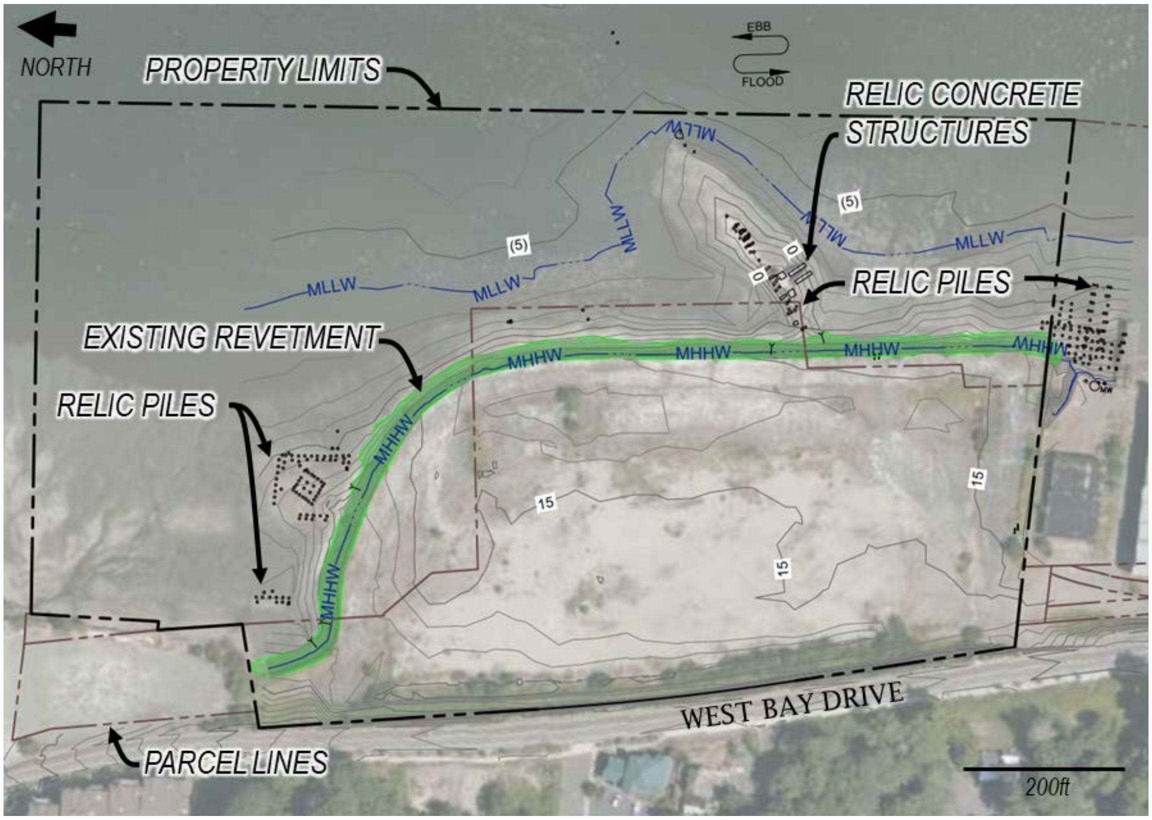


Figure 2-7: Site map with elevation contours in feet referenced to NAVD88.

2.2. Outfall Structures

There are five surveyed outfall structures located at the Project Site. The outfall locations are shown in Figure 2-8. Only one outfall, the northern most outfall, has a known pipe network identified in the 2020 M2C survey and the City of Olympia stormwater systems map. The City of Olympia web site indicates a 12-inch concrete pipe entering the property from the street before transitioning to a corrugated metal pipe of unknown diameter as the pipe connects to the outfall. Offshore flow channels from two of the outfalls, the northern and southern most outfalls, can be seen in the aerials. The remaining outfalls may be abandoned.

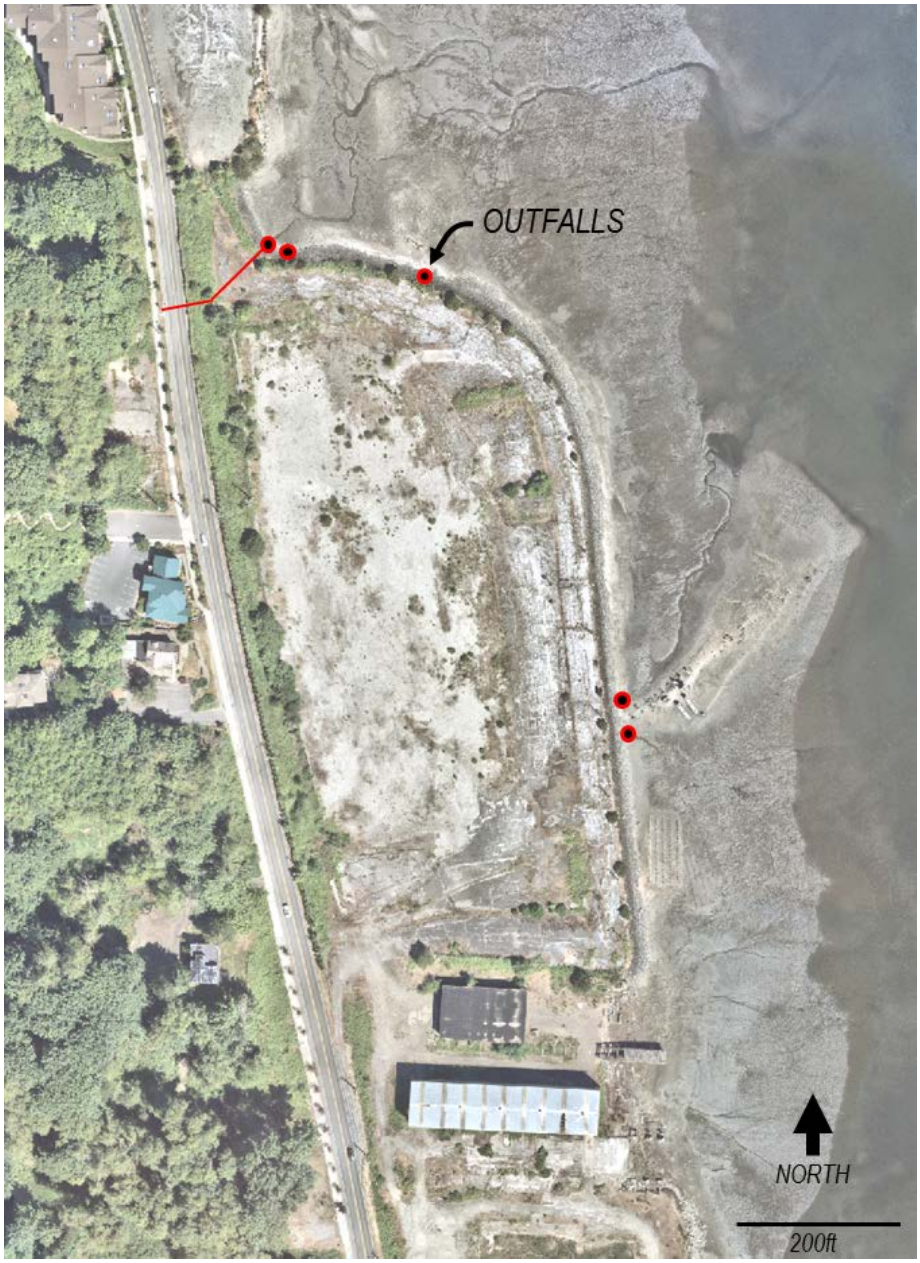


Figure 2-8: Outfalls on the Project Site.

2.3. Geomorphic Setting

In Puget Sound, the major source of coastal zone sediment is from the erosion and reworking of coastal bluff exposures of till, outwash sediments, and glacial marine deposits (Finlayson 2006). These deposits often exhibit a variety of sediment types simultaneously including clay, silt, sand, and gravel. Consequently, the beach sediments derived from these sources are similarly complex with heterogeneous mixtures of pebble gravels and coarse-grained sands being the most prevalent.

Washington State Department of Natural Resources (DNR) identified the geology of the Tumwater Quadrangle (2003), which includes the Project Site shown in Figure 2-10. The site geology is identified as fill (Qf) backed by bluffs comprised of Vashon advance outwash (Qga) (grades from clay to gavels), and Pre-Vashon glaciolacustrine deposits (Qpf) (clays and/or fine sandy silt).

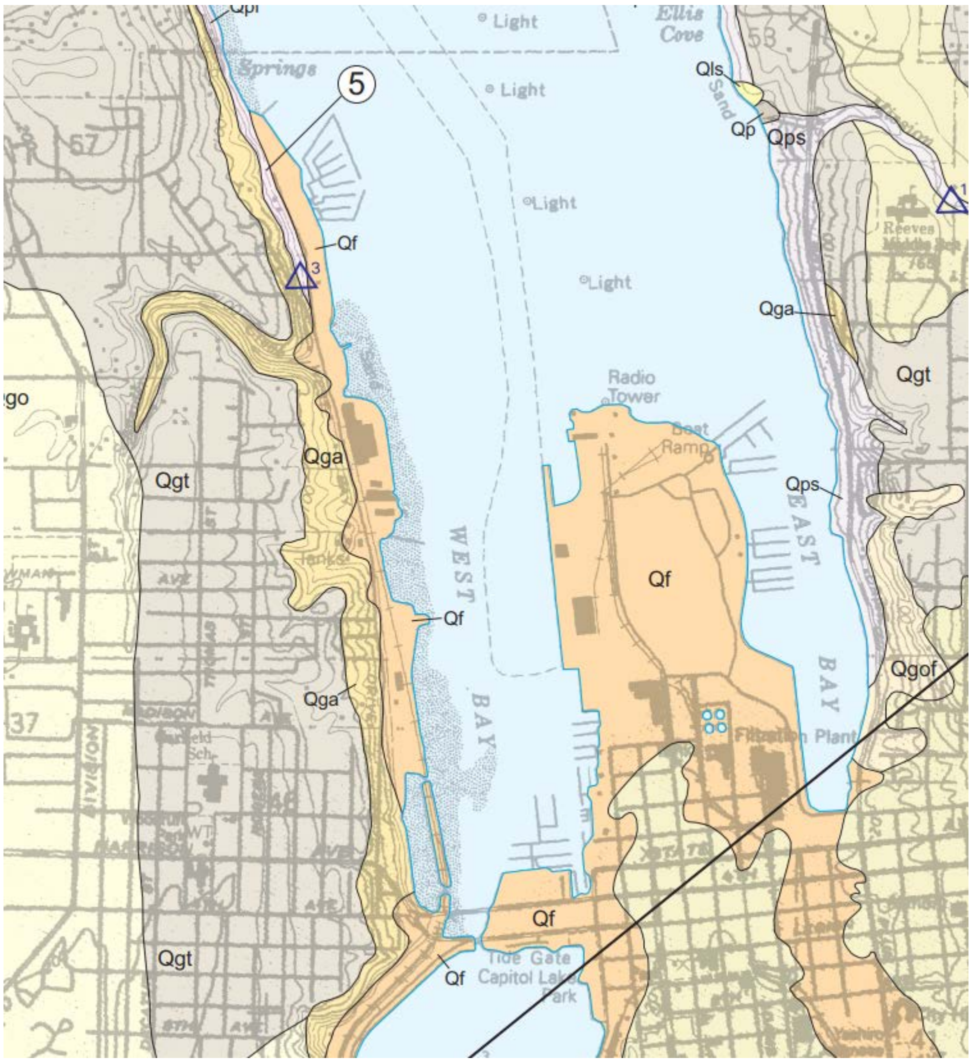


Figure 2-9: Geology of the West Bay vicinity provided by DNR (2003).

2.3.1. Sediment Sources

Historically, the Deschutes River, creeks and bluff erosion provided sediment to the coastal zone in the project vicinity. The Deschutes was dammed in 1890 at the upper Tumwater Falls and again in 1951 to form Capitol Lake. The damming of the Deschutes and the creation of Capitol Lake effectively cut off all sediment coming from the Deschutes River. Some sediment reaches the site from Schneider Creek to the north. A depositional fan spanning from the Schneider Creek outfall can be seen in the aerial (Figure 2-13). Two smaller creeks to the south may provide small amounts of sediment to the site as well. Rivers and creeks near the Project Site are shown in Figure 2-12.

Figure 2-10: Rivers and creeks near the Project Site.

Figure 2-11: Schneider Creek outfall and its depositional fan, north of the Project Site.

2.3.2. Net-Shore Drift

The net-shore drift in Puget Sound is typically aligned with the direction of longest fetch (horizontal distance over which a wind generates waves) and dominant wave energy sector. Washington State Department of Ecology (Ecology) categorized the shoreline along the Project Site as "No appreciable drift".

