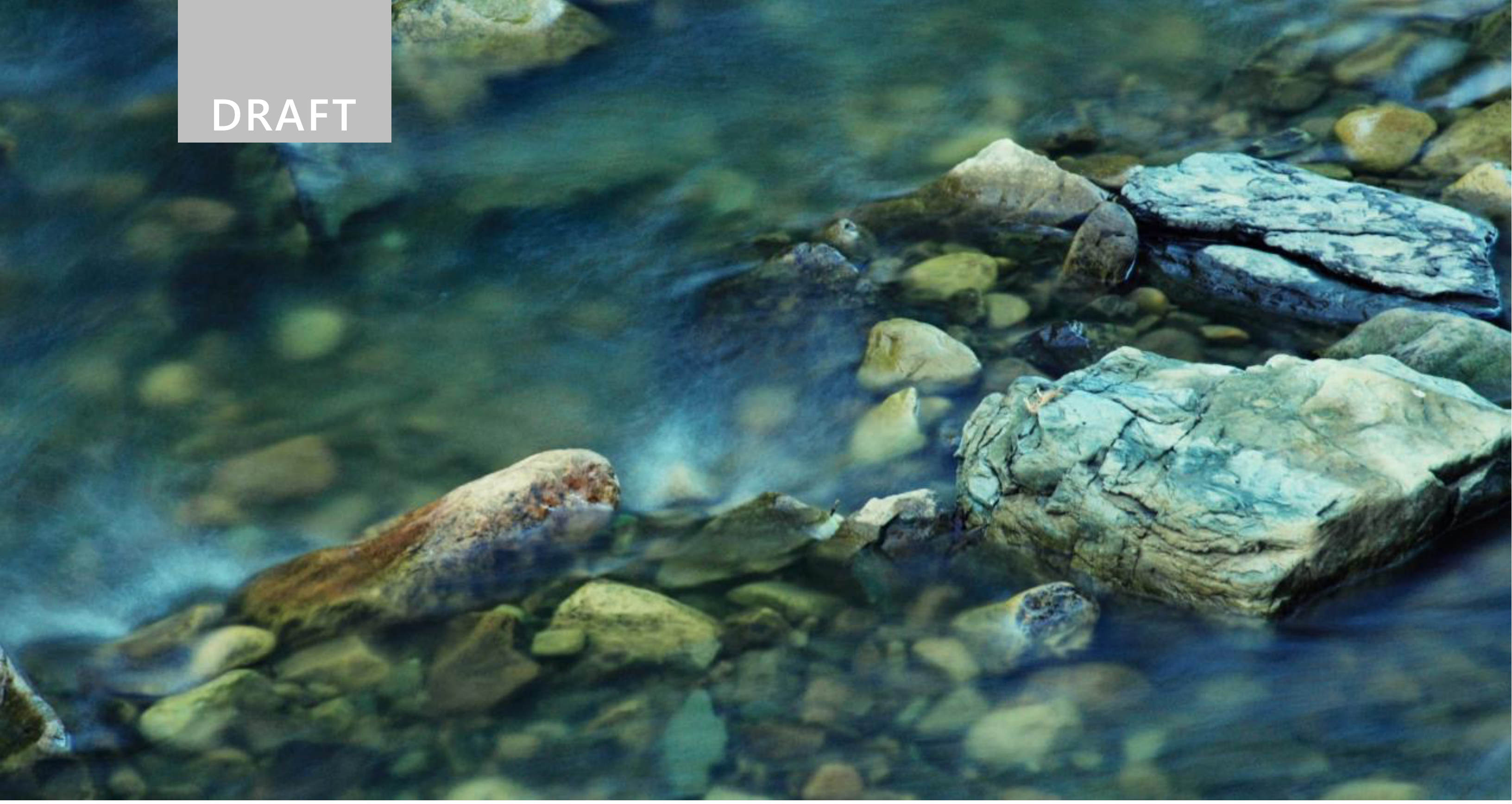

DRAFT

June 2025
JELD-WEN Site

ANCHOR QEA

# Marine Engineering Design Report

Prepared for Washington State Department of Ecology and JELD-WEN, Inc.

DRAFT

June 2025
JELD-WEN Site

# Marine Engineering Design Report

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# ABBREVIATIONS

| | |
|---|---|
| µg/kg | micrograms per kilogram |
| AO | Agreed Order |
| Bay Wood | Bay Wood Products Site |
| BFE | base flood elevation |
| BMP | best management practice |
| CAP | Cleanup Action Plan |
| CAR | Critical Areas Report |
| CEM | Coastal Engineering Manual |
| COC | contaminant of concern |
| COPC | contaminants of potential concern |
| cPAH | carcinogenic polycyclic aromatic hydrocarbon |
| CUL | cleanup level |
| D/F | dioxin/furan |
| dw | dry weight |
| EA | exposure areas |
| Ecology | Washington State Department of Ecology |
| EDR | Engineering Design Report |
| EMNR | Enhanced Monitored Natural Recovery |
| EPA | Environmental Protection Agency |
| ESA | Endangered Species Act |
| FEMA | Federal Emergency Management Agency |
| HASP | Health and Safety Plan |
| IDW | inverse distance weighting |
| IHS | indicator hazardous substance |
| JELD-WEN | JELD-WEN Inc. |
| LiDAR | light detection and ranging |
| MHHW | Mean Higher High Water |
| MIDP | Monitoring and Inadvertent Discovery Plan |
| MLLW | mean lower low water |
| MMMP | marine mammal monitoring plan |
| MNR | Monitored Natural Recovery |
| MTCA | Model Toxics Control Act |
| NAD83 | North American Datum of 1983 |
| NAVD88 | North American Vertical Datum of 1988 |
| ng/kg | nanograms per kilogram |
| NMFS | National Marine Fisheries Service |
| NPDES | National Pollutant Discharge Elimination System |
| OHWM | ordinary high-water mark |
| OMMP | Operation, Maintenance, and Monitoring Plan |
| PAH | polycyclic aromatic hydrocarbon |
| PCB | polychlorinated biphenyl |
| PHS | priority habitats and species |
| PLP | potentially liable party |

| | |
|---|---|
| POC | points of compliance |
| PQL | practical quantitation limit |
| PRDI | pre-remedial design investigation |
| PSO | Protected Species Observer |
| RCW | Revised Code of Washington |
| REL | remediation level |
| RI/FS | Remedial Investigation/Feasibility Study |
| SCL | sediment cleanup levels |
| SCO | sediment cleanup objective |
| SEPA | State Environmental Policy Act |
| Site | JELD-WEN Site located at 300 West Marine View Drive, Everett, Washington, 98201 |
| SLR | sea level rise |
| SMA | Sediment Management Areas |
| SMP | Shoreline Master Program |
| SMS | sediment management standards |
| SPME | Solid-Phase Micro Extraction |
| SPT | Standard Penetration Test |
| SSW | south-southwest |
| SWAC | surface-weighted average concentration |
| SWAN | Simulating Waves Nearshore |
| SWPPP | stormwater pollution prevention plan |
| TEQ | toxicity equivalence |
| TESC | temporary erosion and sediment control |
| USACE | U.S. Army Corps of Engineers |
| WAC | Washington Administrative Code |
| WDFW | Washington Department of Fish and Wildlife |
| WNW | west-northwest |

# 1 Introduction

This Marine Engineering Design Report (EDR) describes the approach and criteria for the design of the marine cleanup actions in the intertidal aquatic areas of the JELD-WEN Site (Site) located at 300 West Marine View Drive, Everett, Washington, 98201. Cleanup of the Site includes both upland and sediment remediation. A separate EDR is being developed describing the proposed remediation for upland contamination. This marine EDR presents the proposed remedy to address contaminated sediment in marine and shoreline areas at the Site.

The required cleanup actions at the Site are set forth in the JELD-WEN Final Cleanup Action Plan (CAP; Ecology 2023), and in accordance with the requirements of Agreed Order (AO) Number DE 5095 and subsequent First Amendment and Second Amendment to the AO between JELD-WEN Inc. (JELD-WEN) and the Washington State Department of Ecology (Ecology). This EDR has been prepared to meet the requirements of the Model Toxics Control Act (MTCA; Ecology 2024a) and Sediment Management Standards (SMS; Ecology 2013] regulations administered by Ecology under Chapters 173-340 and 173-204, respectively, of the Washington Administrative Code (WAC).

This EDR provides a summary of existing background information used to characterize and define the extent of contamination and describes physical, biological, and operational conditions at the Site based on available information. This EDR also describes the proposed remedial actions intended to address sediment contamination and the design elements and criteria that are the basis for the marine remedial design. This EDR presents a narrative discussion of performance standards and how the Site remedial design will meet professional engineering standards of practice and regulatory requirements. This EDR describes the work to be performed to implement the marine remedial actions.

## 1.1 Site Location and Vicinity

The Site is located at the confluence of the Snohomish River to the north and Port Gardner Bay (Possession Sound) to the west (Figure 1). The Site is contained within 10 adjoining parcels with a combined land area of approximately 55 acres that consists of both in-water tidal mudflats and upland. The upland area is approximately 36 acres above ordinary high-water level. The Site is bound to the east-northeast by tidal mudflats and commercial/industrial property owned by the Port of Everett and Baywood Industries, LLC.; to the west by tidal mudflats owned by Port of Everett and W&W Everett Investments, LLC; to the southeast by West Marine View Drive (City of Everett), beyond which to the east is the railway and vacant marshland (Maulsby Marsh) owned by BNSF Railway; and to the north-northwest by commercial/industrial property owned by HM Pacific Northwest 1, LLC, the Snohomish River navigation channel, and Port Gardner Bay.

## 1.2 Report Organization

This EDR is organized following MTCA requirements, as detailed in WAC 173-340-400, and includes the following sections:

- Section 2 summarizes the Site background information.
- Section 3 summarizes design criteria used in the engineering analysis of the cleanup remedy.
- Section 4 summarizes anticipated construction methods.
- Section 5 describes the construction best management practices (BMPs).
- Section 6 describes the net environmental effect of the project.
- Section 7 describes Site preparation and staging designs.
- Section 8 describes remedial design elements.
- Section 9 describes the required compliance monitoring.
- Section 10 describes the proposed institutional and engineering controls.
- Section 11 describes the construction sequencing and schedule.
- Section 12 describes ongoing design considerations.
- Section 13 provides a list of references used to develop this EDR.

The following appendices provide supporting technical evaluations for this EDR:

- Appendix A: Ex Situ Solid-Phase Microextraction Testing Results
- Appendix B: Geotechnical Engineering Assessment
- Appendix C: Coastal Engineering Analysis
- Appendix D: Preliminary Sediment Cap Chemical Isolation Layer Design Analysis
- Appendix E: Construction Best Management Practices
- Appendix F: Inadvertent Discovery Plan

# 2 Background

This section provides relevant Site background information, including Site characteristics such as cultural resources considerations and biological surveys; summaries of previous investigations; Site surveys completed to date; the nature and extent of contamination; required sediment cleanup levels (CULs); points of compliance; and marine sediment remediation levels.

## 2.1 Site Characteristics

This section describes Site characteristics relevant to the engineering design of marine remedial actions, including the project physical setting, stormwater, coastal conditions, cultural resources, and recent biological surveys.

### *2.1.1 Physical Setting and Ownership*

The Site includes former operating areas where industrial activities had occurred and hazardous material had been stored, deposited, or migrated to. The current property owner of the upland area of the Site is W&W Everett Investments LLC. Owners of surrounding tidal mudflat areas include the Port of Everett, W&W Everett Investments LLC, and Baywood Industries, LLC (Figure 1).

The Site lies on an area of fill that extends into Port Gardner Bay. The majority of the Site is relatively flat, with a maximum elevation of approximately 15 feet mean lower low water (MLLW) while the Knoll Area elevation extends to approximately 26 feet MLLW. The tidal mudflats and a portion of the upland areas of the Site lie within the 100-year floodplain.

The current zoning of the Site property is industrial and future use of the Site property is expected to remain industrial. The known existing utilities on the Site are illustrated in Figure 2.

Surface water in the Site vicinity is utilized both commercially and recreationally. The Tulalip Tribes Reservation is located approximately 1 mile north of the Site, on the north side of the Snohomish River. Tulalip tribal members living on the Tulalip Reservation are engaged in both commercial and subsistence fishing near the confluence of Port Gardner Bay and the Snohomish River.

The marine portions of the Site have been divided into three subareas (i.e., the Logway, South Shoreline, and Knoll Area) based on their physical location, characteristics, and cleanup actions (Figure 1). The following subsections briefly describe each area.

#### 2.1.1.1 Logway

The Logway is defined as the channel along the northern edge of the property boundary, separating the Site and the neighboring Baywood property. The Logway is a narrow inlet tidal flat area with a steep armored slope to the upland portion of the Site. The elevation of the majority of the tidal flat area is approximately 2 to 4 feet MLLW, while the steep armored slope to the upland portion of the

Site extends to approximately 14 feet MLLW. It contains an active outfall at the head of the inlet that discharges stormwater from the adjacent Baywood property, two historical outfalls (status unknown), two wooden bulkheads, and numerous wood piles. Historical operations within the Logway included log storage and transloading.

#### 2.1.1.2 The South Shoreline

The South Shoreline is defined as the marine area along the Site's south shoreline. The South Shoreline is a tidal flat with elevations ranging between 2 and 6 feet MLLW with a slope to the upland portion of the Site to approximately 14 feet MLLW. It contains six or seven historical outfalls (status unknown), the remnants of a wooden barge, and numerous wood piles. Historical operations within the South Shoreline included log rafting.

#### 2.1.1.3 Knoll Area

An approximately 2-acre vegetated knoll is located at the southern end of the Site. The Knoll Area was created through several apparent filling operations, initially being filled to match the surrounding grade in the early to mid-1960s. Additional fill material was placed during the 1970s that created the existing "knoll" feature (Figure 1). The Knoll Area is primarily tidal flat with elevations ranging between 6 and 11 feet MLLW with a near vertical bluff along the upland portion of the Site and contains one outfall. The outfall in the Knoll Area drains Maulsby Marsh.

### *2.1.2 Stormwater*

The subject property appears to support a network of stormwater lines that discharge towards the Logway, South Shoreline, and the stormwater network below the west-adjacent West Marine View Drive (Figure 2). JELD-WEN performed an assessment of the stormwater system as part of the source control evaluation (SLR 2019). Results of the assessment indicated that the stormwater pipes and infrastructure had not been serviced or cleaned for several years and many of the catch basins and stormwater lines were partially or completely filled with sediment, debris, or stagnant water. Some stormwater pipes were completely blocked with sediment or debris, which made tracing of those lines unsuccessful.

### *2.1.3 Coastal Conditions*

The Site is situated within tidal flats at the confluence of the Snohomish River to the north and Port Gardner Bay (part of Possession Sound) to the west. While no water level gauges are located directly at the Site, the National Oceanic and Atmospheric Administration tidal station in Everett, Washington (Station ID: 9447659), provides representative datum information. According to this station, tidal elevations at Mean Higher High Water (MHHW) reach 11.09 feet MLLW. The Federal Emergency Management Agency (FEMA) Flood Insurance Study for Snohomish County designates the Site within Flood Zone AE, with a base flood elevation (BFE) of 13 feet North American Vertical Datum of 1988 (NAVD88), or 15.03 feet MLLW.

Wind data from the National Centers for Environmental Information wind gauge located at the Everett Snohomish County Airport (WBAN: 24222) indicate that the dominant wind directions are from the north and south, with southerly winds generally exhibiting the highest magnitudes. These wind patterns may generate wind-driven waves affecting the Site. The Site is potentially exposed to wave energy generated across the long fetch of Possession Sound, as well as from shorter fetches within Port Gardner and the Snohomish River.

Jetty Island provides protection from direct wave action originating from the west; however, its shielding effect does not extend to winds from the west-northwest (WNW). WNW winds can generate wave energy that may enter the Snohomish River via the Port Gardner Bay inlet north of the Site, potentially impacting the Logway during high tide. While waves from the west are typically blocked, under extreme flooding conditions such as those represented by the FEMA BFE, portions of Jetty Island may become inundated, reducing its effectiveness and allowing wave energy from the west to reach the Site. Additionally, strong south-southwesterly (SSW) winds may generate wave activity capable of impacting the South Shoreline during high tide, due to wave development over the shorter fetches within Port Gardner and the Snohomish River.

Projected sea level rise (SLR) data for the Site under Representative Concentration Pathways (RCP) 4.5 and 8.5 scenarios are available through the Washington Coastal Hazards Resilience Network’s visualization tool. These projections will be reviewed to assess the potential influence of SLR on future coastal conditions at the Site, including increased frequency of inundation and potential enhancement of wave exposure under elevated water levels.

### *2.1.4 Cultural Resources*

During the remedial design and permitting phase of the cleanup action, the implementing parties, in consultation with the Washington Department of Archaeology and Historic Preservation, the Tulalip Tribes, and other stakeholders as appropriate, will identify areas that may be affected by the cleanup action. These areas will include locations where cleanup-related disturbance may occur, including removal areas, staging areas, transport routes, and mooring areas, as appropriate.

The Archaeological and Historic Preservation Act (16 United States Code § 496a-1) is applicable if any covered materials are discovered during excavation activities performed as a part of the Site cleanup actions. During the pre-remedial design investigation (PRDI), cultural resources were assessed by a professional archaeologist during the development of the 2022 State Environmental Policy Act Environmental Checklist for the Site (JELD-WEN 2022). It was determined that there is low potential to encounter archaeological or cultural resources during this sampling effort.

Sampling completed in June through August 2024 took place under a Monitoring and Inadvertent Discovery Plan (MIDP; Henley and Bush 2025). The MIDP expected the area may contain historic fill and objects related to industrialization and industrial use on Site as well as possible precontact sites related to transportation and marine resource procurement. Monitored borings included those completed using direct push (73), hallow-stem auger (9), and sonic (14). No historic or archaeological resources were observed. Four stratigraphic layers were observed, including two layers of fill (M1 and M2) underlain by disturbed and quickly accumulated recent sediment that likely was deposited in a subtidal environmental after historic land disturbance and river alteration by nonnative settlers. A possible native mudflat was observed below these layers at depths typically between 40 and 50 feet below the existing ground surface. Based on collected data, project disturbance above 40 feet below the existing ground surface is not expected to encounter cultural resources.

During implementation of the remedial cleanup actions, consistent with Section 106 requirements of the National Historic Preservation Act and Washington State laws, detailed compliance monitoring plans will be developed during the remedial design and permitting phase, consistent with regulatory requirements. If the project includes excavation or constructed elements at or below 30 feet below the ground surface, then a professional archaeologist will review plans and provide recommendations as to whether additional monitoring is needed; however, this is not currently anticipated.

### 2.1.5 Biological Surveys

A Critical Areas Report (CAR) was prepared as part of the Remedial Investigation/Feasibility Study activities (RI/FS; SLR/Anchor 2021). The CAR characterized ecological conditions in the study area to allow for the avoidance, minimization, and mitigation of impacts to critical habitats and protected species related to future cleanup activities. The CAR identified and delineated 14 estuarine wetlands within the Site (Wetlands E1 through E14). Most of these estuarine wetlands are small patches or groups of small patches of salt-tolerant vegetation near the marine ordinary high-water mark (OHWM), and 8 of the 14 wetlands are less than 100 square feet in total area.

Additionally, the City of Everett manages a Shoreline Master Program (SMP), which designates the tidal mudflats south of the Site as "Urban Maritime Interim." The Logway (inlet area north of the Site) and Maulsby Marsh (referred to as Maulsby Swamp in the SMP) are designated in the SMP as Aquatic Conservancy.

Concentrations of shorebirds and waterfowl are included in Washington Department of Fish and Wildlife (WDFW)'s priority habitats and species (PHS) list. A federally listed threatened and state candidate bird species (the purple martin, *Progne subis*) has been identified at the Everett waterfront, in the vicinity of the Site. Bald eagles, which are listed as a federal species of concern and a state sensitive species, may also be found near the Site. While no nesting bald eagles have been observed on the Site, the Site is located within the 800-foot shoreline nest buffer. In addition, during prior work, Anchor QEA personnel observed great blue heron (*Ardea herodias*) nesting approximately 3,500 feet away from the Site and osprey (*Pandion haliaetus*) nesting creosote-treated piles planned for removal within the Site.

There are no federally listed endangered fish species identified in the project area. Federally listed species that may be found in the Snohomish River near the Site include summer and fall-run Chinook Salmon (*Oncorhynchus tshawytscha*), summer and winter-run steelhead (*Oncorhynchus mykiss*), and Bull Trout (*Salvelinus confluentus*; NMFS 2025; USFWS 2025). Additional species identified in the Snohomish River near the Site include Coho Salmon (*Oncorhynchus kisutch*), fall-run Chum Salmon (*Oncorhynchus keta*), Pink Salmon (*Oncorhynchus gorbuscha*), and Sockeye Salmon (*Oncorhynchus nerka*; NWIFC 2025). Any of the above species may migrate through the area during certain periods of the year.

No surf smelt, sand lance, rock sole, or herring spawning areas were identified in the Site area. Dungeness crab is included as a priority species in WDFW's PHS list. Dungeness crab habitat was identified in areas surrounding the Site (SLR/Anchor 2021).

## 2.2 Previous Investigations

This section provides a summary of previous investigations that have been completed in the marine area of the Site. Additional details regarding these investigations can be found in the RI/FS (SLR/Anchor 2021), the CAP (Ecology 2023), and the PRDI Data Report (Anchor QEA 2025).

### *2.2.1 SAIC 2009*

A single surface sediment sample (0 to 10 centimeters [cm]) was collected in August 2008 within the Site area as part of the larger Port Gardner sediment quality investigation conducted by Ecology. The surface sediment sample was collected using a modified Van Veen grab sampler. The sample was analyzed for dioxins/furans and total polychlorinated biphenyls (PCBs; Aroclor method).

### *2.2.2 Bay Wood Products 2009*

Two surface sediment samples were collected by the Port of Everett in June 2009 from the adjacent northern tidal mudflat area as part of the RI/FS for the adjacent Bay Wood Products Site (Bay Wood; Cleanup Site ID: 2581). The Bay Wood surface sediment samples were collected from a depth of 0 to 10 cm at low tide by hand. The two locations were collected by measuring a 1-square-meter grid at the station location and then collecting equal volumes of 0 to 10 cm sediment from each corner of the square using a stainless-steel trowel. Surface sediment samples were analyzed for dioxins/furans.

### 2.2.3 SLR 2009

A total of 34 surface sediment (0 to 10 cm) samples were collected by JELD-WEN in June 2009. Samples were collected from fine-grained materials using hand tools at low tide. Sediment samples were located adjacent to each of the nine identified historical and current stormwater outfalls. Surface sediment samples were also collected from the eastern-most segment of the channel along the north boundary of the Site and in the vicinity of the former fish net storage building and Knoll Area at the southeastern corner of the Site. At each sampling location, three separate grab samples were collected either along the stormwater flow alignment (for outfall area samples) or in a radial pattern (for all other samples), with each sample approximately 10 feet equidistant from the other(s).

### 2.2.4 Anchor QEA 2012/2014

The 2008 and 2009 sampling data, summarized above, identified dioxins/furans and total PCBs as contaminants of potential concern (COPCs) in the marine sediments at the Site. However, additional data was needed to characterize the horizontal and vertical extent of these COPCs at the Site. In addition, since elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) were detected in upland soils and groundwater at the Site, further sampling and analysis were needed to determine if PAHs may also be a COPC in Site sediments. In May 2012, surface sediment (0 to 10 cm) samples were collected from 10 exposure areas (EAs) located immediately adjacent to the Site shoreline. Two Site EAs were targeted for more detailed composite sampling and analysis of surface sediment and tissue. The first composite area targeted tidal mudflats in the Logway Area immediately adjacent to stormwater outfalls draining uplands at the northeastern corner of the Site. The second composite area targeted tidal mudflats immediately adjacent to the former fish net storage building and Knoll Area at the southeastern corner of the Site. For comparison purposes, sediment and tissue samples were also collected from upstream, downstream, and regional reference areas with similar grain size and other habitat characteristics.

In September 2013, the final two surface sediment samples to complete the RI/FS were collected and analyzed.

In March 2014, clam tissue samples were collected and analyzed from an additional three locations to further refine the PCB biota-sediment accumulation factor.

### 2.2.5 Anchor QEA 2023/2024

Data collected during the 2023/2024 PRDI were intended to fill data gaps as outlined in the respective PRDI Work Plans (Anchor QEA 2023, 2024). The existing data collected prior to the 2023/2024 PRDI were sufficient to characterize the nature and extent of contaminant of concern (COC) contamination in the marine portions of the Site, for the purpose of the RI/FS. Further lateral delineation in Enhanced Monitored Natural Recovery (EMNR) and removal and capping areas was needed to refine these areas for the remedial design. The collection of additional surface sediment (0 to 1-foot bml) chemical concentration data to inform the remedial design of Monitored Natural Recovery (MNR) areas (SMA-1), ENMR areas (SMA-2), and complete removal or partial removal and engineered capping areas (SMA-3) was collected during the 2023 Step 1 PRDI investigation as follows:

- Eighty-two dioxin/furan (D/F) and 40 PCB surface sediment samples were collected for additional delineation of D/F and PCBs.
- Fifty-three surface sediment samples were collected for post-cleanup carcinogenic polycyclic aromatic hydrocarbon (cPAH) surface-weighted average concentration (SWAC) evaluation.

Based on review of the Step 1 data, data gaps regarding the presence wood waste, cPAH SWACs (to evaluate the post-construction compliance), D/F and PCB surface and subsurface delineation (removal prisms and EMNR area design), shoreline geotechnical properties (excavation and shoring design), and sediment porewater (chemical isolation cap design) were identified and filled during the 2024 Step 2 PRDI investigation as follows:

- Thirty-five additional D/F and 10 additional PCB surface sediment samples were collected.
- Six additional surface sediment samples were collected for the post-cleanup cPAH SWAC evaluation.
- One composite surface sediment sample (0- to 0.5-foot) was collected from sediment accumulated behind the two bulkheads that will be removed as part of the cleanup.
- Thirty-one subsurface sediment cores of varying lengths were collected and analyzed for vertical delineation of D/F and PCBs.
- Thirteen subsurface short cores (0- to 3-foot) were collected for wood volume measurements.
- Nine sediment cores were collected for ex situ porewater evaluation using the Solid-Phase Micro Extraction (SPME) methodology.

The 2023/2024 PRDI data identified removal/capping and EMNR remediation level (REL) exceedance areas (for the Logway, South Shoreline, and Knoll) that were smaller than those defined in the CAP. These smaller remediation areas resulted from revised interpolations using the additional PRDI bounding data.

Additional cPAH samples were used to update the SWAC for cPAH TEQ within the marine site boundary. The remedial action needs to result in a post-cleanup cPAH TEQ SWAC that meets the cPAH TEQ background concentration. Following the incorporation of the PRDI data, the cPAH SWAC for the Site was 41.4 µg/kg. The remedial design, as presented in Section 8, provides a remedy that achieves a post-cleanup SWAC in compliance with the target background concentration of 21 µg/kg.

Elevated concentrations of D/F were identified in the sediments accumulated behind the bulkheads to be removed from the Logway and these PRDI data will be used to determine disposal requirements for this material.

The subsurface sediment cores identified the depth of contamination exceeding RELs for removal in the South Shoreline (3 to 4 feet bml) and the Knoll Area (2 feet bml). The depth of contamination exceeding RELs for removal in the Logway was not determined at all locations; however, the selected remedy in areas of deeper contamination will be sediment removal and engineered cap placement. This remedy does not require complete delineation of depth of contamination, only data to inform the concentrations immediately below the engineered cap.

Wood waste was identified in the CAP as a potential cleanup action. The 2023/2024 data characterization included work to determine if wood waste content exceeded the threshold of 25% by volume. Wood waste volume measurements collected from the Site were all less than 25% by volume. Ecology determined that total volatile solid and wood sieving percentage data sufficiently characterize the shallow sediments throughout the Site and wood waste cleanup is not required (Ecology 2024b).

The ex situ SPME porewater data determined the concentrations of porewater in sediment at the Site. These porewater concentrations will be used to evaluate the chemical isolation protectiveness of the engineered cap that will be designed and constructed in the areas of the Logway where deeper sediment REL exceedances will be capped in place.

The PRDI Data Report (Anchor QEA 2025) details the collection of Step 1 and Step 2 data and the results. Revised inverse distance weighting (IDW) interpolations for surface sediment were created using the data from the PRDI along with the existing data from the RI/FS and CAP. These updated interpolations for D/F and PCBs were combined using the criteria for MNR, EMNR, and capping/removal, consistent with the CAP to establish updated SMAs. The revised PRDI SMAs are depicted in Figure 3 and inform the remedial design.

## 2.3 Site Elevation Surveys

The bathymetric and shoreline survey was performed by eTrac (Woolpert) acting as a subcontractor to Anchor QEA. The survey was conducted using aerial and stationary Light Detection and Ranging (LiDAR) and collected on November 15 and 18, 2024, at low tides of -3.07 and -3.26 feet MLLW, respectively, as measured at the Everett, Washington, tide station (#9447659). The survey was conducted within the marine site boundary (Figure 2) and a 100-foot buffer beyond the boundary where possible. Limitations in LiDAR data collection occurred where standing water was present during low tides, as LiDAR cannot penetrate water surface; however, this data gap was determined to be minor and limited to small shallow pools within the intertidal mudflat. The survey encompassed the in-water project area and included some upland and shoreline locations, to supplement and link into existing upland survey data. LiDAR was collected with a Riegl VZ400 Terrestrial Scanner, supported by Applanix POS MV V5 Base Station. Data processing utilized Horizontal Datum/Projection of North American Datum of 1983 (NAD83; 2011) and Vertical Datum of mean lower low water (MLLW) using NAVD88 GEOID (2012B). A local benchmark was referenced for conversions in developing the Site-specific bathymetric and upland survey data as follows: U.S. Coast and Geodetic Survey disk stamped as follows: U.S. Coast & Geodetic Survey tidal station disk 4 1934 located at N 47.98000; E -122.22300, with an elevation of 39.89 feet NAVD88 (41.93 feet MLLW). Datum elevations for the Site are presented in Table 1.

## 2.4 Nature and Extent of Contamination

Under MTCA, a site (or facility) is an area where a hazardous substance has come to be located. As such, the nature and extent of contamination in the sediment defines the marine area Site boundary. More specifically, the marine site boundary includes sediment contaminated with PCBs and dioxins/furans above sediment management standards.

### *2.4.1 Sediment*

The following chemicals were identified as COCs for sediment in the CAP based on exceedances of the applicable SMS Sediment Cleanup Objective (SCO) criteria as follows:

- **Total PCBs (Aroclors or congeners):** Concentrations exceed the SCO criterion of 130 µg/kg dry weight (dw) based on benthic protection and the SCO criterion of 30 µg/kg dw (based on protection of human health).
- **Total D/F toxicity equivalence (TEQ):** Concentrations exceed the SCO criterion of 5 nanograms per kilogram (ng/kg) dw (based on the practical quantitation limit [PQL]).
- **Total coplanar PCB congener TEQ:** Concentrations do not exceed the Site-specific SCO of 1.5 ng/kg dw (based on the PQL); however, the risk from D/F and coplanar PCB congener TEQ levels are additive. Areas with elevated PCB congener TEQ are spatially delineated within the extent total PCB and D/F TEQ exceedance area; therefore, coplanar PCB congener TEQ are COCs but are not considered an indicator hazardous substance (IHS).
- **cPAH TEQ:** Concentrations exceed the SCO criterion of 21 µg/kg dw, based on natural background. However, it is important to note that the regional background for cPAH TEQ in Port Gardner Bay has been established as 56 µg/kg in the Washington State Department of Ecology Sediment Cleanup User's Manual (SCUM) Table 10-2 based on the Port Gardner Bay Regional Background: Data Evaluation and Summary Report (Ecology 2014), which also exceeds the SCO criterion. Areas where sediment exceeds the SCO are spatially delineated within the extent of the total PCB and D/F TEQ exceedance area; therefore, cPAH TEQ is a COC but is not considered an IHS. However, PAH source control (creosote-treated pile/structure removal) is integrated into the selected remedial action.

The PRDI results, as summarized in Section 2.2.5 of this EDR and presented in the PRDI Data Report (Anchor QEA 2025) presents data collected resulting from implementation of the Ecology-approved Step 1 and Step 2 Pre-Remedial Design Investigation Work Plans (Anchor QEA 2023, 2024) to inform the marine remedial design. This data was used to refine the SMA boundaries. Figure 3 illustrates the revised SMAs based on the PRDI results.

### *2.4.2 Porewater*

Porewater D/F and PCB data were collected as part of the PRDI (Section 2.2.5). A total of nine sediment cores were collected for ex situ porewater evaluation using the SPME methodology. These data are used to inform the cap design.

In the ex situ SPME test, the highest total D/F porewater concentrations were observed in the Logway (2.97 at PW-041 and 1.75 at PW-044 picograms per liter [pg/L], which correspond to 0.078 and 0.141 pg/L TEQ, respectively). All other total D/F porewater concentrations were lower than 0.60 pg/L, including total D/F porewater concentrations in the South Shoreline and Knoll areas. The total PCB porewater concentration in the Knoll Area was 0.20 nanograms per liter. The complete porewater evaluation including a detailed description of the methodology, calculations of freely dissolved D/F and PCBs in porewater, quality control and quality assurance discussion, and tabulated porewater concentrations is presented in Appendix A.

### *2.4.3 Structures*

Ecology's SCUM (Ecology 2021) identifies creosote-treated piling removal as a form of source control. Creosote-treated structures are present at the Site and include the following: two bulkhead structures containing an unknown number of wooden piles and lagging, a remnant wooden barge, and approximately 53 free-standing piles or dolphins. These structures and debris will be removed as part of the marine remedial actions (Figure 4).

## 2.5 Cleanup Levels

The sediment cleanup level (SCL) is defined as the concentration or level of biological effects of a contaminant in sediment determined by Ecology to be protective of human health and the environment (WAC 173-204-560(2)). The applicable SCLs[1] were defined in the CAP and are summarized in Table 2.

## 2.6 Points of Compliance

For marine sediments, the vertical point of compliance (POC) is surface sediments within the biologically active zone. The biologically active zone is the depth in surface sediments where the species

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[1] The applicable SCL refers to the sediment cleanup level specified in WAC 173-204-560(2)(a).

critical to the function, diversity, and integrity of the benthic community are located. As described in the CAP, the vertical POC at the Site is 30 centimeters (approximately 1 foot). Benthic protection is required on a point-by-point SCL basis (benthic protection criteria in accordance with the SMS).

For bioaccumulative COPCs, such as total PCBs and D/F TEQ, the horizontal POC defined under SMS is based on the SWAC. SWACs are applied to the entire Site area that exceeds the Site-specific SCL. In accordance with the CAP, the SWAC compliance area encompasses all surface and near-surface sediment areas (i.e., to a depth of 1 foot below mudline) with concentrations of total PCBs or D/F TEQ exceeding preliminary SCO chemical criteria.

## 2.7 Marine Sediment Remediation Levels

As described in WAC 173-340-355, a cleanup action selected for a site will often involve a combination of cleanup action components, and RELs may be used to identify the concentrations of hazardous substances at which different cleanup action components will be implemented. RELs are not CULs and, by definition, these exceed CULs. RELs must meet each of the minimum requirements of cleanup as specified in WAC 173-340-360.

The following concentration break points were used to establish REL values in the Feasibility Study and were defined in the CAP:

- Total PCBs:
  - MNR REL: 30 µg/kg dw (human health protection-based SCO)
  - EMNR REL: 117 µg/kg (hill-topping-based REL to achieve a 30 µg/kg dw SWAC)
  - Removal REL: 130 µg/kg dw (benthic protection SCO)
- D/F TEQ:
  - MNR REL: 5 ng/kg dw (PQL-based SCO)
  - EMNR REL: 8 ng/kg dw (hill-topping-based REL to achieve a 5 ng/kg dw SWAC)
  - Removal REL: 15 ng/kg dw (best professional judgement based on direct sediment contact [Ecology 2021])

Wood debris in marine sediments[2] was identified in the CAP as having the potential to adversely affect the benthic community when present in sufficient quantities. Locations with less than 25% wood debris by volume are unlikely to cause adverse effects to the benthic community, and 25% has been selected as an SCL for other remediation sites managed by Ecology (Ecology 2013). Based on the results from the wood volume measurements collected during the PRDI the Site meets cleanup requirements for wood, less than 25% wood debris by volume, and no cleanup actions to address wood debris are required (Ecology 2024b).

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[2] Wood debris in marine sediments is likely related to historical log rafting, log storage, and lumber processing operations not associated with the former Nord Door Facility operations.

# 3 Basis of Design

This section summarizes the overall basis of design for the marine remedy as described in the CAP and updated based on the results of the PRDI.

## 3.1 Health and Safety

Prior to the start of any work, the contractor must provide a Site-specific Health and Safety Plan (HASP). At a minimum, the HASP shall meet all the requirements of local, state, and federal laws, rules, and regulations and shall address all requirements for general health and safety.

The HASP will include the specific requirements for safety provisions and provide inspections and reports by the appropriate safety authorities to be conducted to ensure compliance with the intent of the regulations. The HASP will also inform employees and subcontractors and their employees of the potential danger in working with any potentially contaminated materials, equipment, soils, sediments, and groundwater at the Site.

The contractor will be required to provide a person designated as the Site Safety and Health Officer, who is thoroughly trained in construction safety, marine construction safety, rescue procedures, and the use of all necessary safety equipment that the work requires. The Site Safety and Health Officer must be present at all times while work is being performed.

## 3.2 Required Cleanup Actions

### *3.2.1 Assumed Source Control Activities*

The remedial investigation included the finding that marine sediments were contaminated near the stormwater outfalls. Therefore, as part of source control, the performing potentially liable persons (PLPs) must remove and dispose accumulated sediment and debris from stormwater systems within the Site including, but not limited to, stormwater pipes, catch basins, vaults, and manholes. The cleanout of accumulated sediments must be completed, prior to conducting the marine sediment cleanup. The stormwater cleanup actions are being completed as part of the upland remediation project and details regarding that effort will be included in the upland EDR (to be provided by others). We understand this work will be conducted by others. Property owners and their leasees are responsible for obtaining permits and compliance with stormwater regulations associated with all upland industrial use areas at the Site.

### *3.2.2 Sediment Cleanup Actions*

As described in the CAP, sediment cleanup actions are considered a comprehensive remedy for sediments exceeding Site CULs and will comply with all applicable remedy selection requirements under MTCA and SMS. The cleanup actions to remediate the marine sediments will include the following:

- Remove and dispose of piling and creosote-treated wood debris (SMA-1, -2, and -3)
- Demolish and dispose of two shoreline bulkheads and a remnant barge structure.
- Monitor the natural recovery of surface sediments in SMA-1 (areas with sediment concentrations between 5 and 8 ng/kg dw D/F TEQ and areas with sediment concentrations between 30 and 117 µg/kg dw total PCBs).
- Place a nominal 6-inch-thick layer of clean silty sand as an EMNR layer in SMA-2 in areas with sediment concentrations between 8 and 15 ng/kg dw D/F TEQ and in areas with sediment concentrations between 117 and 130 µg/kg dw total PCBs.
- Excavate sediments in SMA-3 in areas with sediment concentrations above 15 ng/kg dw D/F TEQ, and in areas with sediment concentrations above 130 µg/kg dw total PCBs.
- Construct shoreline erosion protection along the top of the bank adjacent to SMA-3 (as needed).
- Construct engineered caps over portions of SMA-3 (Logway area), following excavation.
- Include institutional controls that must be implemented to protect and maintain engineered caps.

The selected cleanup includes periodic post-construction sampling and testing of sediments within the biologically active zone to verify that cleanup standards are met and continue to be met. The scope and details of the long-term monitoring are discussed further in Section 9.

## 3.3 Sediment Management Areas

This section summarizes the SMAs within the Site boundary for marine remedial actions. Figure 3 illustrates the SMA boundaries based upon the data collected during the PRDI efforts. SMAs shown in Figure 3 are as follows:

- SMA-1: Includes areas where the remediation cleanup technology will be MNR and includes areas within the marine site boundary where IDW interpolated surface sediment concentrations are below 8 ng/kg for D/F TEQ and 117 µg/kg for total PCBs (MNR RELs). Surface sediments will be monitored for natural attenuation according to the Operation, Maintenance, and Monitoring Plan (OMMP), described further in Section 9.
- SMA-2: Includes areas where the remediation cleanup technology will be EMNR and includes areas within the marine site boundary where IDW interpolated surface sediment concentrations are between 8 and 15 ng/kg for D/F TEQ and between 117 and 130 µg/kg for total PCBs (EMNR RELs). Cleanup actions include placing a nominal 6-inch-thick layer of clean silty sand as an EMNR layer and monitoring according to the OMMP, described further in Section 9.

- SMA-3: Includes areas where the remediation cleanup technology will be removal or capping and includes areas within the marine site boundary where IDW interpolated surface sediment concentrations are above 15 ng/kg for D/F TEQ or 130 µg/kg for total PCBs (capping/removal RELs). Monitoring will be performed according to the OMMP, described further in Section 9. Cleanup actions within this SMA vary between the areas and are as follows:
    - Knoll Area: Removal of surficial material exceeding the CULs for this area of SMA-3 to a depth of 1 to 2 feet below existing grade and backfill with clean silty sand to pre-construction grades.
    - South Shoreline: Removal of surficial material exceeding the CULs for this area of SMA-3 to a depth of 2 to 3 feet below existing grade and backfill with clean silty sand to pre-construction grades.
    - Logway: Removal of surficial material exceeding the CULs for this area of SMA-3 to a depth of 2 feet below existing grade and backfill with engineered cap materials, as described in Section 8.5.

## 3.4 Future Use Assumptions

The current zoning of the Site property is industrial and future use of the Site property is expected to remain industrial.

## 3.5 Engineering Design Criteria

This section summarizes design criteria used in the engineering analysis of the sediment cleanup remedy.

### *3.5.1 Project Datums*

The horizontal datum used is Washington State Plane North Zone, NAD83, measured in units of feet. The vertical datum used is National Ocean Survey MLLW measured in units of feet.

### *3.5.2 Stormwater*

Details regarding the source control activities that will be conducted for existing stormwater infrastructure will be included in the upland EDR (to be provided by others). As discussed in Section 3.1.1, the required cleanout of accumulated sediments from stormwater infrastructure must be completed prior to conducting the marine sediment cleanup. This work will be completed as part of upland remedial efforts.

As previously stated, outfall locations may be required within the sediment cleanup extent. JELD-WEN will continue to engage with the property owners throughout the design process to integrate property owner-specified outfall locations, materials, and connection details for integration in future construction plans and specifications development. Stormwater infrastructure improvements will be required to include protective measures for the marine remediation, which may include energy dissipation features at the outfalls to prevent damage and erosion to the marine remedial design (Section 8).

### *3.5.3 Geotechnical Design Criteria*

Geotechnical data that will be utilized to support remedial design is based on results of in situ and laboratory test results as well as geotechnical engineering analysis to determine Site-specific design parameters. Design will include evaluation of the proposed remedial designs with specific regard to short- and long-term slope stability in upland slopes and removal cut slopes, consolidation settlement performance of underlying sediments in engineered cap areas and determination of long-term slope stability mitigation measures (i.e., shoreline armoring) if required.

Information obtained and presented during the PRDI Data Report (Anchor 2025) consists of data collected from eight shoreline geotechnical hollow stem auger borings. Borings were advanced using the standard penetration test (SPT) using a split spoon sampler. Soil and sediment samples collected during the geotechnical investigation were further characterized with laboratory geotechnical testing that included moisture content, grain size distribution, specific gravity, and Atterberg limits tests. To supplement these data, laboratory results and sediment descriptions obtained from sediment core logs are also utilized to support geotechnical design.

Geotechnical performance criteria for the remedial design include the following:

- **Slope Stability:** Slopes for dredge and cap and cover areas and adjacent upland slopes need to be stable. Soil modeling parameters were derived using the *Naval Facilities Engineering Command Design Manual 7.1 Soil Mechanics* (NAVFAC 2022). Stability was evaluated using the infinite slope equation for submerged material according to *Soil Strength and Slope Stability* (Duncan, Wright, and Brandon 2014) and limit equilibrium methods considering circular and noncircular slip surfaces in accordance with *Slope Stability* (USACE 2003). The target factor of safety is 1.3 for temporary slopes and 1.5 for long-term slopes (USACE 2003).
- **Compressibility:** Compressibility of materials to be capped or covered needs to be assessed for cap design to inform cap thickness determinations in the field. Compressibility will be assessed based on the gradation and density of the materials to be capped or covered using Terzaghi and Peck’s one-dimensional consolidation theory (Terzaghi and Peck 1967). Consolidation parameters will be estimated using correlations derived from laboratory testing results of site materials.
- **Bearing Capacity:** Bearing capacity of existing materials will be assessed to inform the cap and cover design as it relates to lift thickness and placement rates. Bearing capacity will be evaluated using methodology set forth by the United States Environmental Protection

Agency (EPA) in 1998 (Palermo et al. 1998), modified to meet a target factor of safety of 1.5 consistent with similar sediment remedy design approaches nation-wide.

Additional information regarding model development and geotechnical engineering design may be found in Appendix B.

### 3.5.4 Coastal Engineering Design Criteria

To address the coastal engineering design criteria for the Site, publicly available and Site-specific bathymetry data were used to perform numerical modeling, and scenario-based wave analysis. Key coastal data inputs—including bathymetry of the Site and surrounding region, historical water level records, and wind measurements—were compiled to establish the baseline environmental forcing conditions. These inputs inform the modeling framework developed to evaluate wave exposure under both existing and future conditions.

An extremal wind analysis was conducted to determine appropriate return-period wind speeds for design, focusing on the 100-year wind events. These wind conditions were applied within a stationary Delft3D Flexible Mesh (Delft-FM) model configured with a broad computational domain that includes the Site and the adjacent Possession Sound region. The model simulated wind forcing from three key directions: the WNW, representing the longest over-water fetch (approximately 12 miles); the SSW, which is the dominant and strongest wind direction at the Site; and the west, which is particularly relevant under FEMA BFE conditions when portions of Jetty Island may be inundated, potentially allowing waves to propagate toward the Site.

These wind scenarios were evaluated across several water level conditions, including Mean Sea Level, MHHW, and FEMA BFE, with each scenario also evaluated under 100 years of projected SLR conditions in accordance with Ecology guidance.

To simulate wave transformation and nearshore wave conditions, a stationary wave model was developed using Delft-FM coupled with SWAN (Simulating Waves Nearshore). The model generated Site-specific wave parameters such as significant wave heights, wave periods, and near-bottom orbital velocities. After evaluating the comprehensive range of forcing conditions described above, the most conservative design scenario was chosen for each area of the Site. Additional information regarding model development and coastal engineering design may be found under Appendix C.

### 3.5.5 Engineered Cap Design Criteria

Engineered caps are primarily designed to isolate or attenuate chemicals in underlying sediment to mitigate risk to human health and the environment. Caps provide both physical isolation and chemical isolation. At a minimum, engineered caps include a chemical isolation layer, which is the layer that provides physical separation between the contaminated sediments and the benthic community and surface water and limits the transport of the dissolved phase COCs to the surface of the cap and surface water. An erosion protection layer (cap armoring) is often placed on top of the chemical isolation layer to provide protection against erosive forces. Where the gradation differences between chemical isolation and cap armoring are significant, an intermediate “filter” layer may be needed. In some cases, the appropriate grain size can be specified such that the functions of all layers can be combined into a single material type.

This section describes the design process for modeling the chemical isolation layer and the cap armor layer.

#### 3.5.5.1 Cap Chemical Isolation

Modeling was conducted to evaluate the effectiveness of a chemical isolation layer in engineered caps in the Logway to address the flux of the dissolved phase D/F and identify a chemical isolation layer design configuration (i.e., thickness and composition, including whether sorptive amendments would be included and, if so, the amounts) that would provide long-term effectiveness in limiting concentrations at the cap surface to which benthic organisms can be exposed to levels less than the sediment CUL of 5 ng/kg dw on a SWAC basis. As described in the CAP, although most organisms burrow to a depth of 10 cm, soft-shell clams (*Mya arenaria*) have been identified in the tidal flats and can burrow as deep as 30 cm; therefore, the POC at this Site is the top 30 cm.

The modeling analyses were performed in accordance with guidance on cap design set forth by EPA and the U.S. Army Corps of Engineers (USACE; Palermo et al. 1998) and the Interstate Technology and Regulatory Council (ITRC 2014, 2023). The widely used model of chemical transport within sediment caps, CapSim (version 4.2; Reible 2023), was used for this evaluation. CapSim, or its predecessors, has been used for protectiveness and sediment cap design evaluations at numerous Superfund and MTCA sediment cleanup sites. This model simulates the time variable fate and transport of chemicals (dissolved and sorbed phases, including partitioning between these phases) under the processes of advection, diffusion and dispersion, biodegradation, bioturbation and bioirrigation, and exchange with the overlying surface water within a sediment cap using a one-dimensional representation of the various cap layers in the vertical direction. Details on the model structure and underlying theory and equations are provided in Shen et al. (2018), Lampert and Reible (2009), and Go et al. (2009).

Details of the modeling approach, model inputs, and results are included in Appendix D. The modeling showed that a 6-inch sand chemical isolation layer is sufficient to meet the marine sediment CUL of 5 ng/kg dw using conservative assumptions.

#### 3.5.5.2 Cap Armoring

Two methods will be used to evaluate stable sediment and armor stone sizes based on the physical forcing conditions at the Site. The selection of appropriate sediment and armor rock sizes will be informed by a representative design case developed through wave modeling described in detail in Appendix C. This case will incorporate applicable wind and water level scenarios and predicted wave characteristics—including wave height, period, and depth—as well as predicted near-bottom wave orbital velocities.

For the engineered caps at the Logway, the Hydraulic Design of Flood Control Channels Manual (EM 1110-2-1601), as referenced in the USACE Coastal Engineering Manual (CEM; USACE 2002), was considered for the analysis of "blanket stability in current fields." This method incorporates wave-induced bottom currents—captured in the model output as orbital velocities at the seabed—to evaluate the potential for sediment mobilization beneath the wave action. However, the resulting orbital velocities at the Logway were too small and this method was deemed inapplicable. Instead, the methodology for rock sizing for submerged structures outlined in the CEM was employed.

The cap design resulting from these evaluations will consist of an armor layer overlying one or more filter layers. If necessary, the filter layers will be sized to prevent winnowing of finer sediment within the chemical isolation layer through the pore spaces of the overlying coarse material due to wave action. The number of required filter layers depends on the degree of contrast in particle size and gradation between the in situ sediments and the selected armor material. In most configurations, one of the filter layers also functions as a chemical isolation layer. The overall geometry and gradation of the cap system follow established design guidance from the CEM (USACE 2002) and supporting literature such as Maynord (2012).

Armor layers for the engineered caps in the Logway Area will also need to consider the stormwater flow from the large outfall in the head of the area. Further discussion and armor sizing of the engineered cap at this location will be required as the design progresses.

### *3.5.6 Work Window and Allowable Construction Work Hours*

In-water construction activities will be performed consistent with allowable work windows established in coordination with state and federal resource agencies and tribes. The USACE permit application states that work below the highest astronomical tide will be completed during the approved work windows for Tidal Reference Area 7 (Everett), which includes saltwater areas in Port Gardner, Port Susan, and parts of Possession Sound and Saratoga Passage (WAC 220-660-310(g)). These work windows are (WAC 220-660-330):

- July 15 to February 15 for all work except dredging in Port Gardner and the Snohomish River.
- September 15 to February 15 for dredging in Port Gardner.
- September 1 to February 15 for dredging in the Snohomish River.

No surf smelt or herring spawning beds are mapped in or near the project Site (DNR 2024), and work windows for those species do not apply.

A great blue heron colony has been observed approximately 1 kilometer south of the Site. WDFW recommends that construction activities within shoreline and wetland habitats within 3 kilometers of a great blue heron colony be limited to outside of the primary nesting period between March 1 and August 31.

In order to comply with federal and state law, direct harm of migratory birds and disturbance of active nesting sites are prohibited. Osprey nests on the Site (present on piles) will need to be monitored and assessed to confirm that they are no longer in use prior to removal. Osprey nests are typically active between February 1 and August 31 but could remain active through September.

Based on the location of the Site, it is assumed that the July 15 to February 15 work window will apply, as the excavations are proposed to be conducted "in the dry"[3] and outside of the Snohomish River channel. During this construction window, typical daytime low tides reach elevation 0 feet MLLW (although on some days this occurs for only a few minutes). Seasonally, the lowest tides during daytime working hours typically occur in June and decrease dramatically in the later summer, fall, and winter months, as shown in Table 3. Permissions to begin work in June will be requested as part of the permitting process. Seasonally low tides lengthen the low-tide period and increase workable time during daylight hours, providing a benefit to the overall project safety and sequencing. The final work windows will be specified in the issued permits for the project, based on discussions with the regulatory agencies.

### *3.5.7 Demolition Design Criteria*

Demolition and removal of creosote-treated timber piles, bulkheads, derelict barge structure and armored slopes will be conducted in several areas of the Site (Figure 4). Piling and timber bulkheads will be removed using equipment and BMPs adapted from U.S. Environmental Protection Agency guidance (USEPA 2007); and the Department of Natural Resources Puget Sound Initiative—Derelict Creosote Piling Removal, BMPs for Pile Removal and Disposal (DNR 2011), as discussed in Section 5. Demolition and removal actions will be conducted so as to minimize residual creosote-treated wood fragments and particle loss during cutting and removal as well as meet geotechnical design criteria for stable slopes.

Armored slopes are generally composed of angular quarry spall rock, broken asphalt and concrete fragments on slope areas within and adjacent to SMA boundaries. In the Logway, armored slopes consisting of armor rock, concrete, and asphalt debris have been over steepened to approximately 2 horizontal to 1 vertical (2H:1V) and are supported at the lower mid-slope and toe by timber piles and bulkhead structures in some locations. Furthermore, buried water and telecommunications utility

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[3] In the context of sediment remediation, the term "in the dry" means when the tide has receded, and work is occurring above the water line at the time of construction. During such conditions, the contractor may encounter wet sediments or pools of standing water that are technically not completely dry.

services and a paved site access road run parallel to the shoreline on the upland, offset from the top of slope by approximately 2 feet. Protection of these utilities may require temporary shoring, temporary rerouting, or other measures when working in the Logway.

Demolition of slopes and structures must be protective of existing upland areas such as structures and buried utilities. Temporary, contractor-designed shoring will be necessary to maintain upland slopes and prevent slope instability during the course of demolition and removal work.

### *3.5.8 Shoreline Stabilization Design Criteria*

Based on the results of the coastal engineering design analysis, a conservative design scenario was selected to guide the shoreline stabilization design for each area of the Site. The results of this analysis indicated that the most conservative design conditions do not always correlate with the largest waves. The FEMA BFE and FEMA BFE with SLR fully submerge the structures, but the relatively deep water and relatively small waves result in little impact to the structure itself. The design scenario selected for the South Shoreline armoring was the rock size resulting from the 100-year wind induced waves originating from SSW at MHHW with 100-years of SLR. For the Logway, the shoreline armoring rock size resulting from the 100-year wind induced waves originating from WNW at MHHW with 100-years SLR was selected.

Shoreline stabilization will primarily consist of rock armoring, as approved by Ecology, with a focus on select shoreline areas adjacent to removal cuts and cap areas. Armor stone sizing and gradation will be determined in accordance with design methodologies outlined in the USACE CEM and the Rock Manual published by Construction Industry Research and Information Association. Additional information on armor stone sizing may be found in Appendix C.

Additionally, shoreline design slopes must also meet the geotechnical design criteria discussed in Section 3.4.2 for shoreline short and long-term stability and provide long-term slope stability at slopes adjacent to removal cuts and cap areas. If slopes will be destabilized during or after remedial actions, stabilization elements will be needed.

## 3.6 Anticipated Permits and Approvals

Table 4 summarizes the environmental permits and approvals anticipated to be required for the project. The table is based on the Applicable or Relevant and Appropriate Requirements listed in the Final CAP (Table 3.2) as well as experience in permitting similar projects in the Puget Sound region.

# 4 Remediation Technologies

Removal of contaminated sediment and creosote-treated wood structures will likely entail accessing removal areas from the shoreline at low tide using land-based equipment. Placement of EMNR material and engineered caps using land-based equipment and working in the dry will allow for more accurate placement and verification than through water column subtidal placement methods.

This section summarizes and reviews the technologies that form the basis for the marine remedial design presented in this EDR. Applicable best management practices are presented in Section 5.

## 4.1 Demolition Methods

All demolition of structures, removal of debris, and piling removal will be performed using mechanical means with access from upland areas, where feasible, prior to contaminated sediment removal in each area. Temporary shoring will be installed to support the shoreline and existing upland utilities prior to the demolition of the bulkheads in the Logway Area. Piling removal will be completed in accordance with the construction BMPs, as outlined in Section 5.

## 4.2 Excavation Methods

All excavation activities are assumed to be performed using land-based equipment. Intertidal excavation will be performed using mechanical means with access from upland areas. Intertidal sediment to be removed will be excavated using mechanical means during low-tide conditions in the dry, to the extent practicable. Conducting intertidal sediment and shoreline bank soil excavation in the dry during low-tide periods will reduce the potential for release of impacted intertidal sediment and shoreline bank soils during construction and will facilitate more efficient handling and processing of excavated sediments because the volume of entrained water is significantly lower than that occurring during wet excavation (i.e., dredging).

Depending on weather, tides, scheduling, and contractor production, it may be necessary to conduct intertidal excavation below the water surface. As necessary, intertidal excavation during shallow water conditions (e.g., to address weather, access, or schedule constraints) would be described in the contractor’s Construction Work Plan and would be subject to approval by the Project Engineer and Ecology to ensure protectiveness.

## 4.3 Cover, Cap, and Armor Material Placement

After excavation is completed, the design includes placing various backfill or capping materials depending on the specific SMA. All material placement activities are assumed to be performed using land-based equipment from upland areas, where feasible. Backfill and capping material will be placed using mechanical means during low-tide conditions in the dry, to the extent practicable.

An EMNR layer will be placed in SMA-2. A variety of silty sands and gravels, engineered caps, and shoreline armoring will be placed in SMA-3. The Construction Specifications will identify acceptable placement methods and material specifications. The contractor will be required to demonstrate that they can consistently meet material placement thickness tolerances.

# 5 Construction Best Management Practices

BMPs will be employed during implementation of the marine cleanup actions at the Site. BMPs are management practices that are determined to be effective, practical, and sustainable means of achieving an environmental performance objective (e.g., compliance with water quality criteria) during Site cleanup. BMPs will be used to meet these performance objectives during construction and to limit potential adverse construction impacts. The BMPs presented in Appendix D are proposed for implementation of the marine cleanup actions at the Site. Final BMPs will be updated where necessary to incorporate additional BMPs if defined during final permits or substantive requirements.

# 6 Net Environmental Effects

All sediment cleanup activities have the potential for short-term environmental impacts in and around the work area; in the long term, sediment cleanup is intended to provide a net environmental benefit. This section describes the evaluation of net environmental effects and discusses potential compensatory mitigation considerations.

## 6.1 Net Environmental Effects Analysis

The cleanup of the Site sediments is expected to have a beneficial impact on environmental conditions and specifically aquatic habitats within the Site.

The intertidal habitat within the Site boundary is highly degraded due to long-term industrial use of the Site and associated sediment contamination, in-water debris and creosote-treated piles, the presence of anthropogenic shoreline debris, and other habitat-limiting factors. It is expected that implementation of this cleanup and source control work will result in an overall improvement of habitat conditions for the intertidal habitats within the Site by addressing these habitat-limiting factors. The net environmental improvement will result due to the following:

- Removal of contaminated sediment present in the seabed
- Removal of existing creosote-treated piles, two bulkheads, and the remnants of a wooden barge
- Removal of anthropogenic shoreline debris in areas adjacent to SMA-3
- Capping of contaminated sediment, therefore removing exposure pathways
- Placement of clean silty sand backfill to manage residuals from SMA-3 removal activities and provide EMNR throughout SMA-2
- Protection from potential future erosion of the upland areas of the Site, adjacent to SMA-3, by appropriately stabilizing the shoreline

Shoreline stabilization will be accomplished by installing temporary sheet piles (as needed in the Logway Area) and placing riprap along vulnerable sections of the shoreline where contaminated upland soils are present. Hard armoring methods like this are considered habitat-limiting compared to soft or hybrid methods because they typically do not support habitat connectivity, sediment transport and accretion, and habitat area for nearshore vegetation, forage fish, and juvenile salmonids. In this instance, however, stabilization of the shoreline along with the removal of creosote-treated piles and removal and capping of contaminated sediments are crucial to removing exposure pathways. The removal of these exposure pathways will overall increase the quality of the existing habitat area and potentially support the native species colonization of the degraded intertidal area.

Potential short-term impacts of the cleanup will be mitigated to the extent practicable. It is expected that the intertidal community will fully recolonize Site sediment and structures within a few years of the completion of the remediation, as there are numerous nearby similar habitats with intertidal organisms that will aid in recolonization. It is likely that the remediation will increase suitable intertidal habitat because the future substrate will have significantly reduced levels of contaminants. Low velocity and fine substrate habitats like the remediated Site tidal area may provide suitable habitat for eelgrass and macroalgae to colonize. Eelgrass is an important spawning substrate for Pacific Herring; an important food source for juvenile salmonids and provides refuge for juvenile salmonids as they grow and migrate into the ocean environment. The removal of anthropogenic shoreline debris, existing creosote-treated piles, two bulkheads, and the remnants of a wooden barge are expected to increase the overall available habitat and further improve water and sediment quality by removing these ongoing sources of contaminants. Overall, the project will create a net positive environmental effect. This project includes removing ongoing sources of contamination, providing clean sediments to support functions and species, endeavoring to achieve net gains in aquatic areas, and restoring lost habitat attributes by removing remnant structures and removing treated timber piles where practicable.

## 6.2 Compensatory Mitigation and Wildlife Considerations

The presence of osprey (*Pandion haliaetus*) nests on creosote-treated piles would necessitate removal of the nests in order to complete the cleanup action. Under the Migratory Bird Treaty Act and state law, all active or occupied nests of migratory birds are protected and cannot be disturbed without specific authorization from WDFW or U.S. Fish and Wildlife Service Regional Office in Portland, Oregon; only inactive osprey nests may be removed (i.e., destroyed) to comply with federal and state wildlife laws. The early and primary nesting season for osprey is generally between February 1 and August 31; however, fledgling may not be completed until as late as September (ODFW 2012). Because osprey have been observed nesting on the Site, nest status should be monitored and confirmed by a WDFW wildlife biologist or other professional wildlife biologist before any removal action occurs. Osprey also exhibit high site fidelity. To prevent re-nesting, nest excluders should be installed on piles where nests are removed if the pile is not removed before the next nesting season (Seattle City Light 2022). Whenever a nesting site is destroyed, agencies recommend that a replacement nest site be provided within 300 feet of the removed nest to protect osprey populations and to help prevent rebuilding of nests in the undesirable location. Work around occupied nests (typically between February 1 and August 31) must be restricted to a setback distance of up to 650 feet.

The great blue heron (*Ardea herodias*) nesting colony would also require consideration prior to work activities. WDFW recommends a series of buffer zones to protect nesting great blue heron populations during and outside of the nesting season. While the Site is well outside of the yearround and seasonal buffers, it is within the designated 3-kilometer foraging habitat (Azerrad 2012). In this instance, WDFW recommends work within key foraging areas be limited to outside the primary nesting period, which is approximately March 1 September 30. Although the Site is within the designated foraging habitat for great blue heron, existing contamination and the lack of suitable vegetation for forage species reduce the value of the foraging habitat. Activities associated with the marine cleanup to remove contamination in nearshore areas will increase the value of the foraging habitat. Additionally, the Site is a very small portion of the overall foraging habitat, with minimally disturbed areas available for foraging to the north and to the west of the Site.

Although there are estuarine wetlands located at the Site, the habitat function of those wetlands is hindered due to the existing contamination. The marine cleanup actions will remove existing contamination and restore the Site to existing grade. For the areas of the Site where wetland impacts cannot be avoided, the cleanup will have temporary impacts during construction but will ultimately result in an overall improvement for wetland habitat function by removal of contamination. Therefore, no compensatory mitigation is anticipated to be needed to offset the temporary impacts to estuarine wetlands on the Site.

# 7 Site Preparation and Staging Areas

As part of construction activities, the Work will require mobilization of land-based equipment such as excavators, backhoes, dozers, loaders, dump trucks or other equipment and potentially water-based equipment including barges and other specialized equipment. The selected contractor or contractors will be required to bring the necessary equipment to the project area. The equipment will be staged, moored, and repositioned as necessary to complete the work and in compliance with all permitting requirements.

This section discusses the project areas that may be used by the contractor to stage equipment and stockpile or transload excavated soils, hardscape, debris, and capping and armor materials. The configuration and layout of upland staging areas will depend on the selected contractor's construction methods and the available space at the Site at the time of construction. Potential temporary staging, stockpiling, and transloading areas are shown in Figure 5.

## 7.1 Staging and Transload Facilities

Portions of the uplands will be made available to the contractor for use in staging equipment and materials for the project, for access to conduct shoreline work, and for temporary stockpiling and transloading of backfill materials, excavated sediment, and debris. Approximately 5 acres near the middle of the uplands portion of the Site will be available to the contractor during construction as shown in Figure 5. The northwestern and southeastern portions will not be available and must remain accessible to the tenants at all times. The available area may be modified as necessary to coordinate construction activities with tenants. Other locations may alternatively be proposed for use by the contractor for staging and stockpiling, pending the approval of the Owners, tenants, and project engineer.

Locations and approximate dimensions of stockpiles within the Staging and Stockpile Area will be described in the contractor's work plans, complying with permitting requirements and subject to Ecology approval. All temporary stockpile areas will be appropriately contained to prevent uncontrolled runoff from entering surface water. Methods for containing the stockpiles will be described in the Construction Work Plan, which will be a required contractor submittal that will detail operations, including setup and breakdown, stormwater management, and maintenance and cleaning of upland work areas. An example containment scenario incorporates stacked ecology blocks, k-rails, or constructed berms, around the perimeter of each stockpile with an impervious geotextile fabric along the stockpile perimeter as shown in Figure 5.

## 7.2 Stockpile and Excavation Dewatering

Effluent from contaminated sediment stockpile dewatering may either be temporarily contained, treated, and discharged under an NPDES permit or (pending further revaluation during remedial design) may be allowed to infiltrate in the uplands. If containment and treatment is required stockpile and excavation dewatering will include the following:

- The contractor will be required to construct water-tight stockpile containment areas and cover stockpiled contaminated sediment to prevent precipitation from collecting in the containment areas.
- The contractor will be required to collect, test, and treat effluent water from stockpiling dewatering operations per local regulations prior to discharge into receiving waters.

Alternatively, if it can be demonstrated that infiltration of effluent water from stockpiling dewatering operations will be protective of groundwater, this effluent may be infiltrated in the upland area of the Site.

## 7.3 Stormwater Management

It is assumed that a Construction Stormwater General Permit (CSGP) will be obtained for construction activities at the upland stockpile and staging areas (to be confirmed during later permitting phases). Clean material staging areas will be kept separate from excavated material stockpile areas. Given that hazardous substances are present in the construction areas, the CSGP may require issuance of an Ecology order to establish discharge limits for dioxin/furans, PAH compounds, and PCBs or proxy for contaminant removal such as turbidity or total suspended solids criterion. Treatment and monitoring may be required for any stormwater from the construction areas prior to discharge to the receiving waters.

Stormwater will be managed according to permit conditions at the upland materials stockpile and staging areas. The contractor will prepare a stormwater pollution prevention plan (SWPPP) that meets conditions of the CSGP, and details BMPs to minimize generated waters and ensure compliance with applicable water quality criteria and discharge requirements. The SWPPP will include the following:

- Identify potential sources of pollution that may be reasonably expected to affect the quality of stormwater discharge from the work area.
- Describe and ensure implementation of practices that will be used to reduce the pollutants in stormwater discharge from the work area.
- Identify applicable BMPs and treatment requirements for stormwater management.

## 7.4 Temporary Site Controls

Upland temporary facilities will be controlled by the contractor with respect to safety, noise, dust, security, and traffic. The construction Site will be closed to the public; however, the owner’s operations at the Site (including that of their tenants) will continue throughout construction.

Temporary erosion and sediment control (TESC) BMPs will be employed to prevent pollution of air and water and control, respond to, and dispose of eroded sediment and turbid water during construction. TESC BMPs will be employed in all work areas, equipment and material storage areas, stockpiles, and haul areas. Areas of the Site will be designated as clean support areas (e.g., imported material staging areas) or contaminated (e.g., excavated material stockpile areas and haul routes to and from contaminated stockpiles). Equipment will be decontaminated before moving from contaminated areas to clean support areas to prevent cross contamination. BMPs such as excavation in the dry, daily backfill cover before tidal inundation, stockpile containment, and sweeping and housekeeping along contaminated material haul routes will further prevent cross contamination.

## 7.5 Other Environmental Considerations

Other environmental considerations associated with upland staging and stockpiling activities include the following:

- **Control of fugitive dust:** The contractor will control fugitive dust from the stockpile and staging areas using appropriate BMPs. The tracking of sediment or dust off Site to City of Everett streets will be controlled.
- **Mitigation of traffic impacts:** Traffic impacts associated with project construction activities will be mitigated to the extent practicable. This will include using barges where appropriate to transport material to and from the Site, using designated truck haul routes. Flaggers will be used if necessary to support traffic safety.

# 8 Remedial Design

The following sections describe the detailed design related to debris removal, contaminated sediment removal, backfill, and capping of cleanup areas, placement of EMNR and MNR within the Site boundary, including water management, sediment and imported material handling, transport, and sediment and debris disposal.

## 8.1 Structure and Debris Removal

Anthropogenic debris present throughout the Site boundary includes derelict piles, failed timber bulkheads, the remnants of a wooden barge, asphalt, concrete objects, and metal objects of various sizes. Creosote-treated piling removal is identified as a form of source control in the CAP. Therefore, the identified debris to be removed as part of the marine remedial actions consists of two bulkhead structures containing an unknown number of piles and lagging, a remnant wooden barge, and approximately 53 free-standing piles or dolphins. The bulkheads, wooden barge, and 32 of the piles are located within the project boundary, an additional 21 piles identified outside of the Site boundary are also required to be removed. Additionally, broken asphalt, concrete objects, logs, wood, and metal objects of various sizes exist adjacent to the removal units and will be removed as incidental debris. In accordance with the CAP, anthropogenic debris that exist within the Site boundary but are not adjacent to removal units will remain in place.

Bulkhead, piling, and debris removal on shorelines adjacent to the Logway channel require limiting disturbance during removal of structures and debris, and following removal cuts so that the uplands remain stable. Temporary shoring will be required to maintain the continued function of buried utilities located at the top of slope, which include water, sewer, and fiber optic infrastructure. In addition, existing concrete and asphalt debris in the Logway and South Shoreline will be removed in areas of shoreline adjacent to removal areas, with replacement by engineered armor to prevent erosion of the banks and future loss of uplands.

Removed structures and debris are expected to be managed and disposed of at a facility permitted to accept these materials. The contractor will select the disposal facility and confirm the facility is properly permitted as part of their pre-construction submittals.

## 8.2 Sediment Removal Unit Design

This section describes the remedial design for the removal of contaminated sediment that is applicable to SMA-3. The Removal Unit development was an iterative process that included integrating multiple design criteria, including the extents of contamination, equipment operational requirements, and Site-specific constraints into one constructable removal prism.

Intertidal excavation during peak tidal exchange periods will increase the potential for water quality impacts. It is assumed excavations will be completed in the dry to the extent possible and backfilled during one tidal cycle.

### 8.2.1 Removal Unit Design

The primary criterion of the Removal Unit design is to provide a constructable surface that removes contaminated sediment above the designed contaminated surface within SMA-3 for full removal of contaminated sediment above the Site CULs in the South Shoreline and Knoll areas where sediment contamination is less than 4 feet below grade. In areas where sediment contamination is greater than 4 feet below grade (Logway Area), engineered caps are proposed and the Removal Unit design is based on the thickness of the engineered cap, where removal depths equal the engineered cap thickness (including material removal and placement tolerances). The Removal Unit design is based on both a quantitative evaluation (use of the sediment core chemistry data) and a subjective evaluation based on past project experience.

Removal Units were designed based on the nature and extent of contamination in each area and based on the target contaminated sediment removal depths, as informed by the CAP and PRDI results. The lateral extents of removal areas are informed by the surface sediment delineation performed during the PRDI. The target removal depths consider the identified depths of contamination within each Removal Unit as the primary consideration. Secondary considerations in Removal Unit design includes geotechnical properties of the sediment, locations, and characteristics of adjacent shorelines, and the typical precision and accuracy of the equipment that will likely be utilized to implement the work (Figures 6 through 10).

In addition to the completion of required monitoring (Section 9), the completeness of designed sediment removal will be verified as described in the Construction Quality Assurance Plan and in the Compliance Monitoring and Contingency Response Plan (to be completed at a later date). Progress surveys will verify that design excavation elevations have been met, and in locations where adequate depth has not been achieved the contractor will be required to remove additional material.

### 8.2.2 Allowable Over-Excavation

Allowable over-excavation is defined as additional material removed from below the required removal surface to account for equipment accuracy and tolerance. With careful vertical control and modern positioning systems, it should be possible to limit over-excavation to 6 inches. Therefore, a 6-inch maximum over-excavation allowance will be used for this project. It should be noted that the 6-inch allowance represents a maximum allowable over-excavation and excavating below this would represent excessive excavation that would not be a payable amount.

### 8.2.3 Excavation Side Slopes and Temporary Shoring

Based on identified sediment geotechnical properties and best professional judgement, external excavation side slopes of 2H:1V have been incorporated into the design around the perimeter of the extent of required removal units. Sloughing beyond 2H:1V may incidentally occur. The occurrence of such sloughing will vary depending how the work is implemented. Slough material must be removed prior to acceptance of the work.

On the landward side of the removal units where steeper slopes may be undermined by contaminated sediment removal or bulkhead removal, temporary shoring will be required to protect the upland infrastructure and buried utilities at the top of the slope. Temporary shoring is expected to be limited to the Logway Area only.

The excavation side slope design and areas of temporary shoring are shown in Figures 6 through 10 and design calculations are included as part of Appendix B.

## 8.3 Sediment Handling, Transport, and Disposal

Excavated sediments and all removed structures and debris will be transloaded and transported to a commercial landfill that is permitted to receive the waste. Final transportation to the landfill is not defined by this engineering design. The selected contractor may utilize barge, truck, and rail depending on their approach to the work and the selected landfill facility. Examples of permitted landfills that have historically managed contaminated sediments and debris include the Waste Management landfills in Wenatchee, Washington, and Arlington, Oregon, and the Allied Waste facility located in Roosevelt, Washington. Other landfills may be utilized for disposal management, provided that the contractor can demonstrate they are properly permitted.

The contractor will be responsible for transport and disposal of the contaminated material at the approved licensed disposal facility. The contractor will be required to meet the following specific requirements for transportation and disposal:

- The contractor will be required to identify its selected licensed disposal facility as part of its bid and provide certification from the disposal facility that they can, and are willing to, accept the project contaminated materials with its contaminant and salinity concentrations.
- Debris will be disposed with the dredge sediment at the selected licensed disposal facility. The separation of debris from the dredge sediment may be completed by the contractor or the contractor may coordinate with the disposal facility to complete separation.
- The contractor will be responsible for the safe transport of all waste (e.g., contaminated sediment, effluent, and debris) in accordance with all applicable regulations and guidelines.
- When wet materials are transported, haul trucks or containers will be lined or otherwise sealed to prevent release of sediment during transport.

- Waste will be tarped and adequately secured to minimize the release of odors and dust and ensure that no spillage occurs.
- The contractor will prepare and sign all manifests and obtain all approvals for the transport of contaminated sediment and debris.
- The contractor will not be permitted to modify its accepted disposal facility without prior acceptance.
- The contractor will be required to provide legible copies of all manifest, weight bills, bill of laden and other records associated with sediment and other material handling, that is associated with off-site transport and disposal.

## 8.4 Material Placement

It is assumed excavations and material placement will be completed in the dry to the extent possible and at least partially backfilled during the same tidal cycle that the excavation is performed. This section summarizes the materials and final grades proposed for each area. The final material placement design integrated multiple design criteria, including equipment operational requirements, the extents of the removal units, engineered cap requirements, slope stability, tidal flat drainage, and surficial COC concentrations outside of Removal Unit boundaries. These criterion are further detailed in the subsequent subsections with material placement design presented in Figures 11 through 15.

### *8.4.1 Allowable Overplacement*

Allowable overplacement is defined as additional material placed above the required material placement design thickness to account for equipment accuracy and tolerance. With careful vertical control and modern positioning systems, it should be possible to limit overplacement to 6 inches. Therefore, a 6-inch maximum overplacement allowance will be used for this project. It should be noted that the 6-inch allowance represents a maximum allowable overplacement and material placed above this would represent excessive placement that would not be a payable amount and may be required to be removed at the contractor's expense.

### *8.4.2 Engineered Cap Design and Placement*

This section summarizes the design for engineered caps to be constructed within SMA 3. An engineered cap will be placed to provide protective containment. The engineered caps will include the following three layers:

- A minimum 6-inch-thick chemical isolation layer of clean sand
- A minimum 6-inch-thick filter layer of sand/gravel material with a $d_{50}$ of approximately 0.4 (3/8) inches.
- A minimum 1-foot-thick armor layer of rock and quarry spalls materials with a $d_{50}$ of approximately 3 inches and a maximum size of 5 inches. This layer will likely vary for the

engineered cap in the head of the Logway Area to protect against the stormwater flows from the existing outfall. Sizing of the armor layer for that engineered cap will occur during future phases of design.

The layers provide protective containment consistent with cleanup requirements. The gradations are summarized below.

**Clean Sand.** The chemical isolation layer of the cap will consist of well-graded sand that is free of debris and organics, with less than 5% passing the US No. 200 sieve.

**Sand/Gravel Filter Layer.** Filter layer of sand/gravel will conform to the following specifications:

| Approximate Size | Percent Passing |
|---|---|
| 2.5-inch | 99-100 |
| 2-inch | 65-95 |
| 1-inch | 50-85 |
| 3/8-inch | 40-60 |
| No. 4 | 26-44 |
| No. 40 | 16 max. |
| No. 200 | 5.0-9.0 |

Notes: 2022 Washington Department of Transportation Standard Specification 9-03.11(1) Streambed Sediment

**Quarry Spalls Armor Layer.** Armor layer of will conform to the following specifications:

| Approximate Size | Percent Passing |
|---|---|
| 5-inch | 99-100 |
| 4-inch | 70-90 |
| 3-inch | 30-60 |
| 2-inch | 10 max. |

### 8.4.3 Removal Area Backfill

Placing clean sand backfill in removal areas that are not slated for engineered caps (following excavation activities) provides greater certainty in achieving post-construction performance standards (i.e., reductions in surficial sediment concentrations). Additionally, with Removal Unit boundaries exclusively in the intertidal zone, the final surface is designed to provide drainage of the tidal flats while avoiding dramatic changes in post-construction elevations. Clean silty sand will be placed as backfill over all excavation extents, except where engineered caps are implemented, to pre-construction grades plus 6 inches, tying into the adjacent EMNR areas to provide consistent tidal flat drainage and habitat elevations.

### 8.4.4 *Enhanced Monitored Natural Recovery*

Following the incorporation of the PRDI data, as discussed in Section 2.2.5, the cPAH SWAC for the Site was 41.4 µg/kg and the estimated, theoretical, post-cleanup SWAC for the entire marine area was 31.5 µg/kg[4]. The post-cleanup SWAC will exceed the target background concentration of 21 micrograms per kilogram (µg/kg), unless remedial design areas for EMNR placement extend beyond the footprint of SMA 2. Therefore, the EMNR layer will be placed over additional areas outside of SMA-2 to achieve the cPAH TEQ SWAC, as needed to produce a final sediment surface that complies with Site CULs. Further discussion regarding the SWAC calculations is presented in Section 8.6.2.

All areas of SMA-2 include EMNR placement as the remedial action. The EMNR layer consists of a nominal 6-inch-thick layer of clean silty sand/gravel cover that will tie into the backfill for excavated areas. This clean material is not an engineered cap. Rather, it is intended to mix with the existing tidal mudflat surface.