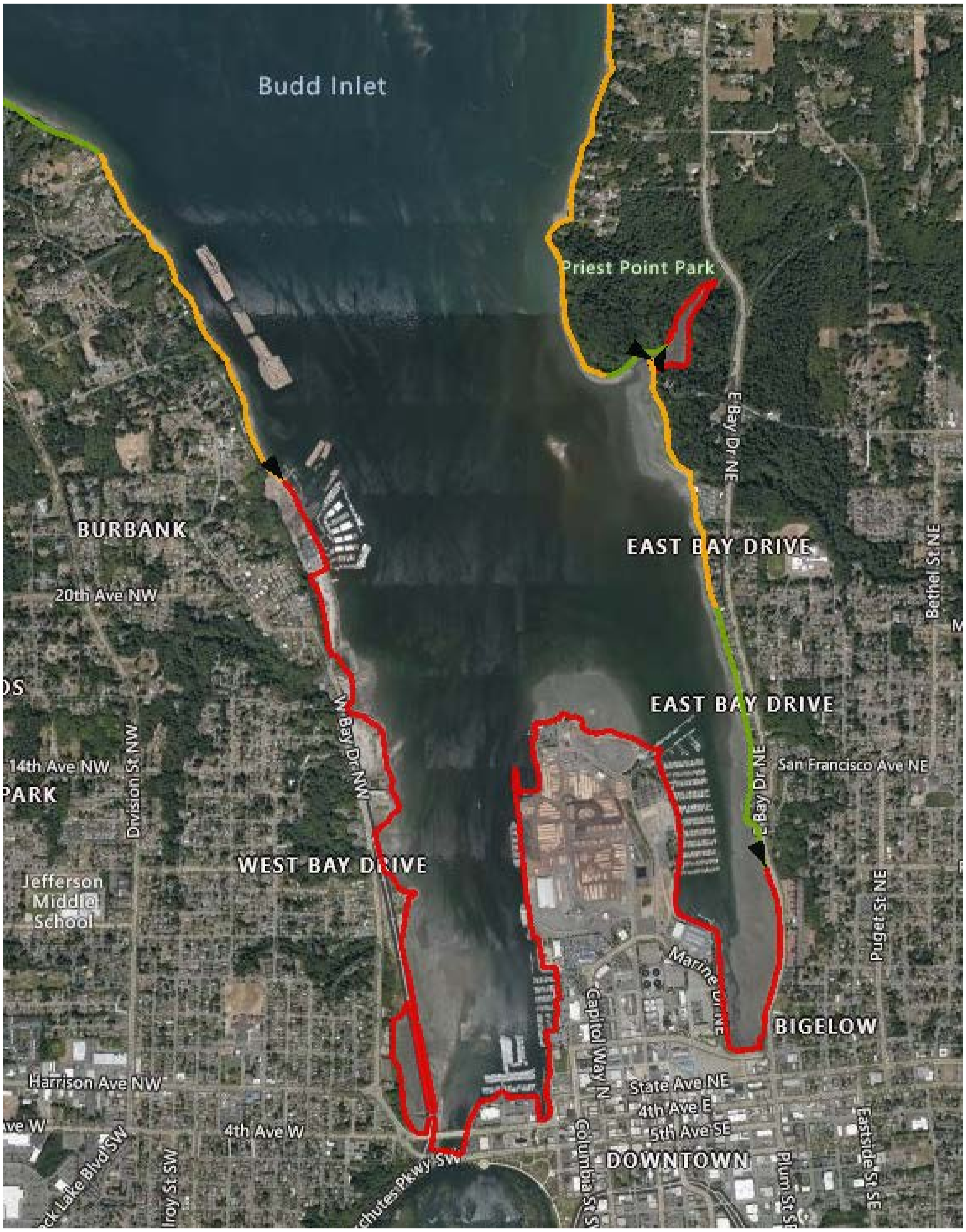


Figure 2-12: Net-Drift direction provided by Ecology (2018). The colors indicate the following: Red – No appreciable drift; Green – Left to Right; Orange – Right to Left. Arrows placed at the end of the lines also indicate direction.

2.4. Shoreline Evolution & Trends

The existing shoreline at Project Site is armored with a revetment. The revetment has protected the upland from erosion and essentially fixed the shoreline. Therefore, no significant shoreline evolution has been observed above mean sea level. This is in agreement with the assessment of "No appreciable drift" for the Project Site (Section 2.5.2 and Figure 2-14).

2.5. Topography and Bathymetry

Numerous topographic data sets with coverage of the Project Site were collected to examine the geomorphic conditions in the nearshore zone. The elevation sources and survey dates are listed in Table 2-1. The topographic data were available from 2005 to 2020 with a few surveys capturing elevations as low as -2 feet, NAVD88.

Table 2-1:Elevation data sources and dates with coverage of the Hardel Site.

Elevation Source and Dataset	Survey Date
Mountain 2 Coast (M2C) Intertidal Survey	January 24, 2020
M2C Upland Survey	June 8, 2020
Western Washington 3DEP QL1 LiDAR Survey	March 29, 2016
Thurston County LiDAR	June 4, 2011
Puget Sound Regional Council LiDAR Survey	February 2005

A basemap surface composite of the M2C 2020 dataset for the Project Site was provided to M&N by the Project Team. All information developed herein with reference to existing grades and elevations is based on this surface.

3. Site Climatology

3.1. Tides and Water Levels

Tides in Puget Sound have a mixed (semidiurnal) pattern characterized by two highs and two lows of unequal heights during each lunar day. Diurnal tidal range (equal to the difference between mean higher high water and mean lower low water) in Puget Sound increases from 6.2 feet at the southern end of Vancouver Island to 14.4 feet in Olympia.

Tides were measured in Budd Inlet (NOAA Station ID# 9446969) for a year between 1977 and 1978. Mean tides were recorded and tidal datums were established. The tidal datums are listed in Table 3-1 in feet relative to NAVD88.

Table 3-1:Tidal datums and water levels at Budd Inlet provided by NOAA referenced to NAVD88 in feet (NOAA Station 9446969).

Datum & Water Level Description	Abbreviation	Budd Inlet, WA
Mean Higher High Water	MHHW	10.53
Mean High Water	MHW	9.52
Mean Sea Level	MSL	4.32
Mean Tide Level	MTL	4.28
National Geodetic Vertical Datum 1929	NGVD29	3.39
North American Vertical Datum 1988	NAVD88	0
Mean Low Water	MLW	-0.97
Mean Lower Low Water	MLLW	-4.03

3.1.1. Extreme Water Levels

High water exceedance probability levels relative to the geodetic NAVD88 are listed in Table 3-2, as provided by the Olympia Sea Level Rise Response Plan (2019). The values identified in the Sea Level Rise Response Plan were based on two earlier studies (FEMA 2016 and CHE 2011). On average, the 1% level will be exceeded in only one year per century, the 10% level will be exceeded in ten years per century, and the 50% level will be exceeded in fifty years per century. The 99% level will be exceeded in all but one year per century, although it could be exceeded more than once in other years, especially during periods with elevated water temperatures due to a strong El Niño.

The extreme levels measured by the tide gauges during storms are called storm tides, which are a combination of the astronomical tide, storm surge, oscillations of water temperature in the Pacific Ocean (El Niño), and limited wave setup caused by breaking waves. For instance, between 2014 and 2016, when water temperatures were elevated in the Puget Sound, measured tides would often be over a foot higher than predicted for up to weeks at a time.

In December 2015, there were 13 tides greater than the 1-year return period water level measured at the Seattle gage and one exceeded the 2-year return period water level.

The extreme water levels provided in this section are "still water levels" and do not include wave runup, the movement of water up a slope. Therefore, the 1% annual exceedance probability levels listed in Table 3-2 do not necessarily correspond to the base flood elevations (BFE) discussed in Section 3.6.

Table 3-2:Annual exceedance probability water levels relative to NAVD88 in feet for the Olympia Waterfront.

Annual Exceedance Probability Level	Return Period	High Water Level
1%	100-year	14.1[1]
2%	50-year	13.9[1]
10%	10-year	13.7[2]
50%	2-year	13.1[2]
99%	1-year	12.4[2]

Sources: [1] FEMA 2016, [2]CHE, 2011

3.2. Sea Level Change

3.2.1. Historical Trend

Sea level change varies locally and regionally based on oceanic and atmospheric circulation patterns and geologic factors such as land subsidence or uplift, compaction of sediment, crustal rebound in formerly glaciated areas, and withdrawal of subsurface fluids. The nearest long-term station for sea level trends is the Seattle Station (NOAA Station ID# 9447130). The existing rate of relative sea level rise is estimated by NOAA to be 2.05 ± 0.15 mm/year, which is equal to approximately 0.67 feet in 100 years, see Figure 3-1. The published NOAA sea level trend for Seattle is obtained based on monthly mean sea level data from 1899 to 2017.

The estimated subsidence rate for Seattle is 0.3 feet/century. The subsidence rate for outside of the downtown waterfront is estimated to be similar (Miller et al. 2018). The estimated subsidence rate for the central waterfront and downtown Olympia, 0.8 feet/century, is greater due to the fluvial soils and fill used to create the waterfront (AECOM 2019). Therefore, the relative sea level rise rate for downtown and central waterfront is likely greater than the Seattle rate.

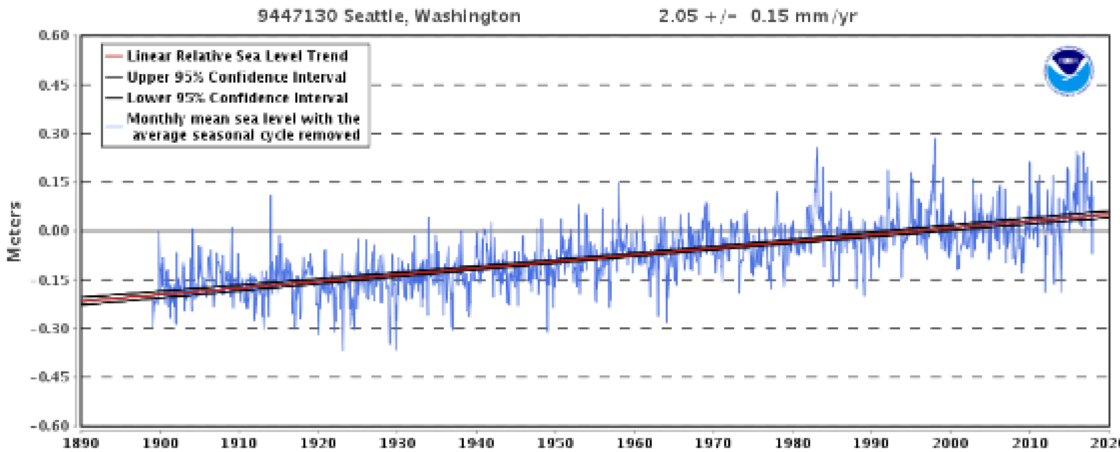


Figure 3-1: Relative sea level trend for Seattle, WA NOAA Station ID# 9447130, (NOAA 2020).

3.2.2. Future Predictions

The latest and best science for sea level rise in Puget Sound and the Project Site is provided by the University of Washington Climate Impacts Group (CIG) (Miller et al 2018). The work of the CIG projects sea level rise for all of the Washington coastline with fine resolution. Local measurements for uplift are applied to the shoreline segments for best possible predictions. Also included are sea level rise exceedance percentages for every decade between present day and year 2150 as well as two climate scenarios (a high and a low emissions scenario). Exceedance probabilities are provided for 99%, 95%, 90%, 83%, 50%, 17%, 10%, 5%, 1%, and 0.1%.

For planning and design purposes, it is most common to use projections more conservative than 17% and using the high emissions scenario. The high emissions projection for the Budd Inlet area (excluding the central waterfront and Downtown Olympia) are provided in Table 3-3. The type of project and sensitivity to sea level rise can help determine the appropriate level or risk (exceedance probability) for the project. The projection year is determined by the design life of the project or major maintenance cycle. The projections provided in this section are relative to the mean sea level for the year 2000 averaged over a 19-year time period (1991-2009).

The sea level rise projections provided in the Olympia Sea Level Rise Response Plan are adapted from National Research Council's (NRC) "High Range" values (NRC 2012). The NRC-based projections roughly match the high emissions scenario, 1% exceedance projections from the CIG (Miller et al 2018). Therefore, we recommend using the 1% exceedance projection for the project design. Projections relevant to planning and design work in Budd Inlet are compared in Table 3-4. A Sea Level Rise study was conducted and recommended raising top of bank for 2.0 feet and also recommended base elevations for buildings, see Mott (2019).

Table 3-3:Sea level rise projections for various probabilities of exceedance relative to the year 2000 for Budd Inlet (excluding the Central Waterfront & Downtown Olympia) and a high emissions global climate model (Miller et al. 2018).

Projection Year	50% *"Central Estimate"*	17% *Upper end of "Likely Range"*	10%	5%	1%	0.1% *Extreme*
2030	0.4	0.5	0.5	0.6	0.7	0.8
2040	0.6	0.7	0.8	0.9	1.0	1.4
2050	0.8	1.0	1.1	1.2	1.5	2.1
2060	1.1	1.4	1.5	1.6	2.0	3.0
2070	1.3	1.7	1.9	2.1	2.6	4.2
2080	1.7	2.1	2.3	2.6	3.4	5.4
2090	2.0	2.6	2.8	3.1	4.1	7.1
2100	2.3	3.1	3.4	3.8	5.1	8.5
2110	2.5	3.3	3.6	4.1	5.8	10.0

Table 3-4:Sea level rise projection relevant to planning near the Project Site. Values are relative to 2000.

Projection	2040 (20-years)	2070 (50-years)	2100 (80-years)
City of Olympia Sea Level Rise Response Plan High Range	1.5	3.3	5.7
UW CIG Olympia (High Emissions, 1% Exceedance)	1.2	2.9	5.5
UW CIG Budd Inlet (High Emissions, 1% Exceedance)	**1**	**2.6**	**5.1**

3.3. Riverine and Tidal Currents

Rivers and creeks near the Project Site are shown in Figure 2-12. The Deschutes River empties into the West Bay near the Project Site through the Fifth Street Dam at the terminus of Capitol Lake. The Deschutes River originates from the Bald Hills in Gifford Pinchot National Forest and is much smaller than the better-known Deschutes River in Oregon. The effect of the Deschutes on currents near the site is probably limited, with or without the dam. The nearest major creek to the site is Schneider Creek, which is just north of the Project Site. Two smaller creeks are located to the south of the site, West Bay Creek and a creek running through Garfield Ravine.