## 8.5 Shoreline Stabilization and Armoring

Shoreline stabilization will primarily consist of rock armoring where needed, and as required by Ecology, with a focus on shoreline areas along the Logway and South Shoreline areas within SMA-3. In some areas, shoreline armoring will be connected to the engineered caps and overlap as needed. Armor stone will be placed after the structure and debris removal and temporary shoring installation has been completed. Areas outside of the remedial footprint that will be armored include areas where debris are removed and areas required by Ecology. Upland bank-area samples are being collected to support the decision for placing armor as a source control measure.

Armor sizing and layer thickness are dependent on armor placement location. The design scenario selected for the South Shoreline armoring resulted in armor stone with a $D_{50}$ of about 11 inches. For the Logway, the shoreline armoring should have a $D_{50}$ of 3 inches. For the South Shoreline armoring, the bedding layer should have a $D_{50}$ of 3 inches and can fit the same gradation as the armor stone for the Logway. For the Logway armoring, the bedding layer should have a $D_{50}$ of 3/8 inches. Bedding layer thickness of 6 inches underneath 18 inches of armor stone will be required to meet long-term slope stability design requirements as well as resistance to wave and current erosive forces. Discussion of armor layer thickness and nominal sizing is included in Appendices B and C, respectively.

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[4] The post-cleanup SWAC was estimated by using an assumed replacement value of 12 µg/kg cPAH TEQ for clean imported material in SMA-2 (areas exceeding the D/F and PCB RELs for EMNR) and in SMA-3 (areas exceeding the D/F and PCB RELs for capping/removal).

### 8.5.1 Climate Change Resilience Considerations

Climate change is being addressed in this design by incorporating projected SLR and extreme wind events into the coastal design framework. The SLR memo prepared for this project (Anchor QEA 2020) designated the project as a long-term or high-risk remedial site that requires the consideration of SLR at the high end of the projections assumed for the end of the century, as well as inundation under both the BFE and MHHW. *Projected Sea Level Rise for Washington State – A 2018 Assessment* (Miller et al. 2018) states that the likely range of SLR is considered to fall between the 83% and 17% likelihood. In this case, by 2100 SLR could reach 1.6 to 2.9 feet (0.49 to 0.88 meters) under RCP 8.5, respectively. Due to the high-risk categorization of the Site determined using Ecology guidance, at a minimum, the upper end of this range should be considered. Rather than accounting solely for the end-of-century estimate, this analysis accounted for the 100-year SLR estimate using the RCP 8.5 50% likelihood estimate for 2130 of 3.0 feet (0.91 meters). In addition, extremal wind analyses were performed to characterize the 100-year return-period wind speeds, ensuring that wind-driven wave conditions are appropriately captured under both current and anticipated future climates. These considerations help ensure that the shoreline stabilization and cap designs remain resilient and effective over the long term.

## 8.6 Post-Construction Surface Chemistry Conditions

A predicted SWAC of the post-construction surface was estimated using digital geospatial methods. Industry standard ArcGIS Pro software was used to conduct all geospatial analyses associated with this effort. The calculations are provided in the subsequent sections, along with the predicted post construction surface concentrations in Figure 16.

### 8.6.1 Inverse Distance Weighting Interpolation

Chemistry interpolations of Site surface sediments concentrations were performed using the IDW algorithm, as implemented within the GeoStatistical Analyst extension to ArcGIS Pro. IDW is a relatively basic algorithm that is well suited to estimations involving environmental data. IDW assigns values to unsampled points within the interpolation domain using a weighted average of the sample points within some search distance of the unsampled points, with the points nearer to the unsampled point having greater influence over the concentration assigned to the unsampled point than points farther away. IDW interpolation parameters were selected based on exploratory analyses of the chemistry data. A brief discussion of IDW parameters used to perform the cPAH concentration interpolation is presented below:

- **Power:** Sample weights are assigned using the inverse of the distance between a sampled location and an estimated location raised to a mathematical power. Higher power values allow nearby sample locations to apply greater influence, while lower power values increase the influence of sample locations that are farther away. A power of 3 was used for inverse distance squared weighted interpolation because it provided the best compromise between minimizing the root mean squared error during cross-validation while maintaining interpolation continuity.

- **Search Radius:** The search radius defines the distance around each estimated location within which sample points are selected to calculate its estimated value. A search radius of 500 feet was selected to ensure that a sufficient number of neighboring data points would be captured within the search radius in site areas having lower data density.
- **Minimum Number of Neighbors:** This parameter defines the minimum number of sample points within a search radius that are used to calculate an estimated value. A value of 6 was selected to ensure that estimated values were based on a reasonably sized sample of neighboring values. If too few samples exist in the search area to meet this minimum criterion, the algorithm will interpolate values using whatever samples are available, down to a minimum of three samples.
- **Maximum Number of Neighbors:** This parameter defines the maximum number of sample points within a search radius that are used to calculate an estimated value. A value of 12 was selected as a reasonable but not excessive number of neighboring points to use for interpolation. Larger values of this parameter may produce smoother contours, but at the expense of more aggressive averaging and a reduced ability to resolve local heterogeneities in the concentration distribution.

All concentration data were log-transformed prior to interpolation to account for the pronounced skewness and lognormality of the datasets, which is typical of environmental data and further compounded by the heterogeneous conditions at the Site. Site cPAH surface sediment concentrations within the dataset range from 1.7 µg/kg to 300 µg/kg and include locally steep gradients. The cPAH IDW interpolation was conducted using log-transformed values, and a log-transformed raster surface was developed consistent with the generally lognormal data distributions. Then, a back-transformed raster surface was generated to enable presentation of the raster in its original units of µg/kg and to enable calculation of the SWAC for the Site.

### *8.6.2 SWAC Calculation*

A SWAC is an area-weighted average of the interpolated sample concentration raster surface used to estimate mean contaminant concentration across a specified area. The interpolated raster surface created for cPAH using the IDW algorithm comprises a mesh of 1-foot by 1-foot grid cells distributed across all site areas within the marine site boundary. Because each grid cell is exactly the same area (i.e., 1 square foot), using the average of the interpolated concentration of all grid cells yields the average cPAH concentration within the marine site boundary.

A pre-construction SWAC of 41.37 µg/kg was calculated from the original cPAH interpolated raster surface without considering the remedial design implementation. Then a second, post-construction predicted SWAC was calculated from a modified version of the original cPAH interpolated raster where all concentrations within site areas targeted for sediment removal and backfill/capping or EMNR placement were replaced with a value of 12 µg/kg (approximately half of natural background concentrations). This replacement value was determined through an iterative evaluation of the effectiveness of EMNR and is based on assumed concentrations of import materials. The calculated post-construction SWAC is 19.97 µg/kg, which includes SMA-1 where no EMNR placement is occurring.

# 9 Compliance Monitoring

Compliance monitoring requirements associated with remedy implementation consist of the following:

- Protection monitoring during construction to confirm that environmental impacts associated with remedial activities are minimized
- Performance monitoring to ensure that remedy construction is in accordance with the project plans and design
- Confirmation monitoring following remedy completion to confirm compliance with cleanup standards (Ecology 2023)

Requirements for compliance monitoring will be further established in the OMMP and the Construction Quality Assurance Project Plan to be submitted to Ecology with the 60% Construction Plans and Specifications as presented in the AO schedule of deliverables.

## 9.1 Protection Monitoring

The performing PLPs will conduct protection monitoring during construction and operation and maintenance activities to confirm the protection of human health and the environment. Protection monitoring requirements for worker safety will be described in Health and Safety Plans, and environmental protection monitoring will be described in the OMMP and Construction Quality Assurance Project Plan or equivalent documents developed as pre-construction submittals. Such documents will be reviewed and approved by Ecology.

Marine sediment protection monitoring may consist of the following:

- A Water Quality Monitoring Plan may be prepared for the unlikely event that intertidal excavation needs to be performed in water (during high tide periods when the work zone is submerged) using land-based equipment; however the intent is to perform this work in the dry during low tide. Thus there may not be a need for Water Quality Monitoring.

In-water construction activities will be performed during allowable work windows established in coordination with state and federal resource agencies and tribes. Final work windows will be specified in the issued permits for the project.

### *9.1.1 Marine Mammal Monitoring*

Pile removal and pile installation will be completed during low tide (in the dry) as much as possible. Therefore, the project is not anticipated to require an Incidental Harassment Authorization to comply with the Marine Mammal Protection Act. For any of the pile installation or removal work that cannot be accomplished in the dry, a marine mammal monitoring plan (MMMP) will be developed and implemented specifically for Southern resident killer whale (*Orcinus orca*) and humpback whale

(*Megaptera novaeangliae*), which are listed under the Endangered Species Act (ESA). Marine mammal monitoring will be conducted according to the MMMP by protected species observers (PSOs) only when pile removal or pile installation activities must occur in water due to unforeseen construction issues. Pulling of broken or whole timber piles without using vibratory equipment will not require monitoring even if completed in water.

The monitoring area will consist of an Exclusion Zone that is inclusive of both the Level A Injury Zone and Level B Harassment Zone for each species. The Exclusion Zone will vary by the type of pile work and marine mammal functional hearing group (Southern resident killer whale is a mid-frequency cetacean; humpback whale is a low-frequency cetacean). The Exclusion Zone comprises the areas where a Stop Work Order will be issued and a take documented if an ESA-listed marine mammal was present. A temporary stop-work protocol may be triggered when an ESA-listed marine mammal is observed approaching the Exclusion Zone during in-water vibratory or impact pile driving. Exclusion Zones will be established for each hearing group based on the type of in-water pile and construction activities, which could include the following:

- Removal of up to 200 timber piles (12- to 24-inch)
- Installation of up to 600 linear feet of sheet pile
- Installation and removal of up to 10 temporary steel pipe piles (24-inch)

The Exclusion Zone will be monitored by a sufficient number of qualified PSOs to effectively implement the MMMP. The number of PSOs may be different for each pile activity, which will be determined during development of the MMMP.

### *9.1.2 Bird Monitoring*

U.S. Fish and Wildlife and WDFW recommend a nesting bird survey be completed before the commencement of cleanup activities to identify any active nests and avoid disturbing protected species within the Site. Additionally, a WDFW or other professional biologist would need to monitor and assess any nesting sites prior to their destruction or relocation.

### *9.1.3 Archaeological Monitoring*

Multiple state and federal preservation laws may require review of potential impacts to archaeological and historic properties, including but not limited to the National Historic Properties Act, the Archaeological Resources Protection Act, the State Environmental Policy Act, Governor’s Executive Order 21-02, Revised Code of Washington (RCW) 27.44, RCW 27.43, and RCW 68.50. Since the project and excavation are anticipated to take place at least 10 feet above sediments with potential to contain unrecorded archaeological resources, no further analysis is anticipated. If proposed project elements or excavation may take place deeper than 30 feet below existing ground surface, then additional review by a professional archaeologist and Ecology may be needed.

There is low potential to encounter archaeological or cultural resources during the project. An MIDP is included in Appendix E and will be kept on Site during ground-disturbing activities.

## 9.2 Performance Monitoring

Performance monitoring will be performed during and immediately after cleanup construction to confirm that cleanup action has attained cleanup standards, remediation levels, other performance standards such as construction quality control measures or monitoring necessary to demonstrate compliance with a permit, or, where a permit exemption applies, the substantive requirements of other laws. Performance monitoring will be described in the Construction Quality Assurance Plan or equivalent documents developed for such monitoring. The performing PLPs will submit such documents to Ecology for review and approval.

Performance monitoring will consist of the following:

- Construction quality control surveys of intertidal material removal to ensure design criteria (limits and depths) are achieved during construction
- Construction quality control surveys of intertidal material placement (backfill, EMNR layer, and engineered caps) to ensure design criteria (thicknesses and tolerances) are achieved during construction
- Chemical and geotechnical testing of imported backfill and capping material

## 9.3 Confirmation (Long-Term) Monitoring

Confirmation monitoring will be performed after cleanup construction to confirm the long-term effectiveness of the cleanup action once cleanup standards have been attained. Confirmation monitoring will be described in the OMMP or equivalent documents developed for such monitoring. The OMMP will be submitted to Ecology for review and approval.

Confirmation monitoring will consist of the following:

- Routine visual inspections and surveys of engineered sediment cap areas to verify that the caps remain intact and protective
- Periodic post-construction sampling and testing of sediments within the biologically active zone to verify that cleanup standards are met and continue to be met
- Periodic post-construction sampling and testing of sediments near the outfalls to check for any recontamination.

Details of the confirmation monitoring requirements will be presented in the OMMP. The OMMP will specify details such as the following:

- Survey and inspection methods and frequency
- Sediment sampling methods, locations, analyses, and frequency
- Required maintenance activities

# 10 Institutional and Engineering Controls

Institutional controls to be implemented under this project include the recording of a restrictive covenant on the property with the County Assessor's Office. This covenant will include restrictions for sediment in capped areas. Institutional controls are needed where the cleanup action leaves contaminated sediment exceeding CULs. Sediment exceeding CULs will remain where engineered capping is the selected cleanup method, and a protective covenant will restrict disturbance in these areas. The covenant will also include requirements for any future use or development in capped areas so that the capping is not compromised or caps are reconstructed if disturbed. The covenant will be recorded following the completion of the work as described in this EDR.

# 11 Construction Sequencing and Schedule

This work described in this EDR is distinct from the upland cleanup work at the Site. There are no direct dependencies between the upland and marine cleanup actions however there may be advantages to completing upland and in-water work under the same construction action. This section provides an overview of the anticipated implementation sequencing and schedule for the work.

Cleanup construction activities described in this EDR are targeted to be completed within a single season. The work will comply with applicable work windows established in final project permits and approvals. The targeted start date for construction is June 2026, subject to final permitting approvals. Construction activities will be conducted in a manner that achieves the following goals:

- Provide for a safe work environment.
- Protect existing facilities from damage.
- Maintain reasonable access and operation for tenants.
- Minimize the potential for recontamination.
- Accomplish the work in a timely manner.
- Accomplish the in-water work during the allowable work windows established in the project permits (if applicable).
- Accomplish the work in a cost-effective manner.
- Comply with all state, federal, and local regulations.

Activities that are not subject to in-water work restrictions may include the following:

- Preparation and removal of staging areas
- Preparation, processing, testing, and removal of upland stockpile areas
- Upland staging or transportation and disposal of removed contaminated sediment, soils, debris, and other construction materials

The contractor will prepare a construction sequencing approach in their Construction Work Plan that describes how they will meet sequencing requirements of all material removal, debris and structure removal, and material placement. The estimated material removal volumes and material placement volumes for this phase of the design efforts are as follows:

- Sediment Removal: 7,800 cubic yards
- Engineered Cap Placement: 500 cubic yards
- General Backfill: 7,600 cubic yards
- Shoreline Armor: 1,700 cubic yards
- EMNR: 8,700 cubic yards

It is expected that the work will follow the general sequence outlined as follows:

- Demolition of marine structures (including the barge remnants and two bulkheads) and approximately 53 timber piles or dolphins
- Contaminated sediment removal and backfill of Removal Units (general backfill or engineered cap areas), completed in a phased manner such that all excavated areas are backfilled or at a minimum, initially covered during a single tide cycle to minimize contaminated sediment redistribution
- EMNR placement per the design drawings, which may begin after all removal and backfill activities are complete within a given area. EMNR placement may occur simultaneously with removal activities, but only if the two activities are being completed in different areas (i.e., EMNR placement in the Logway Area while removal and backfill activities are occurring along the South Shoreline).
- Following the completion of all remedial work, implement the post-construction confirmation monitoring.

# 12 Ongoing Design Considerations

At this phase of development of design, several considerations will need to be addressed as discussions with Ecology and other permitting agencies progress. These considerations will be further explored, and design components will be proposed to address them as needed. The list of ongoing design considerations is as follows:

- Engineered cap armor sizing in the Logway Area to account for predicted stormwater flows from the outfall in the head of the Logway Area
- Final work windows as determined in the issued permits, including measures to relocate or work around existing osprey nests
- Site staging and stockpiling area layout
- Contaminate characterization of shoreline bank areas (in progress) to determine if additional shoreline armor will be required
- Further evaluation of recreational and other vessel traffic in the Logway Area to ensure engineered cap armoring is sufficient
- Availability of backfill, capping, and EMNR materials to confirm if proposed gradations and chemical characteristics are achievable from local sources
- Final locations of stormwater outfalls, energy dissipation structures, and other erosion control methods

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# Tables

## Table 1
## Datum Elevations (Station No. 9447659)

| Tide Level | Meters (MLLW) | Feet (MLLW) |
|---|---|---|
| Highest Astronomical Tide | 4.016 | 13.17 |
| Mean Higher High Water | 3.38 | 11.09 |
| Mean high water | 3.114 | 10.21 |
| Mean tide level | 1.984 | 6.51 |
| Mean sea level | 1.976 | 6.48 |
| Mean diurnal tide level | 1.689 | 5.54 |
| Mean low water | 0.854 | 2.8 |
| Mean lower low water | 0 | 0 |
| Lowest Astronomical Tide | -1.304 | -4.28 |
| NAVD88 | 0.62 | 2.03 |

Notes:
MLLW: mean lower low water
NAVD88: North American Vertical Datum of 1988

## Table 2
## Marine Sediment Cleanup Levels

| Parameter | Units | SCL | Basis | Compliance Evaluation |
|---|---|---|---|---|
| Total PCBs[a] | µg/kg dw | 130 | Benthic Protection | Point-by-Point |
| Total Dioxin/Furan TEQ[a] | ng/kg dw | 5 | Human Health | SWAC |
| Total PCB Congeners[a] | µg/kg dw | 30 | Human Health | SWAC |
| Coplanar PCB Congener TEQ[b] | ng/kg dw | 1.5 | Human Health | SWAC |
| cPAH TEQ[b] | µg/kg dw | 21 | Human Health | SWAC |

Notes:

a. Site indicator hazardous substance chemicals

b. Sediment areas exceeding the sediment cleanup objective for coplanar PCB congener TEQ and cPAH TEQ are within areas already defined by dioxin/furan TEQ and total PCBs; thus, these chemicals are not indicator hazardous substances for the Site.

µg/kg: microgram per kilogram

cPAH: carcinogenic polycyclic aromatic hydrocarbon

dw: dry weight

ng/kg: nanogram per kilogram

PCB: polychlorinated biphenyl

SCL: sediment cleanup level

SWAC: surface-weighted average concentration

TEQ: toxicity equivalence

## Table 3
## Available "Dry" Working Hours

| Date/Time | Hours Tide Is Below Elevations | |
|---|---|---|
| | +6 Feet MLLW | +2 Feet MLLW |
| 2026-06/0700-2200 | 238 | 118 |
| 2026-06/2200-0700 | 36 | 0 |
| 2026-07/0700-2200 | 218 | 109 |
| 2026-07/2200-0700 | 63 | 7 |
| 2026-08/0700-2200 | 178 | 75 |
| 2026-08/2200-0700 | 126 | 22 |
| 2026-09/0700-2200 | 136 | 40 |
| 2026-09/2200-0700 | 153 | 58 |
| 2026-10/0700-2200 | 111 | 13 |
| 2026-10/2200-0700 | 176 | 90 |
| 2026-11/0700-2200 | 104 | 29 |
| 2026-11/2200-0700 | 162 | 78 |
| 2026-12/0700-2200 | 123 | 42 |
| 2026-12/2200-0700 | 140 | 63 |
| 2027-01/0700-2200 | 154 | 58 |
| 2027-01/2200-0700 | 106 | 46 |
| 2027-02/0700-2200 | 83 | 26 |
| 2027-02/2200-0700 | 46 | 15 |

Note:

MLLW: mean lower low water

## Table 4
## Anticipated Environmental Permits and Approvals

| Permit or Approval | Lead Agency | Trigger | Notes and Status |
|---|---|---|---|
| **Federal** | | | |
| Rivers and Harbors Act Section 10 Permit and Clean Water Act Section 404 Individual Permit | USACE | Discharge of dredge and fill material and work proposed within navigable waters of the U.S. | An application was submitted to USACE for the project in spring 2024. The submittal included the following materials:<br>• Completed JARPA Form<br>• Project Drawings (approximately 10% design level)<br>• Critical Areas Report<br>• Final Cleanup Action Plan<br>• ESA memorandum documenting project compliance with the Salish Sea Nearshore Programmatic Biological Opinions<br>• Water Quality Monitoring Plan<br>• ESA-Listed Marine Mammal Monitoring Plan<br>• Marbled Murrelet Monitoring Plan<br>• SEPA Checklist<br>The USACE issued a Public Notice for the project on March 19, 2025. The public comment period ends on April 18, 2025. The USACE has indicated that an Individual Permit will apply to the project. |
| National Environmental Policy Act Review | USACE | Projects with a federal nexus (federal funding, use of federally owned properties, and/or issuance of a federal permit) | As the federal lead agency, USACE will complete the NEPA process as part of its Section 10/404 application review. |
| Rivers and Harbors Act Section 14 (408) Civil Works Permit | USACE | Projects proposed within or adjacent to USACE Civil Works projects | The project is adjacent to the Snohomish River Federal Navigation Channel. The USACE will review potential effects on the channel as part of its Section 408 application review. |
| National Historic Preservation Act Section 106 Consultation | USACE in consultation with DAHP | Projects with a federal nexus that have the potential to affect cultural, archaeological, or historical properties | USACE has consulted with Tribes and the Washington State Department of Archaeology and Historic Preservation as part of its Section 10/404 permit review process. An Inadvertent Discovery Plan will be required. |
| ESA Section 7 Concurrence | USACE in consultation with NMFS/USFWS | Projects with a federal nexus occurring in the vicinity of any threatened or endangered species or that could destroy or adversely modify critical habitat | USACE has consulted with NMFS and USFWS as part of its Section 10/404 permit review process. The design team met with NMFS in February 2025 to discuss shoreline armoring issues and consistency with the Salish Sea Nearshore Programmatic Biological Opinion and conservation calculator. |
| Magnuson-Stevens Fishery Conservation and Management Act Concurrence | USACE in consultation with NMFS/USFWS | Projects with a federal nexus that have the potential to affect essential fish habitat | Consultation is underway concurrent with Endangered Species Act review. |
| Coastal Zone Management Act Consistency Determination | USACE in coordination with Ecology | Projects that contain a federal nexus proposed within any of Washington's 15 coastal counties | A CZMA consistency form was submitted to USACE on March 4, 2025, for consultation with Ecology. |
| Marine Mammal Protection Act Incidental Harassment Authorization | National Oceanic and Atmospheric Administration | In-water activities such as pile driving with the potential to result in take of marine mammals in U.S. waters. Take includes to hunt harass, capture, or kill. | The work will avoid or minimize potential impacts to marine mammals by working during low tides (in the dry) or during regulatory in-water work windows for protection of aquatic species to the extent practicable. It is assumed that an Incidental Harassment Authorization will not be required if best management practices are followed. |
| Migratory Bird Treaty Act Compliance | USFWS | Activities with the potential to impact migratory birds. | The project team will consult with USFWS at approximately 30% design to discuss project effects and impact minimization measures for nesting osprey, great blue heron, purple martin, and other migratory bird species that may be affected by pile removal and project construction. |
| Bald and Golden Eagle Protection Act Compliance | USFWS | Activities with the potential to impact bald or golden eagles. | The project team will consult with USFWS at approximately 30% design to discuss project effects and impact minimization measures for bald eagles that may use the project vicinity. |
| **State** | | | |
| State Environmental Policy Act Review | Ecology | Activities requiring state or local approvals that do not meet regulatory criteria for an exemption. | Ecology issued a SEPA Mitigated Determination of Nonsignificance on June 15, 2023. |
| Clean Water Act Section 401 Water Quality Certification | Ecology | Work within waters of the state that could affect water quality. | A Section 401 Individual Water Quality Certification request was submitted to Ecology on March 5, 2025. |

**Table 4**
**Anticipated Environmental Permits and Approvals**

| Permit or Approval | Lead Agency | Trigger | Notes and Status |
|---|---|---|---|
| Hydraulic Project Approval | WDFW | Work that changes the natural flow or bed of a water body and therefore has the potential to affect fish habitat. | MTCA remedial actions are exempt from the procedural requirements of the state Hydraulic Code but must comply with the substantive requirements. The project team will consult with WDFW at approximately 30% design to discuss project effects and impact minimization measures for fish. |
| Construction Stormwater General Permit | Ecology | Construction resulting in more than 1 acre of ground disturbance, or smaller disturbance areas with contaminated soils, sediment, or groundwater. | A Construction Stormwater General Permit will be obtained by the project team at 90% design and transferred to the selected construction contractor. |
| **Local** | | | |
| City of Everett Code Compliance | City of Everett Planning and Public Works | Non-exempt activities affecting designated shorelines, critical areas, or floodplains; grading and changes in stormwater or drainage exceeding area thresholds; construction noise outside of designated hours; haul truck operations or construction affecting public roadways. | MTCA remedial actions are exempt from the procedural requirements of local codes but must comply with the substantive requirements. The project team will consult with the City at approximately 30% design to discuss the substantive compliance process for the following potentially applicable local reviews:<br>• Shorelines<br>• Critical areas<br>• Floodplains<br>• Stormwater and Drainage<br>• Grading<br>• Noise<br>• Traffic<br>• Building Code |
| Discharge to Municipal Sewer System | City of Everett | Discharge of water from dewatering activities (e.g., excavation or sediment stockpile dewatering) to a publicly owned treatment works. | If the contractor requires discharge to the municipal sewer system, a permit will be required. |
| Piles Used for Storage Treatment Permit | Snohomish County Health Department | Outdoor stockpiling of contaminated dredged material for greater than 90 days. | If the contractor requires outdoor storage of contaminated dredged materials for greater than 90 days, a permit will be required. |

# Figures

**LEGEND:**

▭ Marine Site Boundary

▭ Parcel

**NOTES:**
1. Aerial imagery: Esri (2022)
2. Base map: Esri World Topographic Map

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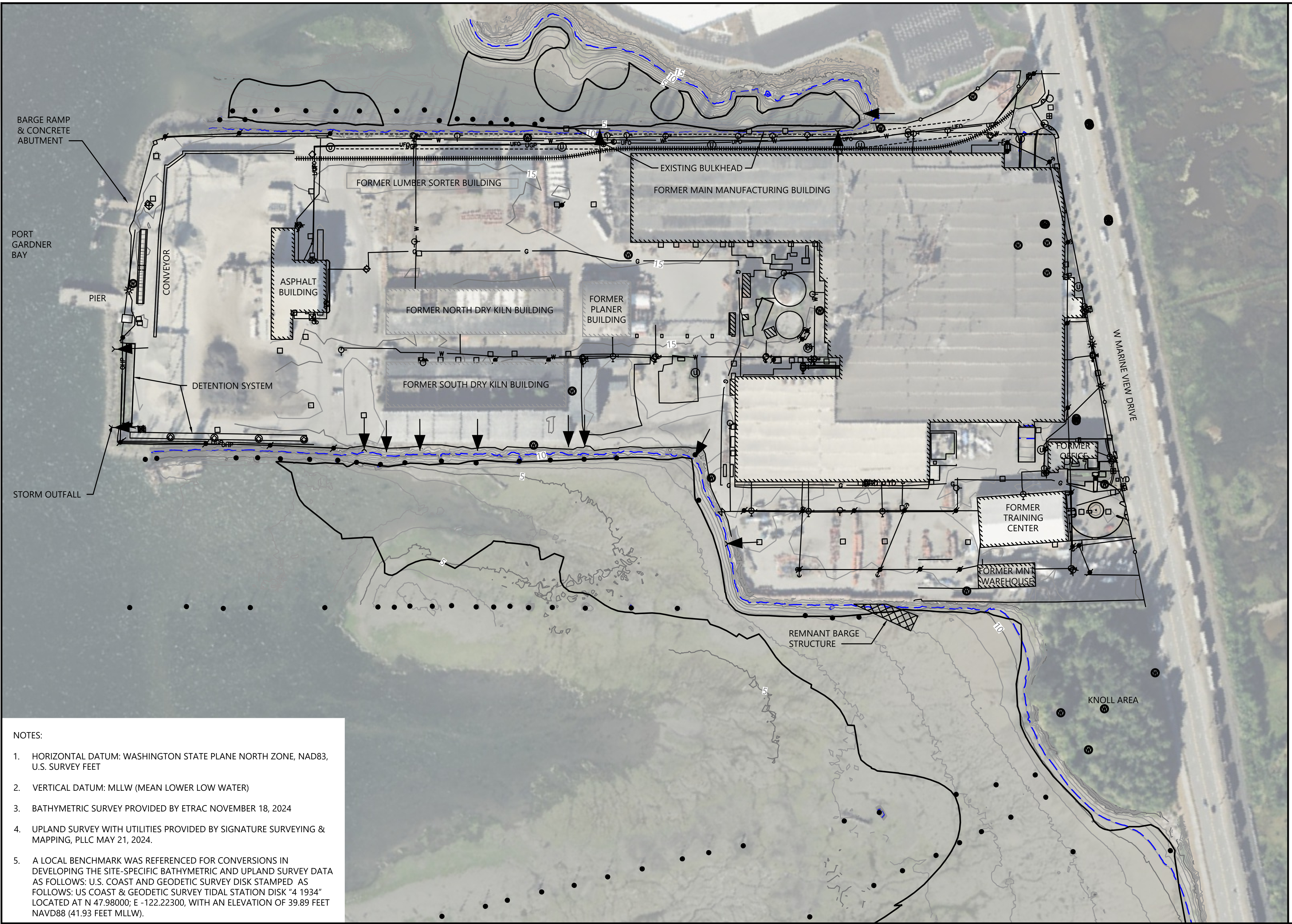
ANCHOR QEA

**Figure 1**
**Site Vicinity Map and Parcel Ownership**
Marine Engineering Design Report
Marine Areas of the Jeld Wen Site



LEGEND:

MARINE SITE BOUNDARY
500 EXISTING BATHYMETRIC CONTOURS (1' & 5' INTERVAL)
MEAN HIGHER HIGH WATER (MHHW) EL= 11.09'
STORMWATER OUTFALL LOCATION
PILING
EXISTING BULKHEAD
OHP OVERHEAD UTILITY LINE
UGP UNDERGROUND POWER LINE
UFO UNDERGROUND FIBER OPTIC
W WATER LINE
G GAS LINE
POWER METER
GAS METER
POWER MANHOLE
UTILITY POLE
WATER METER
FIRE HYDRANT
POST INDICATOR VALVE
STORM DRAIN MANHOLE
SANITARY SEWER MANHOLE
CLEAN OUT
YD YARD DRAIN
VALVE
CATCH BASIN
GAS VALVE
MONITORING WELL
CULVERT
JUNCTION BOX
UNKNOWN UTILITY MANHOLE
BUILDING

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD83, U.S. SURVEY FEET
2. VERTICAL DATUM: MLLW (MEAN LOWER LOW WATER)
3. BATHYMETRIC SURVEY PROVIDED BY ETRAC NOVEMBER 18, 2024
4. UPLAND SURVEY WITH UTILITIES PROVIDED BY SIGNATURE SURVEYING & MAPPING, PLLC MAY 21, 2024.
5. A LOCAL BENCHMARK WAS REFERENCED FOR CONVERSIONS IN DEVELOPING THE SITE-SPECIFIC BATHYMETRIC AND UPLAND SURVEY DATA AS FOLLOWS: U.S. COAST AND GEODETIC SURVEY DISK STAMPED AS FOLLOWS: US COAST & GEODETIC SURVEY TIDAL STATION DISK "4 1934" LOCATED AT N 47.98000; E -122.22300, WITH AN ELEVATION OF 39.89 FEET NAVD88 (41.93 FEET MLLW).

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

**DRAFT-30% DESIGN**
**NOT FOR CONSTRUCTION**

ANCHOR QEA

REVISIONS

| REV | DATE | BY | APP'D | DESCRIPTION |
|---|---|---|---|---|
| | | | | |
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| | | | | |

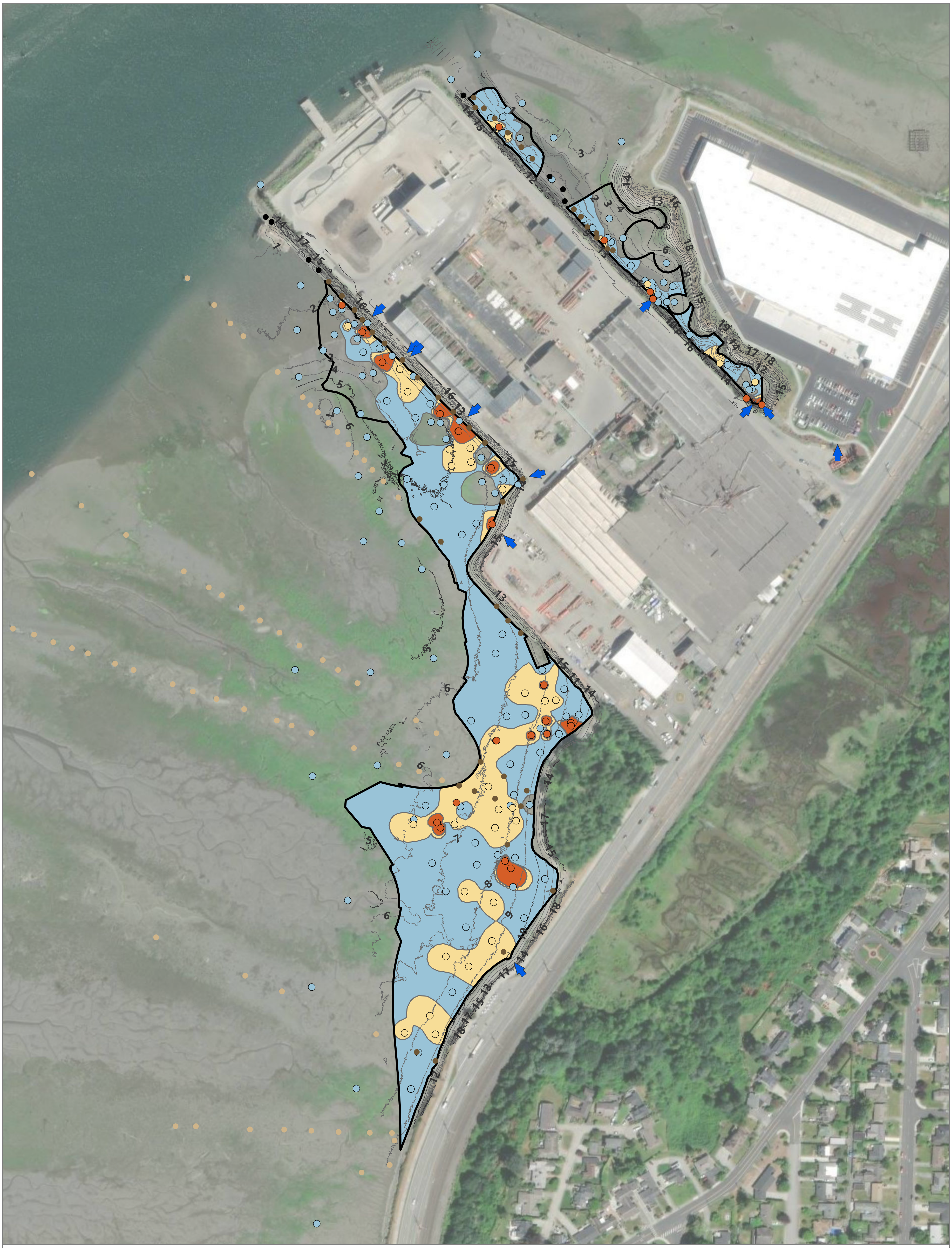
DESIGNED BY: G. CASSON
DRAWN BY: N. REED
CHECKED BY: I. LASTNAME
APPROVED BY: I. LASTNAME
SCALE: AS NOTED
DATE: MARCH 2025

# JELD-WEN REMEDIATION PROJECT MARINE ENGINEERING DESIGN REPORT

## EXISTING CONDITIONS & UTILITIES

## FIGURE 2

Jun 12, 2025 12:42pm nreed K:\Projects\0909-Jeld Wen\Jeld Wen Former Nord Door Site\Construction Plans\0909-PL-EXISTING CONDITIONS.dwg EXISTING CONDITIONS & UTILITIES



**LEGEND:**

- ▭ Marine Site Boundary
- ● Pile Location Outside Project Boundary
- ● Pile Location Within Project Boundary
- ● Pile Location Outside Project Boundary but Identified for Removal Pending Owner Approval
- — 1-foot Contour (MLLW)
- — 5-foot Contour (MLLW)
- ➡ Stormwater Outfall Location

**TPCB and Dioxin Furan TEQ Data Point Locations used for SMA Delineation**

- ○ SMA-1 Monitored Natural Recovery (MNR)
- ○ SMA-2 Enhanced Monitored Natural Recovery (EMNR)
- ● SMA-3 Capping or Removal

**SMAs Derived from TPCB and Dioxin Furan TEQ**

- 🟦 SMA-1 Monitored Natural Recovery (MNR)
- 🟨 SMA-2 Enhanced Monitored Natural Recovery (EMNR)
- 🟧 SMA-3 Capping or Removal

**NOTES:**

1. Aerial imagery: Esri (2022)
2. SMA-1 = surface sediment areas within the Marine Site Boundary <8 ng/kg dw D/F TEQ (u=1/2) and <117 ug/kg dw total PCBs (u=0)
3. SMA-2 = surface sediment areas exceeding the RALs for EMNR, 8 to 15 ng/kg dw D/F TEQ (u=1/2) and 117 to 130 ug/kg dw total PCB (u=0)
4. SMA-3 = surface sediment areas exceeding the RALs for capping/removal, 15 ng/kg dw D/F TEQ u=1/2 and 130 ug/kg dw total PCB (u=0)

0 300
Feet

**Figure 3**
**SMA Delineations - Updated with PRDI Data**

Marine Engineering Design Report
Marine Areas of the Jeld Wen Site

LEGEND:

| | |
|---|---|
| ▬ | MARINE SITE BOUNDARY |
| —— 500 —— | EXISTING BATHYMETRIC CONTOURS (1' & 5' INTERVAL) |
| – – – | MEAN HIGHER HIGH WATER (MHHW) EL= 11.09' |
| ◀— | STORMWATER OUTFALL LOCATION |
| ● | EXISTING PILING TO BE REMOVED |
| ● | EXISTING PILING TO REMAIN IN PLACE |
| —□— | EXISTING BULKHEAD TO BE REMOVED |
| ▨ | REMNANT BARGE STRUCTURE TO BE REMOVED |

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD83, U.S. SURVEY FEET
2. VERTICAL DATUM: MLLW (MEAN LOWER LOW WATER)
3. L.F. (LINEAR FEET)

NORTH

0 150 300

SCALE IN FEET

***DRAFT-30% DESIGN***
***NOT FOR CONSTRUCTION***

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

K:\Projects\0909-Jeld Wen\Jeld Wen Former Nord Door Site\Construction Plans\0909-PL-STRUCTURE & DEBRIS REMOVAL.dwg STRUCTURE & DEBRIS REMOVAL

Jun 12, 2025 12:42pm nreed

ANCHOR QEA

REVISIONS

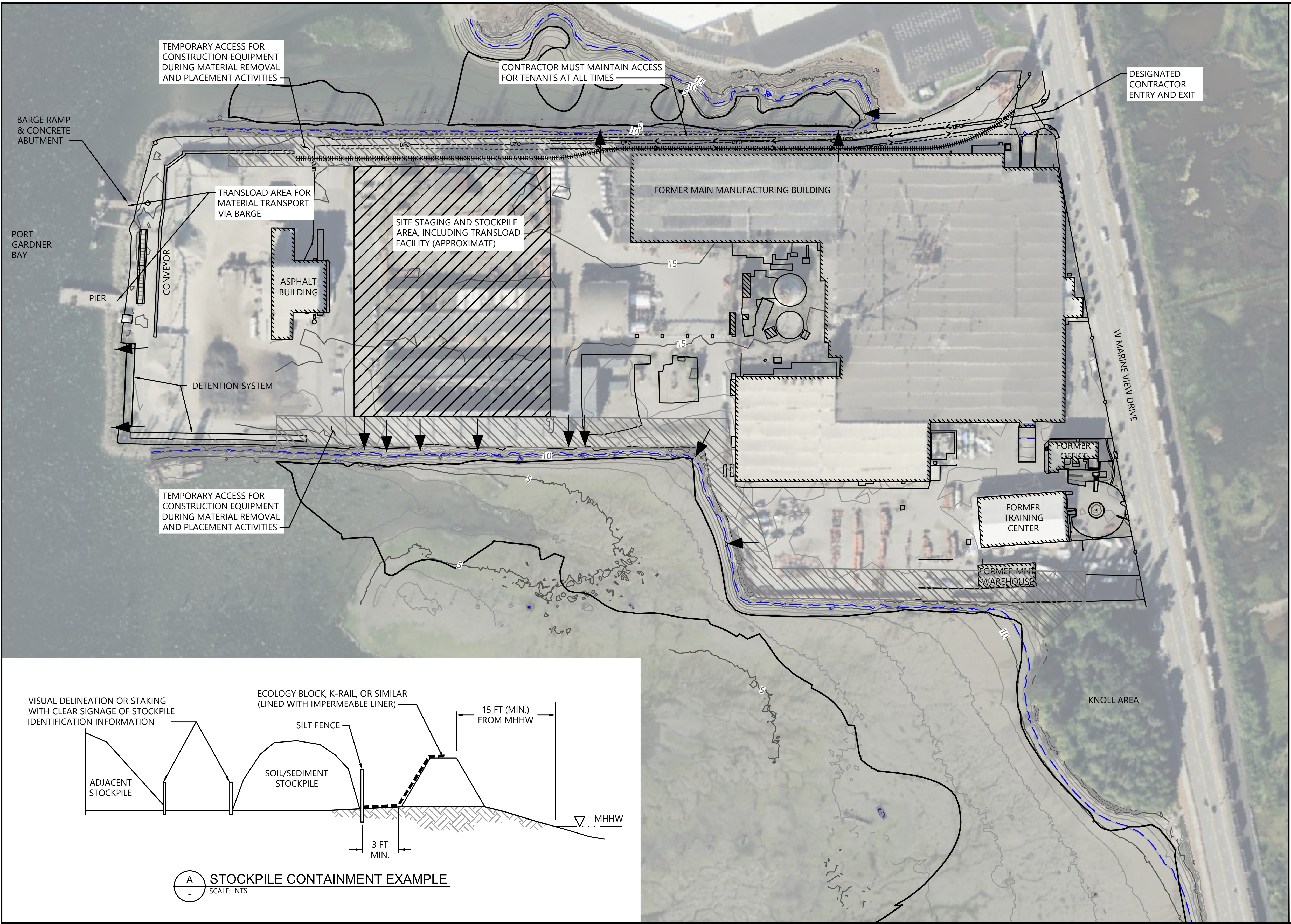
| REV | DATE | BY | APP'D | DESCRIPTION |
|---|---|---|---|---|
| | | | | |

DESIGNED BY: G. CASSON
DRAWN BY: N. REED
CHECKED BY: I. LASTNAME
APPROVED BY: I. LASTNAME
SCALE: AS NOTED
DATE: MARCH 2025

**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**STRUCTURE & DEBRIS REMOVAL**

**FIGURE 4**



A
-
STOCKPILE CONTAINMENT EXAMPLE
SCALE: NTS

LEGEND:

| | |
|---|---|
| ▬ | MARINE SITE BOUNDARY |
| — 500 — | EXISTING BATHYMETRIC CONTOURS (1' & 5' INTERVAL) |
| – – – | MEAN HIGHER HIGH WATER (MHHW) EL= 11.09' |
| ⇆ | ACCESS ROUTE |
| ▨ | STAGING AND STOCKPILE AREA |
| ◀ | STORMWATER OUTFALL LOCATION |
| ▧ | TEMPORARY CONSTRUCTION ACCESS |

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD83, U.S. SURVEY FEET
2. VERTICAL DATUM: MLLW (MEAN LOWER LOW WATER)

NORTH

0 100 200
SCALE IN FEET

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

**DRAFT-30% DESIGN**
**NOT FOR CONSTRUCTION**

K:\Projects\0909-Jeld Wen\Jeld Wen Former Nord Door Site\Construction Plans\0909-PL-Site Staging & Stockpile Plan.dwg STAGING

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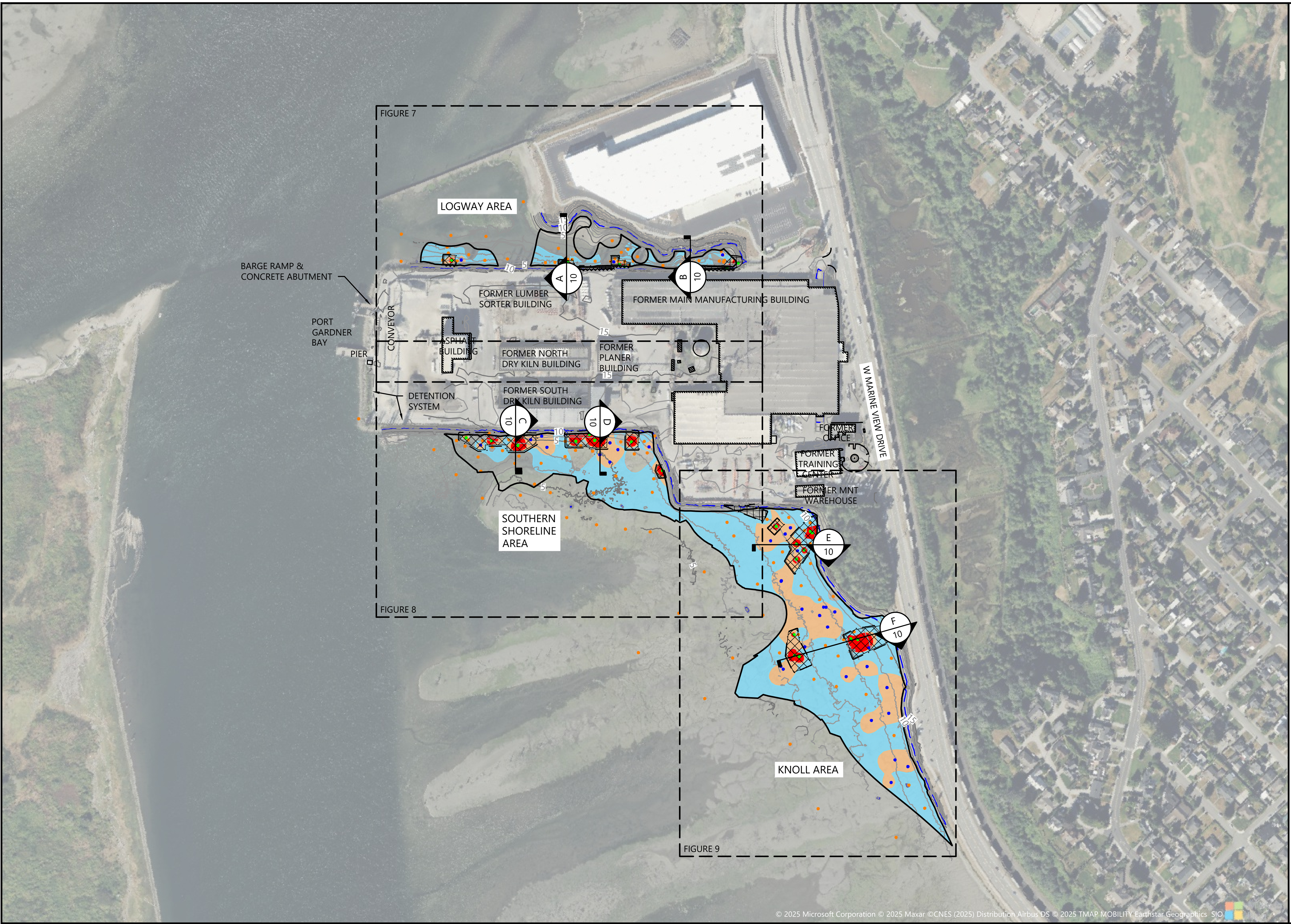
DRAWN BY: N. REED
CHECKED BY: I. LASTNAME
APPROVED BY: I. LASTNAME
SCALE: AS NOTED
DATE: MARCH 2025

**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**SITE STAGING, STOCKPILE, & ACCESS PLAN**

**FIGURE 5**



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LEGEND:

| | |
|---|---|
| ▬ | MARINE SITE BOUNDARY |
| — 500 — | EXISTING BATHYMETRIC CONTOURS (1' & 5' INTERVAL) |
| – – – | MEAN HIGHER HIGH WATER (MHHW) EL= 11.09' |
| 🟦 | SMA-1 MONITORED NATURAL RECOVERY (MNR) |
| 🟧 | SMA-2 ENHANCED MONITORED NATURAL RECOVERY (EMNR) |
| 🟥 | SMA-3 CAPPING OR REMOVAL |
| ● | SAMPLE LOCATION SMA-1 |
| ● | SAMPLE LOCATION SMA-2 |
| ● | SAMPLE LOCATION SMA-3 |
| ▨ | REMOVAL AREAS |
| — · — | LIMITS OF EXCAVATION |
| ~~~~ | TEMPORARY SHORING |
| —□— | EXISTING BULKHEAD TO BE REMOVED |

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD83, U.S. SURVEY FEET
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3. SMA-1 = SURFACE SEDIMENT AREAS WITHIN THE MARINE SITE BOUNDARY <8 ng/kg dw D/F TEQ (u=1/2) AND <117 ug/kg dw TOTAL PCBs (u=0)
4. SMA-2 = SURFACE SEDIMENT AREAS EXCEEDING THE RALs FOR EMNR, 8 TO 15 ng/kg dw D/F TEQ (u=1/2) AND 117 TO 130 ug/kg dw TOTAL PCB (u=0)
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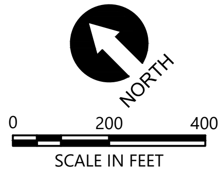

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

***DRAFT-30% DESIGN***
***NOT FOR CONSTRUCTION***

K:\Projects\0909-Jeld Wen\Jeld Wen Former Nord Door Site\Construction Plans\0909-PL-REMOVAL PLAN.dwg SITE SEDIMENT REMOVAL PLAN

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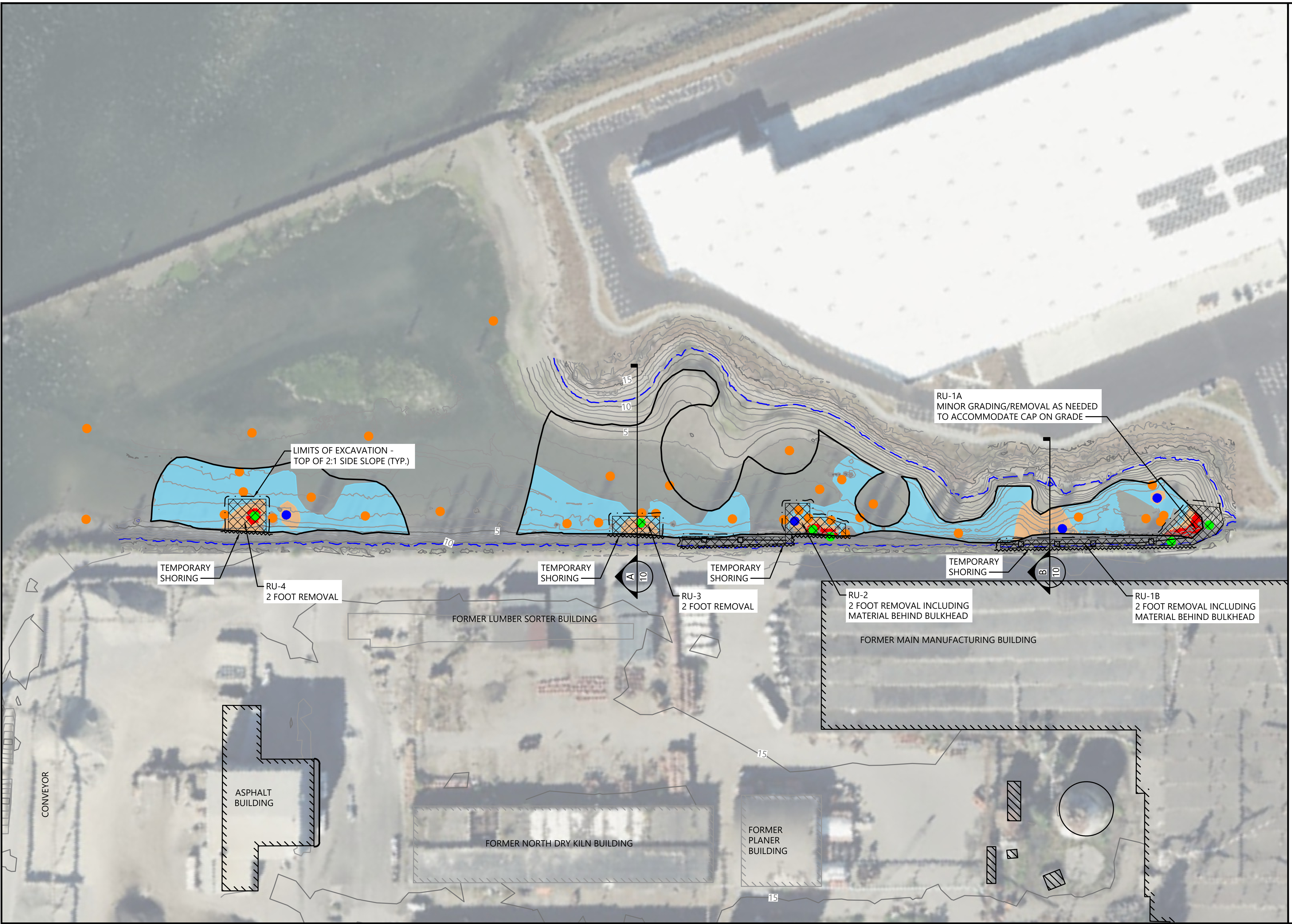
DRAWN BY: N. REED
CHECKED BY: I. LASTNAME
APPROVED BY: I. LASTNAME
SCALE: AS NOTED
DATE: MARCH 2025

**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**SITE SEDIMENT REMOVAL PLAN**

**FIGURE 6**



LEGEND:

| | |
|---|---|
| ——— | MARINE SITE BOUNDARY |
| —— 500 —— | EXISTING BATHYMETRIC CONTOURS (1' & 5' INTERVAL) |
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| 🟧 | SMA-2 ENHANCED MONITORED NATURAL RECOVERY (EMNR) |
| 🟥 | SMA-3 CAPPING OR REMOVAL |
| ● | SAMPLE LOCATION SMA-1 |
| ● | SAMPLE LOCATION SMA-2 |
| ● | SAMPLE LOCATION SMA-3 |
| ▨ | REMOVAL AREAS |
| — · — · — | LIMITS OF EXCAVATION |
| ∿∿∿∿ | TEMPORARY SHORING |
| —□— | EXISTING BULKHEAD TO BE REMOVED |

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NORTH

0 60 120
SCALE IN FEET

***DRAFT-30% DESIGN***
***NOT FOR CONSTRUCTION***

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

K:\Projects\0909-Jeld Wen\Jeld Wen Former Nord Door Site\Construction Plans\0909-PL-REMOVAL PLAN.dwg LOGYARD REMOVAL

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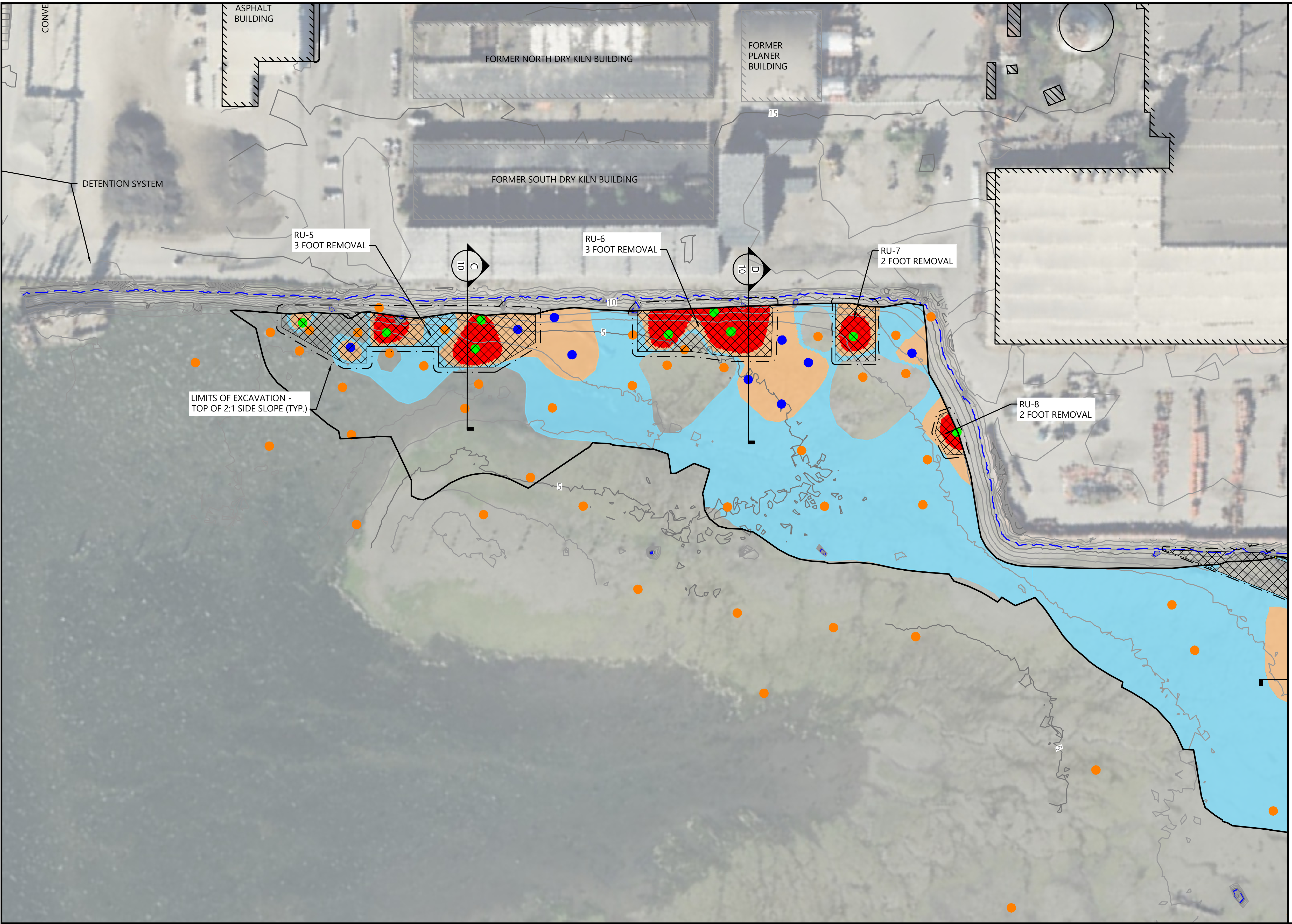
CHECKED BY: I. LASTNAME
APPROVED BY: I. LASTNAME
SCALE: AS NOTED
DATE: MARCH 2025

**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**LOGYARD AREA SEDIMENT REMOVAL PLAN**

**FIGURE 7**



LEGEND:

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|---|---|
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| 🟥 | SMA-3 CAPPING OR REMOVAL |
| ● | SAMPLE LOCATION SMA-1 |
| ● | SAMPLE LOCATION SMA-2 |
| ● | SAMPLE LOCATION SMA-3 |
| ▨ | REMOVAL AREAS |
| — · — | LIMITS OF EXCAVATION |

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NORTH

0 60 120
SCALE IN FEET

***DRAFT-30% DESIGN***
***NOT FOR CONSTRUCTION***

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

K:\Projects\0909-Jeld Wen\Jeld Wen Former Nord Door Site\Construction Plans\0909-PL-REMOVAL PLAN.dwg SOUTHERN SHORELINE REMOVAL

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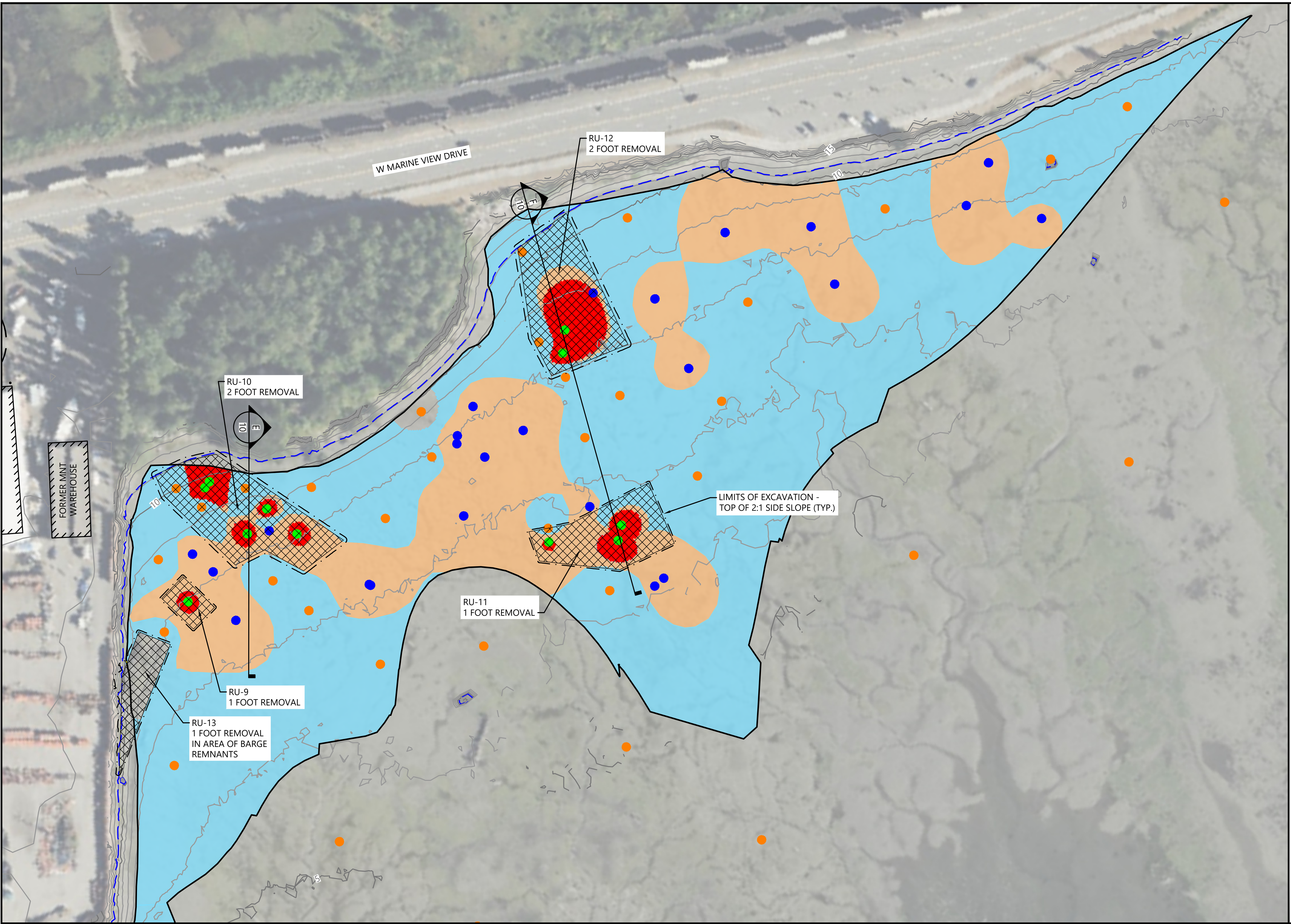
**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**SOUTHERN SHORELINE AREA SEDIMENT REMOVAL PLAN**

**FIGURE 8**



LEGEND:

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|---|---|
| ▬ | MARINE SITE BOUNDARY |
| —— 500 —— | EXISTING BATHYMETRIC CONTOURS (1' & 5' INTERVAL) |
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| 🟥 | SMA-3 CAPPING OR REMOVAL |
| ● | SAMPLE LOCATION SMA-1 |
| ● | SAMPLE LOCATION SMA-2 |
| ● | SAMPLE LOCATION SMA-3 |
| ▨ | REMOVAL AREAS |
| — · — · — | LIMITS OF EXCAVATION |

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NORTH

0 60 120

SCALE IN FEET

***DRAFT-30% DESIGN***
***NOT FOR CONSTRUCTION***

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

K:\Projects\0909-Jeld Wen\Jeld Wen Former Nord Door Site\Construction Plans\0909-PL-REMOVAL PLAN.dwg KNOLL REMOVAL

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CHECKED BY: I. LASTNAME
APPROVED BY: I. LASTNAME
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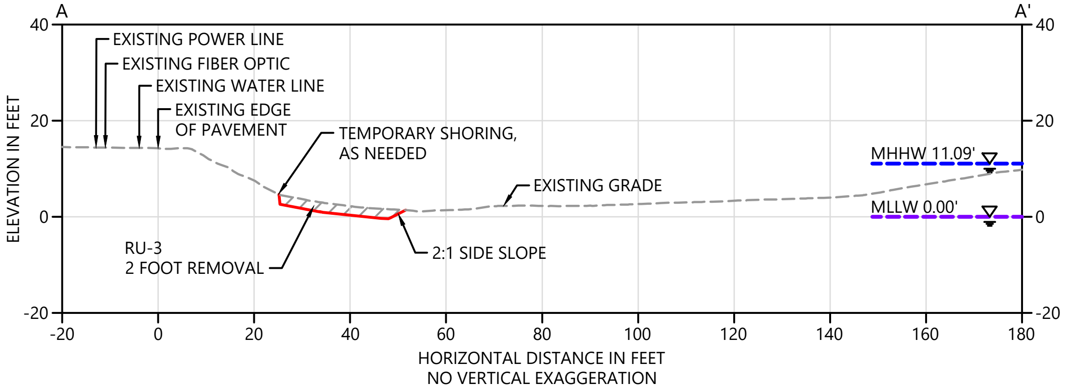
DATE: MARCH 2025

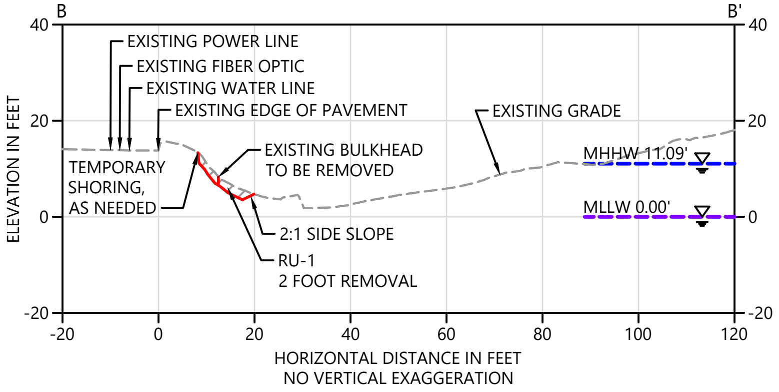
**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**KNOLL AREA SEDIMENT REMOVAL PLAN**

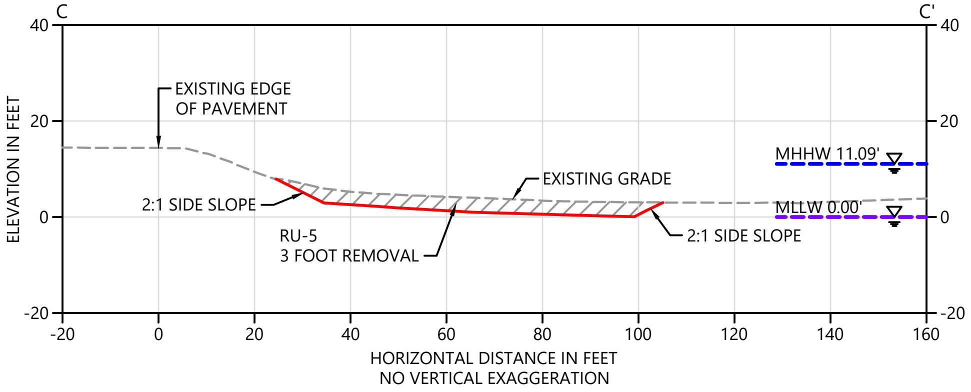
**FIGURE 9**



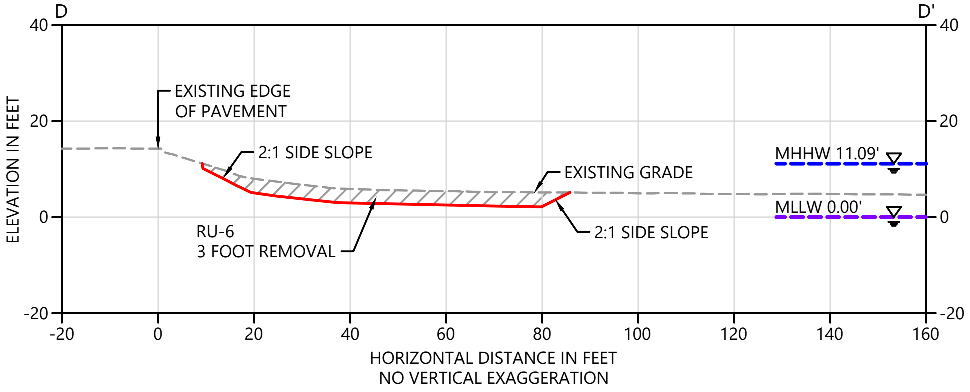
A
7
SECTION A
SCALE: 1" = 20'



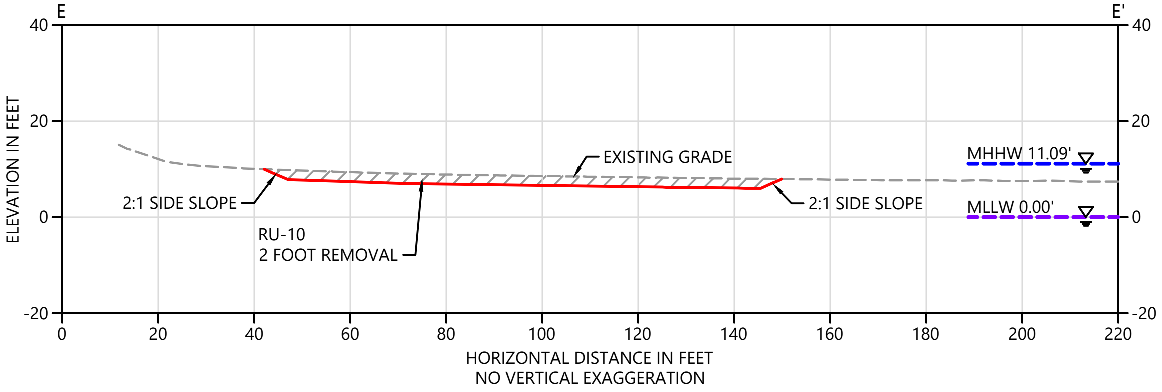
B
7
SECTION B
SCALE: 1" = 20'



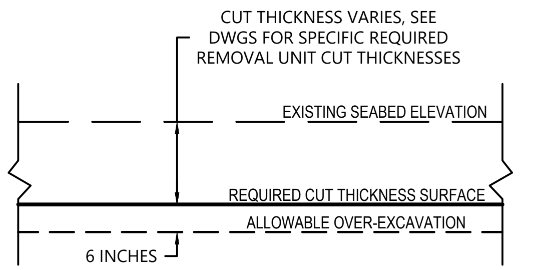
C
8
SECTION C
SCALE: 1" = 20'



D
8
SECTION D
SCALE: 1" = 20'



E
9
SECTION E
SCALE: 1" = 20'



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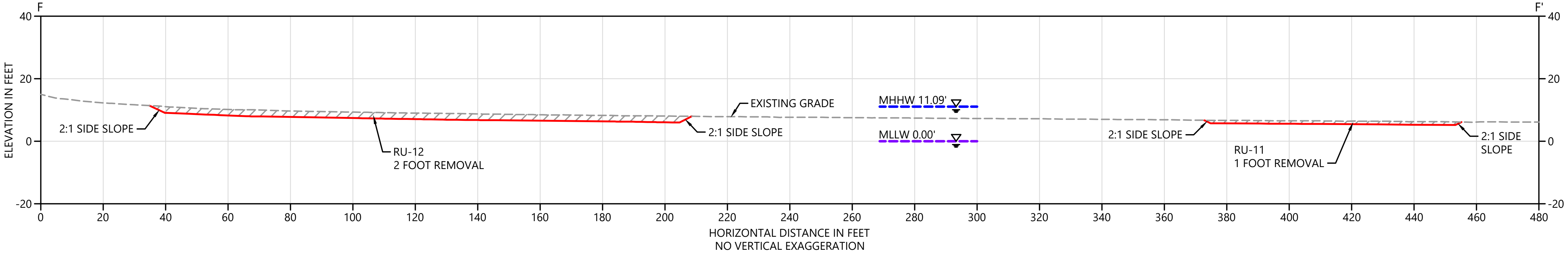
REQUIRED REMOVAL (REQUIRED CUT THICKNESS)
SCALE: N.T.S.



F
9
SECTION F
SCALE: 1" = 20'

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD83, U.S. SURVEY FEET
2. VERTICAL DATUM: MLLW (MEAN LOWER LOW WATER)
3. ALL UTILITIES SHOWN ARE APPROXIMATE. NO AS-BUILT ELEVATION INFORMATION IS AVAILABLE

0 20 40
SCALE IN FEET

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

**DRAFT-30% DESIGN**
**NOT FOR CONSTRUCTION**

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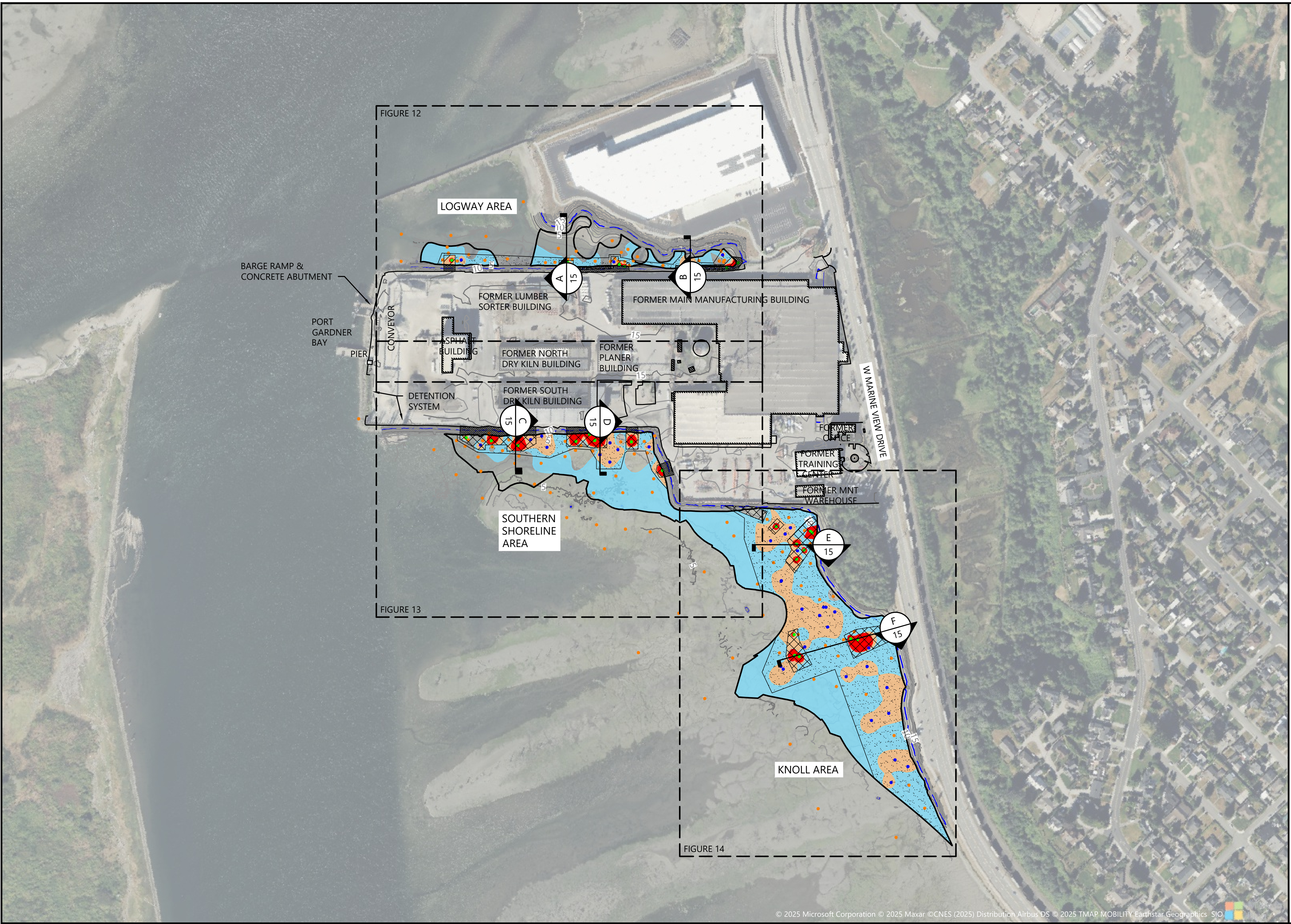
**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**SEDIMENT REMOVAL SECTIONS AND TYPICAL DETAILS**

**FIGURE 10**



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|---|---|
| — | MARINE SITE BOUNDARY |
| —— 500 —— | EXISTING BATHYMETRIC CONTOURS (1' & 5' INTERVAL) |
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| 🟥 | SMA-3 CAPPING OR REMOVAL |
| ● | SAMPLE LOCATION SMA-1 |
| ● | SAMPLE LOCATION SMA-2 |
| ● | SAMPLE LOCATION SMA-3 |
| ☒ | REMOVAL AREA BACKFILL (SEE NOTE 6) |
| ☐ | EMNR PLACEMENT (6" CLEAN SILTY SAND) |
| ▦ | SHORELINE STABILITY AND ARMORING |
| ▨ | ENGINEERED CAP |

NOTES:

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6. REMOVAL AREAS TO BE BACKFILLED TO PRE-CONSTRUCTION GRADES WITH CLEAN MATERIAL, THEN COVERED WITH 6" CLEAN SAND TO MAINTAIN CONSISTENT GRADING.