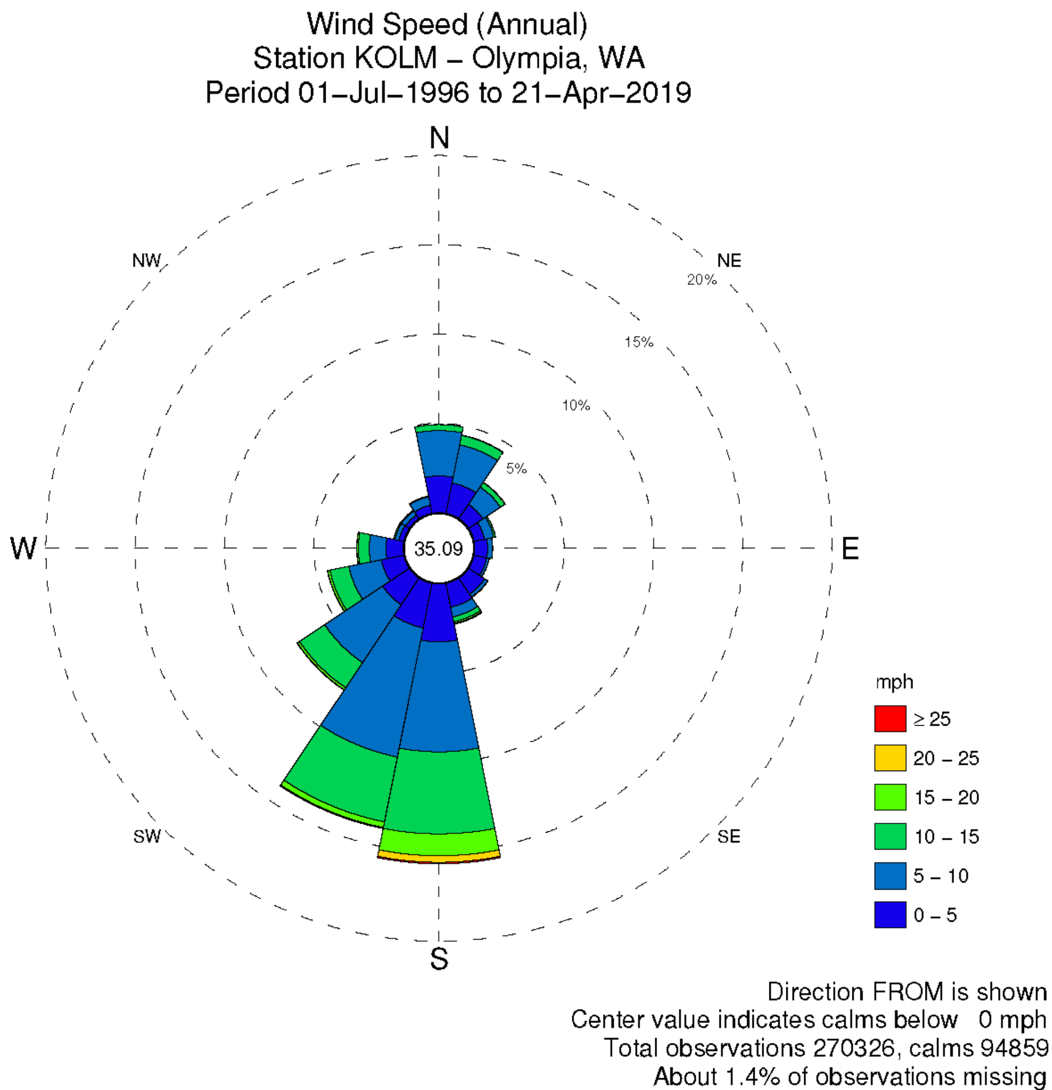
3.4. Wind and Waves

3.4.1. Winds

Prevailing (most frequent) storms over Central Puget Sound are southerly followed by occasional strong northerly storms during winter. The nearest wind station is at the Olympia

Regional Airport, located about 6 miles south of the Project Site. The wind rose for the Olympia Regional Airport is shown in Figure 3-2.

The Project Site is only exposed to waves generated from the northern fetch. The wind records from the Olympia Regional Airport were adjusted for exposure and location (from inland to overwater) and used for an extreme analysis. The results of the extreme analysis are shown in Figure 3-3.



Percentage of Occurrence

Wind Speed, mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
Total	4.93	4.47	2.45	1.23	1.01	0.87	1.30	2.33	15.66	13.99	7.55	4.37	2.61	0.59	0.56	0.99	64.91
≥ 25																	0.10
20 – 25									0.37								0.50
15 – 20									1.22	0.33	0.15	0.13					2.06
10 – 15	0.33	0.54	0.31					0.28	4.59	3.70	1.69	1.08	0.61				13.45
5 – 10	2.55	2.17	1.16	0.53	0.27	0.14	0.20	0.56	6.16	7.37	3.89	1.86	0.93	0.23	0.27	0.49	28.77
0 – 5	2.05	1.74	0.97	0.60	0.72	0.72	1.08	1.35	3.23	2.54	1.80	1.28	0.96	0.29	0.25	0.45	20.02

Figure 3-2: Wind Rose for Olympia Regional Airport

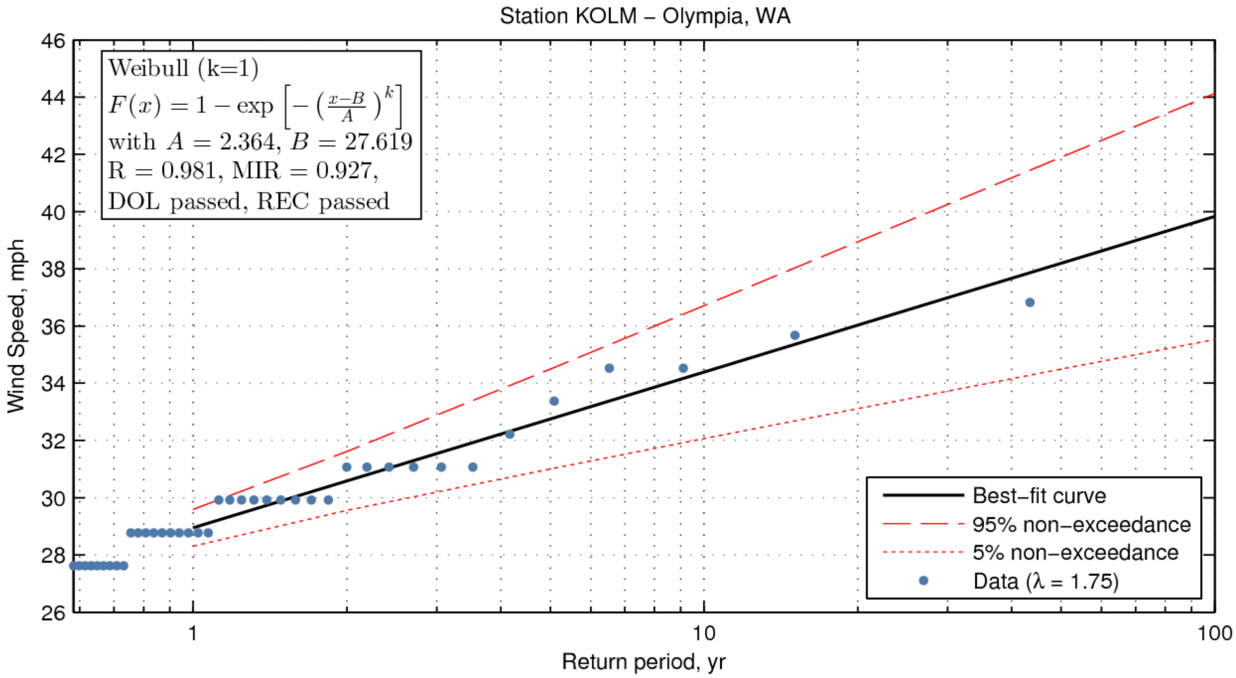


Figure 3-3: Return period wind speeds for Olympia Regional Airport

3.4.2. Waves

Local winds can generate waves over Puget Sound where the largest waves are generated by the predominant southerly storms in winter. However, the Project Site is only exposed to winds and waves from the north. Wave measurements are not available at the site. However, wind-wave conditions at the site were characterized with numerical simulation of wave growth and propagation over Puget Sound using existing measurements of wind speed (M&N 2021). The results for the 25- and 50-year return period event are shown in Figure 3-3. The wave conditions were extracted offshore of the Project Site at a depth of 20 feet, MLLW for various storm conditions and are summarized in Table 3-6.

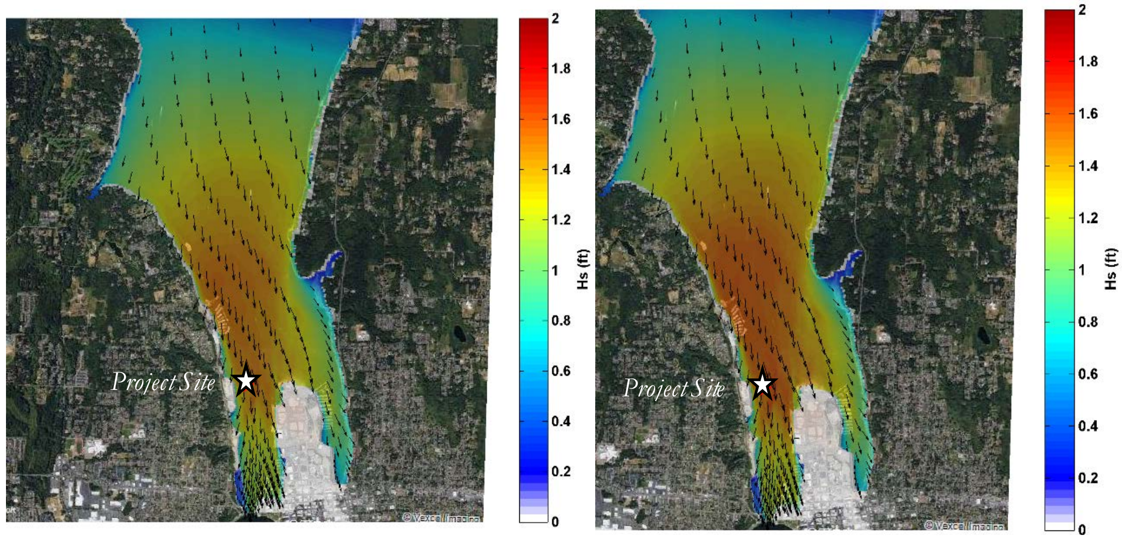


Figure 3-4: Wave height pattern representing 25- and 50-year return period storm.

Table 3-5:Estimated wave conditions at the Project Site for various return periods.

Annual Exceedance Probability Level	Return Period	Significant Wave Height (ft)	Peak Wave Period (seconds)	Wave Direction (azimuth degrees)
2%	50-year	1.5	3.1	2.3
10%	25-year	1.5	3.1	1.9

3.5. Vessel Wakes

Passing vessel-generated short-period (Kelvin) wakes may affect the stability of the shoreline. Vessels passing by the Project Site include fishing vessels, tug boats serving the Port of Olympia, bulk and break bulk carrier vessels calling on the Port of Olympia, and recreational boats traveling in Central Puget Sound. Passing vessel wake energy at the shoreline is largely a function of vessel type, speed, and distance from the shoreline to sailing line. Large passing vessels near the Project Site will stay within the federal navigation channel, which is approximately 1000 feet west of the Project Site. Figure 3-4 shows two vessels, similar to vessels serving or calling the Port of Olympia, and their generated wake. The wake generated by the tug is more noticeable. The vessels in the figure are also about 1000 feet from the shore.

The vessel speed limit near the site, as stated in the City Municipal Code, varies at the site. The transition between the two speed limit zones is identified as an east-west line transecting the tip of the Port Peninsula. South of the dividing line the speed limit is 5 knots, north of the line the speed limit is 7 knots.

The large shipping vessels will be traveling at slow speed as they approach or just begin their departure from the harbor; therefore, their wake will be small. Tug boats will likely generate the largest waves as they depart the port at faster speeds to meet the incoming shipping vessels. A tug boat traveling at 10 knots will generate a maximum wake height around 1-2 feet that will decay to 0.5-1.0 feet at the shoreline.

3.6. Riverine/Tidal Currents

The Deschutes River flows into Capitol Lake, which empties into Budd Inlet. Extreme statistics of the Deschutes River flow were developed using extreme value analysis based on both the daily and 15-min discharge data (M&N 2021). Maximum current speeds for combination of an extreme /typical river flow with typical/extreme tide is shown in Figure 3-17. Model results indicate that maximum riverine/tidal currents do not exceed 1 knot in the project vicinity.

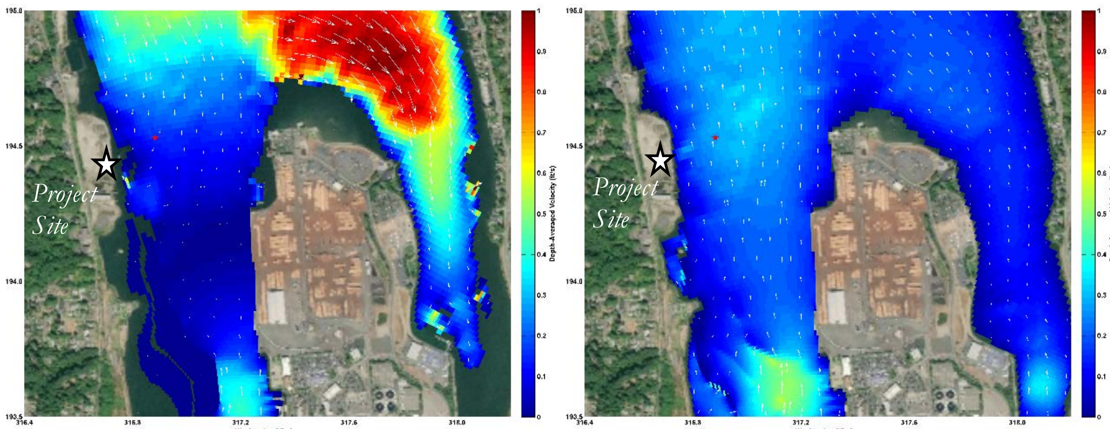


Figure 3-5: Current Speeds for (a) 100-year tide + 1-year River Flow; (b) 1-year tide + 100-year River Flow

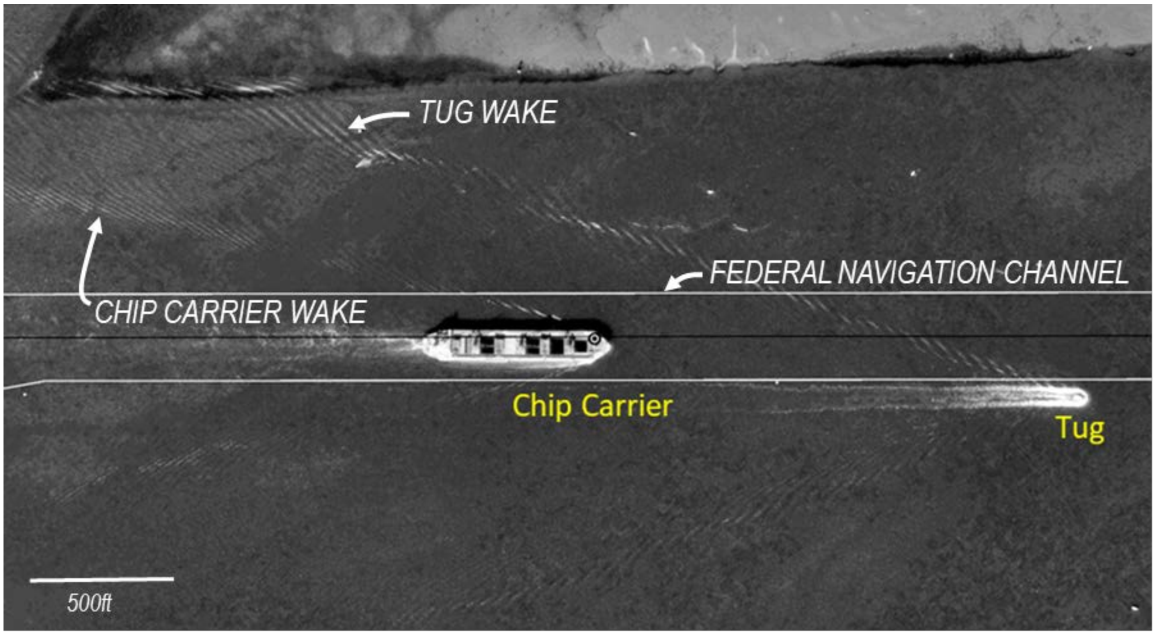


Figure 3-6: A tug and chip carrier transiting a navigation channel generating wake.