NORTH

0 200 400
SCALE IN FEET

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

***DRAFT-30% DESIGN***
***NOT FOR CONSTRUCTION***

K:\Projects\0909-Jeld Wen\Jeld Wen Former Nord Door Site\Construction Plans\0909-PL_PLACEMENT PLAN.dwg SITE MATERIAL PLACEMENT PLAN

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CHECKED BY: I. LASTNAME
APPROVED BY: I. LASTNAME
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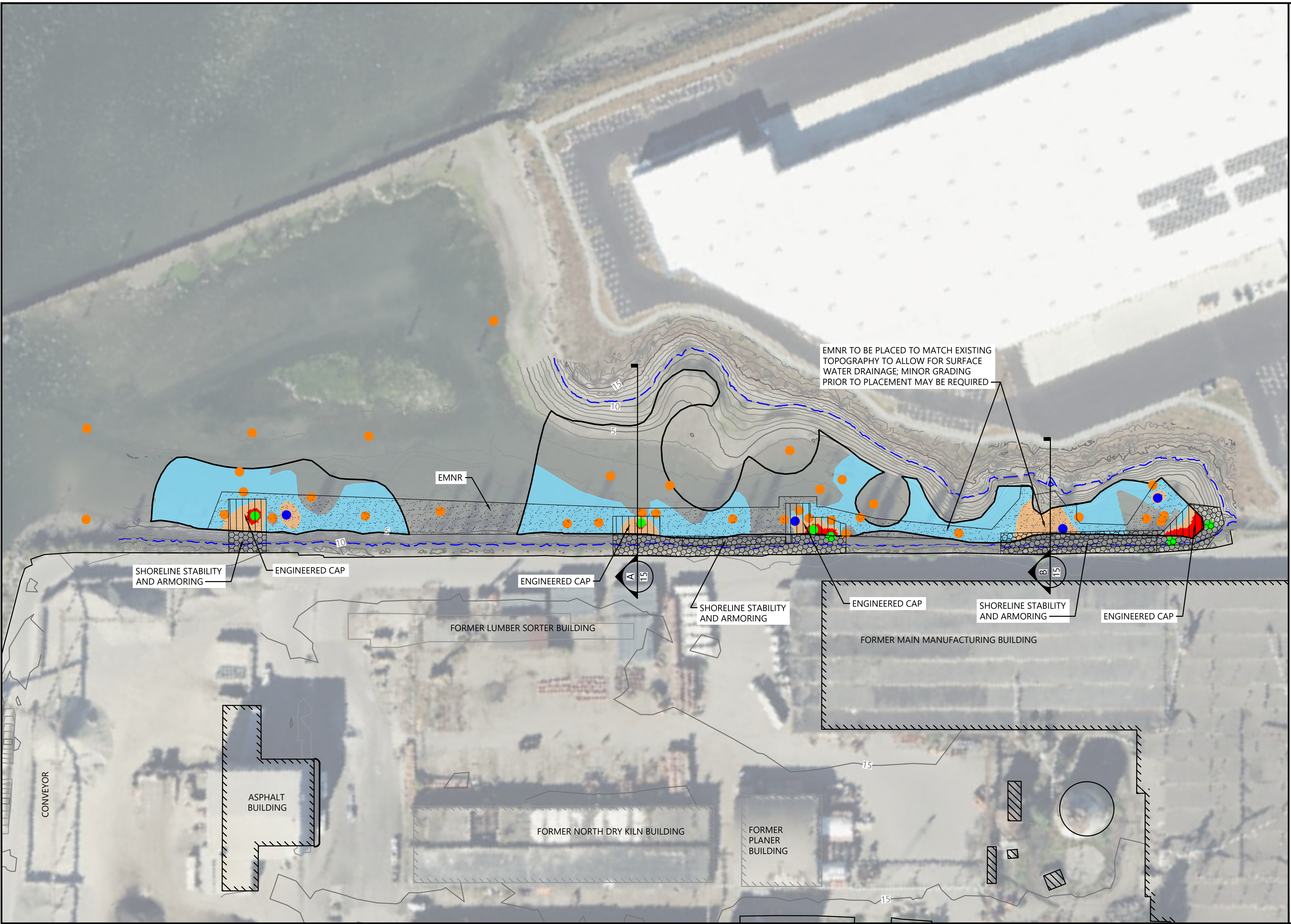
DATE: MARCH 2025

**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**SITE MATERIAL PLACEMENT PLAN**

**FIGURE 11**



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| ● | SAMPLE LOCATION SMA-2 |
| ● | SAMPLE LOCATION SMA-3 |
| ░ | EMNR PLACEMENT (6" CLEAN SILTY SAND) |
| ▩ | SHORELINE STABILITY AND ARMORING |
| ▨ | ENGINEERED CAP |

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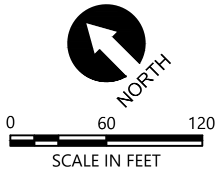

***DRAFT-30% DESIGN***
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ONE INCH
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ANCHOR QEA

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APPROVED BY: I. LASTNAME
SCALE: AS NOTED
DATE: MARCH 2025

**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**LOGYARD PLACEMENT PLAN**

**FIGURE 12**

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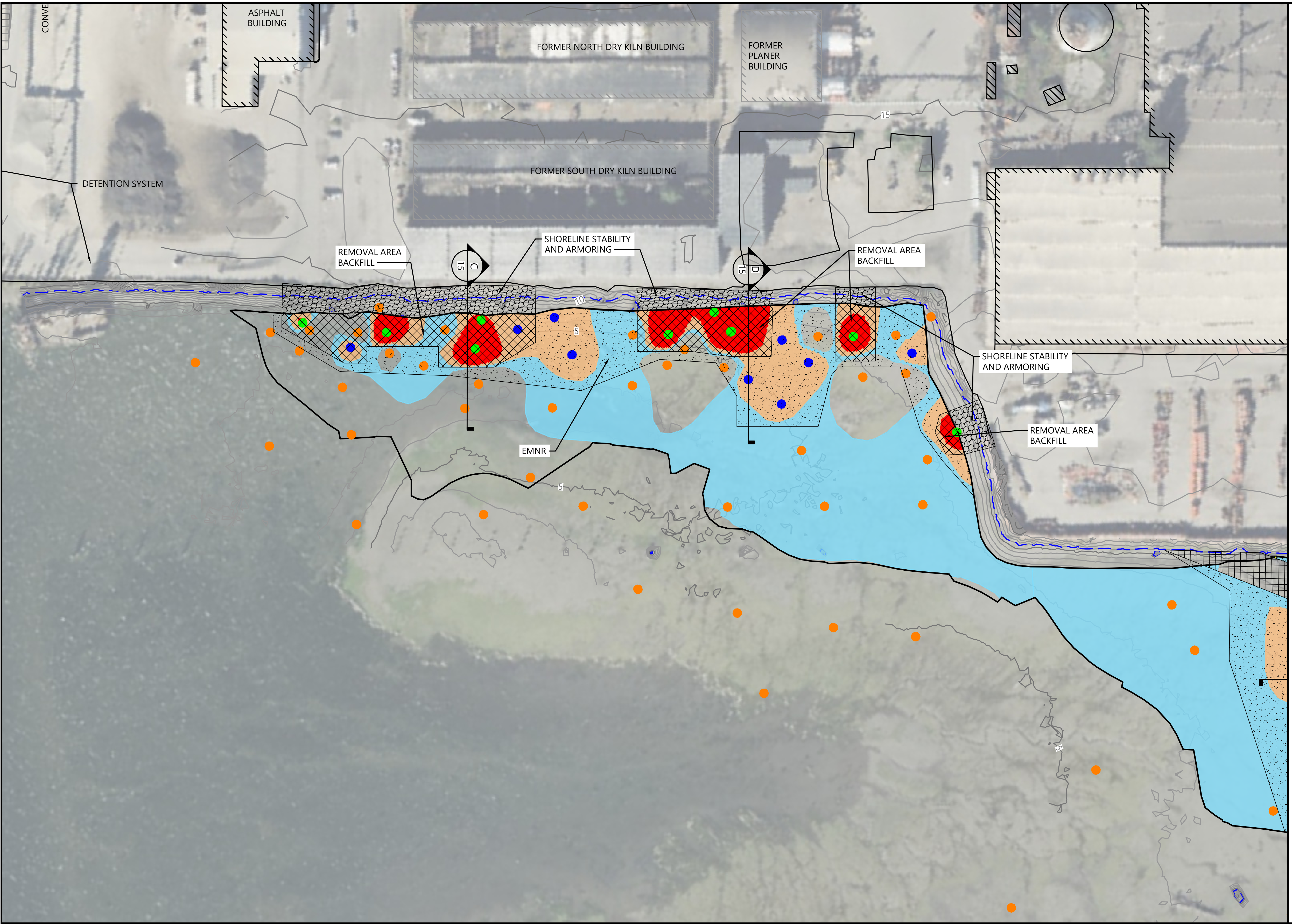

LEGEND:

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| ▨ | SHORELINE STABILITY AND ARMORING |

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1. HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD83, U.S. SURVEY FEET
2. VERTICAL DATUM: MLLW (MEAN LOWER LOW WATER)
3. SMA-1 = SURFACE SEDIMENT AREAS WITHIN THE MARINE SITE BOUNDARY <8 ng/kg dw D/F TEQ (u=1/2) AND <117 ug/kg dw TOTAL PCBs (u=0)
4. SMA-2 = SURFACE SEDIMENT AREAS EXCEEDING THE RALs FOR EMNR, 8 TO 15 ng/kg dw D/F TEQ (u=1/2) AND 117 TO 130 ug/kg dw TOTAL PCB (u=0)
5. SMA-3 = SURFACE SEDIMENT AREAS EXCEEDING THE RALs FOR CAPPING/REMOVAL, 15 ng/kg dw D/F TEQ (u=1/2) AND 130 ug/kg dw TOTAL PCB (u=0)
6. REMOVAL AREAS TO BE BACKFILLED TO PRE-CONSTRUCTION GRADES WITH CLEAN MATERIAL, THEN COVERED WITH 6" CLEAN SAND TO MAINTAIN CONSISTENT GRADING.

NORTH

0 60 120
SCALE IN FEET

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

**DRAFT-30% DESIGN**
**NOT FOR CONSTRUCTION**

ANCHOR QEA

REVISIONS

| REV | DATE | BY | APP'D | DESCRIPTION |
|---|---|---|---|---|
| | | | | |

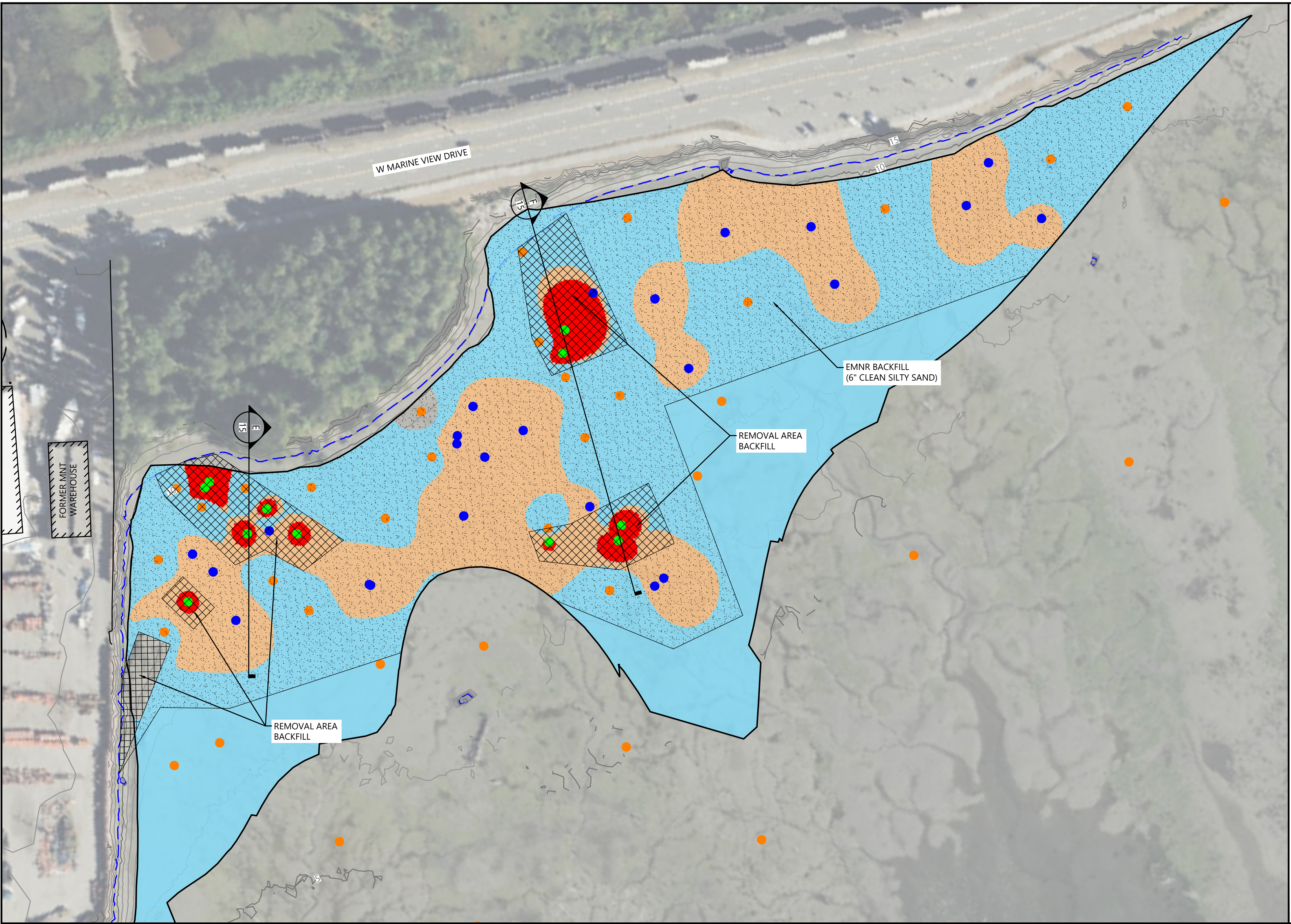
DESIGNED BY: G. CASSON
DRAWN BY: N. REED
CHECKED BY: I. LASTNAME
APPROVED BY: I. LASTNAME
SCALE: AS NOTED
DATE: MARCH 2025

**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**SOUTHERN SHORELINE PLACEMENT PLAN**

**FIGURE 13**

Jun 12, 2025 12:43pm nreed K:\Projects\0909-Jeld Wen\Jeld Wen Former Nord Door Site\Construction Plans\0909-PL-PLACEMENT PLAN.dwg SOUTHERN SHORELINE PLACEMENT



LEGEND:

| | |
|---|---|
| ━━━ | MARINE SITE BOUNDARY |
| —— 500 —— | EXISTING BATHYMETRIC CONTOURS (1' & 5' INTERVAL) |
| — — — — | MEAN HIGHER HIGH WATER (MHHW) EL= 11.09' |
| 🟦 | SMA-1 MONITORED NATURAL RECOVERY (MNR) |
| 🟧 | SMA-2 ENHANCED MONITORED NATURAL RECOVERY (EMNR) |
| 🟥 | SMA-3 CAPPING OR REMOVAL |
| ● | SAMPLE LOCATION SMA-1 |
| ● | SAMPLE LOCATION SMA-2 |
| ● | SAMPLE LOCATION SMA-3 |
| ▨ | REMOVAL AREA BACKFILL (SEE NOTE 6) |
| ░ | EMNR PLACEMENT (6" CLEAN SILTY SAND) |

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD83, U.S. SURVEY FEET
2. VERTICAL DATUM: MLLW (MEAN LOWER LOW WATER)
3. SMA-1 = SURFACE SEDIMENT AREAS WITHIN THE MARINE SITE BOUNDARY <8 ng/kg dw D/F TEQ (u=1/2) AND <117 ug/kg dw TOTAL PCBs (u=0)
4. SMA-2 = SURFACE SEDIMENT AREAS EXCEEDING THE RALs FOR EMNR, 8 TO 15 ng/kg dw D/F TEQ (u=1/2) AND 117 TO 130 ug/kg dw TOTAL PCB (u=0)
5. SMA-3 = SURFACE SEDIMENT AREAS EXCEEDING THE RALs FOR CAPPING/REMOVAL, 15 ng/kg dw D/F TEQ (u=1/2) AND 130 ug/kg dw TOTAL PCB (u=0)
6. REMOVAL AREAS TO BE BACKFILLED TO PRE-CONSTRUCTION GRADES WITH CLEAN MATERIAL, THEN COVERED WITH 6" CLEAN SAND TO MAINTAIN CONSISTENT GRADING.

NORTH

0 60 120
SCALE IN FEET

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

***DRAFT-30% DESIGN***
***NOT FOR CONSTRUCTION***

ANCHOR QEA

REVISIONS

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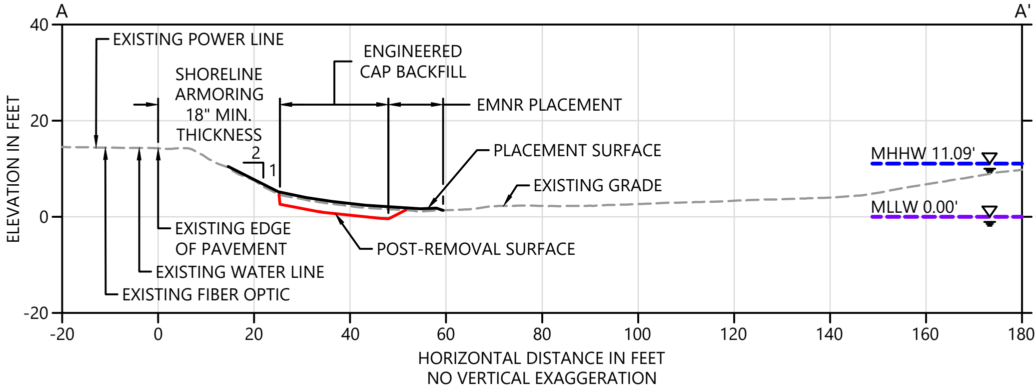
DESIGNED BY: G. CASSON
DRAWN BY: N. REED
CHECKED BY: I. LASTNAME
APPROVED BY: I. LASTNAME
SCALE: AS NOTED
DATE: MARCH 2025

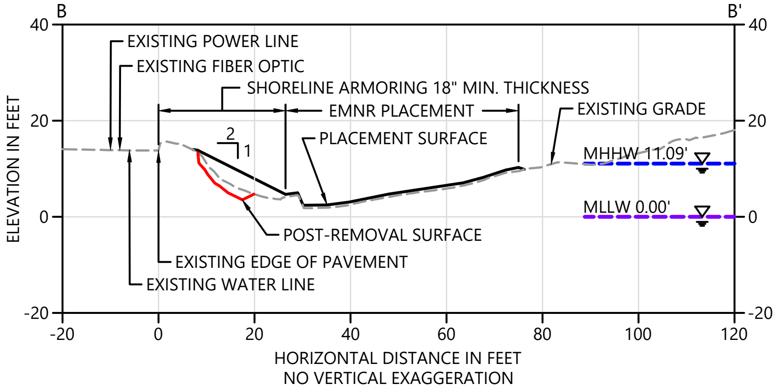
**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**KNOLL PLACEMENT PLAN**

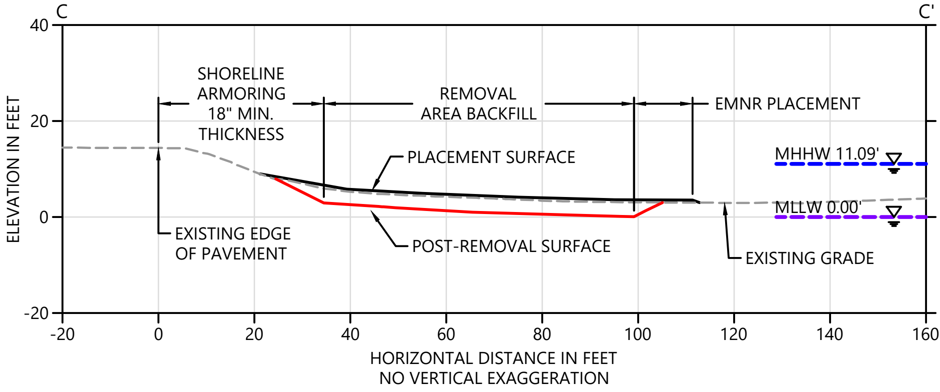
**FIGURE 14**



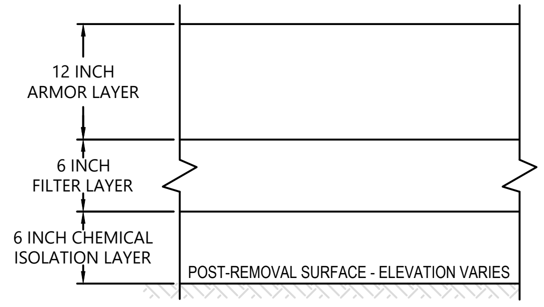
A
12
SECTION A
SCALE: 1" = 20'



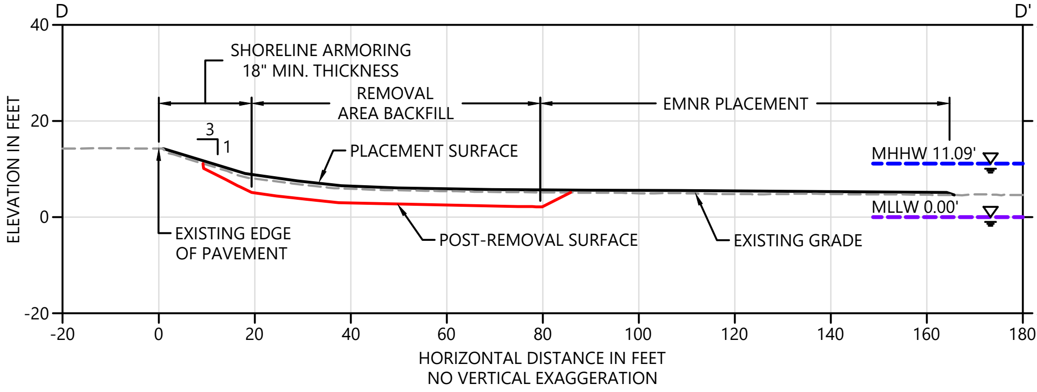
B
12
SECTION B
SCALE: 1" = 20'



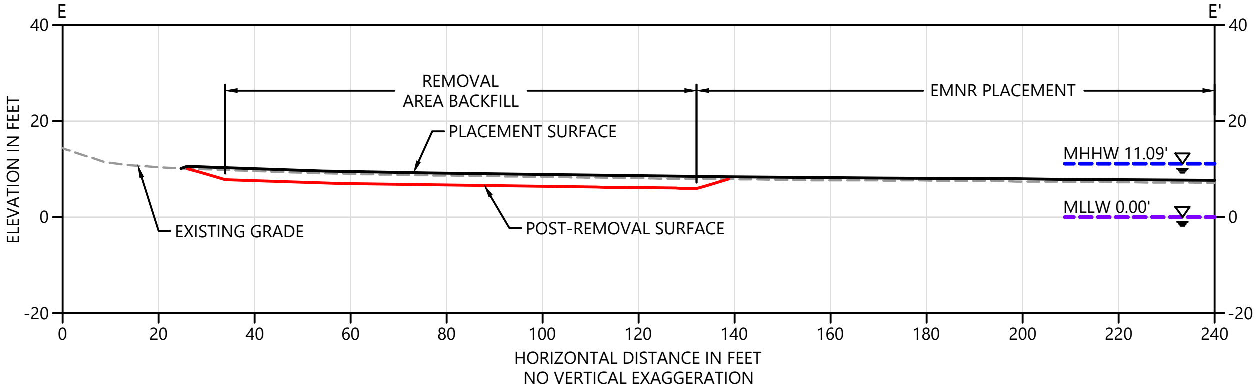
C
13
SECTION C
SCALE: 1" = 20'



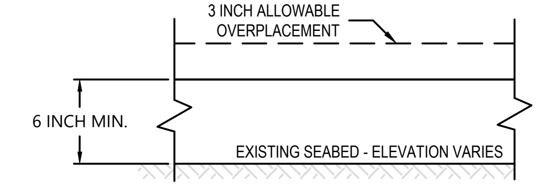
1
ENGINEERED CAP
SCALE: N.T.S.



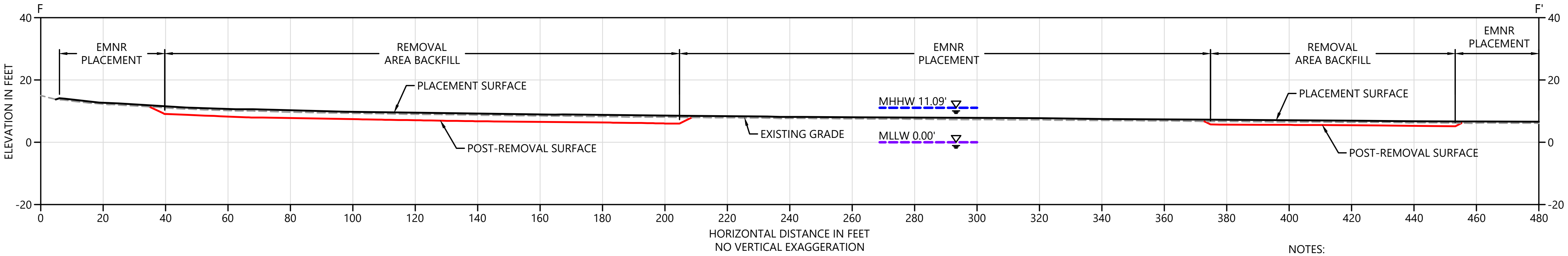
D
13
SECTION D
SCALE: 1" = 20'



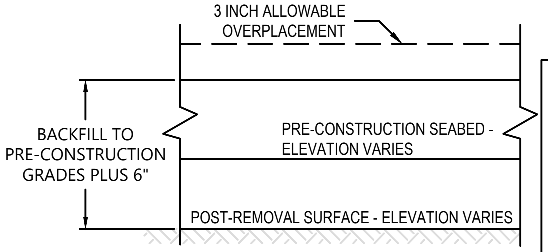
E
14
SECTION E
SCALE: 1" = 20'



2
EMNR PLACEMENT
SCALE: N.T.S.



F
14
SECTION F
SCALE: 1" = 20'



3
REMOVAL AREA BACKFILL
SCALE: N.T.S.

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD83, U.S. SURVEY FEET
2. VERTICAL DATUM: MLLW (MEAN LOWER LOW WATER)
3. ALL UTILITIES SHOWN ARE APPROXIMATE. NO AS-BUILT ELEVATION INFORMATION IS AVAILABLE

0 20 40
SCALE IN FEET

***DRAFT-30% DESIGN***
***NOT FOR CONSTRUCTION***

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

K:\Projects\0909-Jeld Wen\Jeld Wen Former Nord Door Site\Construction Plans\0909-PL_PLACEMENT PLAN.dwg SECTIONS

Jun 12, 2025 12:43pm nreed

ANCHOR QEA

REVISIONS

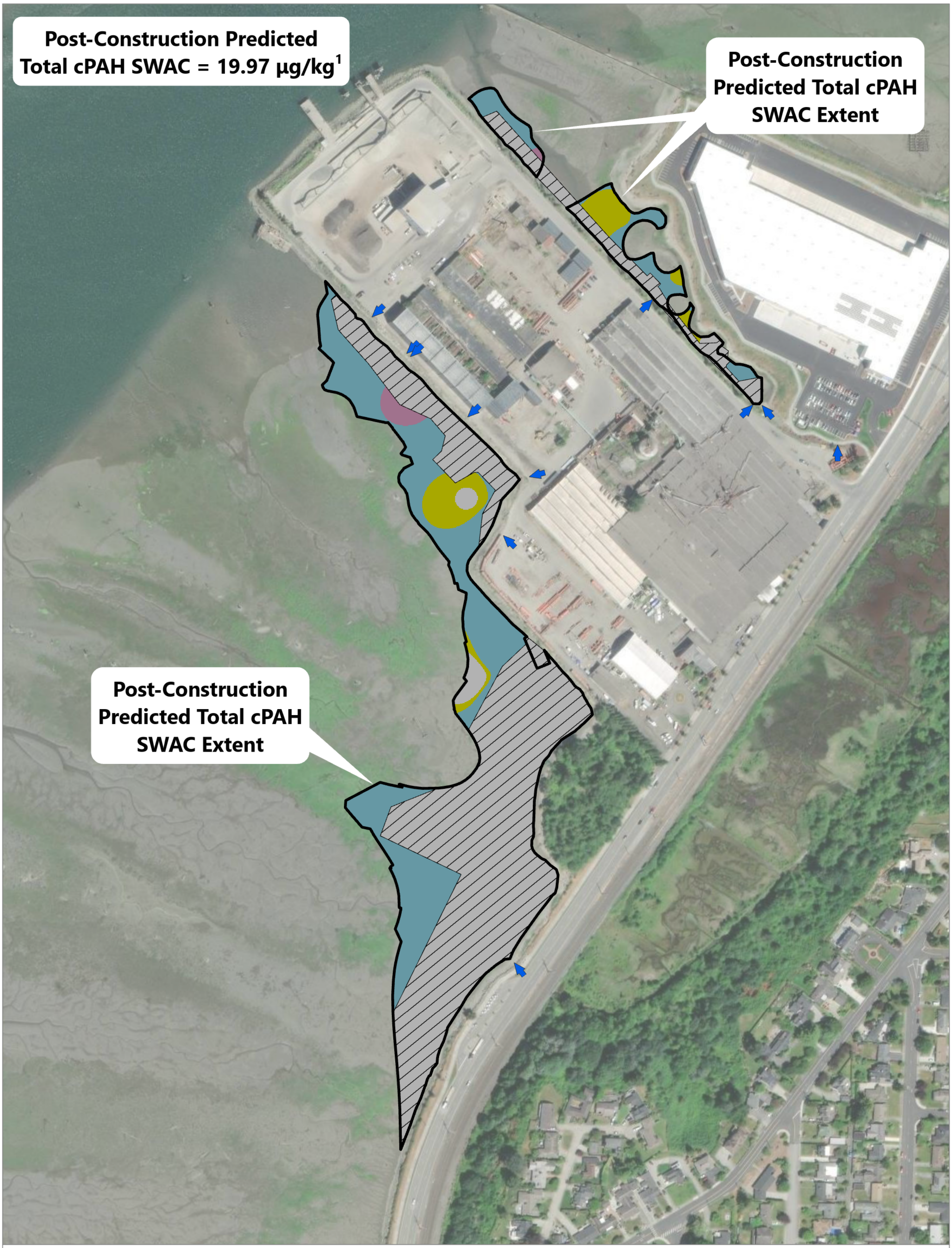
| REV | DATE | BY | APP'D | DESCRIPTION |
|---|---|---|---|---|
| | | | | |

DESIGNED BY: G. CASSON
DRAWN BY: N. REED
CHECKED BY: J. LASTNAME
APPROVED BY: J. LASTNAME
SCALE: AS NOTED
DATE: MARCH 2025

**JELD-WEN REMEDIATION PROJECT**
**MARINE ENGINEERING DESIGN REPORT**

**MATERIAL PLACEMENT SECTIONS AND TYPICAL DETAILS**

**FIGURE 15**



**LEGEND:**

**Interpolated cPAH Concentration (µg/kg)**

- ⬜ 0 to <=12
- 🟨 >12 to <=21
- 🟦 >21 to <=60
- 🟪 >60
- ▨ EMNR Areas
- ▭ Marine Site Boundary
- ➡ Outfall Location

0 75 150 300
Feet

**NOTES:**

1. Within the extent of the Marine Site Boundary, the surface weighted average concentration (SWAC) for cPAH for the inverse distance weighting (IDW) interpolation shown is 41.37 µg/kg. Replacement of all cPAH concentrations within the EMNR areas shown with a value of 12 µg/kg results in a predicted SWAC within the Marine Site Boundary of 19.97 µg/kg.
2. Background orthoimagery provided by Esri and their imagery partners.
3. Total cPAH IDW interpolation performed using ArcGIS Pro software. Log-transformed cPAH concentration data were used in the interpolation, and the resulting surface was then back-transformed into units of µg/kg for presentation and SWAC calculations.
4. Step 1 locations and RIFS locations are included in interpolation data set.

Publish Date: 2025/05/14, 1:54 PM | User: cgardner
Filepath: \\GSTFile01\gis\Jobs\JELD-WEN_0546\Maps\MEDR\MEDR.aprx | AQ_JW_MEDR_Fig16_cPAH_SWAC

**Figure 16**
**Post-Construction Predicted Total cPAH SWAC within Marine Site Boundary**

# Appendix A
## Ex Situ Solid-Phase Microextraction Testing Results

1201 3rd Avenue, Suite 2600
Seattle, Washington 98101
206.287.9130

# Memorandum

June 19, 2025

To: Nathan Soccorsy and Jason Cornetta, Anchor QEA

From: Masa Kanematsu, PhD, Anchor QEA

**Re: JELD-WEN Ex Situ Solid-Phase Microextraction Testing Results for Dioxins/Furans and Polychlorinated Biphenyls**

This memorandum presents the results of ex situ solid-phase microextraction (SPME) testing conducted to measure the freely dissolved and potentially bioavailable concentrations of dioxins/furans (D/F) and polychlorinated biphenyls (PCBs) in sediment porewater of the marine areas of the JELD-WEN Site (Site) located at 300 West Marine View Drive, Everett, Washington, 98201.

Ex situ SPME tests were performed for the sediment samples at Anchor QEA's Portland, Oregon, Environmental Geochemistry Laboratory (EGL). In this test, polydimethylsiloxane (PDMS)-coated glass fibers (i.e., SPME fibers) spiked with performance reference compounds (PRCs) were deployed for 34 days within surface sediments collected from the Site. PRCs are isotope-labeled dioxins and PCBs and spiked to SPME fibers prior to deployment to estimate the fraction of equilibrium of the target chemicals between sediment porewater and the SPME fibers. During deployment, PRCs diffused out of the SPME fiber while target chemicals diffused into them. After retrieval, target chemicals and PRCs were extracted and quantified in an analytical laboratory. By combining the measured loss of PRCs with equations describing mass transport, the fraction of equilibrium of target chemicals can be estimated. This, in turn, allows for the estimation of freely dissolved concentrations of D/F and PCBs, which are widely considered to be the bioavailable fraction. The test methodology was conducted in accordance with the U.S. Environmental Protection Agency passive sampling manual (USEPA, SERDP, and ESTCP 2017).

## Methods

### Polydimethylsiloxane (PDMS)-Coated Glass Fiber Preparation

PDMS-coated glass fibers (i.e., SPME fibers) were obtained from Polymicro Technologies Inc. (Phoenix, Arizona; Part No. FSS10001070). The SPME fiber consists of a 1,000-micrometer (µm)-diameter inert glass core coated with 35 µm of PDMS. Prior to use, SPME fibers were sequentially soaked in high-performance liquid chromatography (HPLC)-grade hexane, methanol, and deionized water in a glass tube on a shaker table to remove any potential contaminants that may interfere with subsequent analysis. Clean SPME fibers were then soaked in a methanol/water (80:20) mixture spiked with four $^{13}C$-labeled dioxins (i.e., 1,2,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), 1,2,4,7,8-Pentachlorodibenzo-p-dioxin (PeCDD), 1,2,3,4,6,8-Hexachlorodibenzo-p-dioxin (HxCDD), and

1,2,3,4,6,7,9-Heptachlorodibenzo-p-dioxin (HpCDD)) and $^{13}$C-labeled PCBs (i.e., PCB-008, PCB-031, PCB-060, PCB-085, PCB-128, and PCB-182) purchased from Wellington Laboratories Inc. (Ontario, Canada) and Cambridge Isotope Inc. (Tewksbury, Massachusetts), respectively, and allowed to equilibrate for 14 days on a shaker table. Subsequently, all SPME fibers were removed from the PRC solution and rinsed with deionized water to remove residual methanol. Then, four of the SPME samples (approximately 45 to 60 centimeters [cm] each) were immediately sent to SGS North America (Wilmington, North Carolina) to measure the initial PRC concentrations for quality assurance/quality control (QA/QC).

## Ex Situ Solid-Phase Microextraction Test

A total of 10 surface sediment samples, including one field duplicate, were collected at the Site on July 20 to 24, 2024. Each surface sediment sample was thoroughly homogenized, placed in a 32-ounce glass jar at the Site, and immediately transported on ice in coolers to the EGL. Upon receipt of the sediment samples at the EGL, large rocks and debris, if present, were removed by gloved hands, and the moisture content of the samples was measured. Then, sediment slurries were prepared in 32-ounce glass jars by mixing predetermined amounts of sediment with a 0.01 molar calcium chloride solution to achieve a target moisture content of 70%. A small amount of sodium azide solution was added to each sediment slurry jar to reach a concentration of 50 mg/L in sediment porewater, preventing the biodegradation of the target chemicals (Van der Heijden and Jonker 2009; Fagervold et al. 2010). Then, PRC-spiked SPME fibers (approximately 45 cm in total length) were cut to approximately 15 cm each, enclosed in cleaned stainless-steel mesh sleeves, and deployed into the sediment slurry jars. The sediment jars were placed on a shaker table and agitated at 120 revolutions per minute. The SPME fibers were deployed for 34 days from August 22 to September 25, 2024.

After the deployment period, the SPME fibers were gently retrieved from the sediment slurry jars with gloved hands, rinsed with high performance liquid chromatography (HPLC)-grade water, and wiped with laboratory tissue to remove water and adhering particles. After measuring their masses and lengths, the retrieved SPME samples were immediately shipped on ice to SGS North America for analysis. The SPME samples were analyzed for D/F, PCBs, and PRCs and using U.S. Environmental Protection Agency Method 1613B and 1669C. Laboratory reports are presented as appendices to the report.

## Calculation of Freely Dissolved Concentrations of D/F and PCBs in Sediment Porewater

The freely dissolved concentrations of D/F and PCBs in sediment porewater are estimated using the concentrations of D/F and PCBs on the deployed SPME fibers measured at the analytical laboratory, divided by the PDMS-water partitioning coefficient and the fraction of equilibrium achieved within the SPME fiber, as shown in Equation 1 (USEPA, SERDP, and ESTCP 2017).

**Equation 1**

$$C_d = \frac{C_{PDMS}}{K_{PDMS-W} \times f_e}$$

where:

$C_d$ = Concentration in porewater (micrograms per liter [µg/L])
$C_{PDMS}$ = Concentration in PDMS polymer (micrograms per kilogram [µg/kg])
$K_{PDMS\text{-}W}$ = PDMS-water partitioning coefficient (liters per kilogram [L/kg])
$f_e$ = Fraction of equilibrium (unitless)

The PDMS-water partitioning coefficients ($K_{PDMS\text{-}W}$) of D/F were cited from literature (Cornelissen et al., 2008). For PCBs, a regression between measured PDMS-water partitioning coefficient ($K_{PDMS\text{-}W}$) values and published octanol-water partitioning coefficient ($K_{OW}$) values for selected PCBs were cited from literature (Ghosh et al., 2014). Log $K_{OW}$ values of PCBs were cited from Hawker and Connell (1988) and were adjusted based on the $K_{OW}$ values measured by De Bruijn et al. (1989) with a slow stirring method, which is generally considered a more reliable method to measure $K_{OW}$ values (OECD 2006). The cited regression was adjusted based on the log $K_{OW}$ values (Equation 2) and used to calculate the log $K_{PDMS\text{-}water}$ value of each PCB congener.

**Equation 2**

$$\log K_{PDMS-W} = 0.908 \times \log K_{OW} - 0.136 \; (r^2 = 0.913)$$

where:

$K_{PDMS\text{-}W}$ = PDMS-water partitioning coefficient of PCB congener
$K_{OW}$ = Octanol-water partitioning coefficient of PCB congener

As the SPME fiber deployment period is typically insufficient to achieve equilibrium between sediment porewater and PDMS, the losses of PRCs are used to estimate the fraction of equilibrium of the target compounds. First, the fraction of equilibrium for each of the PRC was calculated using the ratio of the final concentration of PRC (i.e., following deployment) to the initial concentration, as follows in Equation 3.

**Equation 3**

$$f_e = 1 - \frac{C_{PRC,final}}{C_{PRC,init}}$$

where:

$f_e$ = Fraction of equilibrium
$C_{PRC,final}$ = Final PRC concentration in SPME fiber (μg/kg)
$C_{PRC,init}$ = Initial PRC concentration in SPME fiber (μg/kg)

Subsequently, the calculated $f_e$ values of the PRCs were incorporated into the mathematical model to estimate the $f_e$ values of the target chemicals (Tcaciuc et al. 2015; Borrelli et al. 2019). The freely dissolved concentrations of D/F and PCBs in sediment porewater can be estimated from the measured concentration sorbed to PDMS polymer and the PDMS-water partition coefficient and the fraction of equilibrium ($f_e$) as shown in Equation 1.

## Results

### Fraction of Equilibrium ($f_e$)

As noted previously, all deployed SPME fibers were spiked with the four $^{13}$C-labeled dioxins and the $^{13}$C-labeled PCBs. The $f_e$ values of the dioxin PRCs and PCB PRCs are presented as a function of the $K_{PDMS\text{-}water}$ values in Figure 1 and 2, respectively. All the dioxin PRCs and lower-molecular weight PCB PRCs reached equilibrium for all samples during the deployment period. The $f_e$ values of $^{13}$C-PCB-182, which is the largest molecular weight PCB PRC, were close to 0.50.

The $f_e$ values of target D/F and PCBs in the deployed SPME samples were estimated using the $f_e$ of the PRCs and the mathematical model as noted. The model predictions of $f_e$ values of target D/F and PCBs are presented as a function of their $K_{PDMS\text{-}W}$ values for selected SPME samples in Figure 1 and 2, respectively. The estimated $f_e$ values were used to calculate the freely dissolved concentrations of D/F and PCBs in sediment porewater using Equation 1.

### Dioxin/Furans in Sediment Porewater

The freely dissolved concentrations of D/F and PCBs are presented in Table 1. Since the masses of almost all D/F and PCBs found in the QA/QC samples were nondetect or very low, they did not warrant adjustments to the analyses or conclusions.

In the ex situ SPME test, the highest DF porewater concentration was observed in the sediment PW-041 (2.97 picograms per liter [pg/L]), which corresponds to 0.078 pg/L toxic equivalent PW-044 had the second highest total DF porewater concentration (1.75 pg/L). PW-1044, a field duplicate of PW-

044, had a similar total DF porewater concentration (0.90 pg/L). All other total DF porewater concentrations were lower than 0.60 pg/L. The total PCB porewater concentration in PW-032 was 0.18 ng/L. Note that the SPME sample deployed in PW-025 was lost at the analytical laboratory.