3.7. Coastal Flooding

Flood Insurance Rate Maps (FIRMs) are developed by FEMA to identify riverine or coastal flood hazard areas. These maps identify the base (1-percent-annual-chance) flood elevation (BFE) to which flood water is anticipated to rise during a base flood. Currently, FIRMs developed in 2018 are effective for the Project Site.

FEMA FIRM panel 53067C0166F, effective date of May 15, 2018, has identified a BFE of 17 feet along the shoreline and 15 feet at the upland, see Figure 3-5. The FEMA flood elevations are referenced to NAVD88. The 15-foot elevation AE zone is subject to inundation by the 1-percent-annual-chance flood event as determined by the FEMA flooding study. The 17-foot elevation VE zone at the Project Site is the same as the AE zone with additional hazards due to storm-induced wave action. The VE zone elevation is approximately 3 feet above the 100-year extreme still water level calculated by FEMA.

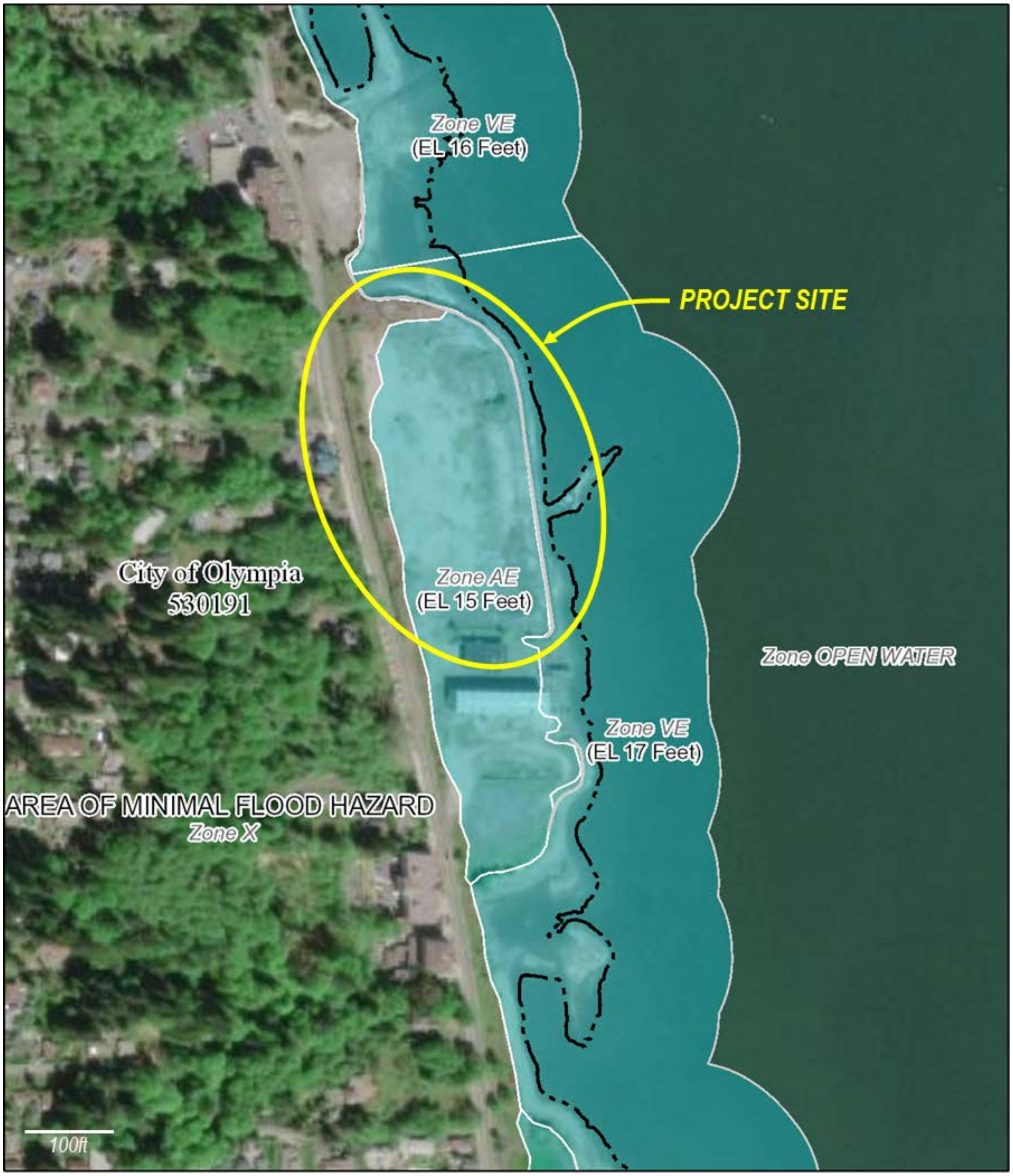


Figure 3-7: FEMA FIRM map for the Project Site (effective 5/15/2018).

4. Design Criteria

4.1. Codes and Standards

- U.S. Army Corps of Engineers (USACE). 2011. Coastal Engineering Manual
- Washington State Department of Fish and Wildlife (WDFW). 2014. Marine Shoreline Design Guidelines, prepared for The Aquatic Habitat Guidelines Program.

4.2. Design Criteria for Shoreline Enhancement Design

Design Criteria	Value
Design Still Water Level	**14.1 feet, NAVD88**
Design Sea Level Rise	**5.1 feet by 2100**
Design Storm	**25-year Waves, 1-year Still Water Level**
Significant Wave Height	1.5 feet
Peak Wave Period	3.1 seconds
Still Water Level	12.4 feet, NAVD88
Design Wake Height/Period	**1 feet/2.5 sec**
Design Current (Depth-Averaged)	1 knot

5. Preliminary Design

The proposed Project includes restoration and enhancement of the existing armored shoreline to more natural conditions by placement of fill comprised of finer substrate (clean material consisting of mixed sand and gravel) seaward of the existing armored shoreline. Design drawings have been developed by M&N at a preliminary level of design, see Appendix A.

5.1. Project Elements

The Project engineering design consists of Debris Removal, sand and gravel beach, and a drift sill. Habitat elements are covered in the environmental documents (see Grette 2022 a to e). Overall design for the site is shown on a site plan prepared by M&N.

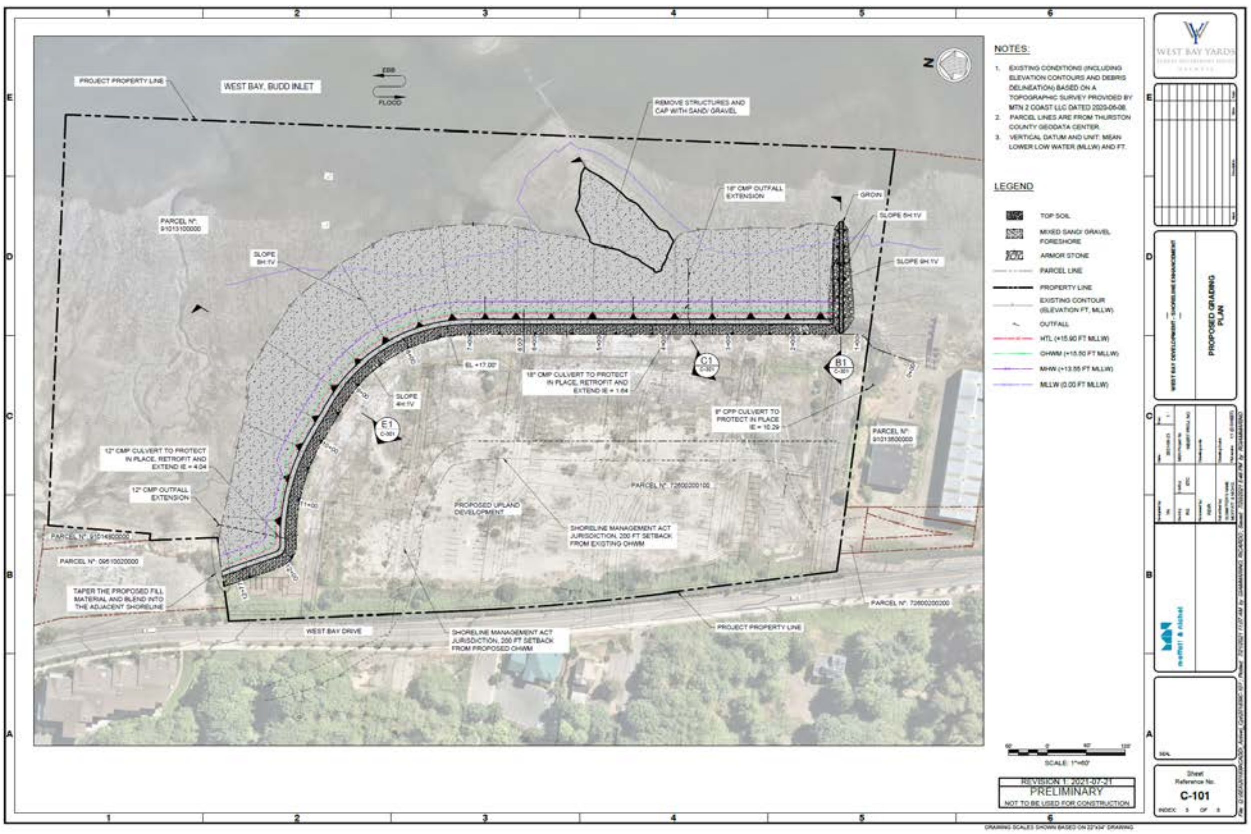


Figure 5-1: Proposed Grading Plan

5.1.1. Debris Removal

Debris removal will include the removal of derelict structures, including 179 creosote-treated piles, the remnants of a dilapidated timber dock, and an old concrete structure, remnant of past concrete foundation. In addition, various debris, including concrete debris, metal iron beams, and iron pipe, will also be removed. It is anticipated that up to 270 cy of concrete, 180 cy of treated timber, and 0.5 cy of metal will be removed from over approximately 0.25

acres. Debris removal will be completed using land-based excavators at low tide to minimize impacts to water quality. A dozer and loader could also be used to remove large pieces of debris from the site. Haul trucks will be used to dispose of materials. Debris will be collected and disposed of at an appropriately authorized waste disposal facility.

5.1.2. Sand and Gravel Beach

The existing shoreline will be flattened/widened by the placement of sand and gravel waterward of the HTL, see Figure 5-2. The purpose of the expansion to the existing sand and gravel beach is to cover the existing armored shoreline with more natural sand and gravel substrate fill, which will improve intertidal habitat function as well as waterfront access and provide hand-carry kayak launch access for the public. Up to 260 cy of rip rap from the armored shoreline will be removed from above HTL, and up to 26,255 cy of mixed sand and gravel fill (2.5-inch minus) and 13,053 cy of washed gravel fill will be added to the shoreline to improve habitat. The newly constructed beach will be sloped at approximately 8H:1V. The washed gravel will be placed above and below HTL by land-based equipment. Topsoil and sand will only be placed above HTL to reduce material loss due to wave action and reduce maintenance costs. Material placement atop existing grade will result in the conversion of 0.77 acres of degraded aquatic habitat to upland habitat.

Construction areas will be accessed from existing uplands, and work will be conducted from land using excavators. A small dozer and loader may also be used to construct the shoreline improvements. Haul trucks would be used to import and export material. Construction of the sand and gravel beach and handy-carry launch is anticipated to take up to eight weeks. The sequence of construction will depend upon the contractor's equipment and water levels during construction activities. In general, construction will start in intertidal areas at the toe of the proposed beach and progress upslope (landward). No excavation will take place below HTL. No land-based equipment will enter the water. Using clean and washed gravel will minimize in-water disturbances and remove the need for a turbidity curtain.

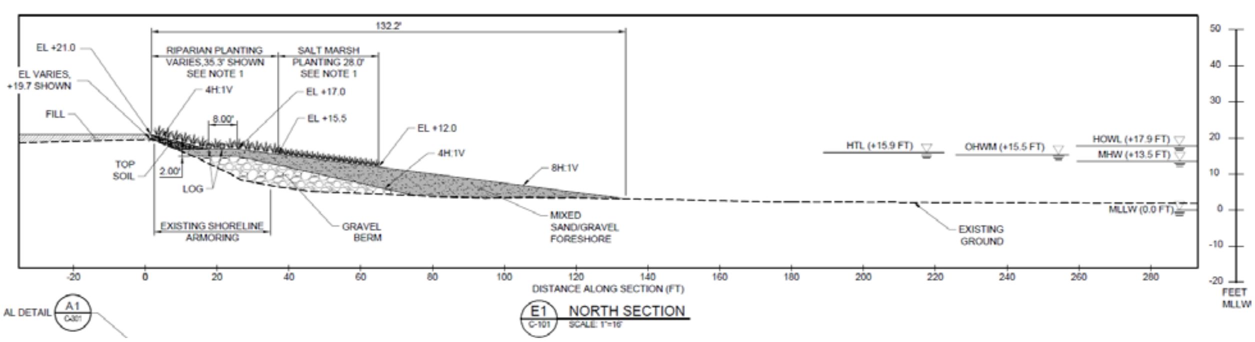


Figure 5-2: Cross section of the Sand and Gravel Beach

5.1.3. Drift Sill

The drift sill was designed to minimize down-drift (southward) loss of the beach restoration material. To meet this function, the length of the sill was established to provide effective control of beach material loss from the drift-aligned beach, while minimizing the footprint, see . The drift sill alignment and cross-sectional dimensions will be refined using two-dimensional (2-D) numerical wave modeling. This design was developed based on examples from WDFW's 2014 Marine Shoreline Design Guidelines.

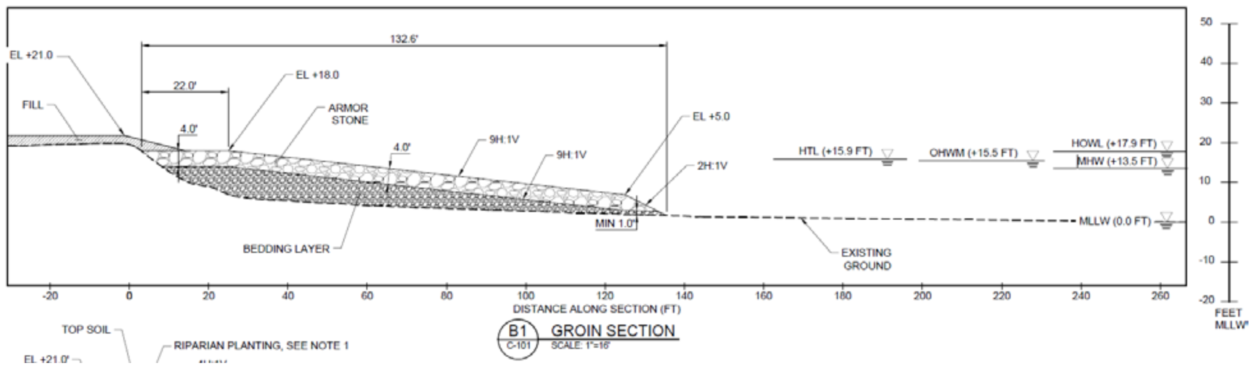


Figure 5-3: Cross-section of the Drift Sill

The crest elevation was designed to be sloping from +18.0 feet MLLW at the landward end to +5.0 feet MLLW at the seaward end of the sill. The crest elevation was selected to minimize wave overtopping during extreme storm events and to match the existing upland elevation.

The drift sill crest width was established from the stable median rock size and is equal to approximately twice the median armor rock diameter. Armor rock for the sill was sized using standard methods for stability against the 25-year design wave from the north occurring at the design high tide level.

The side slopes of the sill were set at a 2H:1V slope. The slopes were selected to account for wave exposure and the need to minimize the sill footprint.

A gravel-cobble layer will be placed at the toe and along a partial length of the sill to provide a transition between the existing revetment rock and the habitat beach as a means of controlling the displacement of beach material at the interface of material types. Cobble material will be placed at a slope of 5H:1V.

The drift sill is meant to be temporary in nature, preserving the opportunity for future beach restoration to the south to be integrated into the proposed West Bay beach restoration. If this drift sill were not present, the proposed beach restoration material would need to be tapered to the property boundary, resulting in a smaller beach restoration within the property. Additionally, the movement of beach material to the south and off the site would lead to exposure of underlying gravel and the existing riprap, degrading the habitat conditions established by the restoration. When future restoration of the shoreline to the south occurs, the drift sill would be removed and the slopes of the shoreline would be matched, resulting in a continuous, restored intertidal beach.

6. Summary and Conclusions

Informed by technical engineering studies, the conceptual design for restoration of shoreline at the Former Hardel Site was advanced to a preliminary level of design. The design took into account regulatory considerations and future sea level rise. The restoration concept was developed by the 2016 West Bay Environmental Assessment (CHE 2016), conducted for the City.

The restoration design would expand intertidal areas, while maintaining the stability of the shoreline slope. This design provides improved access to Puget Sound, improves ecological processes, and promotes resiliency to rising sea levels. Some slight improvement to coastal processes (sediment supply) could be realized at neighboring properties by allowing the restored beach to erode to its equilibrium position, thus supplying sediment to the littoral system.

The proposed more natural beach fill (mixed sand and gravel) has been engineered to remain stable against local site coastal processes (wind waves, tides and currents, and vessel wakes) using analytical engineering calculation methods laid out in the Coastal Engineering Manual (USACE 2011). Fill placement will simulate similar Puget Sound beaches (Toft et al 2009) with similar site conditions.

The preliminary (30%) engineering design will be refined further at the later phases of design to minimize extent of the proposed fill and consequently project footprint and associated construction cost.

The following subsections describe the proposed Project at a preliminary level of design with respect to key criteria, opportunities, and constraints.

6.1. Sediment Transport and Littoral Drift

The Project shoreline is exposed to waves and currents. The design of the Project took into account this exposure and designed a profile to be stable during design wind storms and riverine/tidal currents.

Ecology provides mapping of littoral drift along shorelines of Puget Sound (Ecology 2022). Ecology has identified ‘no appreciable drift’ for the southwestern shoreline of West Bay (from the Fifth Avenue Dam at the south to the West Bay Marina to the north) that includes the project site (Ecology 2022). The southwestern shoreline of West Bay is armored and there are no sources of sediment (such as feeder bluffs) within this stretch of shoreline (Grette 2009, Ecology 2022).

Given the designation of ‘no appreciable drift’ and lack of sediment sources along this stretch of shoreline, construction of the proposed project is unlikely to adversely or beneficially impact littoral drift and sediment transport processes.

6.2. Resiliency to Sea Level Rise (SLR)

City of Olympia Sea Level Response Plan (AECOM 2020) states that "Naturally sloped, vegetated shorelines help moderate upland flooding by reducing wave energy as waves approach the shoreline. Green shorelines can reduce the risk of high waves overtopping the shoreline."

The proposed Project flattens the shoreline slope and will result in reduced wave energy and wave runup. Therefore, the proposed Project will reduce risk of coastal flooding for the upland property. The proposed more natural beach fill (mixed sand and gravel) is analogous to natural stretches of shoreline and reference sites within Puget Sound.

In the event that future SLR results in excessive changes to the shoreline profile, possible adaptive management measures such as the following, could be implemented:

- During maintenance of the beach (sediment placement), the sediment grain size and beach profile may be varied to adapt to changing wave loads.
- It may be appropriate to provide scour protection such as buried rock at the top of the beach.

6.3. Nearshore Habitat

The goal of the proposed changes to the shoreline is aquatic habitat restoration, enhancement, and establishment as well as improved public access.

The proposed changes include restoration and enhancement of existing armored shoreline to more natural conditions that could support establishment of marsh and riparian areas by placement of more natural beach fill (mixed sand and gravel material) seaward of the existing armored shoreline.

6.4. Regulatory Permitting Requirements

The design was developed incorporating regulatory permitting requirements in collaboration with the Project's environmental team, Grette Associates (see Grette 2022a, b, c, d). In particular, requirements of City of Olympia Shoreline Master Program Regulations OMC 18.20.833 and 18.20.837 that regulate shoreline fill were incorporated into the design (see Grette 2022d).

The proposed changes to the shoreline do not include any large structures such as dikes, breakwater, piers, docks, weirs, or bulkheads. No new hard shoreline armoring is proposed as part of this project.

6.5. Construction

It is anticipated that construction will be conducted using land-based equipment. During construction, it is likely that isolated sections of the existing riprap and armored shoreline could be disturbed to provide access for construction equipment to the beach. As part of the project construction requirements, the contractor will be responsible to investigate and maintain stability of slopes and prevent erosion during construction and to restore any disturbance to the shoreline and upland areas after the construction.

Construction staging and best management practices (BMPs) such as silt curtains will be established to avoid contaminants or other construction materials from entering West Bay. A temporary staging and access point will be established in the upland area, which will not require additional improvements for construction activities. Temporary construction fencing around active work areas and temporary restrictions to the property will be implemented. An area for stockpiling will also be established in the upland areas, to be located a minimum distance of 100 feet from the OHWM, see (Grette 2022d).

6.6. Maintenance and Monitoring

The proposed fill has been engineered to remain stable against coastal processes (design wind waves, tides and currents, and vessel wakes) using analytical engineering calculation methods provided in the Coastal Engineering Manual (USACE 2011) as well as mimicking reference beaches around the Puget Sound (Toft et al 2009) with similar site conditions.

If the design criteria are exceeded, there will be the need for some monitoring and potential maintenance, including the collection of debris and trash that may end up on the shoreline, in order to maintain a welcoming beach environment. The mixed sand and gravel beach will be visually monitored annually after construction to assess whether long-term maintenance is required. If visual monitoring indicates changes in the beach (i.e., erosion or accretion of materials), survey transects may be conducted to document the beach profile. Periodic long-term maintenance of the beach may be required which could include placement of supplemental beach fill.

6.7. Geotechnical Slope Stability

Geotechnical slope stability of the existing as well as the proposed Project have been investigated (LAI 2021). The geotechnical engineering assessment of the existing project shoreline stated that "Evidence of slope instability was not observed along the shoreline during LAI's May 2020 and October 2021 site investigations; however, evidence of soil erosion and piping through existing riprap was observed", see (LAI 2021).

Results of the geotechnical assessment indicate that the existing shoreline is stable with riprap (Factor of Safety or FS = 1.5) and instable (FS = 0.7) without riprap under static conditions. This geotechnical assessment further stated that "LAI does not recommend removing riprap, as doing so could undermine the stability of slope" (LAI 2021). Therefore, the existing armor (riprap) along the shoreline will not be removed prior to placement of mixed sand and gravel material and will be buried.

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Appendix A: Preliminary Design Drawings