## Quality Control/Quality Assurance Summary

The following quality assurance/quality control (QA/QC) samples were prepared to ensure SPME data quality: a method blank; a field duplicate; and PRC-loaded SPME reproducibility standards. The method blank was collected after thoroughly washing with HPLC grade n-hexane, methanol, and water to check background contamination. More specifically, a total of approximately 45 centimeters of SPME fiber was cut and cleaned with other SPME fibers, wrapped with aluminum foil, and stored in an air-tight bag in a refrigerator at 4°C until other SPME fibers were retrieved from the sediments. No notable contamination was found in the method blank. The field duplicate (PW-1044) was collected for sediment PW-044 at the same location at the same time. As noted, the sediment porewater total DF concentrations in the duplicate sediments were similar each other 1.79 and 1.14 pg/L). The PRC-loaded SPME reproducibility standards were prepared to check the variability in initial PRC concentrations. The initial PRC concentrations in the QA/QC samples had small variability (the coefficient of variation ranged from 3.1% to 7.8%). The PRC concentrations in the SPME samples deployed in the sediments were substantially lower than the initial PRC concentrations in the QA/QC samples, which warrant the calculation of the fraction of equilibrium. No notable background contamination was found in the QA/QC samples as well.

## References

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Ghosh, U., S. Kane Driscoll, R.M. Burgess, M.T.O. Jonker, D. Reible, F. Gobas, Y. Choi, S.E. Apitz, K.A. Maruya, W.R. Gala, M. Mortimer, and C. Beegan, 2014. "Passive Sampling Methods for Contaminated Sediments: Practical Guidance for Selection, Calibration and Implementation." *Integrated Environmental Assessment and Management* 10:210–223.

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Tcaciuc, A.P., J.N. Apell, and P.M. Gschwend, 2015. "Modeling the transport of organic chemicals between polyethylene passive samplers and water in finite and infinite bath conditions." *Environmental Toxicology and Chemistry* 34, 2739e2749.

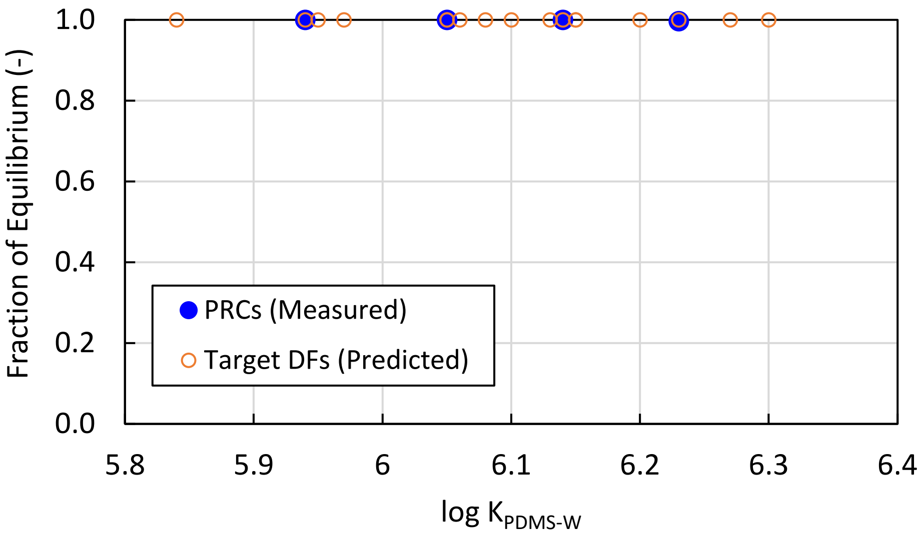
USEPA (U.S. Environmental Protection Agency), 2003. *Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures.* EPA Office of Research and Development. EPA-600-R-013. November 2003.

USEPA, SERDP, and ESTCP (U.S. Environmental Protection Agency, Strategic Environmental Research and Development Program, and Environmental Security Technology Certification Program), 2017. *Laboratory, Field, and Analytical Procedures for Using Passive Sampling in the Evaluation of Contaminated Sediments: User's Manual.* EPA/600/R-16/357. Office of Research and Development, Washington, DC.

# Figures

**Figure 1**

**Fraction of Equilibrium ($f_e$) of the dioxin PRCs and Predicted Fraction of Equilibrium ($f_e$) of Target D/F in the Selected SPME Sample (PW-004).**

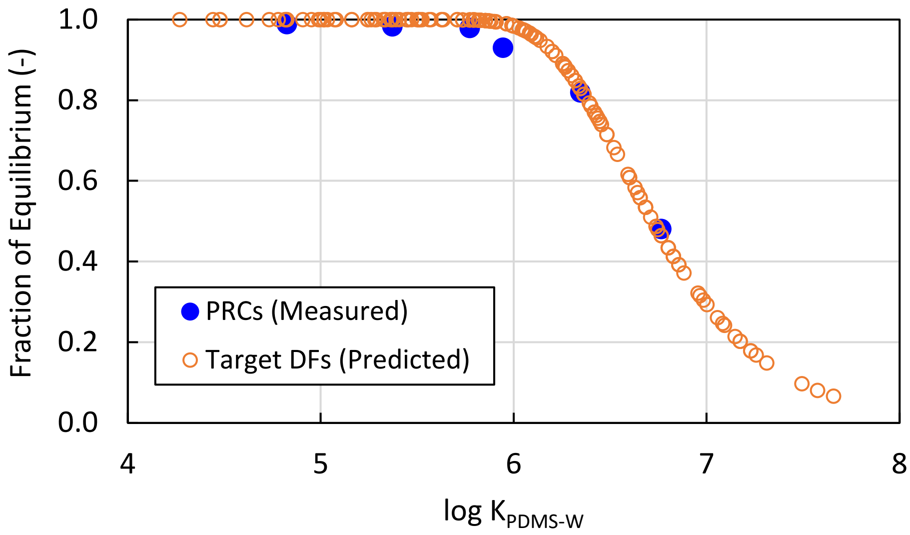


Notes:

1. The results for the other SPME samples are nearly identical.
2. Blue closed symbols and orange open symbols indicate the measured fraction of equilibrium of the dioxin PRCs and the predicted fraction of equilibrium of the target D/F, respectively.

**Figure 2**

**Fraction of Equilibrium ($f_e$) of the PCB PRCs and Predicted Fraction of Equilibrium ($f_e$) of Target PCBs in the Selected SPME Sample (PW-032).**



Notes:

1. Blue closed symbols and orange open symbols indicate the measured fraction of equilibrium of the PCB PRCs and the predicted fraction of equilibrium of the target PCBs, respectively.

# Table

## Table 1
## Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater

| | Task | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 |
|---|---|---|---|---|---|---|
| | **Location ID** | **JW-PW-004-2024** | **JW-PW-013-2024** | **JW-PW-019-2024** | **JW-PW-029-2024** | **JW-PW-032-2024** |
| | **Sample ID** | **JW-PW-004-2-3-20240722-SPME** | **JW-PW-013-2-3-20240721-SPME** | **JW-PW-019-2-3-20240722-SPME** | **JW-PW-029-2-3-20240722-SPME** | **JW-PW-032-2-3-20240721-SPME** |
| | **Sample Date** | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** |
| | **Sample Type** | **N** | **N** | **N** | **N** | **N** |
| | **Matrix** | **SPME** | **SPME** | **SPME** | **SPME** | **SPME** |
| **Dioxin Furans (SPME) (ng/L)** | | | | | | |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) | E1613B | 0.0000430 U | 0.0000495 U | 0.0000401 U | 0.0000323 U | -- |
| 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD) | E1613B | 0.0000219 U | 0.0000202 U | 0.0000214 U | 0.0000265 U | -- |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) | E1613B | **0.0000346 J** | **0.0000506 J** | **0.0000555 J** | **0.0000439 J** | -- |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) | E1613B | 0.0000110 U | 0.0000127 U | 0.0000138 U | 0.0000159 U | -- |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD) | E1613B | **0.0000246 J** | **0.0000227 J** | **0.0000224 J** | 0.0000169 U | -- |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD) | E1613B | **0.0000869 J** | **0.0000264 J** | 0.00000761 U | **0.0000109 J** | -- |
| 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD) | E1613B | **0.000316 J** | **0.0000445 J** | **0.0000294 J** | **0.0000502 J** | -- |
| 2,3,7,8-Tetrachlorodibenzofuran (TCDF) | E1613B | 0.0000194 U | 0.0000187 U | 0.0000239 U | 0.0000298 U | -- |
| 1,2,3,7,8-Pentachlorodibenzofuran (PeCDF) | E1613B | 0.0000230 U | 0.0000291 U | 0.0000216 U | 0.0000213 U | -- |
| 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) | E1613B | 0.0000231 U | 0.0000249 U | 0.0000205 U | 0.0000190 U | -- |
| 1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF) | E1613B | 0.0000148 U | 0.00000781 U | 0.0000105 U | 0.0000247 U | -- |
| 1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF) | E1613B | 0.0000139 U | 0.00000696 U | 0.0000104 U | 0.0000243 U | -- |
| 1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF) | E1613B | 0.0000143 U | 0.00000768 U | 0.0000115 U | 0.0000251 U | -- |
| 2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF) | E1613B | 0.0000142 U | 0.00000705 U | 0.0000105 U | 0.0000249 U | -- |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) | E1613B | **0.0000337 J** | 0.00000713 U | 0.00000551 U | 0.0000137 U | -- |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF) | E1613B | 0.00000534 U | 0.00000674 U | 0.00000532 U | 0.0000121 U | -- |
| 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF) | E1613B | 0.00000923 U | 0.0000103 U | 0.0000138 U | 0.0000143 U | -- |
| Total Dioxin/Furan (U = 1/2 max limit) | | **0.000602 J** | **0.000249 J** | **0.000216 J** | **0.000255 J** | -- |
| Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2 max limit) | | **0.0000479 J** | **0.0000497 J** | **0.0000461 J** | **0.0000453 J** | -- |
| **PCB Congeners (SPME) (ng/L)** | | | | | | |
| PCB-001 | E1668C | -- | -- | -- | -- | 0.00255 U |
| PCB-002 | E1668C | -- | -- | -- | -- | 0.00167 U |
| PCB-003 | E1668C | -- | -- | -- | -- | 0.00187 U |
| PCB-004 | E1668C | -- | -- | -- | -- | **0.00651 J** |
| PCB-005 | E1668C | -- | -- | -- | -- | 0.00265 U |
| PCB-006 | E1668C | -- | -- | -- | -- | 0.00184 U |
| PCB-007 | E1668C | -- | -- | -- | -- | 0.00208 U |
| PCB-008 | E1668C | -- | -- | -- | -- | **0.00250 J** |
| PCB-009 | E1668C | -- | -- | -- | -- | 0.00190 U |
| PCB-010 | E1668C | -- | -- | -- | -- | 0.00202 U |
| PCB-011 | E1668C | -- | -- | -- | -- | **0.00340 J** |
| PCB-012/013 | E1668C | -- | -- | -- | -- | 0.00137 U |
| PCB-014 | E1668C | -- | -- | -- | -- | 0.00132 U |

## Table 1
## Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater

| Task | | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** |
|---|---|---|---|---|---|
| **Location ID** | | **JW-PW-036-2024** | **JW-PW-041-2024** | **JW-PW-044-2024** | **JW-PW-1044-2024** |
| **Sample ID** | | **JW-PW-036-2-3-20240720-SPME** | **JW-PW-041-2-3-20240720-SPME** | **JW-PW-044-2-3-20240720-SPME** | **JW-PW-1044-2-3-20240720-SPME** |
| **Sample Date** | | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** |
| **Sample Type** | | **N** | **N** | **N** | **N** |
| **Matrix** | | **SPME** | **SPME** | **SPME** | **SPME** |
| **Dioxin Furans (SPME) (ng/L)** | | | | | |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) | E1613B | 0.0000384 U | 0.0000391 U | 0.0000341 U | 0.0000575 U |
| 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD) | E1613B | 0.0000201 U | 0.0000234 U | **0.0000503 J** | 0.0000367 U |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) | E1613B | **0.0000421 J** | **0.0000742 J** | **0.000111 J** | 0.0000332 U |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) | E1613B | **0.0000210 J** | **0.0000896 J** | **0.0000884 J** | 0.0000348 U |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD) | E1613B | 0.00000936 U | **0.0000468 J** | **0.0000823 J** | 0.0000320 U |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD) | E1613B | **0.0000875 J** | **0.000462 J** | **0.000221 J** | **0.000173 J** |
| 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD) | E1613B | **0.000210 J** | **0.00188** | **0.000614 J** | **0.000426 J** |
| 2,3,7,8-Tetrachlorodibenzofuran (TCDF) | E1613B | 0.0000258 U | 0.0000235 U | 0.0000242 U | 0.0000331 U |
| 1,2,3,7,8-Pentachlorodibenzofuran (PeCDF) | E1613B | 0.0000244 U | **0.0000371 J** | 0.0000252 U | 0.0000259 U |
| 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) | E1613B | 0.0000216 U | 0.0000191 U | **0.0000535 J** | 0.0000243 U |
| 1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF) | E1613B | 0.0000141 U | **0.0000358 J** | **0.0000755 J** | 0.0000450 U |
| 1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF) | E1613B | 0.0000138 U | **0.0000268 J** | **0.0000474 J** | 0.0000421 U |
| 1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF) | E1613B | **0.0000334 J** | **0.0000423 J** | **0.0000640 J** | 0.0000467 U |
| 2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF) | E1613B | 0.0000142 U | **0.0000336 J** | **0.0000536 J** | 0.0000407 U |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) | E1613B | **0.0000393 J** | **0.000101 J** | **0.000118 J** | **0.0000620 J** |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF) | E1613B | 0.00000676 U | **0.0000112 J** | **0.0000383 J** | 0.0000147 U |
| 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF) | E1613B | 0.0000115 U | **0.0000728 J** | **0.0000933 J** | 0.0000167 U |
| Total Dioxin/Furan (U = 1/2 max limit) | | **0.000533 J** | **0.00297 J** | **0.00175 J** | **0.000903 J** |
| Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2 max limit) | | **0.0000477 J** | **0.0000776 J** | **0.000141 J** | **0.0000691 J** |
| **PCB Congeners (SPME) (ng/L)** | | | | | |
| PCB-001 | E1668C | -- | -- | -- | -- |
| PCB-002 | E1668C | -- | -- | -- | -- |
| PCB-003 | E1668C | -- | -- | -- | -- |
| PCB-004 | E1668C | -- | -- | -- | -- |
| PCB-005 | E1668C | -- | -- | -- | -- |
| PCB-006 | E1668C | -- | -- | -- | -- |
| PCB-007 | E1668C | -- | -- | -- | -- |
| PCB-008 | E1668C | -- | -- | -- | -- |
| PCB-009 | E1668C | -- | -- | -- | -- |
| PCB-010 | E1668C | -- | -- | -- | -- |
| PCB-011 | E1668C | -- | -- | -- | -- |
| PCB-012/013 | E1668C | -- | -- | -- | -- |
| PCB-014 | E1668C | -- | -- | -- | -- |

## Table 1
## Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater

| | Task<br>Location ID<br>Sample ID<br>Sample Date<br>Sample Type<br>Matrix | **JeldWenPreDesignInvestP22024**<br>**JW-PW-004-2024**<br>**JW-PW-004-2-3-20240722-SPME**<br>**9/25/2024**<br>**N**<br>**SPME** | **JeldWenPreDesignInvestP22024**<br>**JW-PW-013-2024**<br>**JW-PW-013-2-3-20240721-SPME**<br>**9/25/2024**<br>**N**<br>**SPME** | **JeldWenPreDesignInvestP22024**<br>**JW-PW-019-2024**<br>**JW-PW-019-2-3-20240722-SPME**<br>**9/25/2024**<br>**N**<br>**SPME** | **JeldWenPreDesignInvestP22024**<br>**JW-PW-029-2024**<br>**JW-PW-029-2-3-20240722-SPME**<br>**9/25/2024**<br>**N**<br>**SPME** | **JeldWenPreDesignInvestP22024**<br>**JW-PW-032-2024**<br>**JW-PW-032-2-3-20240721-SPME**<br>**9/25/2024**<br>**N**<br>**SPME** |
|---|---|---|---|---|---|---|
| PCB-015 | E1668C | -- | -- | -- | -- | **0.000777 J** |
| PCB-016 | E1668C | -- | -- | -- | -- | **0.00882 J** |
| PCB-017 | E1668C | -- | -- | -- | -- | **0.00709** |
| PCB-018/030 | E1668C | -- | -- | -- | -- | **0.0145** |
| PCB-019 | E1668C | -- | -- | -- | -- | **0.00353 J** |
| PCB-020/028 | E1668C | -- | -- | -- | -- | **0.00944** |
| PCB-021/033 | E1668C | -- | -- | -- | -- | **0.00560** |
| PCB-022 | E1668C | -- | -- | -- | -- | **0.00308** |
| PCB-023 | E1668C | -- | -- | -- | -- | 0.00123 U |
| PCB-024 | E1668C | -- | -- | -- | -- | 0.00121 U |
| PCB-025 | E1668C | -- | -- | -- | -- | 0.000804 U |
| PCB-026/029 | E1668C | -- | -- | -- | -- | 0.00106 U |
| PCB-027 | E1668C | -- | -- | -- | -- | 0.00101 U |
| PCB-031 | E1668C | -- | -- | -- | -- | **0.00971** |
| PCB-032 | E1668C | -- | -- | -- | -- | **0.00379** |
| PCB-034 | E1668C | -- | -- | -- | -- | 0.00102 U |
| PCB-035 | E1668C | -- | -- | -- | -- | 0.000698 U |
| PCB-036 | E1668C | -- | -- | -- | -- | 0.000542 U |
| PCB-037 | E1668C | -- | -- | -- | -- | 0.000651 U |
| PCB-038 | E1668C | -- | -- | -- | -- | 0.000754 U |
| PCB-039 | E1668C | -- | -- | -- | -- | 0.000588 U |
| PCB-040/071 | E1668C | -- | -- | -- | -- | **0.00489** |
| PCB-041 | E1668C | -- | -- | -- | -- | **0.00135 J** |
| PCB-042 | E1668C | -- | -- | -- | -- | **0.00304** |
| PCB-043 | E1668C | -- | -- | -- | -- | **0.000498 J** |
| PCB-044/047/065 | E1668C | -- | -- | -- | -- | **0.0138** |
| PCB-045 | E1668C | -- | -- | -- | -- | **0.00407** |
| PCB-046 | E1668C | -- | -- | -- | -- | **0.00177 J** |
| PCB-048 | E1668C | -- | -- | -- | -- | **0.00313** |
| PCB-049/069 | E1668C | -- | -- | -- | -- | **0.00654** |
| PCB-050/053 | E1668C | -- | -- | -- | -- | **0.00354 J** |
| PCB-051 | E1668C | -- | -- | -- | -- | **0.00220** |
| PCB-052 | E1668C | -- | -- | -- | -- | **0.0111** |
| PCB-054 | E1668C | -- | -- | -- | -- | 0.000140 U |

## Table 1
## Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater

| | | | | | |
|---|---|---|---|---|---|
| | Task | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** |
| | Location ID | **JW-PW-036-2024** | **JW-PW-041-2024** | **JW-PW-044-2024** | **JW-PW-1044-2024** |
| | Sample ID | **JW-PW-036-2-3-20240720-SPME** | **JW-PW-041-2-3-20240720-SPME** | **JW-PW-044-2-3-20240720-SPME** | **JW-PW-1044-2-3-20240720-SPME** |
| | Sample Date | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** |
| | Sample Type | **N** | **N** | **N** | **N** |
| | Matrix | **SPME** | **SPME** | **SPME** | **SPME** |
| PCB-015 | E1668C | -- | -- | -- | -- |
| PCB-016 | E1668C | -- | -- | -- | -- |
| PCB-017 | E1668C | -- | -- | -- | -- |
| PCB-018/030 | E1668C | -- | -- | -- | -- |
| PCB-019 | E1668C | -- | -- | -- | -- |
| PCB-020/028 | E1668C | -- | -- | -- | -- |
| PCB-021/033 | E1668C | -- | -- | -- | -- |
| PCB-022 | E1668C | -- | -- | -- | -- |
| PCB-023 | E1668C | -- | -- | -- | -- |
| PCB-024 | E1668C | -- | -- | -- | -- |
| PCB-025 | E1668C | -- | -- | -- | -- |
| PCB-026/029 | E1668C | -- | -- | -- | -- |
| PCB-027 | E1668C | -- | -- | -- | -- |
| PCB-031 | E1668C | -- | -- | -- | -- |
| PCB-032 | E1668C | -- | -- | -- | -- |
| PCB-034 | E1668C | -- | -- | -- | -- |
| PCB-035 | E1668C | -- | -- | -- | -- |
| PCB-036 | E1668C | -- | -- | -- | -- |
| PCB-037 | E1668C | -- | -- | -- | -- |
| PCB-038 | E1668C | -- | -- | -- | -- |
| PCB-039 | E1668C | -- | -- | -- | -- |
| PCB-040/071 | E1668C | -- | -- | -- | -- |
| PCB-041 | E1668C | -- | -- | -- | -- |
| PCB-042 | E1668C | -- | -- | -- | -- |
| PCB-043 | E1668C | -- | -- | -- | -- |
| PCB-044/047/065 | E1668C | -- | -- | -- | -- |
| PCB-045 | E1668C | -- | -- | -- | -- |
| PCB-046 | E1668C | -- | -- | -- | -- |
| PCB-048 | E1668C | -- | -- | -- | -- |
| PCB-049/069 | E1668C | -- | -- | -- | -- |
| PCB-050/053 | E1668C | -- | -- | -- | -- |
| PCB-051 | E1668C | -- | -- | -- | -- |
| PCB-052 | E1668C | -- | -- | -- | -- |
| PCB-054 | E1668C | -- | -- | -- | -- |

**Table 1**

**Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater**

| | **Task** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** |
|---|---|---|---|---|---|---|
| | **Location ID** | **JW-PW-004-2024** | **JW-PW-013-2024** | **JW-PW-019-2024** | **JW-PW-029-2024** | **JW-PW-032-2024** |
| | **Sample ID** | **JW-PW-004-2-3-20240722-SPME** | **JW-PW-013-2-3-20240721-SPME** | **JW-PW-019-2-3-20240722-SPME** | **JW-PW-029-2-3-20240722-SPME** | **JW-PW-032-2-3-20240721-SPME** |
| | **Sample Date** | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** |
| | **Sample Type** | **N** | **N** | **N** | **N** | **N** |
| | **Matrix** | **SPME** | **SPME** | **SPME** | **SPME** | **SPME** |
| PCB-055 | E1668C | -- | -- | -- | -- | 0.000101 U |
| PCB-056 | E1668C | -- | -- | -- | -- | **0.00125** |
| PCB-057 | E1668C | -- | -- | -- | -- | 0.0000964 U |
| PCB-058 | E1668C | -- | -- | -- | -- | 0.0000841 U |
| PCB-059/062/075 | E1668C | -- | -- | -- | -- | **0.000809 J** |
| PCB-060 | E1668C | -- | -- | -- | -- | **0.000815 J** |
| PCB-061/070/074/076 | E1668C | -- | -- | -- | -- | **0.00578** |
| PCB-063 | E1668C | -- | -- | -- | -- | **0.000178 J** |
| PCB-064 | E1668C | -- | -- | -- | -- | **0.00361** |
| PCB-066 | E1668C | -- | -- | -- | -- | **0.00245 J** |
| PCB-067 | E1668C | -- | -- | -- | -- | 0.0000806 U |
| PCB-068 | E1668C | -- | -- | -- | -- | 0.0000794 U |
| PCB-072 | E1668C | -- | -- | -- | -- | 0.0000755 U |
| PCB-073 | E1668C | -- | -- | -- | -- | 0.0000863 U |
| PCB-077 | E1668C | -- | -- | -- | -- | 0.0000716 U |
| PCB-078 | E1668C | -- | -- | -- | -- | 0.0000669 U |
| PCB-079 | E1668C | -- | -- | -- | -- | 0.0000499 U |
| PCB-080 | E1668C | -- | -- | -- | -- | 0.0000505 U |
| PCB-081 | E1668C | -- | -- | -- | -- | 0.0000674 U |
| PCB-082 | E1668C | -- | -- | -- | -- | **0.000141 J** |
| PCB-083 | E1668C | -- | -- | -- | -- | 0.000202 U |
| PCB-084 | E1668C | -- | -- | -- | -- | **0.00121** |
| PCB-085/116 | E1668C | -- | -- | -- | -- | **0.000294 J** |
| PCB-086/087/097/109/119/125 | E1668C | -- | -- | -- | -- | **0.00136 J** |
| PCB-088 | E1668C | -- | -- | -- | -- | 0.000200 U |
| PCB-089 | E1668C | -- | -- | -- | -- | 0.000176 U |
| PCB-090/101/113 | E1668C | -- | -- | -- | -- | **0.00203** |
| PCB-091 | E1668C | -- | -- | -- | -- | **0.000952** |
| PCB-092 | E1668C | -- | -- | -- | -- | **0.000418 J** |
| PCB-093/100 | E1668C | -- | -- | -- | -- | 0.000168 U |
| PCB-094 | E1668C | -- | -- | -- | -- | 0.000180 U |
| PCB-095 | E1668C | -- | -- | -- | -- | **0.00257** |
| PCB-096 | E1668C | -- | -- | -- | -- | 0.000201 U |
| PCB-098 | E1668C | -- | -- | -- | -- | 0.000148 U |

**Table 1**

**Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater**

| | Task | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 |
|---|---|---|---|---|---|
| | Location ID | JW-PW-036-2024 | JW-PW-041-2024 | JW-PW-044-2024 | JW-PW-1044-2024 |
| | Sample ID | JW-PW-036-2-3-20240720-SPME | JW-PW-041-2-3-20240720-SPME | JW-PW-044-2-3-20240720-SPME | JW-PW-1044-2-3-20240720-SPME |
| | Sample Date | 9/25/2024 | 9/25/2024 | 9/25/2024 | 9/25/2024 |
| | Sample Type | N | N | N | N |
| | Matrix | SPME | SPME | SPME | SPME |
| PCB-055 | E1668C | -- | -- | -- | -- |
| PCB-056 | E1668C | -- | -- | -- | -- |
| PCB-057 | E1668C | -- | -- | -- | -- |
| PCB-058 | E1668C | -- | -- | -- | -- |
| PCB-059/062/075 | E1668C | -- | -- | -- | -- |
| PCB-060 | E1668C | -- | -- | -- | -- |
| PCB-061/070/074/076 | E1668C | -- | -- | -- | -- |
| PCB-063 | E1668C | -- | -- | -- | -- |
| PCB-064 | E1668C | -- | -- | -- | -- |
| PCB-066 | E1668C | -- | -- | -- | -- |
| PCB-067 | E1668C | -- | -- | -- | -- |
| PCB-068 | E1668C | -- | -- | -- | -- |
| PCB-072 | E1668C | -- | -- | -- | -- |
| PCB-073 | E1668C | -- | -- | -- | -- |
| PCB-077 | E1668C | -- | -- | -- | -- |
| PCB-078 | E1668C | -- | -- | -- | -- |
| PCB-079 | E1668C | -- | -- | -- | -- |
| PCB-080 | E1668C | -- | -- | -- | -- |
| PCB-081 | E1668C | -- | -- | -- | -- |
| PCB-082 | E1668C | -- | -- | -- | -- |
| PCB-083 | E1668C | -- | -- | -- | -- |
| PCB-084 | E1668C | -- | -- | -- | -- |
| PCB-085/116 | E1668C | -- | -- | -- | -- |
| PCB-086/087/097/109/119/125 | E1668C | -- | -- | -- | -- |
| PCB-088 | E1668C | -- | -- | -- | -- |
| PCB-089 | E1668C | -- | -- | -- | -- |
| PCB-090/101/113 | E1668C | -- | -- | -- | -- |
| PCB-091 | E1668C | -- | -- | -- | -- |
| PCB-092 | E1668C | -- | -- | -- | -- |
| PCB-093/100 | E1668C | -- | -- | -- | -- |
| PCB-094 | E1668C | -- | -- | -- | -- |
| PCB-095 | E1668C | -- | -- | -- | -- |
| PCB-096 | E1668C | -- | -- | -- | -- |
| PCB-098 | E1668C | -- | -- | -- | -- |

## Table 1
## Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater

| | **Task** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** |
|---|---|---|---|---|---|---|
| | **Location ID** | **JW-PW-004-2024** | **JW-PW-013-2024** | **JW-PW-019-2024** | **JW-PW-029-2024** | **JW-PW-032-2024** |
| | **Sample ID** | **JW-PW-004-2-3-20240722-SPME** | **JW-PW-013-2-3-20240721-SPME** | **JW-PW-019-2-3-20240722-SPME** | **JW-PW-029-2-3-20240722-SPME** | **JW-PW-032-2-3-20240721-SPME** |
| | **Sample Date** | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** |
| | **Sample Type** | **N** | **N** | **N** | **N** | **N** |
| | **Matrix** | **SPME** | **SPME** | **SPME** | **SPME** | **SPME** |
| PCB-099 | E1668C | -- | -- | -- | -- | **0.000799** |
| PCB-102 | E1668C | -- | -- | -- | -- | **0.000126 J** |
| PCB-103 | E1668C | -- | -- | -- | -- | 0.000127 U |
| PCB-104 | E1668C | -- | -- | -- | -- | 0.000161 U |
| PCB-105 | E1668C | -- | -- | -- | -- | **0.000133 J** |
| PCB-106 | E1668C | -- | -- | -- | -- | 0.0000442 U |
| PCB-107 | E1668C | -- | -- | -- | -- | **0.0000626 J** |
| PCB-108/124 | E1668C | -- | -- | -- | -- | 0.0000417 U |
| PCB-110 | E1668C | -- | -- | -- | -- | **0.00118** |
| PCB-111 | E1668C | -- | -- | -- | -- | 0.0000388 U |
| PCB-112 | E1668C | -- | -- | -- | -- | 0.0000555 U |
| PCB-114 | E1668C | -- | -- | -- | -- | 0.0000418 U |
| PCB-115 | E1668C | -- | -- | -- | -- | 0.0000485 U |
| PCB-117 | E1668C | -- | -- | -- | -- | 0.0000716 U |
| PCB-118 | E1668C | -- | -- | -- | -- | **0.000351** |
| PCB-120 | E1668C | -- | -- | -- | -- | 0.0000316 U |
| PCB-121 | E1668C | -- | -- | -- | -- | 0.0000409 U |
| PCB-122 | E1668C | -- | -- | -- | -- | 0.0000525 U |
| PCB-123 | E1668C | -- | -- | -- | -- | 0.0000385 U |
| PCB-126 | E1668C | -- | -- | -- | -- | 0.0000181 U |
| PCB-127 | E1668C | -- | -- | -- | -- | 0.0000292 U |
| PCB-128/166 | E1668C | -- | -- | -- | -- | **0.0000872 J** |
| PCB-129/138/163 | E1668C | -- | -- | -- | -- | **0.00103** |
| PCB-130 | E1668C | -- | -- | -- | -- | **0.000108 J** |
| PCB-131 | E1668C | -- | -- | -- | -- | 0.0000338 U |
| PCB-132 | E1668C | -- | -- | -- | -- | **0.000469** |
| PCB-133 | E1668C | -- | -- | -- | -- | 0.0000205 U |
| PCB-134 | E1668C | -- | -- | -- | -- | 0.0000426 U |
| PCB-135/151 | E1668C | -- | -- | -- | -- | **0.000561** |
| PCB-136 | E1668C | -- | -- | -- | -- | **0.000423 J** |
| PCB-137 | E1668C | -- | -- | -- | -- | 0.0000252 U |
| PCB-139/140 | E1668C | -- | -- | -- | -- | 0.0000254 U |
| PCB-141 | E1668C | -- | -- | -- | -- | **0.000160 J** |
| PCB-142 | E1668C | -- | -- | -- | -- | 0.0000374 U |

**Table 1**
**Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater**

| | Task | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 |
|---|---|---|---|---|---|
| | Location ID | JW-PW-036-2024 | JW-PW-041-2024 | JW-PW-044-2024 | JW-PW-1044-2024 |
| | Sample ID | JW-PW-036-2-3-20240720-SPME | JW-PW-041-2-3-20240720-SPME | JW-PW-044-2-3-20240720-SPME | JW-PW-1044-2-3-20240720-SPME |
| | Sample Date | 9/25/2024 | 9/25/2024 | 9/25/2024 | 9/25/2024 |
| | Sample Type | N | N | N | N |
| | Matrix | SPME | SPME | SPME | SPME |
| PCB-099 | E1668C | -- | -- | -- | -- |
| PCB-102 | E1668C | -- | -- | -- | -- |
| PCB-103 | E1668C | -- | -- | -- | -- |
| PCB-104 | E1668C | -- | -- | -- | -- |
| PCB-105 | E1668C | -- | -- | -- | -- |
| PCB-106 | E1668C | -- | -- | -- | -- |
| PCB-107 | E1668C | -- | -- | -- | -- |
| PCB-108/124 | E1668C | -- | -- | -- | -- |
| PCB-110 | E1668C | -- | -- | -- | -- |
| PCB-111 | E1668C | -- | -- | -- | -- |
| PCB-112 | E1668C | -- | -- | -- | -- |
| PCB-114 | E1668C | -- | -- | -- | -- |
| PCB-115 | E1668C | -- | -- | -- | -- |
| PCB-117 | E1668C | -- | -- | -- | -- |
| PCB-118 | E1668C | -- | -- | -- | -- |
| PCB-120 | E1668C | -- | -- | -- | -- |
| PCB-121 | E1668C | -- | -- | -- | -- |
| PCB-122 | E1668C | -- | -- | -- | -- |
| PCB-123 | E1668C | -- | -- | -- | -- |
| PCB-126 | E1668C | -- | -- | -- | -- |
| PCB-127 | E1668C | -- | -- | -- | -- |
| PCB-128/166 | E1668C | -- | -- | -- | -- |
| PCB-129/138/163 | E1668C | -- | -- | -- | -- |
| PCB-130 | E1668C | -- | -- | -- | -- |
| PCB-131 | E1668C | -- | -- | -- | -- |
| PCB-132 | E1668C | -- | -- | -- | -- |
| PCB-133 | E1668C | -- | -- | -- | -- |
| PCB-134 | E1668C | -- | -- | -- | -- |
| PCB-135/151 | E1668C | -- | -- | -- | -- |
| PCB-136 | E1668C | -- | -- | -- | -- |
| PCB-137 | E1668C | -- | -- | -- | -- |
| PCB-139/140 | E1668C | -- | -- | -- | -- |
| PCB-141 | E1668C | -- | -- | -- | -- |
| PCB-142 | E1668C | -- | -- | -- | -- |

## Table 1
## Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater

| | **Task** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** |
|---|---|---|---|---|---|---|
| | **Location ID** | **JW-PW-004-2024** | **JW-PW-013-2024** | **JW-PW-019-2024** | **JW-PW-029-2024** | **JW-PW-032-2024** |
| | **Sample ID** | **JW-PW-004-2-3-20240722-SPME** | **JW-PW-013-2-3-20240721-SPME** | **JW-PW-019-2-3-20240722-SPME** | **JW-PW-029-2-3-20240722-SPME** | **JW-PW-032-2-3-20240721-SPME** |
| | **Sample Date** | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** |
| | **Sample Type** | **N** | **N** | **N** | **N** | **N** |
| | **Matrix** | **SPME** | **SPME** | **SPME** | **SPME** | **SPME** |
| PCB-143 | E1668C | -- | -- | -- | -- | 0.0000291 U |
| PCB-144 | E1668C | -- | -- | -- | -- | 0.0000272 U |
| PCB-145 | E1668C | -- | -- | -- | -- | 0.0000425 U |
| PCB-146 | E1668C | -- | -- | -- | -- | **0.000191** |
| PCB-147/149 | E1668C | -- | -- | -- | -- | **0.00145** |
| PCB-148 | E1668C | -- | -- | -- | -- | 0.0000239 U |
| PCB-150 | E1668C | -- | -- | -- | -- | 0.0000400 U |
| PCB-152 | E1668C | -- | -- | -- | -- | 0.0000413 U |
| PCB-153/168 | E1668C | -- | -- | -- | -- | **0.000940** |
| PCB-154 | E1668C | -- | -- | -- | -- | **0.0000353 J** |
| PCB-155 | E1668C | -- | -- | -- | -- | 0.0000262 U |
| PCB-156/157 | E1668C | -- | -- | -- | -- | **0.0000269 J** |
| PCB-158 | E1668C | -- | -- | -- | -- | **0.0000816 J** |
| PCB-159 | E1668C | -- | -- | -- | -- | 0.0000225 U |
| PCB-160 | E1668C | -- | -- | -- | -- | 0.0000174 U |
| PCB-161 | E1668C | -- | -- | -- | -- | 0.0000129 U |
| PCB-162 | E1668C | -- | -- | -- | -- | 0.0000257 U |
| PCB-164 | E1668C | -- | -- | -- | -- | 0.0000132 U |
| PCB-165 | E1668C | -- | -- | -- | -- | 0.0000158 U |
| PCB-167 | E1668C | -- | -- | -- | -- | 0.0000253 U |
| PCB-169 | E1668C | -- | -- | -- | -- | 0.0000287 U |
| PCB-170 | E1668C | -- | -- | -- | -- | **0.0000929 J** |
| PCB-171/173 | E1668C | -- | -- | -- | -- | **0.0000585 J** |
| PCB-172 | E1668C | -- | -- | -- | -- | 0.0000417 U |
| PCB-174 | E1668C | -- | -- | -- | -- | **0.000130 J** |
| PCB-175 | E1668C | -- | -- | -- | -- | 0.0000446 U |
| PCB-176 | E1668C | -- | -- | -- | -- | 0.0000121 U |
| PCB-177 | E1668C | -- | -- | -- | -- | **0.000108 J** |
| PCB-178 | E1668C | -- | -- | -- | -- | **0.0000583 J** |
| PCB-179 | E1668C | -- | -- | -- | -- | **0.000132 J** |
| PCB-180/193 | E1668C | -- | -- | -- | -- | **0.000219 J** |
| PCB-181 | E1668C | -- | -- | -- | -- | 0.0000403 U |
| PCB-182 | E1668C | -- | -- | -- | -- | 0.0000348 U |
| PCB-183 | E1668C | -- | -- | -- | -- | **0.000107 J** |

**Table 1**
**Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater**

| | Task | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 |
|---|---|---|---|---|---|
| | Location ID | JW-PW-036-2024 | JW-PW-041-2024 | JW-PW-044-2024 | JW-PW-1044-2024 |
| | Sample ID | JW-PW-036-2-3-20240720-SPME | JW-PW-041-2-3-20240720-SPME | JW-PW-044-2-3-20240720-SPME | JW-PW-1044-2-3-20240720-SPME |
| | Sample Date | 9/25/2024 | 9/25/2024 | 9/25/2024 | 9/25/2024 |
| | Sample Type | N | N | N | N |
| | Matrix | SPME | SPME | SPME | SPME |
| PCB-143 | E1668C | -- | -- | -- | -- |
| PCB-144 | E1668C | -- | -- | -- | -- |
| PCB-145 | E1668C | -- | -- | -- | -- |
| PCB-146 | E1668C | -- | -- | -- | -- |
| PCB-147/149 | E1668C | -- | -- | -- | -- |
| PCB-148 | E1668C | -- | -- | -- | -- |
| PCB-150 | E1668C | -- | -- | -- | -- |
| PCB-152 | E1668C | -- | -- | -- | -- |
| PCB-153/168 | E1668C | -- | -- | -- | -- |
| PCB-154 | E1668C | -- | -- | -- | -- |
| PCB-155 | E1668C | -- | -- | -- | -- |
| PCB-156/157 | E1668C | -- | -- | -- | -- |
| PCB-158 | E1668C | -- | -- | -- | -- |
| PCB-159 | E1668C | -- | -- | -- | -- |
| PCB-160 | E1668C | -- | -- | -- | -- |
| PCB-161 | E1668C | -- | -- | -- | -- |
| PCB-162 | E1668C | -- | -- | -- | -- |
| PCB-164 | E1668C | -- | -- | -- | -- |
| PCB-165 | E1668C | -- | -- | -- | -- |
| PCB-167 | E1668C | -- | -- | -- | -- |
| PCB-169 | E1668C | -- | -- | -- | -- |
| PCB-170 | E1668C | -- | -- | -- | -- |
| PCB-171/173 | E1668C | -- | -- | -- | -- |
| PCB-172 | E1668C | -- | -- | -- | -- |
| PCB-174 | E1668C | -- | -- | -- | -- |
| PCB-175 | E1668C | -- | -- | -- | -- |
| PCB-176 | E1668C | -- | -- | -- | -- |
| PCB-177 | E1668C | -- | -- | -- | -- |
| PCB-178 | E1668C | -- | -- | -- | -- |
| PCB-179 | E1668C | -- | -- | -- | -- |
| PCB-180/193 | E1668C | -- | -- | -- | -- |
| PCB-181 | E1668C | -- | -- | -- | -- |
| PCB-182 | E1668C | -- | -- | -- | -- |
| PCB-183 | E1668C | -- | -- | -- | -- |