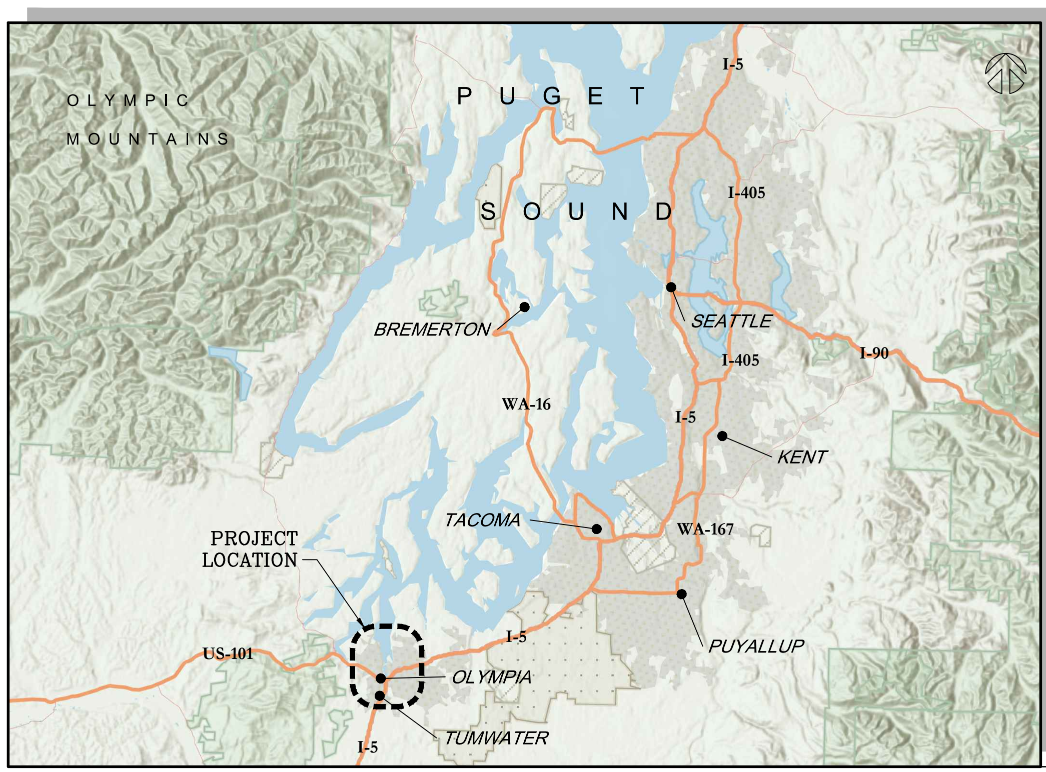
Attachment 14.C

WEST BAY YARDS
LUXURY WATERFRONT LIVING
OLYMPIA

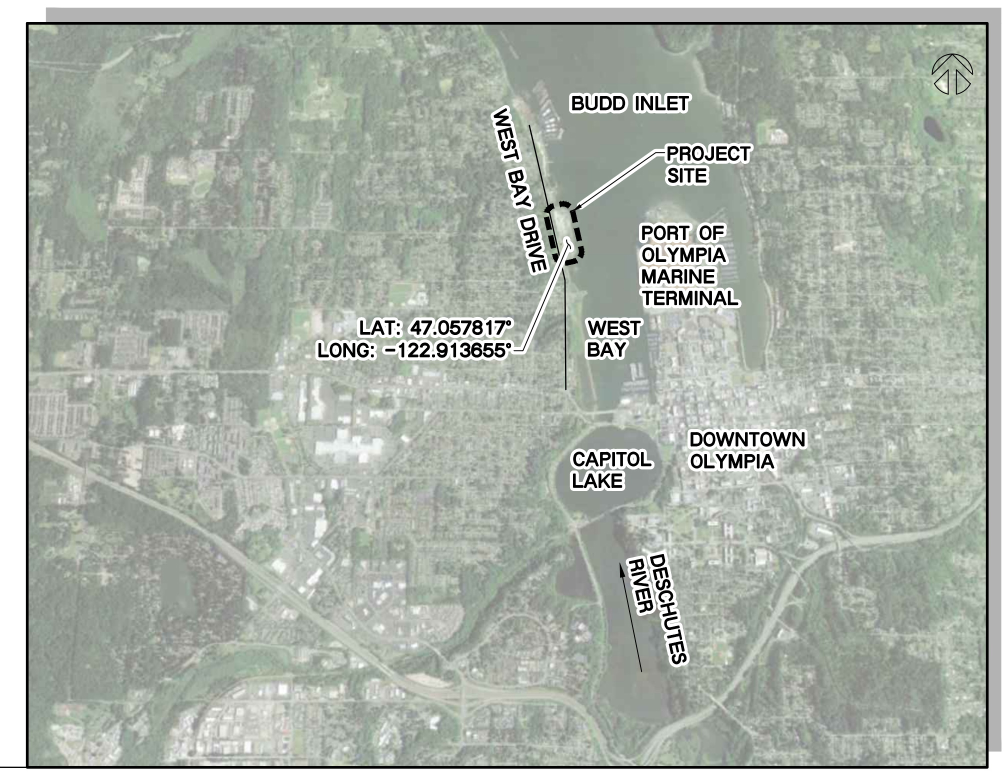
WEST BAY DEVELOPMENT

SHORELINE ENHANCEMENT

PROJECT ADDRESS:
1210 WEST BAY DRIVE NORTHWESTOLYMPIA, WA 98502



VICINITY MAP
SCALE: NTS



LOCATION PLAN
SCALE: NTS

LIST OF DRAWINGS

INDEX NO	SHEET NO	SHEET TITLE
		GENERAL
1	G-001	COVER SHEET & INDEX
2	G-002	GENERAL NOTES & ABBREVIATIONS LIST
		CIVIL
3	V-101	EXISTING SITE PLAN
4	XD-101	DEBRIS REMOVAL AND DEMOLITION
		GRADING
5	C-101	PROPOSED GRADING PLAN
6	C-301	GRADING SECTIONS
		HABITAT
7	L-101	PROPOSED PLANTING PLAN
8	L-301	PLANTING SECTIONS

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Mark | Description | Date | Appr

WEST BAY DEVELOPMENT - SHORELINE ENHANCEMENT

COVER SHEET & INDEX

Rev: 1 | Date: 2021-06-23 | M&N Project No. INSERT PROJ. NO. | Drawing code: | Drawing Scale: 1:1 (D SHEET) | Plot scale:

Designed by: YN | Chk'd by: ETC | Dwn by: RG | Reviewed by: REVR | Submitted by: SUBMITTER'S NAME MOFFATT & NICHOL

moffatt & nichol

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Sheet Reference No.
G-001
INDEX: 1 OF 8

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DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Attachment 14.C

GENERAL NOTES:

1. SCOPE OF WORK: THE WORK GENERALLY INCLUDES CREATING HIGH QUALITY FISH HABITAT THROUGH CONSTRUCTION OF A MIXED SAND AND GRAVEL FORESHORE AND BACK BEACH THAT ALLOWS SALT MARSH AND RIPARIAN PLANTING.
2. THE CONTRACTOR SHALL ABIDE BY APPLICABLE ENVIRONMENTAL REQUIREMENTS, LAWS, AND REGULATIONS.
3. THE CONTRACTOR SHALL ABIDE BY ALL APPLICABLE SAFETY REGULATIONS (I.E. OHS, WBC). SAFE CONSTRUCTION OF EXCAVATION SLOPES AND SHORING (IF APPLICABLE) ARE THE RESPONSIBILITY OF THE CONTRACTOR AND SHOULD COMPLY WITH ALL APPLICABLE SAFETY REGULATIONS. METHODS OF DEMOLITION AND CONSTRUCTION OF MATERIAL ARE THE RESPONSIBILITY OF THE CONTRACTOR.
4. ALL EQUIPMENT AND MACHINERY WORKING ON SITE MUST BE IN GOOD WORKING CONDITION AND FREE OF LEAKS OR EXCESS OIL AND GREASE. A FUEL AND SPILL PREVENTION/ CONTINGENCY PLAN IS TO BE REVIEWED WITH THE OWNER'S REPRESENTATIVE PRIOR TO CONSTRUCTION. A FUEL AND SPILL CONTAINMENT EQUIPMENT AND CLEANUP SUPPLIES SHALL BE ONSITE PRIOR TO CONSTRUCTION.
5. ALL DIMENSIONS ARE GIVEN IN FEET UNLESS NOTED OTHERWISE. SCALE INDICATED ON DRAWING IS APPROPRIATE TO SCALE AT FULL SIZE(D) 22" X 34'.
6. THE CONTRACTOR SHALL DETERMINE THE EXISTENCE, LOCATION, AND ELEVATION OF ALL UTILITIES AND CONCEALED STRUCTURES, AND SHALL NOTIFY THE APPROPRIATE COMPANY, DEPARTMENT OR PERSON(S) OF ITS INTENTION TO CARRY OUT ITS OPERATIONS.
7. THE CONTRACTOR SHALL CHECK THE DRAWINGS AGAINST EXISTING CONDITIONS AND PROPOSED WORK AND NOTIFY THE OWNER'S REPRESENTATIVE IN WRITING OF ANY DISCREPANCIES IN DIMENSIONS OR SITE CONDITIONS. THE CONTRACTOR SHALL NOT BEGIN CONSTRUCTION IN ANY SUCH AFFECTED AREA UNTIL THIS DISCREPANCY HAS BEEN RESOLVED BY THE OWNER'S REPRESENTATIVE.
8. NOTES AND DETAILS ON THE DRAWINGS SHALL TAKE PRECEDENCE OVER THESE GENERAL NOTES. REFER TO RELATED SPECIFICATIONS OF THE PROJECT SPECIFICATIONS FOR ADDITIONAL PROJECT REQUIREMENTS.

SURVEY, WATER LEVELS AND DATUM:

1. EXISTING CONDITIONS (INCLUDING ELEVATION CONTOURS AND DEBRIS DELINEATION) BASE ON A TOPOGRAPHIC SURVEY PROVIDED BY MTN 2 COAST LLC DATED 2020-06-08.
2. PARCEL LINES ARE FROM THURSTON COUNTY GEODATA CENTER
3. HORIZONTAL DATUM IS WASHINGTON STATE PLANE COORDINATES, SOUTH ZONE, NAD 83/2011 BASED ON GPS TIES TO MONUMENTS USING THE WASHINGTON STATE REFERENCE NETWORK.
4. VERTICAL DATUM IS NAVD 88 BASED ON GPS TIES TO MONUMENTS USING THE WASHINGTON STATE REFERENCE NETWORK.
5. ALL ELEVATIONS AND CONTOURS ARE IN FEET. VERTICAL DATUM AND UNIT IS MEAN LOWER LOW WATER (MLLW) AND FT.
6. CONVERSION FROM NAVD 88 TO MLLW: SUBTRACT 4.03 FEET.
7. AERIAL PHOTO FROM NEARMAP JUNE 25, 2019.
8. TIDAL DATUMS FOR THE SITE ARE AS FOLLOWS:

TABLE1. TIDAL DATUMS AT NOAA STATION 9446969, OLYMPIA, BUDD INLET, PUGET SOUND, WA

		FEET MLLW	FEET NAVD88
HIGHEST OBSERVED WATER LEVEL (12/15/1977)		17.94	13.95
MEAN HIGHER HIGH WATER	MHHW	14.56	10.57
MEAN HIGH WATER	MHW	13.55	9.56
MEAN SEA LEVEL	MSL	8.35	4.36
MEAN TIDE LEVEL	MTL	8.31	4.32
NATIONAL GEODETIC VERTICAL DATUM OF 1929	NGVD29	7.40	3.41
NORTH AMERICAN VERTICAL DATUM OF 1988	NAVD88	3.99	0.00
MEAN LOW WATER	MLW	3.07	-0.92
MEAN LOWER LOW WATER	MLLW	0.00	-3.99
LOWEST OBSERVED WATER LEVEL (1/12/1977)		-4.33	-8.32

TABLE 2. WATER LEVELS AT FIELD DELINEATION BY A MARINE BIOLOGIST ON APRIL 28th, 2021 AND TIDAL DATA.

		FEET MLLW	FEET NAVD88
HIGH TIDE LINE	HTL	15.90	11.91
ORDINARY HIGH WATER MARK	OHWM	15.50	11.51

ABBREVIATIONS

CMP	CORRUGATED METAL PIPE
CPP	CORRUGATED PLASTIC PIPE
EL	ELEVATION
ELEV	ELEVATION
FT	FOOT or FEET
H	HORIZONTAL
HOWL	HIGHEST OBSERVED WATER LEVEL
HTL	HIGH TIDE LINE
IE	INVERT ELEVATION
LAT	LATITUDE
LONG	LONGITUDE
MHW	MEAN HIGH WATER
MHHW	MEAN HIGHER HIGH WATER
MIN	MINIMUM
MLW	MEAN LOW WATER
MLLW	MEAN LOWER LOW WATER
MSL	MEAN SEA LEVEL
MTL	MEAN TIDE LEVEL
NAD	NORTH AMERICAN DATUM
NAVD	NORTH AMERICAN VERTICAL DATUM
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NO	NUMBER
NTS	NOT TO SCALE
OHWM	ORDINARY HIGH WATER MARK
TYP	TYPICAL
V	VERTICAL

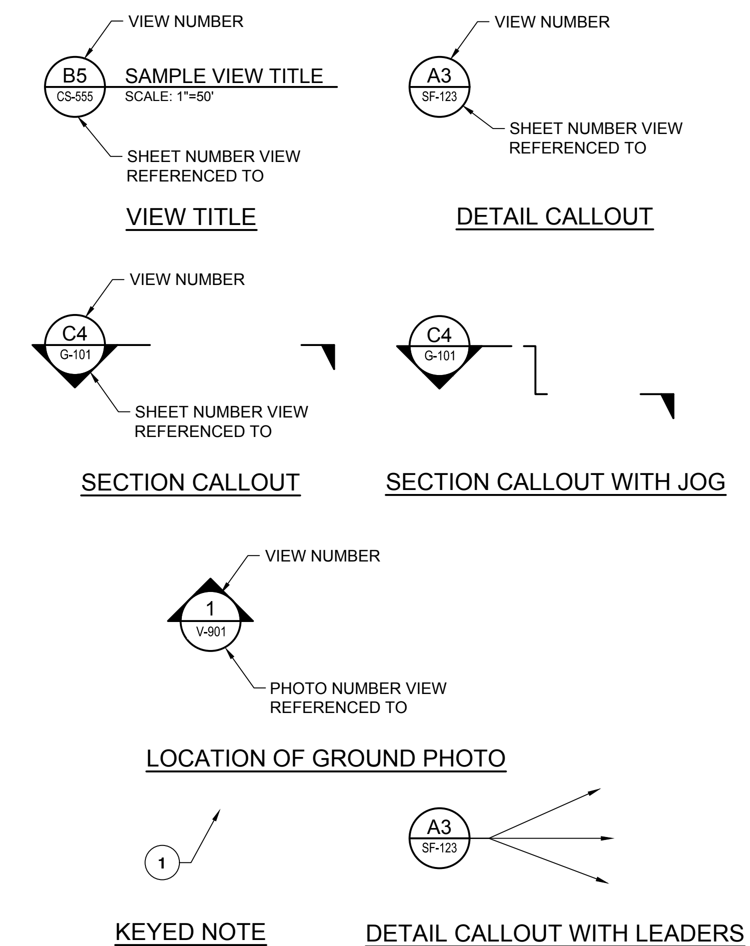
SHEET TYPE DESIGNATORS	
0	GENERAL (COVER SHEET, LEGEND, NOTES)
1	PLANS (HORIZONTAL VIEWS)
2	ELEVATIONS (NOT TYPICALLY USED)
3	SECTIONS (OVERALL VIEWS)
4	LARGE-SCALE VIEWS (PLANS, SECT. OR ELEV. - NOT DETAILS)
5	DETAILS (MAY BE PLAN, SECT. OR ELEV. VIEWS)
6	SCHEDULES
7	USER DEFINED
8	USER DEFINED
9	3D ISOMETRIC

DISCIPLINE DESIGNATORS

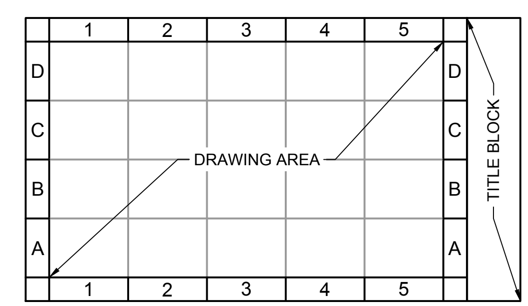
DISCIPLINE	DESIGNATOR
GENERAL	G
SURVEY/MAPPING	V
GEOTECHNICAL	B
CIVIL WORKS	W
CIVIL	C
STRUCTURAL	S
MECHANICAL	M
ELECTRICAL	E
OTHER DISCIPLINES	X