**Table 1**

**Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater**

| | **Task** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** | **JeldWenPreDesignInvestP22024** |
|---|---|---|---|---|---|---|
| | **Location ID** | **JW-PW-004-2024** | **JW-PW-013-2024** | **JW-PW-019-2024** | **JW-PW-029-2024** | **JW-PW-032-2024** |
| | **Sample ID** | **JW-PW-004-2-3-20240722-SPME** | **JW-PW-013-2-3-20240721-SPME** | **JW-PW-019-2-3-20240722-SPME** | **JW-PW-029-2-3-20240722-SPME** | **JW-PW-032-2-3-20240721-SPME** |
| | **Sample Date** | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** | **9/25/2024** |
| | **Sample Type** | **N** | **N** | **N** | **N** | **N** |
| | **Matrix** | **SPME** | **SPME** | **SPME** | **SPME** | **SPME** |
| PCB-184 | E1668C | -- | -- | -- | -- | 0.00001000 U |
| PCB-185 | E1668C | -- | -- | -- | -- | 0.0000452 U |
| PCB-186 | E1668C | -- | -- | -- | -- | 0.0000111 U |
| PCB-187 | E1668C | -- | -- | -- | -- | **0.000188** |
| PCB-188 | E1668C | -- | -- | -- | -- | 0.00000944 U |
| PCB-189 | E1668C | -- | -- | -- | -- | 0.0000222 U |
| PCB-190 | E1668C | -- | -- | -- | -- | 0.0000338 U |
| PCB-191 | E1668C | -- | -- | -- | -- | 0.0000322 U |
| PCB-192 | E1668C | -- | -- | -- | -- | 0.0000283 U |
| PCB-194 | E1668C | -- | -- | -- | -- | 0.0000132 U |
| PCB-195 | E1668C | -- | -- | -- | -- | **0.0000139 J** |
| PCB-196 | E1668C | -- | -- | -- | -- | **0.0000166 J** |
| PCB-197 | E1668C | -- | -- | -- | -- | 0.00000431 U |
| PCB-198/199 | E1668C | -- | -- | -- | -- | **0.0000248 J** |
| PCB-200 | E1668C | -- | -- | -- | -- | 0.00000431 U |
| PCB-201 | E1668C | -- | -- | -- | -- | 0.00000421 U |
| PCB-202 | E1668C | -- | -- | -- | -- | 0.00000374 U |
| PCB-203 | E1668C | -- | -- | -- | -- | 0.00000413 U |
| PCB-204 | E1668C | -- | -- | -- | -- | 0.00000383 U |
| PCB-205 | E1668C | -- | -- | -- | -- | 0.0000124 U |
| PCB-206 | E1668C | -- | -- | -- | -- | 0.0000307 U |
| PCB-207 | E1668C | -- | -- | -- | -- | 0.0000159 U |
| PCB-208 | E1668C | -- | -- | -- | -- | 0.0000146 U |
| PCB-209 | E1668C | -- | -- | -- | -- | 0.0000133 U |
| Total PCB Congeners (U = 1/2 max limit) | | -- | -- | -- | -- | **0.184 J** |

**Table 1**

**Freely Dissolved Concentraitons of Dioxins/Furans and Polychlorinated Biphenyls in Sediment Porewater**

| | Task | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 | JeldWenPreDesignInvestP22024 |
|---|---|---|---|---|---|
| | Location ID | JW-PW-036-2024 | JW-PW-041-2024 | JW-PW-044-2024 | JW-PW-1044-2024 |
| | Sample ID | JW-PW-036-2-3-20240720-SPME | JW-PW-041-2-3-20240720-SPME | JW-PW-044-2-3-20240720-SPME | JW-PW-1044-2-3-20240720-SPME |
| | Sample Date | 9/25/2024 | 9/25/2024 | 9/25/2024 | 9/25/2024 |
| | Sample Type | N | N | N | N |
| | Matrix | SPME | SPME | SPME | SPME |
| PCB-184 | E1668C | -- | -- | -- | -- |
| PCB-185 | E1668C | -- | -- | -- | -- |
| PCB-186 | E1668C | -- | -- | -- | -- |
| PCB-187 | E1668C | -- | -- | -- | -- |
| PCB-188 | E1668C | -- | -- | -- | -- |
| PCB-189 | E1668C | -- | -- | -- | -- |
| PCB-190 | E1668C | -- | -- | -- | -- |
| PCB-191 | E1668C | -- | -- | -- | -- |
| PCB-192 | E1668C | -- | -- | -- | -- |
| PCB-194 | E1668C | -- | -- | -- | -- |
| PCB-195 | E1668C | -- | -- | -- | -- |
| PCB-196 | E1668C | -- | -- | -- | -- |
| PCB-197 | E1668C | -- | -- | -- | -- |
| PCB-198/199 | E1668C | -- | -- | -- | -- |
| PCB-200 | E1668C | -- | -- | -- | -- |
| PCB-201 | E1668C | -- | -- | -- | -- |
| PCB-202 | E1668C | -- | -- | -- | -- |
| PCB-203 | E1668C | -- | -- | -- | -- |
| PCB-204 | E1668C | -- | -- | -- | -- |
| PCB-205 | E1668C | -- | -- | -- | -- |
| PCB-206 | E1668C | -- | -- | -- | -- |
| PCB-207 | E1668C | -- | -- | -- | -- |
| PCB-208 | E1668C | -- | -- | -- | -- |
| PCB-209 | E1668C | -- | -- | -- | -- |
| Total PCB Congeners (U = 1/2 max limit) | | -- | -- | -- | -- |

Notes:

**Bold: Detected result**

Calculated values have been rounded to laboratory-reported significant digits

J: Estimated value

ng/L: nanogram per liter

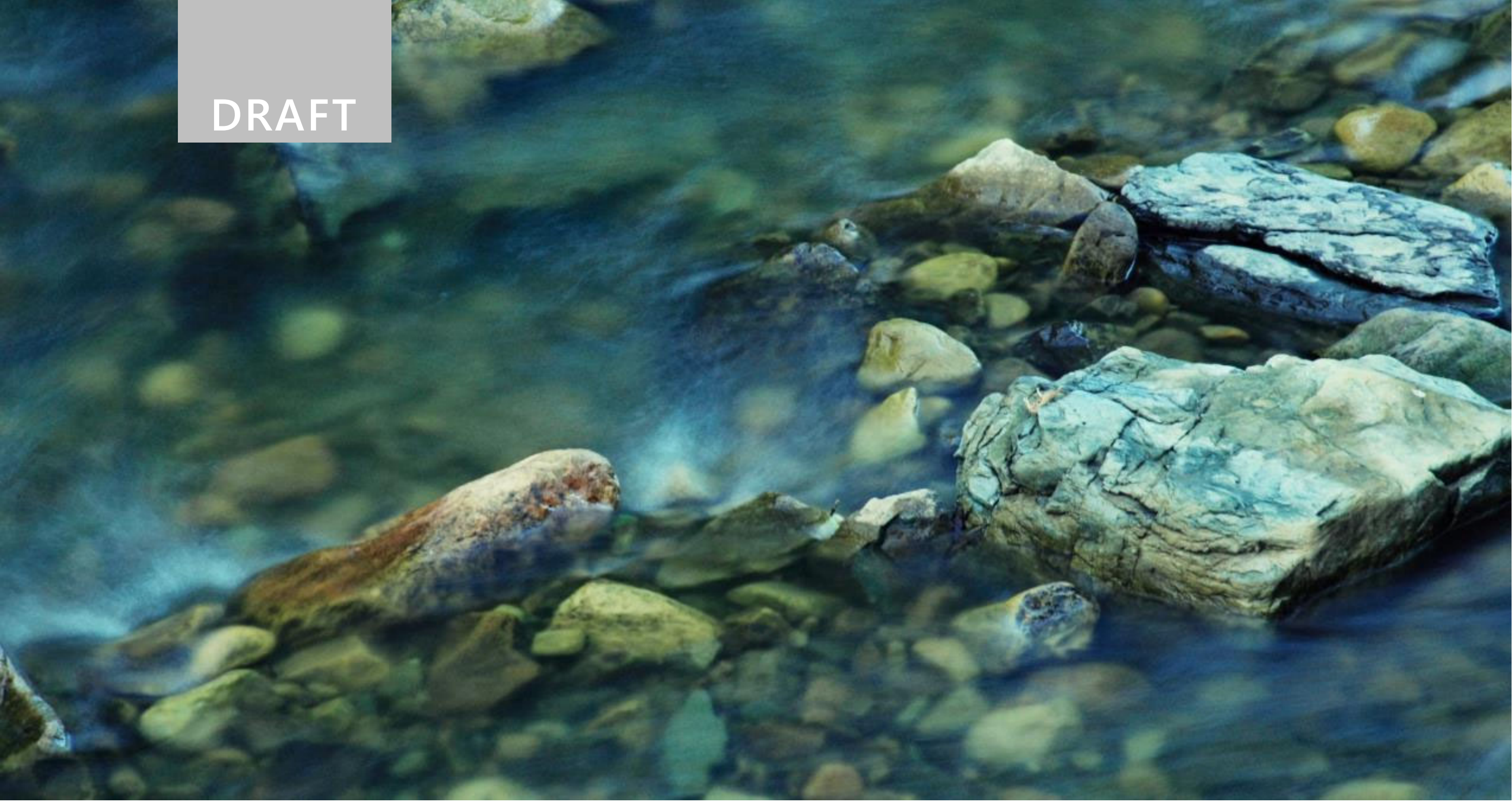
PCB: polychlorinated biphenyls

SPME: solid-phase microextraction

U: Compound analyzed for, but not detected above detection limit

# Appendix B

# Geotechnical Engineering Assessment



DRAFT

June 2025
JELD-WEN Site

# Geotechnical Engineering Evaluation: Marine Area Sediment Cleanup Design

**Prepared for**
JELD-WEN, Inc.
300 West Marine View Drive
Everett, Washington 98201

**Prepared by**
Anchor QEA
1201 3rd Avenue No. 2600
Seattle, Washington 98101

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## TABLES

## FIGURES

## ATTACHMENTS

# ABBREVIATIONS

| | |
|---|---|
| ASTM | ASTM International |
| bgs | below ground surface |
| CL | lean clay |
| D50 | mean particle size distribution value |
| EDR | Engineering Design Report |
| FoS | factor of safety |
| H:V | horizontal to vertical (ratio) |
| N/A | not available |
| NP | non-plastic |
| pcf | pound per cubic foot |
| PI | plasticity index |
| SPT | standard penetration test |
| RD | remedial design |
| USCS | Unified Soil Classification System |

# 1 Introduction and Purpose

This *Geotechnical Engineering Evaluation: Marine Area Sediment Cleanup Design* has been prepared to summarize the results of geotechnical sampling and laboratory testing and provide geotechnical engineering recommendations for the JELD-WEN Marine Area remedial engineering design as an element of the *Engineering Design Report* (EDR). The JELD-WEN site consists of a series of industrial developed and undeveloped parcels at the confluence of the Snohomish River and Port Gardner Bay and includes upland areas, riverfronts at the west end with large tidal flats, and inlets to the north and south. The upland is a generally rectangular peninsula constructed of fill materials and includes a higher elevation "knoll" area to the southeast along historic shoreline. To support remedial design (RD), the site has been further divided into three distinct areas: the Logway, along the north shore of the peninsula (now a tidal inlet and stormwater outlet); the South Shoreline; and the Knoll area, southeast of the peninsula.

Anchor QEA mobilized to the JELD-WEN site in September 2024 to conduct in-water sediment sampling for geotechnical laboratory testing and chemistry analysis and to perform shoreline subsurface explorations with in situ standard penetration test (SPT) split spoon sample collection. These data were collected to provide a more comprehensive geotechnical engineering dataset to inform marine area RD including the following:

- Preparing geotechnical engineering design recommendations for excavation and capping
- Assessing impacts of RD implementation to shoreline slopes resulting from removal of contaminated sediments, shoreline debris, piling, and bulkheads
- Assessing geotechnical performance of RD following implementation, with regard to slope stability

Construction activities associated with the proposed RD include debris, piling, and bulkhead removal; sediment removal; clean material placement for backfill; capping; and enhanced natural recovery.

This report includes the following:

- Review of existing geotechnical information, including subsurface conditions
- Review of sediment geotechnical sampling test results and subsurface conditions in situ test results
- Geotechnical engineering evaluations and conclusions, including evaluation of slope stability of excavations and piling, and bulkhead demolition areas

# 2 Geotechnical Data Review and Collection

Geotechnical samples were collected as described in the *Pre-Remedial Design Investigation Sampling and Analysis Plan* (Anchor QEA 2024) and summarized in the *Pre-Remedial Design Investigation Data Report* (Anchor QEA 2025). This investigation was completed to support RD for project elements described in the EDR. This section presents an overview of the geotechnical sampling completed in 2024 and a review of site subsurface conditions and laboratory geotechnical results obtained during the exploration and sampling effort.

The sampling in August 2024 included geotechnical borings conducted near the top of slopes and sediment cores collected in intertidal mudflats. Eight hollow-stem auger borings advanced to 42 feet below ground surface (bgs) were completed near the top of slopes around the perimeter of the upland area. During these borings, SPTs and sampling were completed every 2.5 feet bgs over the upper 10 feet and every 5 feet below the upper 10 feet. Geotechnical boring logs are included in Attachment B-1, and exploration locations are depicted in Figures B-1 to B-3. The work also included collection of geotechnical data from subsamples collected during the sediment chemistry sampling effort. Sediment stratigraphy and descriptions were completed on 44 sediment cores, which were collected to provide sediment chemistry information and limited geotechnical characterization, up to 8 feet deep.

Samples obtained from the upland borings were submitted for the following geotechnical laboratory testing, with results included in Attachment B-2:

- Water content (ASTM International [ASTM] D2216)
- Atterberg limits (ASTM D4318)
- Grain size (ASTM D422)
- Specific gravity (ASTM D854)

Geotechnical borings encountered different layering of sandy and silty soils, with components of woody debris. Groundwater levels are not indicated on logs; however, subsurface materials were observed to be wet at approximately 10 feet bgs, and several boreholes were terminated early due to sand heave on the auger stem. Reported depth to groundwater on the uplands is typically 3 to 4 feet bgs, with more observed connectivity between the groundwater and tide elevations on the perimeter of the site and a muted or negligible effect of tide elevations on groundwater on the interior of the uplands. Descriptions of subsurface materials are provided in Section 3.

# 3 Soil and Sediment Geotechnical Characteristics

This section provides a summary of geotechnical observations and test results for site soil and sediments.

## 3.1 Soil and Sediment Descriptions

Samples collected from geotechnical borings were obtained using a 2-inch-diameter split spoon sampler, visually classified in the field, containerized, and transported to a geotechnical testing laboratory for further characterization. Geotechnical boring logs and SPT results are included in Attachment B-1. In addition, sediment chemistry cores were visually logged in the field to supplement the geotechnical observations. Geologic units encountered in the investigation varied in layer thicknesses and order depending on exploration location (upland versus tidal flats). Several types of soil and sediment materials were observed and sampled. Generally, these materials are listed in the order in which they appear from the surface downwards; however, because much of the upland peninsula is composed of fill materials, the presence of these materials varies somewhat in each exploration location. Key geologic soil types observed at the site are detailed as follows:

- **Gray, Tan, and Brown Sand (Unified Soil Classification System [USCS] SP):** Poorly graded; fine to medium grained sand; loose to medium dense; low to moderate moisture content; and occasional trace silt or gravel. Wood detected throughout. Generally observed in the near surface, at depths in upland borings, and occasionally at below 3 feet bgs in tidal flat samples at the south tidal flat.
- **Gray to Dark Gray Sandy Silt (USCS ML-OL):** Low plasticity; fine sand; soft to medium stiff; moderate to high moisture content; and occasional trace fine gravel. Wood detected throughout, especially in shallow layers. Commonly observed in the upper 3 feet of tidal flat sediments and typically comprises the entire depth of sediment observed in cores.
- **Gray to Dark Gray Silty Sand (USCS SM):** Well-graded; non-plastic; loose to medium dense; low to moderate moisture content; and occasional clay lenses and shell fragments. Observed in uppermost upland soils adjacent to the South Shoreline and at depths along the Logway upland borings to the west of the peninsula.
- **Dark Gray Silty, Clayey Sand (USCS SC-SP):** Poorly graded; fine to medium grained sand; non-plastic to low plasticity; very loose; and moderate moisture content. Wood and shell fragments detected throughout. Commonly encountered at depths in upland borings but occasionally in surficial upland soils (Borehole GT-006) and below ML-OL soils in the vicinity of the South Shoreline and Knoll areas.

## 3.2 Laboratory Geotechnical Testing

Laboratory geotechnical tests were conducted on selected representative materials sampled during the exploration program. Descriptions of laboratory tests and their results are presented as follows:

- **Grain Size:** The primary stratigraphic unit encountered included sand-based fill. Grain size distribution was tested in 17 samples within sand-based fill units. Fines content and gravel content varied with occasional degrading wood or asphalt encountered. Gravel content ranged from 0% to 23% in tested samples, with an arithmetic mean of 6%. Sand content ranged from 42% to 92%, with an arithmetic mean of 74%. Fines content ranged from 7% to 42%, with an arithmetic mean of 17%.
- **Moisture Content:** Moisture content was tested in 74 samples. Values ranged from 0.5% to 69.8%, with an arithmetic average of 20.5% in tested samples. Finer grained samples trended toward higher moisture content, while near-surface samples typically had lower moisture contents.
- **Atterberg Limits:** Atterberg limits were tested in six primarily fine-grained samples (as visually observed during logging by the field representative). Four of the tested samples were determined to be non-plastic. Of the plastic samples, the sample collected from GT03 at a depth of 3.4 to 4 feet had a liquid limit of 28.3% and a plastic limit of 18.6% (USCS lean clay [CL]). The sample collected from GT07 at a depth of 5.2 to 6 feet had a liquid limit of 49.1% and a plastic limit of 36.0% (USCS CL).
- **Specific Gravity:** Specific gravity was tested for 13 samples. Eleven samples were within the sand-based fill units, with two samples within a fines-based unit. The sand-dominated unit values ranged from 2.68 to 2.78, with an arithmetic mean of 2.73. The fines-dominated unit values were 2.74 and 2.75, respectively.

Table B-1 presents the geotechnical engineering parameters for these materials that were selected for slope stability modeling, as discussed in Section 4.1. Material shear strength and consolidation parameters were derived using correlations presented in the *Naval Facilities Engineering Command Design Manual 7.1 Soil Mechanics* (NAVFAC 2022). Modifications to NAVFAC parameters were made in some cases where wood debris was present within subsurface materials, according to guidance provided by Demars et al. (2000).

## Table B-1
## Soil Index and Engineering Parameters for Geotechnical Analysis

| Soil Layer (USCS) | Total Unit Weight (pcf) | Internal Friction Angle, $\phi'$ (degrees)[1] | Average Moisture Content (%) | Percent Fines (%) | Plasticity Index (PI) |
|---|---|---|---|---|---|
| Poorly graded sand with wood debris (SP) | 100 | 30 | 18.5 | 8.8 | NP |
| Sandy silt with wood debris (ML-OL) | 102.5 | 27 | 27.7 | N/A | 13.1 |
| Silty sand (SM) | 105 | 34 | 16.4 | 19.7 | NP |
| Silty, clayey sand (SC-SM) | 110 | 26 | 22.8 | 36.9 | 9.7 |
| Armor stone[2] | 130 | 40 | N/A | N/A | N/A |

Note:

1. Armor stone was not sampled during site exploration. Values provided in Table B-1 are prescriptive and were used in slope stability modeling.

# 4 Geotechnical Engineering Evaluations

This section provides geotechnical design evaluations for excavation, demolition and removal, slope design, slope protection, and temporary shoring and settlement. The geotechnical evaluations focus on the scope of the marine remedial work, including assessment of short- and long-term slope stability including the effects from live loads during construction.

## 4.1 Excavations, Demolitions, and Removal

Excavation will be performed for sediment removal adjacent to and within the toe-of-slope areas. In addition, vibratory or mechanical extraction of piles and bulkheads will be conducted in the Logway, and wood, concrete, and asphalt debris will be removed from slopes.

Temporary shoring has been assumed to be installed between the buried utility trench and the top of slope to protect the bank area. Temporary shoring is discussed in Section 4.3.

Excavations are proposed to be completed at low tide to protect water quality. Removal cuts will be completed in small sections determined by the contractor so material removal and initial placement of cap or backfill materials can be completed during the same low-tide interval in which excavation occurs. A debris boom will be used to collect wood debris generated from piling and bulkhead extraction.

## 4.2 Slope Stability Evaluations

To evaluate shoreline stability, five cross sections throughout the site were selected to represent the range of shoreline geometries where excavations will be performed, with a focus on the most critical (e.g., steepest) configuration in each location. Slope stability at all cross sections were modeled using Slide2, version 9.038 (Rocscience 2025), a 2D limit equilibrium slope stability analysis software used to evaluate soil and rock slopes. Slide2 was used to calculate the existing factor of safety (FoS), short- (post-removal) and long-term (post backfill/cap) FoS for remedial actions. The FoS is defined as the ratio of the capacity to the demand or, in the case of slope stability evaluations, the ratio of the resisting forces, governed by the strength of the soils to the driving forces, governed by loading from surcharges, water pressure, and soil weight. A FoS of less than 1.0 means that the driving force/demand is greater than the available resisting capacity, which implies an unstable slope condition. The modeled short- and long-term FoS values show an improvement over current conditions; however, they still do not meet minimum requirements for maintaining stable slopes. For this reason, shoring will be required at the top of slope to prevent potentially unstable slopes from affecting upland areas and reduce driving forces on slopes. Shoring is discussed in Section 4.3.

Table B-2 summarizes the results of the slope stability evaluation for critical slopes in the Logway only (A-A’ and B-B’). Cross sections for section cuts C, D, and E were not evaluated because slope stability performance is not critical in these areas. Slope stability modeling results are included in Attachment B-3.

**Table B-2**
**Summary of Slope Stability Evaluations**

| Section | Case | Factor of Safety (Target) | | |
|---|---|---|---|---|
| | | Existing (N/A)[1] | Short Term (1.3)[2] | Long Term (1.5)[2] |
| A-A′ | Pre-construction | 1.0 | -- | -- |
| | Excavation slopes (2H:1V) | -- | 0.8 | -- |
| | Post-excavation backfill (2H:1V) | -- | -- | 1.1 |
| B-B′ | Pre-construction | 0.5 | -- | -- |
| | Excavation slopes (2H:1V) | -- | 0.3 | -- |
| | Post-excavation backfill (2H:1V) | -- | -- | 1.0 |

Notes:

1. There is no target FoS for the existing slope. Existing conditions evaluation was performed for comparative purposes.
2. The short-term evaluation considers stability during construction. The long-term evaluation considers stability after capping or backfilling. Target factors of safety are based on USACE (2003).

--: not evaluated

## 4.3 Slope Protection and Shoring Evaluations

The RD includes removal of debris along shoreline slopes; some of this debris provides protection from erosion. In addition, excavation along slopes has the potential to destabilize the shoreline, which could damage utilities and upland property. This section describes evaluations regarding temporary shoring for the Logway and general slope protection recommendations for all shorelines around the site. Generally, if existing debris on slopes is acting as armoring and will be removed as part of site work, armor should be replaced on slopes following debris removal.

Along the South Shoreline and Logway, slope armor, as discussed in the Coastal Engineering Appendix (Appendix C), will be used to protect slopes from erosion in areas of excavation and debris removal. In the vicinity of the Knoll area, armor will not be used. The steep sand bluffs in the Knoll area will continue to erode naturally to support habitat functions, as discussed with the Washington State Department of Ecology.

Where planned work adjacent to the South Shoreline maintains 3H:1V slopes following excavation, demolition, debris removal, backfill, and armor placement, FoS targets will be met.

For slopes along the Logway, implementation of slope armor will be required adjacent to the sediment removal and cap areas to maintain the design 2H:1V slopes above these remedial areas and protect the sediment remedies.

In the vicinity of timber piling bulkhead removal, removal excavation protective measures such as temporary shoring will be required near the top of the slopes to prevent sloughing of upland materials that may undermine or damage the utilities present at the top of the slope. Shoring will be contractor-designed and may consist of soldier piles, sheet piles, or similar means and methods to protect the in-place buried utilities and roadway during work. Shoring may be left in place following work or be removed provided that removal of shoring will not cause damage or reduce FoS below the targets defined in Section 4.2. Work will be staged appropriately so removal work will not adversely affect the existing upland conditions.

# 5 Conclusions

The recommendations and evaluations presented in this report are for the design of remedial alternatives implemented at the JELD-WEN site. Temporary dredge-cut slopes shall not exceed 2H:1V, and final shoreline slopes may be either 2H:1V or 3H:1V. Armor thickness where armor material D50 equals 3 inches shall be 18 and 22 inches where armor stone D50 is 11 inches. Armor may be nominally thickened where required to match existing slope surface and final shoreline slope. Where required, filter stone (D50 of 3 inches) layers shall be no less than 6 inches thick.

# 6 Limitations of This Report

This report was prepared to meet the specific needs of the marine sediment cleanup design. No party should apply this report for any purpose other than that originally contemplated without first conferring with Anchor QEA.

This report is based on an investigation plan designed to consider a unique set of project-specific factors. Unless otherwise indicated, this report should not be used in the following instances: 1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); 2) when the size, elevation, or configuration of the proposed project is altered; 3) when the location or orientation of the proposed project is modified; 4) when there is a change of ownership; or 5) for application to an adjacent site. Anchor QEA cannot accept responsibility for problems that may occur if we are not consulted after factors considered in the development of the report have changed.

Subsurface conditions may be affected as a result of natural processes or human activity. Because this report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of this report. Anchor QEA should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

Site exploration and testing identify actual surface and subsurface conditions only at those points where samples are collected. The data were extrapolated by Anchor QEA, and we applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than this report indicates. Actual conditions in areas not sampled may differ from those predicted in this report. Although nothing can be done to prevent such situations, we can work together to help reduce their impacts. Retaining Anchor QEA to observe subsurface construction operations can be particularly beneficial in this respect.

The conclusions contained in this report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout the site. Actual subsurface conditions can be discerned only during earthwork; therefore, we recommend Anchor QEA be retained to observe actual conditions and to provide conclusions. Anchor QEA cannot assume responsibility or liability for the adequacy of this report's recommendations if another party is retained to observe construction.

# 7 References

Anchor QEA, 2024. *Pre-Remedial Design Investigation Sampling and Analysis Plan*. JELD WEN, Everett, Washington.

Anchor QEA, 2025. *Pre-Remedial Design Investigation Data Report.* April 2025.

Demars, K.R., R.P. Long, and J.R. Ives, 2000. *Use of Wood Waste Materials for Erosion Control*. The New England Transportation Consortium. April 2000.

NAVFAC (Naval Facilities Engineering Systems Command), 2022. *Naval Facilities Engineering Command Design Manual 7.1 Soil Mechanics*.

Rocscience, 2025. Slide2 software, version 9.038. Available at: https://www.rocscience.com/software/slide2.

USACE (U.S. Army Corps of Engineers), 2003. *Slope Stability*. Engineering Manual EM 1110-2-1902. October 2003.

# Figures

**LEGEND:**

▭ Marine Site Boundary

▭ Parcel

- - Water Line

Proposed Sampling Locations

▣ 8-Foot Short Core (D/F)

▣ Surface Grab Sample for PCBs and D/F (0–0.5 Feet) Aliquot for Composites SG-136 through SG-141 and SG-133 through SG-135

▣ Shoreline Geotechnical Boring

**NOTES:**
1. Aerial imagery: Esri (2022)
2. Basemap: Esri Light Gray Canvas
3. D/F: dioxin/furan
4. PCB: polychlorinated biphenyl

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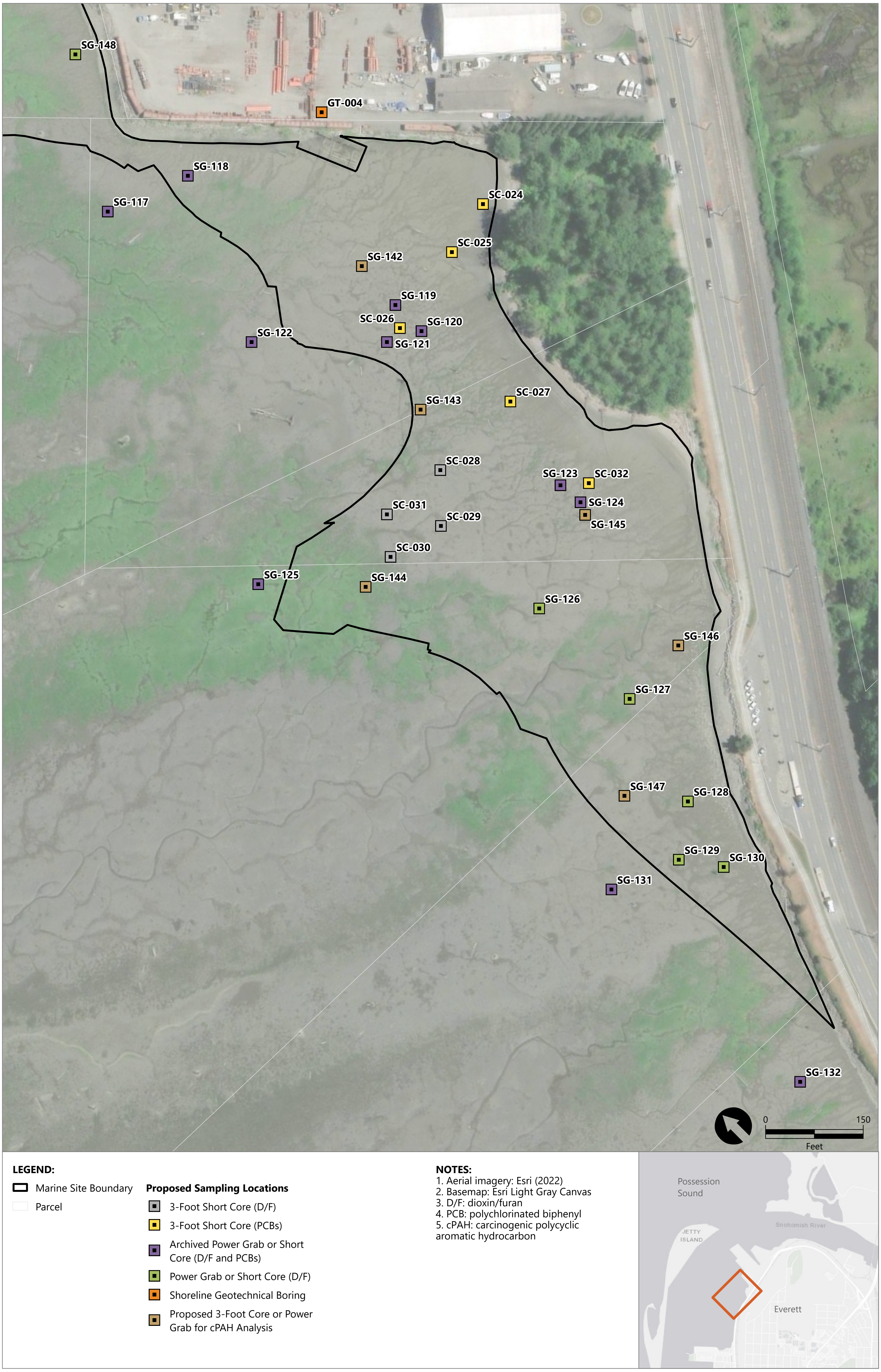
**Figure B-1**
**Surface and Subsurface Sediment Chemistry and Geotechnical Sample Locations (Logway)**
Geotechnical Engineering Evaluation: Marine Area Sediment Cleanup Design
JELD-WEN Site



**LEGEND:**

- ▭ Marine Site Boundary
- ▭ Parcel

**Proposed Sampling Locations**

- ▣ 3-Foot Short Core (D/F)
- ▣ 3-Foot Short Core (PCBs)
- ▣ Archived Power Grab or Short Core (D/F and PCBs)
- ▣ Power Grab or Short Core (D/F)
- ▣ Shoreline Geotechnical Boring
- ▣ Proposed 3-Foot Core or Power Grab for cPAH Analysis

**NOTES:**

1. Aerial imagery: Esri (2022)
2. Basemap: Esri Light Gray Canvas
3. D/F: dioxin/furan
4. PCB: polychlorinated biphenyl
5. cPAH: carcinogenic polycyclic aromatic hydrocarbon

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**Figure B-2**
**Surface and Subsurface Sediment Chemistry and Geotechnical Sample Locations (Knoll Area)**
Geotechnical Engineering Evaluation: Marine Area Sediment Cleanup Design
JELD-WEN Site

**LEGEND:**

| | |
|---|---|
| ▭ | Marine Site Boundary |
| ▭ | Parcel |

**Proposed Sampling Locations**

| | |
|---|---|
| ▣ | 6-Foot Short Core (D/F) |
| 🟩 | Power Grab or Short Core (D/F) |
| 🟧 | Shoreline Geotechnical Boring |

**NOTES:**
1. Aerial imagery: Esri (2022)
2. Basemap: Esri Light Gray Canvas

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**Figure B-3**
**Surface and Subsurface Sediment Chemistry and Geotechnical Sample Locations (South Shoreline)**

# Attachment B-1

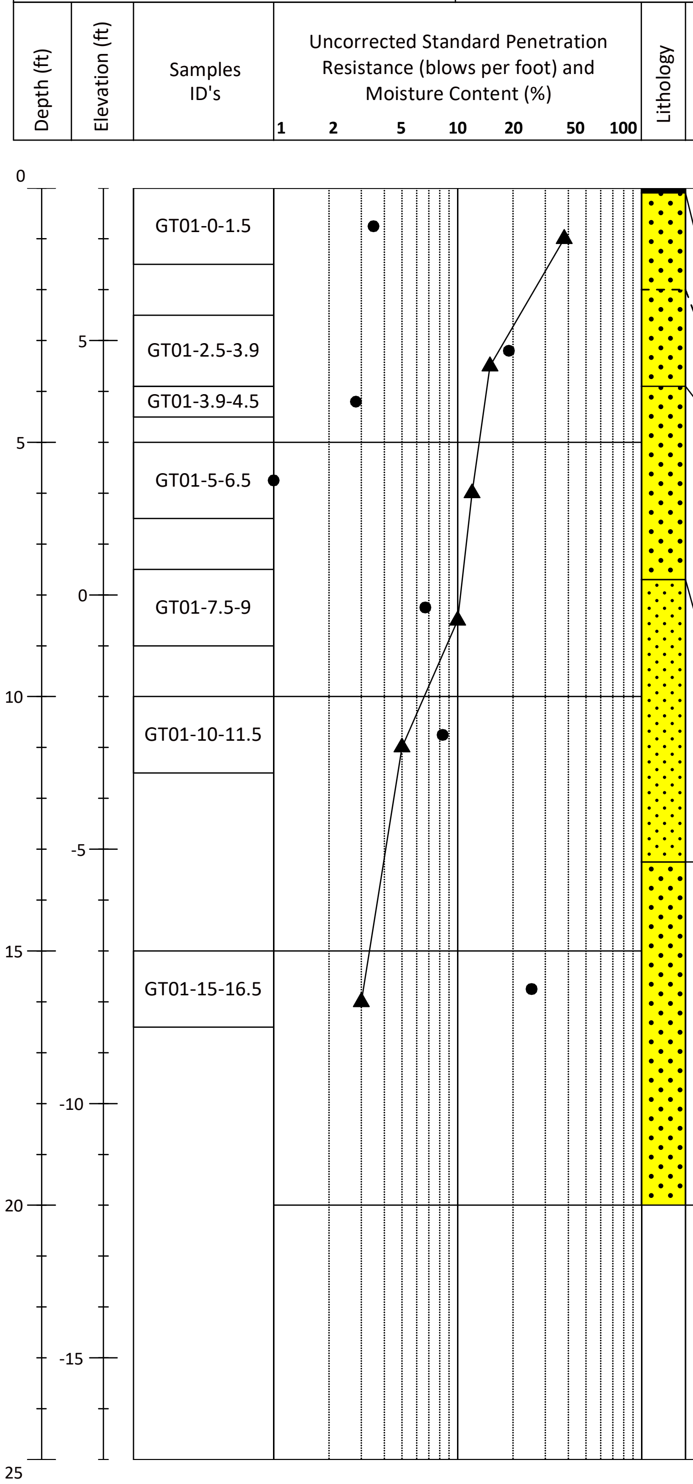
# Boring Logs

# Soil Boring Log

## GT01

Sheet 1 of 1

| | | |
|---|---|---|
| Project #: **240909-01.01** | Project: **Former Nord Door Cleanup** | Method: **Hollow Stem Auger** |
| Location: **Everett, Washington** | Northing/Latitude: **122°12'51.16"W** | Total Depth (ft): **20** |
| Client: **Jeld-Wen, Inc.** | Easting/Longitude: **48° 0'57.13"N** | Ground Surface Elevation (ft): **8** |
| Collection Date: **8/21/24** | Horiz. Datum: **North American Datum of 1983** | Hammer: **140-lb Auto Hammer** |
| Contractor: **Holocene Drilling, Inc** | Vert. Datum: **North American Vertical Datum 1988** | Rig Model: **GT8 Track Mounted Rig** |
| Logged By: **RBP** | Sampler(s): **Split Spoon Sampler** | |



**Soil Description**

Samples and descriptions are in recovered depths.
Classification scheme: USCS

| Soil Description | Lab Tests |
|---|---|
| 0-2 in: Asphalt | MC |
| 2 in - 2 ft: Dense, moist, orangy brown, gravelly SAND with silt (SP-ML), medium sand, fine to medium gravel, no odor. | |
| 2-3.9 ft: Medium dense, moist, gray, SAND (SP), fine to medium sand, no odor. | MC, SG |
| 3.9-7.7: Medium dense, moist, gray, SAND with trace gravel and silt (SP), fine to medium sand, no odor.<br>@4.1 ft: Asphalt piece.<br>@5 ft: Grades to darker color.<br>@5.2-5.9 ft: Asphalt.<br>@5.9 ft: Gray brown clay pocket.<br>@7.5-7.7 ft: Broken asphalt. | MC, GSD<br>MC |
| 7.7-13.25 ft: Loose to medium dense, moist, light blue gray, SAND with silt and gravel (SW-SM), fine to coarse sand, fine gravel, no odor.<br>@8 ft: Grades to gray coloring.<br>@10 ft: Grades to higher gravel content. | MC, GSD<br>MC |
| 13.25-20 ft: Very loose, wet, SAND with trace silt (SP), fine to medium sand, very faint petroleum/sulfur-like odor.<br>@15.7 ft: Clay pocket.<br>@16.1 ft: Decaying wood piece. | MC |
| END OF BORING AT 20 FT DUE TO HEAVING SANDS | |

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▲ SPT N-Value
● Moisture Content (%)
▼ Groundwater Level

**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

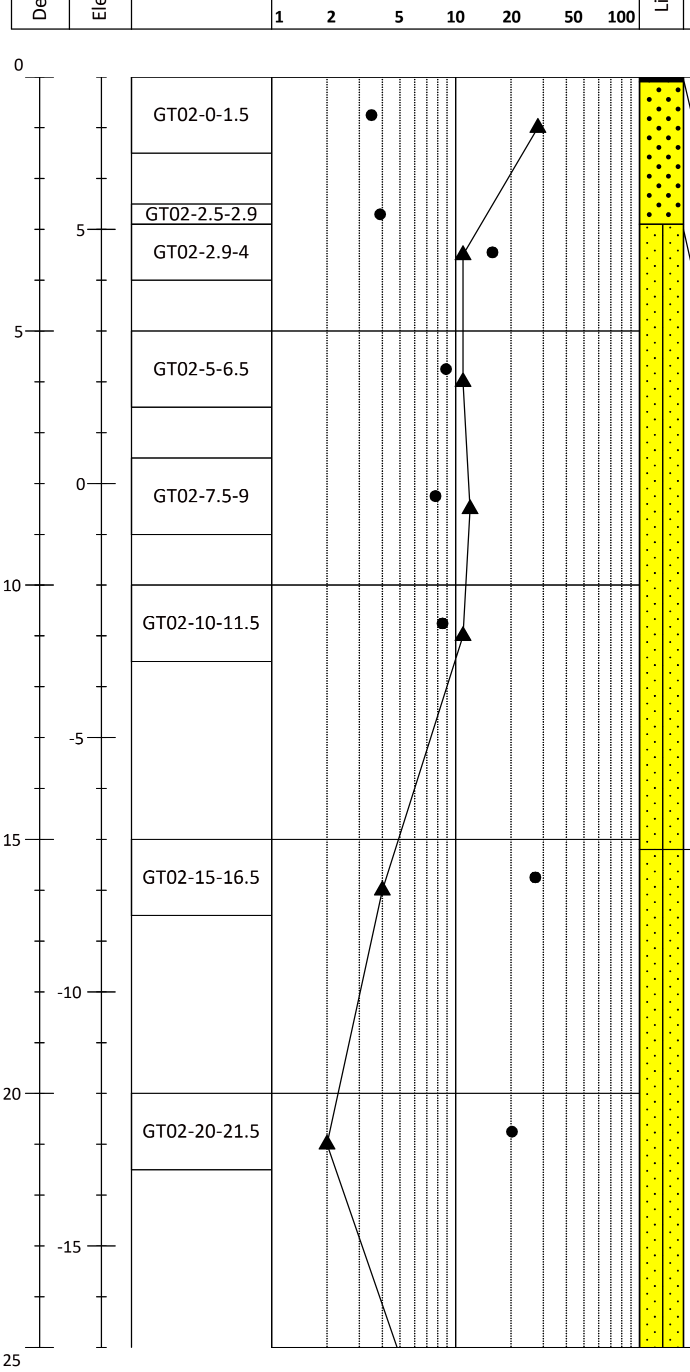
# Soil Boring Log

## GT02

**Sheet 1 of 2**

| | | | | | |
|---|---|---|---|---|---|
| Project #: | **240909-01.01** | Project: | **Former Nord Door Cleanup** | Method: | **Hollow Stem Auger** |
| Location: | **Everett, Washington** | Northing/Latitude: | **122°12'48.30"W** | Total Depth (ft): | **35** |
| Client: | **Jeld-Wen, Inc.** | Easting/Longitude: | **48° 0'54.87"N** | Ground Surface Elevation (ft): | **8** |
| Collection Date: | **8/20/24** | Horiz. Datum: | **North American Datum of 1983** | Hammer: | **140-lb Auto Hammer** |
| Contractor: | **Holocene Drilling, Inc** | Vert. Datum: | **North American Vertical Datum 1988** | Rig Model: | **GT8 Track Mounted Rig** |
| Logged By: | **RBP** | Sampler(s): | **Split Spoon Sampler** | | |

| Depth (ft) | Elevation (ft) | Samples ID's | Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) | Lithology | **Soil Description**<br>Samples and descriptions are in recovered depths.<br>Classification scheme: USCS | Lab Tests |
|---|---|---|---|---|---|---|



| Samples ID's | Lab Tests |
|---|---|
| GT02-0-1.5 | MC |
| GT02-2.5-2.9 | MC |
| GT02-2.9-4 | MC, GSD, SG |
| GT02-5-6.5 | MC, GSD, SG |
| GT02-7.5-9 | MC |
| GT02-10-11.5 | MC |
| GT02-15-16.5 | MC |
| GT02-20-21.5 | MC |

0-1 in: Asphalt.