SECONDARY DESIGNATORS	
DEMOLITION	D
GENERAL	G
SUBSTRUCTURE	B
FRAMING	F
COMPONENT	C
SITE	S
TIMBER	T

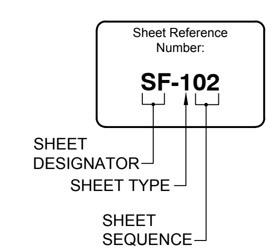
LEGEND



* VIEW NUMBER IS BASED ON THE (DACS) LOCATION OF THE LOWER-LEFT EXTENTS OF THE VIEW ON THE REFERENCED SHEET. WHEN REFERENCING DRAWING INFORMATION BETWEEN SHEETS, BOTH THE VIEW AND SHEET NUMBERS MUST BE QUOTED TOGETHER - EITHER IN A CALLOUT FORMAT AS SHOWN ABOVE OR IN THE FORM;
"VIEW NO./SHEET NO." (EG A1/CS-5001)



DRAWING AREA COORDINATE SYSTEM (DACS)



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WEST BAY YARDS
LUXURY WATERFRONT LIVING
OLYMPIA

WEST BAY DEVELOPMENT - SHORELINE ENHANCEMENT

GENERAL NOTES & ABBREVIATIONS LIST

Rev. 1
Date: 2021-06-23
M&N Project No. INSERT PROJ. NO.
Designed by: YN
Dwn by: RG
Chk'd by: ETC
Reviewed by: REVR
Submitted by: SUBMITTER'S NAME MOFFATT & NICHOL
Drawing Scale: 1:1 (D SHEET)

moffatt & nichol

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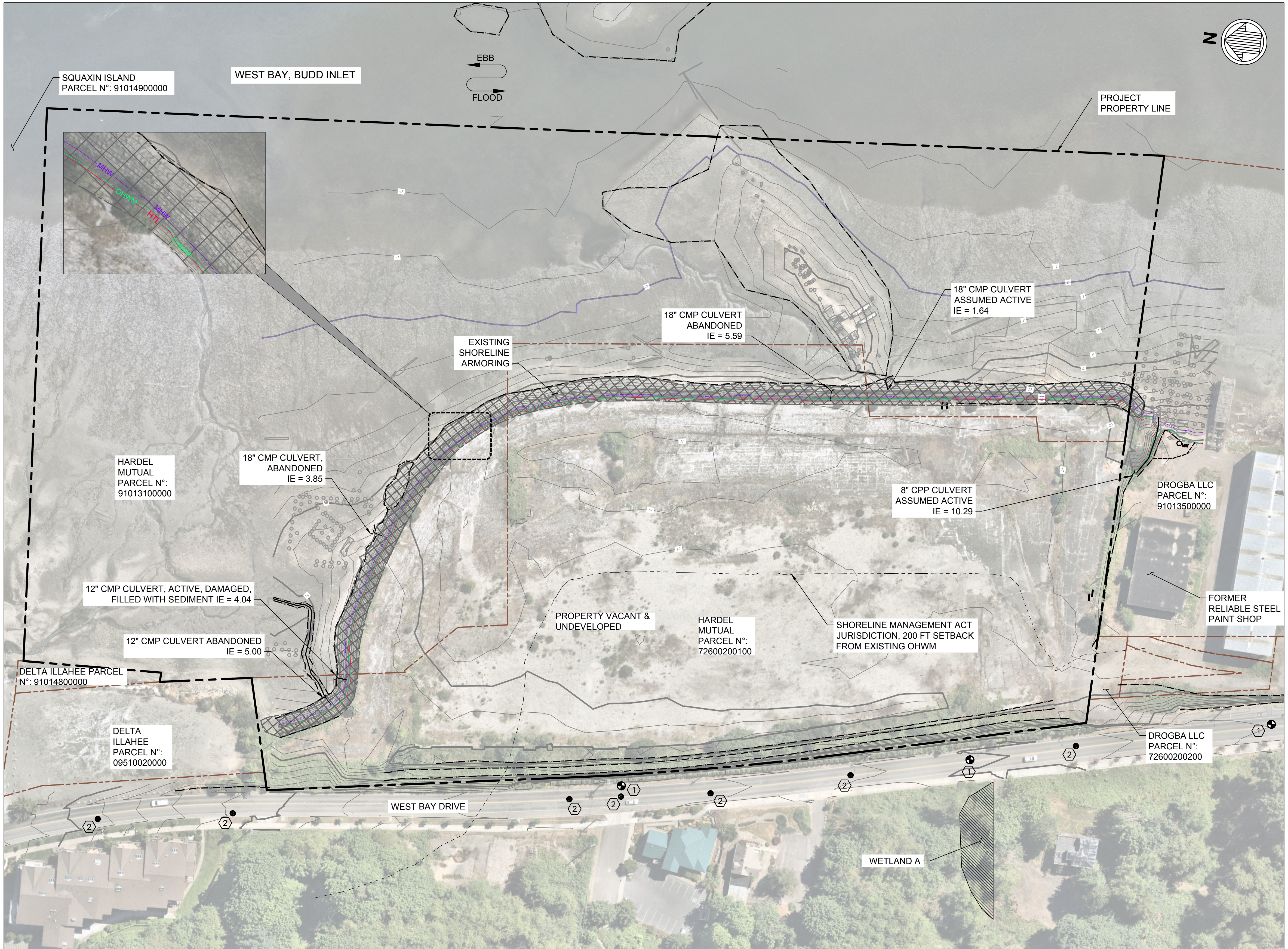
Sheet Reference No.
G-002
INDEX: 2 OF 8

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Attachment 14.C



NOTES:

1.

LEGEND

- MONUMENT #1
- MONUMENT #2
- RELIC PILES
- RELIC CONCRETE STRUCTURES
- EXISTING ARMOR
- PARCEL LINE
- PROPERTY LINE
- EXISTING CONTOUR (ELEVATION FT, MLLW)
- OUTFALL
- HTL (+15.90 FT MLLW)
- OHWM (+15.50 FT MLLW)
- MHW (+13.55 FT MLLW)
- MLLW (0.00 FT MLLW)

MONUMENT NOTES

BASED ON A TOPOGRAPHIC SURVEY PROVIDED BY MTN 2 COAST LLC

1. FOUND 2 1/2" BRASS DISC IN CONCRETE.
2. FOUND 2 1/2" BRASS DISC IN MONUMENT CASE.

60' 0' 60' 120'

SCALE: 1"=60'

REVISION 1: 2021-08-10

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NOT TO BE USED FOR CONSTRUCTION

WEST BAY YARDS
LUXURY WATERFRONT LIVING
OLYMPIA

Mark | Description | Date | Appr

WEST BAY DEVELOPMENT - SHORELINE ENHANCEMENT

EXISTING SITE PLAN

Rev.: 1 | Date: 2021-06-23 | M&N Project No.: INSERT PROJ. NO. | Drawing code: | Drawing Scale: 1:1 (D SHEET) | Plot scale:

Designed by: YN | Dwn by: RG | Ckd by: ETC | Reviewed by: REVR | Submitted by: SUBMITTER'S NAME MOFFATT & NICHOL

moffatt & nichol

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V-101
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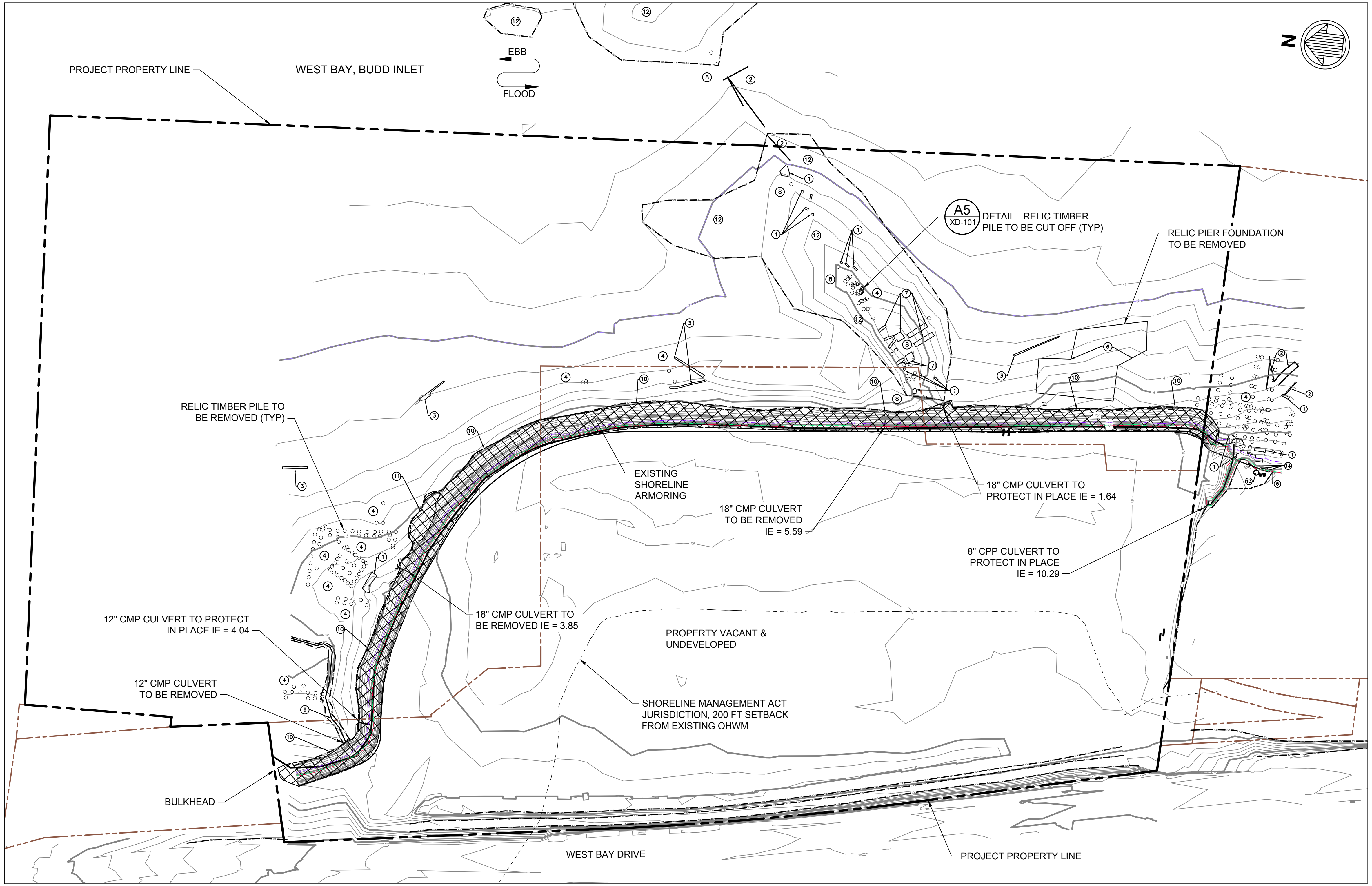
File: Q:\SEA\201839\CADD_Active_Cp\201839V-101 ; Plotted: 3/2/2022 1:54 PM by GIAMMARINO, RICARDO ; Saved: 8/10/2021 3:50 PM by RGIAMMARINO

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Attachment 14.C



NOTES:

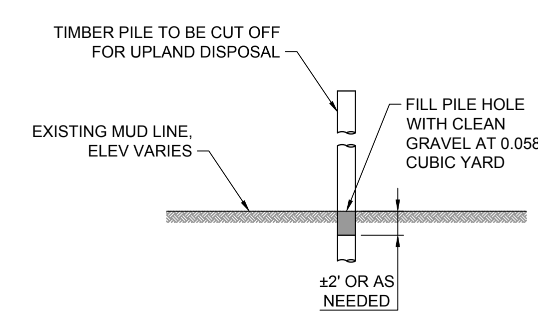
1. CALL 811 BEFORE YOU DIG.

LEGEND

- RELIC PILES
- RELIC CONCRETE STRUCTURES
- EXISTING ARMOR
- PARCEL LINE
- PROPERTY LINE
- EXISTING CONTOUR (ELEVATION FT, MLLW)
- OUTFALL
- HTL (+15.90 FT MLLW)
- OHWM (+15.50 FT MLLW)
- MHW (+13.55 FT MLLW)
- MLLW (0.00 FT MLLW)

(X) DEBRIS TO BE REMOVED

1. CONCRETE DEBRIS
2. METAL IRON BEAMS
3. WOOD LOGS
4. AREA OF OLD WOOD PILINGS
5. WOOD RETAINING WALL
6. OUTLINE OF OLD DILAPIDATED DOCK
7. OLD CONCRETE STRUCTURE
8. CONCRETE PILINGS
9. SWALE DUE TO STORM WATER RUNOFF OUT OF CULVERT
10. TOE LINE IS BOTTOM OF ROCK SLOPE
11. WASHED OUT ROCK FROM WALL
12. RAISED AREA IN BAY
13. MONITORING WELL
14. 1.5" IRON PIPE



A5 XD-101 DETAIL - TYPICAL PILE CUTOFF
SCALE: 1"=8'

60' 0' 60' 120'
SCALE: 1"=60'

REVISION 1: 2021-08-10
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

WEST BAY YARDS
LUXURY WATERFRONT LIVING
OLYMPIA

WEST BAY DEVELOPMENT - SHORELINE ENHANCEMENT

DEBRIS REMOVAL AND DEMOLITION

Rev. 1 | Date: 2021-06-23 | M&N Project No. INSERT PROJ. NO. | Drawing code: | Drawing Scale: 1:1 (D SHEET)
Designed by: YN | Dwn by: RG | Ckd by: ETC | Reviewed by: REVR | Submitted by: SUBMITTER'S NAME MOFFATT & NICHOL

moffatt & nichol

SEAL

Sheet Reference No.
XD-101
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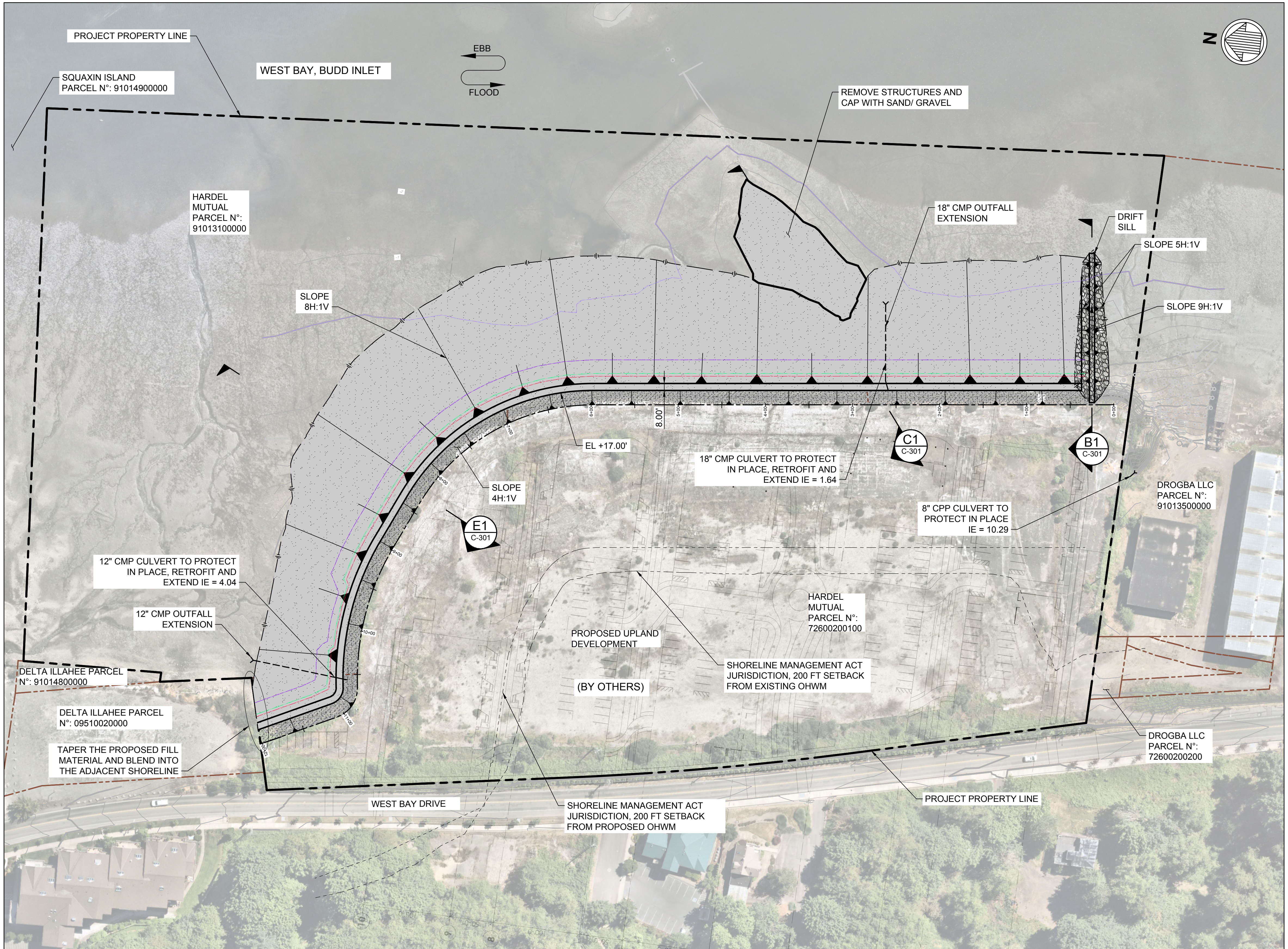
DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Attachment 14.C



NOTES:

1.

LEGEND

- TOP SOIL
- MIXED SAND/ GRAVEL FORESHORE
- ARMOR STONE
- PARCEL LINE
- PROPERTY LINE
- EXISTING CONTOUR (ELEVATION FT, MLLW)
- OUTFALL
- HTL (+15.90 FT MLLW)
- OHWM (+15.50 FT MLLW)
- MHW (+13.55 FT MLLW)
- MLLW (0.00 FT MLLW)

Point Table			
Point #	Northing	Easting	Description
1	637679.49	1039148.45	EST 0+00
2	637778.87	1039137.28	EST 1+00
3	637878.24	1039126.10	EST 2+00
4	637977.61	1039114.93	EST 3+00
5	638076.99	1039103.75	EST 4+00
6	638176.36	1039092.58	EST 5+00
7	638275.73	1039081.39	EST 6+00
8	638369.43	1039048.74	EST 7+00
9	638440.80	1038979.81	EST 8+00
10	638484.66	1038890.07	EST 9+00
11	638508.61	1038793.49	EST 10+00
12	638518.24	1038697.30	EST 11+00
13	638607.67	1038652.77	EST 12+00

60' 0' 60' 120'

SCALE: 1"=60'

REVISION 1: 2021-08-10

PRELIMINARY

NOT TO BE USED FOR CONSTRUCTION

WEST BAY YARDS
LUXURY WATERFRONT LIVING
OLYMPIA

WEST BAY DEVELOPMENT - SHORELINE ENHANCEMENT

PROPOSED GRADING PLAN

Date: 2021-06-23 Rev. 1

M&N Project No. INSERT PROJ. NO.

Designed by: YN Dwn by: RG Ckd by: ETC

Reviewed by: REVR

Submitted by: SUBMITTER'S NAME MOFFATT & NICHOL

moffatt & nichol

SEAL

Sheet Reference No.

C-101

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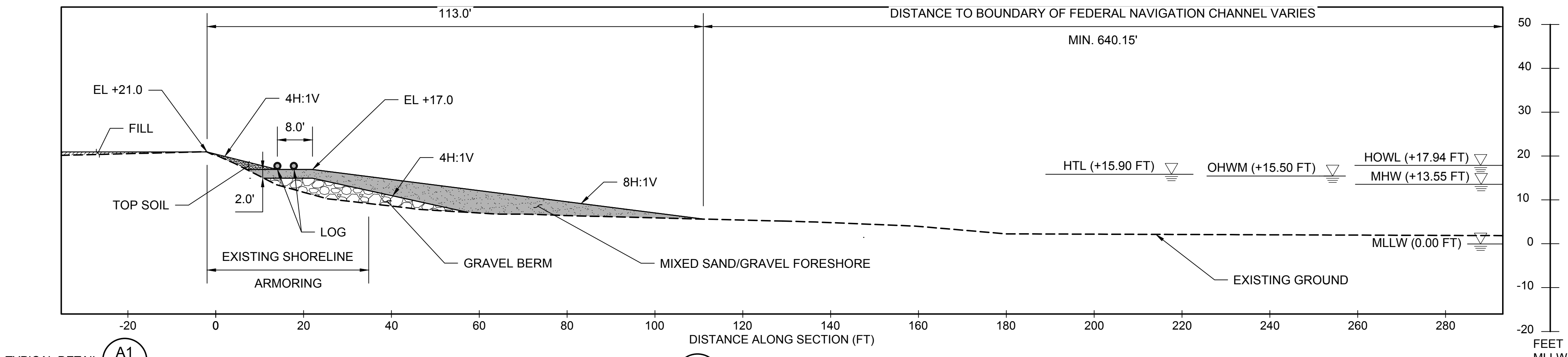
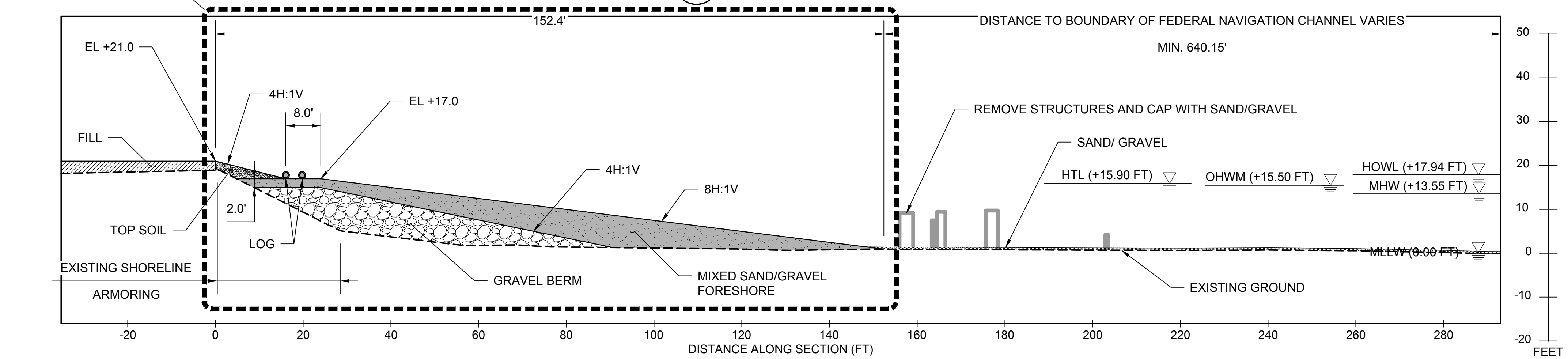
DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

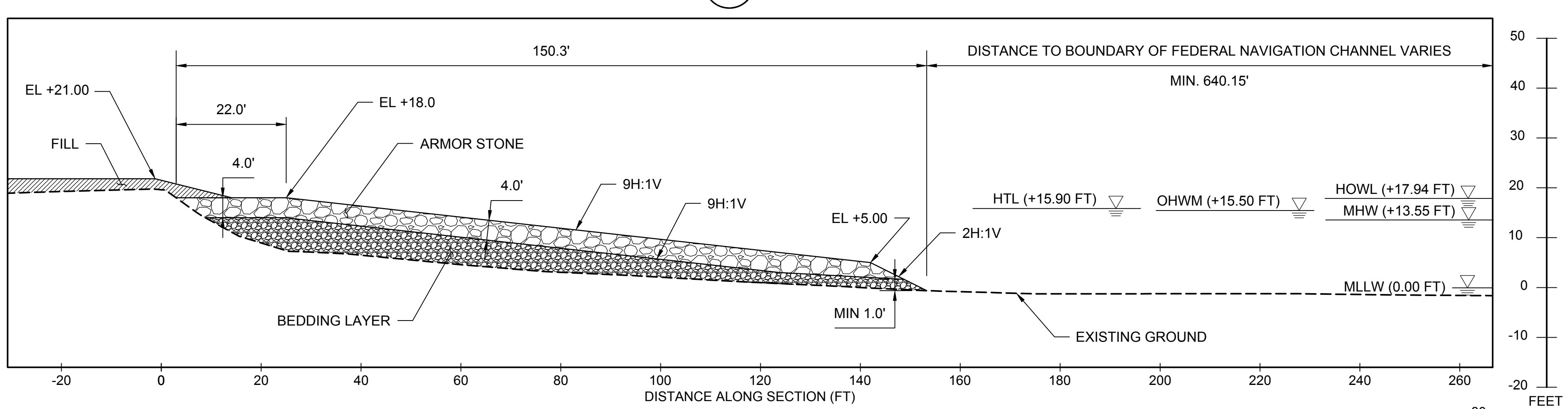
Attachment 14.C



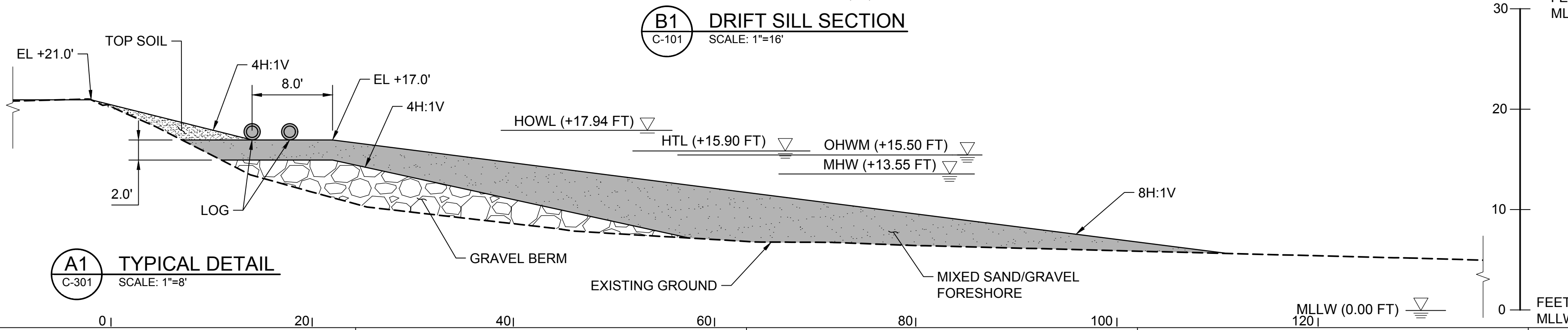
E1 C-101 NORTH SECTION
SCALE: 1"=16'



C1 C-101 RELIC PIER SECTION
SCALE: 1"=16'



B1 C-101 DRIFT SILL SECTION
SCALE: 1"=16'



A1 C-301 TYPICAL DETAIL
SCALE: 1"=8'

NOTES:

1. SEE LANDSCAPE ARCHITECTURE DRAWINGS FOR DETAILS.

LEGEND

- × LIMITS OF EXISTING SHORELINE ARMOR
- EXISTING GROUND
- PROPOSED GRADE
- TOP SOIL
- MIXED SAND/ GRAVEL FORESHORE
- GRAVEL BERM
- ROCK REVETMENT
- BEDDING LAYER
- FILL

SCALE: 1"=8'
SCALE: 1"=16'

REVISION 1: 2021-08-10
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

WEST BAY YARDS
LUXURY WATERFRONT LIVING
OLYMPIA

WEST BAY DEVELOPMENT - SHORELINE ENHANCEMENT

GRADING SECTIONS

moffatt & nichol

Date: 2021-06-23
Rev.: 1
M&N Project No.: INSERT PROJ. NO.
Designed by: YN
Dwn by: RG
Ckd by: ETC
Reviewed by: REVR
Submitted by: SUBMITTER'S NAME MOFFATT & NICHOL
Drawing Scale: 1:1 (D SHEET)

SEAL

Sheet Reference No.
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