1 in-2.9 ft: Medium dense, moist, tan, gravelly SAND with silt (SP-SM), medium sand, fine to coarse gravel, no odor.

@0.3 ft: Grades to gray coloring.
@2 ft: Grades to darker coloring, higher silt content.

2.9-15.2 ft: Stiff, dark gray, moist, silty SAND with gravel (SM), fine sand, non-plastic, no odor.
@3.3 ft: Asphalt.
@4.5 ft: Grades to higher sand content.
@5.5 ft: Grades to interbedded asphalt. Interbedded asphalt.

15.2-35 ft: Very loose to loose, wet, gray, silty SAND (SM), fine to medium sand, no odor.

@21.4 ft: Grades to medium to coarse sand.

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▲ SPT N-Value
● Moisture Content (%)
▼ Groundwater Level

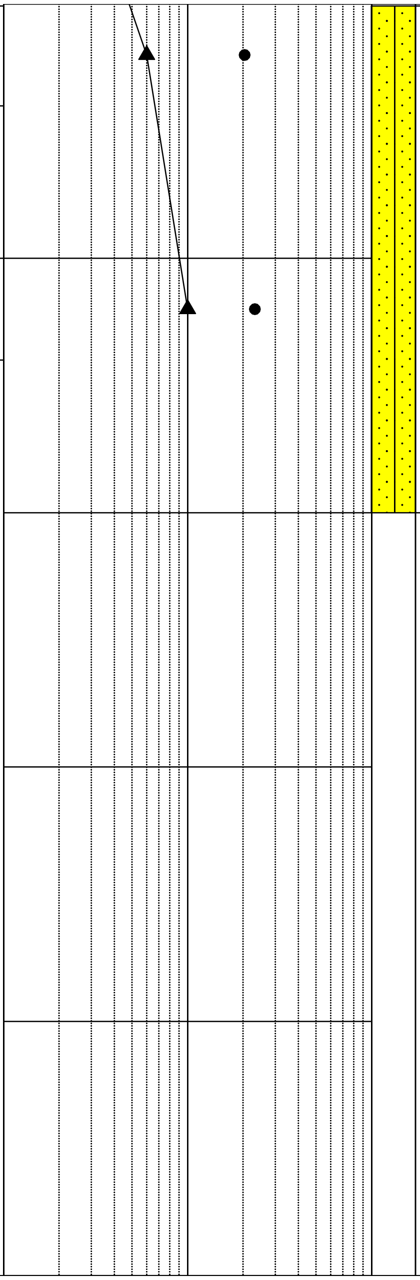
**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

# Soil Boring Log

## GT02

Sheet 2 of 2

| | | |
|---|---|---|
| Project #: **240909-01.01** | Project: **Former Nord Door Cleanup** | Method: **Hollow Stem Auger** |
| Location: **Everett, Washington** | Northing/Latitude: **122°12'48.30"W** | Total Depth (ft): **35** |
| Client: **Jeld-Wen, Inc.** | Easting/Longitude: **48° 0'54.87"N** | Ground Surface Elevation (ft): **8** |
| Collection Date: **8/20/24** | Horiz. Datum: **North American Datum of 1983** | Hammer: **140-lb Auto Hammer** |
| Contractor: **Holocene Drilling, Inc** | Vert. Datum: **North American Vertical Datum 1988** | Rig Model: **GT8 Track Mounted Rig** |
| Logged By: **RBP** | Sampler(s): **Split Spoon Sampler** | |



| Depth (ft) | Elevation (ft) | Samples ID's | **Soil Description**<br>Samples and descriptions are in recovered depths.<br>Classification scheme: USCS | Lab Tests |
|---|---|---|---|---|
| 25 | | GT02-25-27 | 15.2-35 ft: Very loose to loose, wet, gray, silty SAND (SM), medium to coarse sand, no odor.<br>@26.1 ft: Decomposing wood fragment.<br>@27 ft: Pocket of sandy silt (fine sand) with wood. | MC, SG |
| | -20 | | | |
| 30 | | GT02-30-32 | @31 ft: Clay lens.<br>@31.1-31.8 ft: Shell fragments throughout.<br>@31.9 ft: Wood chunks. | MC, GSD |
| | -25 | | | |
| 35 | | | END OF BORING AT 35 FT DUE TO HEAVING SANDS | |
| | -30 | | | |
| 40 | | | | |
| | -35 | | | |
| 45 | | | | |
| | -40 | | | |
| 50 | | | | |

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▲ SPT N-Value
● Moisture Content (%)
▼ Groundwater Level

**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

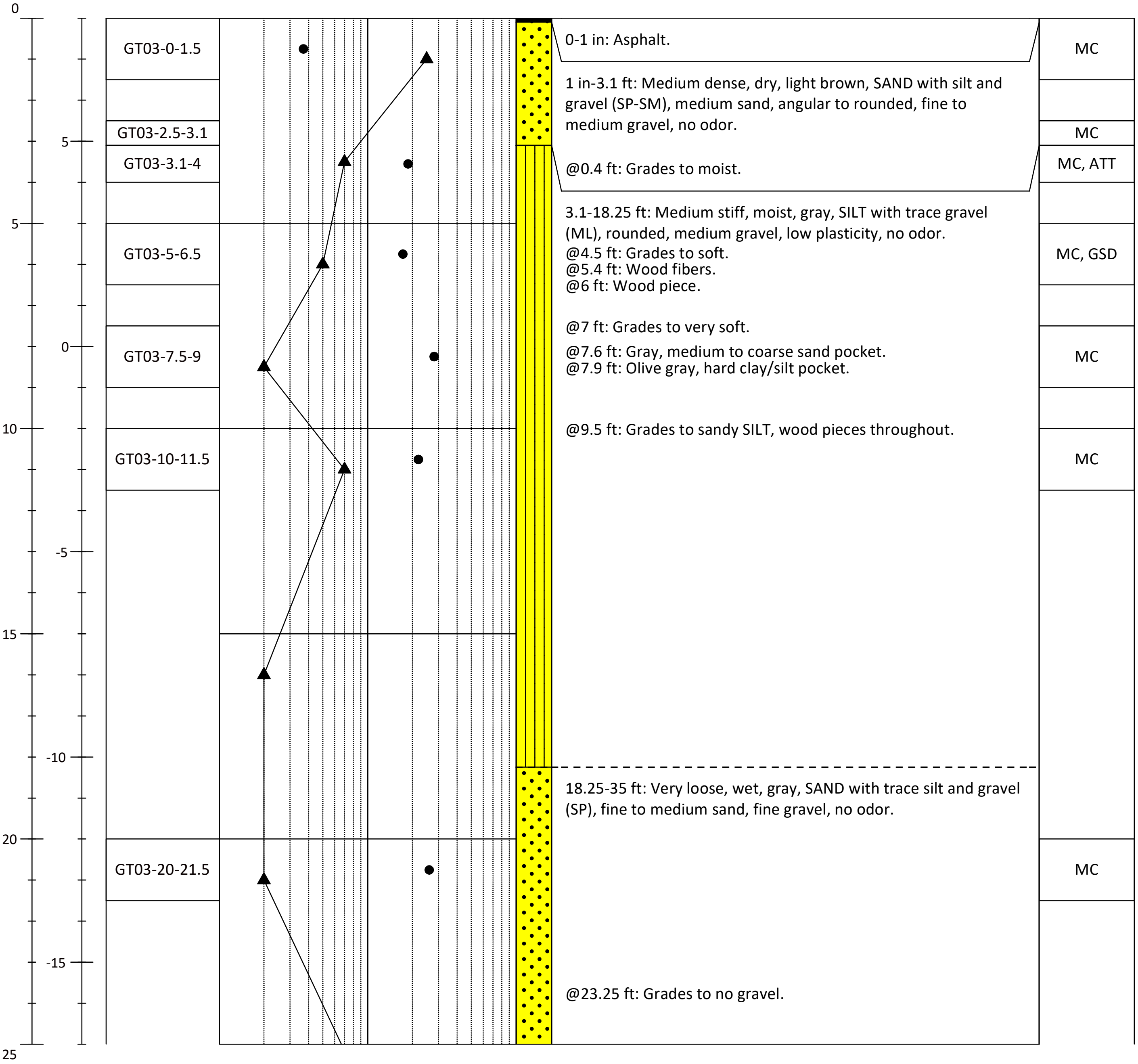
# Soil Boring Log

## GT03

**Sheet 1 of 2**

| | | |
|---|---|---|
| Project #: **240909-01.01** | Project: **Former Nord Door Cleanup** | Method: **Hollow Stem Auger** |
| Location: **Everett, Washington** | Northing/Latitude: **122°12'45.97"W** | Total Depth (ft): **41.5** |
| Client: **Jeld-Wen, Inc.** | Easting/Longitude: **48° 0'52.62"N** | Ground Surface Elevation (ft): **8** |
| Collection Date: **8/20/24** | Horiz. Datum: **North American Datum of 1983** | Hammer: **140-lb Auto Hammer** |
| Contractor: **Holocene Drilling, Inc** | Vert. Datum: **North American Vertical Datum 1988** | Rig Model: **GT8 Track Mounted Rig** |
| Logged By: **RBP** | Sampler(s): **Split Spoon Sampler** | |

| Depth (ft) | Elevation (ft) | Samples ID's | Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) | Lithology | **Soil Description**<br>Samples and descriptions are in recovered depths.<br>Classification scheme: USCS | Lab Tests |
|---|---|---|---|---|---|---|



| Samples ID's | Lab Tests |
|---|---|
| GT03-0-1.5 | MC |
| GT03-2.5-3.1 | MC |
| GT03-3.1-4 | MC, ATT |
| GT03-5-6.5 | MC, GSD |
| GT03-7.5-9 | MC |
| GT03-10-11.5 | MC |
| GT03-20-21.5 | MC |

0-1 in: Asphalt.

1 in-3.1 ft: Medium dense, dry, light brown, SAND with silt and gravel (SP-SM), medium sand, angular to rounded, fine to medium gravel, no odor.

@0.4 ft: Grades to moist.

3.1-18.25 ft: Medium stiff, moist, gray, SILT with trace gravel (ML), rounded, medium gravel, low plasticity, no odor.
@4.5 ft: Grades to soft.
@5.4 ft: Wood fibers.
@6 ft: Wood piece.

@7 ft: Grades to very soft.

@7.6 ft: Gray, medium to coarse sand pocket.
@7.9 ft: Olive gray, hard clay/silt pocket.

@9.5 ft: Grades to sandy SILT, wood pieces throughout.

18.25-35 ft: Very loose, wet, gray, SAND with trace silt and gravel (SP), fine to medium sand, fine gravel, no odor.

@23.25 ft: Grades to no gravel.

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▲ SPT N-Value
● Moisture Content (%)
▼ Groundwater Level

**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

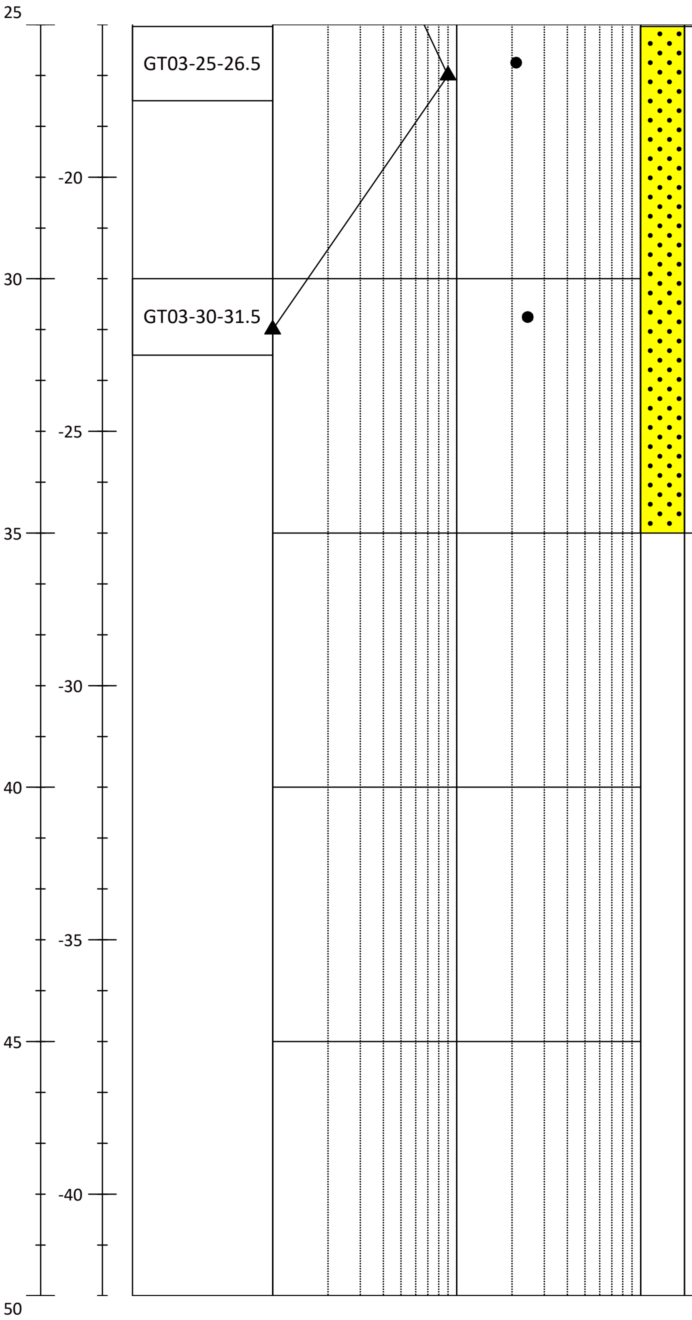
# Soil Boring Log

## GT03

**Sheet 2 of 2**

| | | |
|---|---|---|
| Project #: **240909-01.01** | Project: **Former Nord Door Cleanup** | Method: **Hollow Stem Auger** |
| Location: **Everett, Washington** | Northing/Latitude: **122°12'45.97"W** | Total Depth (ft): **41.5** |
| Client: **Jeld-Wen, Inc.** | Easting/Longitude: **48° 0'52.62"N** | Ground Surface Elevation (ft): **8** |
| Collection Date: **8/20/24** | Horiz. Datum: **North American Datum of 1983** | Hammer: **140-lb Auto Hammer** |
| Contractor: **Holocene Drilling, Inc** | Vert. Datum: **North American Vertical Datum 1988** | Rig Model: **GT8 Track Mounted Rig** |
| Logged By: **RBP** | Sampler(s): **Split Spoon Sampler** | |

| Depth (ft) | Elevation (ft) | Samples ID's | Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) | Lithology | **Soil Description**<br>Samples and descriptions are in recovered depths.<br>Classification scheme: USCS | Lab Tests |
|---|---|---|---|---|---|---|
| 25 | | GT03-25-26.5 | | | 18.25-35 ft: Very loose, wet, gray, SAND with trace silt (SP), fine to medium sand, no odor. | MC |
| 30 | | GT03-30-31.5 | | | | MC |
| 35 | | | | | END OF BORING AT 35 FT DUE TO HEAVING SANDS | |



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▲ SPT N-Value
● Moisture Content (%)
▼ Groundwater Level

**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

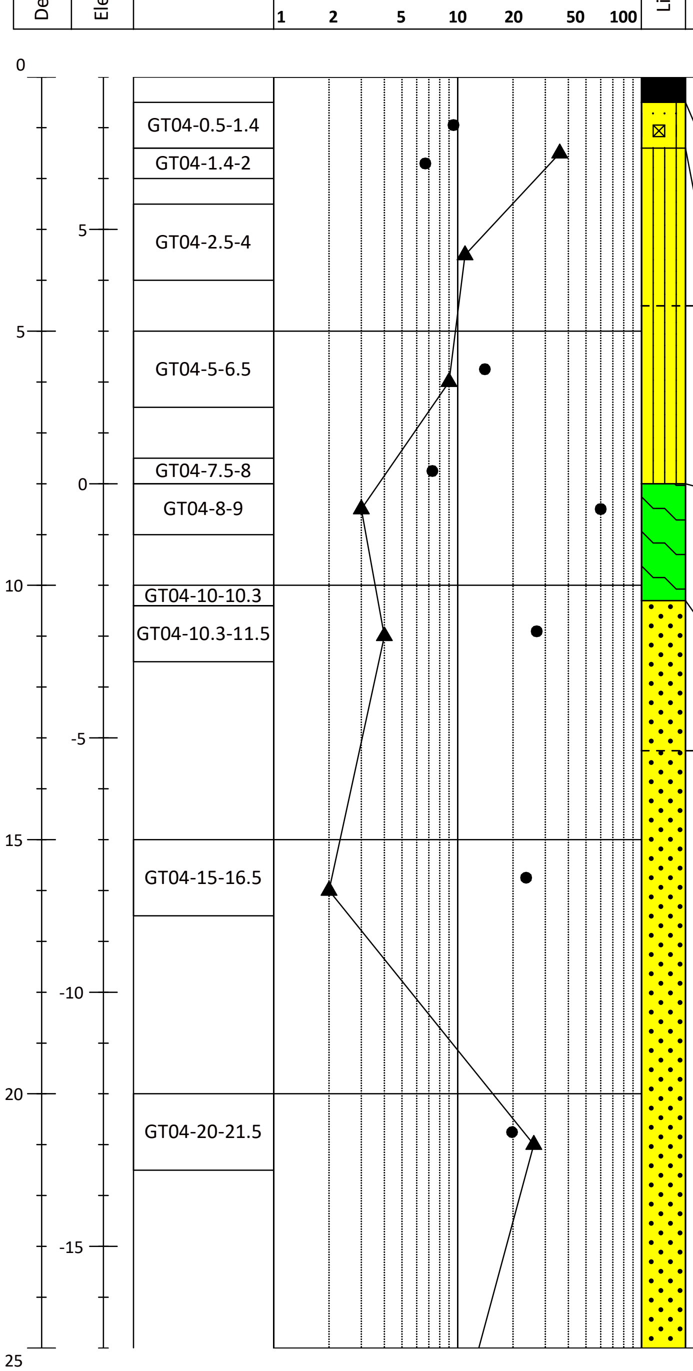
# Soil Boring Log

**Sheet 1 of 2**

## GT04

| | | |
|---|---|---|
| Project #: **240909-01.01** | Project: **Former Nord Door Cleanup** | Method: **Hollow Stem Auger** |
| Location: **Everett, Washington** | Northing/Latitude: **122°12'44.83"W** | Total Depth (ft): **30** |
| Client: **Jeld-Wen, Inc.** | Easting/Longitude: **48° 0'48.41"N** | Ground Surface Elevation (ft): **8** |
| Collection Date: **9/19/24** | Horiz. Datum: **North American Datum of 1983** | Hammer: **140-lb Auto Hammer** |
| Contractor: **Holocene Drilling, Inc** | Vert. Datum: **North American Vertical Datum 1988** | Rig Model: **GT8 Track Mounted Rig** |
| Logged By: **RBP** | Sampler(s): **Split Spoon Sampler** | |

Depth (ft) | Elevation (ft) | Samples ID's | Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) | Lithology



| Samples ID's | Lab Tests |
|---|---|
| GT04-0.5-1.4 | MC |
| GT04-1.4-2 | MC |
| GT04-2.5-4 | MC |
| GT04-5-6.5 | MC, GSD |
| GT04-7.5-8 | MC |
| GT04-8-9 | MC, ATT |
| GT04-10-10.3 | MC |
| GT04-10.3-11.5 | MC |
| GT04-15-16.5 | MC |
| GT04-20-21.5 | MC, SG |

### Soil Description

Samples and descriptions are in recovered depths.
Classification scheme: USCS

0-0.5 ft: Asphalt.

0.5-1.4 ft: Dense, moist, light gray brown, silty GRAVEL with sand (GM), no odor.

1.4-4.5 ft: Medium dense, moist, light gray, sandy SILT with gravel (ML), fine sand, fine gravel, no odor.

4.5-8 ft: Loose, moist, mottled brown and blue gray, sandy SILT with trace gravel (ML), fine to coarse sand, fine gravel, no odor.

@7 ft: Grades to higher sand and gravel content.

8-10.3 ft: Soft, moist, dark brown, SILT with clayey sand (ML), non-plastic, wood throughout, high plasticity, no odor.

@9.5 ft: Grades to gravelly clay with sand.

10.3-13.25 ft: Very loose to loose, wet, brownish black, SAND with trace silt (SP), fine to medium sand, no odor.

13.25-30 ft: Very loose, wet, gray, SAND with trace silt and gravel (SP), medium to coarse sand, fine gravel.

@15 ft: Metal piece. Wood chips.

@18.25 ft: Grades to well graded sand and gravel, moist, medium dense.

@23.25 ft: Grades to fine to medium sand, wet.

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- ▲ SPT N-Value
- ● Moisture Content (%)
- ▼ Groundwater Level

**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits*\A second attempt was made several feet away (GT04b). No samples were obtained. The boring was terminated at 8 feet due to lage amounts of wood and a metal piece.

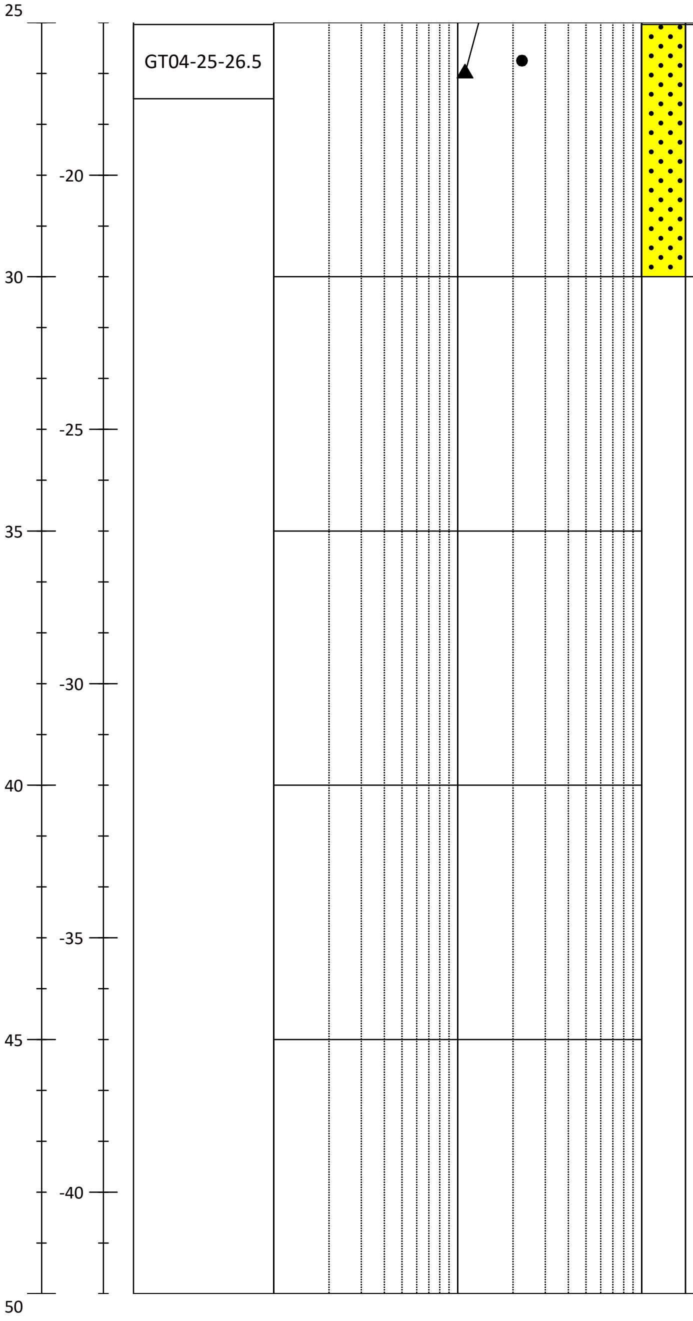
# Soil Boring Log

## GT04

**Sheet 2 of 2**

| | | |
|---|---|---|
| Project #: **240909-01.01** | Project: **Former Nord Door Cleanup** | Method: **Hollow Stem Auger** |
| Location: **Everett, Washington** | Northing/Latitude: **122°12'44.83"W** | Total Depth (ft): **30** |
| Client: **Jeld-Wen, Inc.** | Easting/Longitude: **48° 0'48.41"N** | Ground Surface Elevation (ft): **8** |
| Collection Date: **9/19/24** | Horiz. Datum: **North American Datum of 1983** | Hammer: **140-lb Auto Hammer** |
| Contractor: **Holocene Drilling, Inc** | Vert. Datum: **North American Vertical Datum 1988** | Rig Model: **GT8 Track Mounted Rig** |
| Logged By: **RBP** | Sampler(s): **Split Spoon Sampler** | |

| Depth (ft) | Elevation (ft) | Samples ID's | Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) | Lithology | **Soil Description**<br>Samples and descriptions are in recovered depths.<br>Classification scheme: USCS | Lab Tests |
|---|---|---|---|---|---|---|
| | | GT04-25-26.5 | | | 15-30 ft: Very loose, wet, gray, SAND with trace silt and gravel (SP), fine to medium sand, fine gravel.<br>@25.3 ft: Grades to coarse sand.<br>@26 ft: Wood chunks. | MC |
| | | | | | END OF BORING AT 30 FT DUE TO HEAVING SANDS | |



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▲ SPT N-Value
● Moisture Content (%)
Groundwater Level

**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits*\A second attempt was made several feet away (GT04b). No samples were obtained. The boring was terminated at 8 feet due to lage amounts of wood and a metal piece.

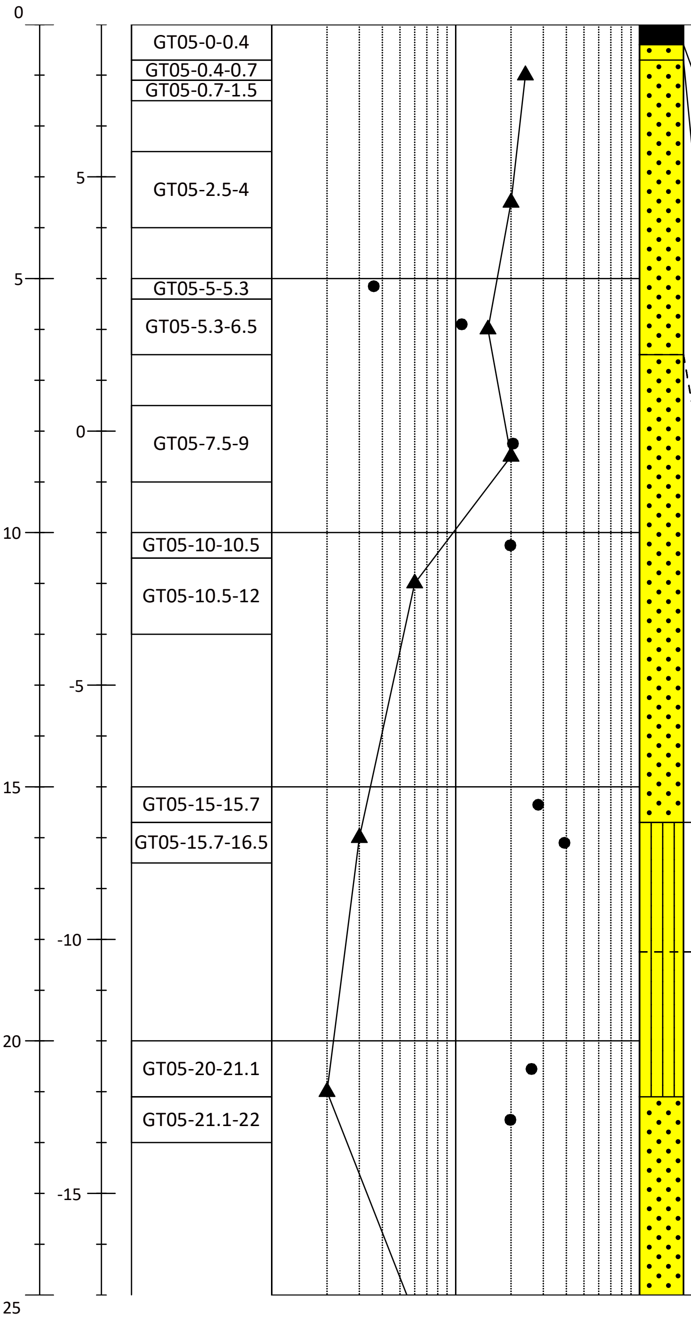
# Soil Boring Log

## GT05

Sheet 1 of 2

| | | |
|---|---|---|
| Project #: **240909-01.01** | Project: **Former Nord Door Cleanup** | Method: **Hollow Stem Auger** |
| Location: **Everett, Washington** | Northing/Latitude: **122°12'47.08"W** | Total Depth (ft): **42** |
| Client: **Jeld-Wen, Inc.** | Easting/Longitude: **48° 1'2.00"N** | Ground Surface Elevation (ft): **8** |
| Collection Date: **8/21/24** | Horiz. Datum: **North American Datum of 1983** | Hammer: **140-lb Auto Hammer** |
| Contractor: **Holocene Drilling, Inc** | Vert. Datum: **North American Vertical Datum 1988** | Rig Model: **GT8 Track Mounted Rig** |
| Logged By: **RBP** | Sampler(s): **Split Spoon Sampler** | |

Depth (ft) | Elevation (ft) | Samples ID's | Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) | Lithology | **Soil Description** Samples and descriptions are in recovered depths. Classification scheme: USCS | Lab Tests



| Samples ID's | Lab Tests |
|---|---|
| GT05-0-0.4 | MC |
| GT05-0.4-0.7 | MC |
| GT05-0.7-1.5 | MC |
| GT05-2.5-4 | MC, GSD |
| GT05-5-5.3 | MC |
| GT05-5.3-6.5 | MC, SG |
| GT05-7.5-9 | MC |
| GT05-10-10.5 | MC |
| GT05-10.5-12 | MC |
| GT05-15-15.7 | MC |
| GT05-15.7-16.5 | MC, ATT |
| GT05-20-21.1 | MC |
| GT05-21.1-22 | MC |

0-0.4 ft: Asphalt.

0.4-0.7 ft: Medium dense, moist, tan brown, SAND with gravel and trace silt (SP), fine to medium gravel, fine to medium sand, no odor.

0.7-6.5 ft: Medium dense, moist, tan, SAND with trace gravel (SP), fine sand, fine gravel.

@2.8 ft: Grades to light gray coloring, shells throughout.
@3.5-3.6 ft: Orange yellow banding.
@4.5 ft: Grades to dark brown, increased fine gravel content.
@5.3 ft: Grades to light light gray, no gravel content.
@5.6 ft: Grades to light yellow tan coloring with orange yellow striations.

6.5-15.7 ft: Medium dense, wet, dark gray, SAND (SP), fine to medium sand, no odor.

@10.5 ft: Grades to fine sand with increased silt content.

@13.5 ft: Grades to fine to medium sand, no silt content.

15.7-18.25 ft: Very soft, moist, dark gray, SILT with fine sand (ML), non-plastic, no odor.

18.25-33.5 ft: Very loose, wet, dark gray, sandy SILT (ML), fine sand, no odor.

@21.1 ft: Grades to fine to medium sand with silt, wood fibers throughout.

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▲ SPT N-Value
● Moisture Content (%)
▼ Groundwater Level

**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

# Soil Boring Log

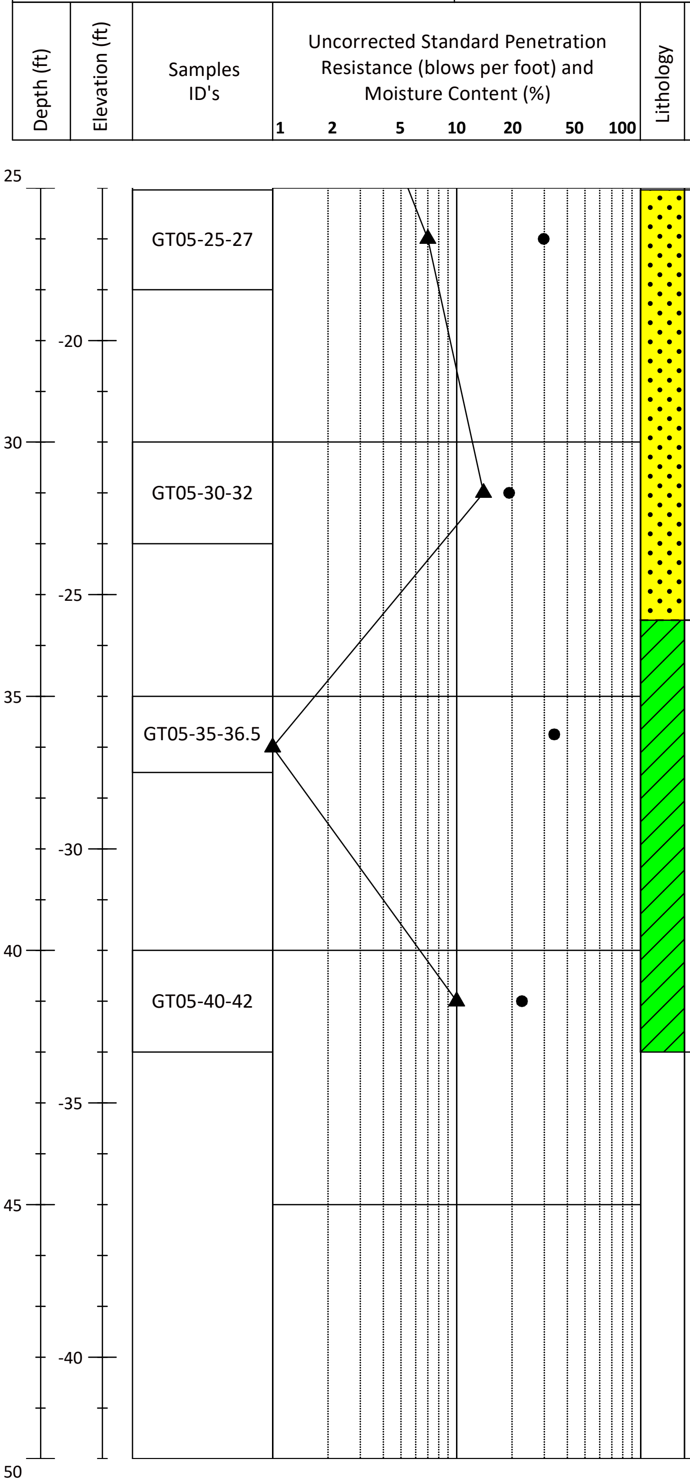
## GT05

Sheet 2 of 2

Project #: **240909-01.01**
Location: **Everett, Washington**
Client: **Jeld-Wen, Inc.**
Collection Date: **8/21/24**
Contractor: **Holocene Drilling, Inc**
Logged By: **RBP**

Project: **Former Nord Door Cleanup**
Northing/Latitude: **122°12'47.08"W**
Easting/Longitude: **48° 1'2.00"N**
Horiz. Datum: **North American Datum of 1983**
Vert. Datum: **North American Vertical Datum 1988**
Sampler(s): **Split Spoon Sampler**

Method: **Hollow Stem Auger**
Total Depth (ft): **42**
Ground Surface Elevation (ft): **8**
Hammer: **140-lb Auto Hammer**
Rig Model: **GT8 Track Mounted Rig**



**Soil Description**

Samples and descriptions are in recovered depths.
Classification scheme: USCS

18.25-33.5 ft: Very loose, wet, dark gray, SAND with silt (SP-SM), fine to medium sand, no odor.

@25-25.5 ft: Sandy silt, very wet, clay pocket within.
@25.8-25.9 ft: Decaying wood.

@30-30.8 ft: Silty sand, very wet, dark gray.

@31.4 ft: Decaying wood.

@32 ft: Clay pocket.

33.5-41.5 ft: Very soft, moist, dark gray, silty SAND with clay (SM), non-plastic, shell fragments throughout, no odor.

@39 ft: Grades to stiff, fine to medium sand, lower fines content.

END OF BORING AT 42 FT

| Samples ID's | Lab Tests |
|---|---|
| GT05-25-27 | MC |
| GT05-30-32 | MC |
| GT05-35-36.5 | MC, ATT, GSD |
| GT05-40-42 | MC, GSD, SG |

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▲ SPT N-Value
● Moisture Content (%)
▼ Groundwater Level

**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

# Soil Boring Log

## GT06

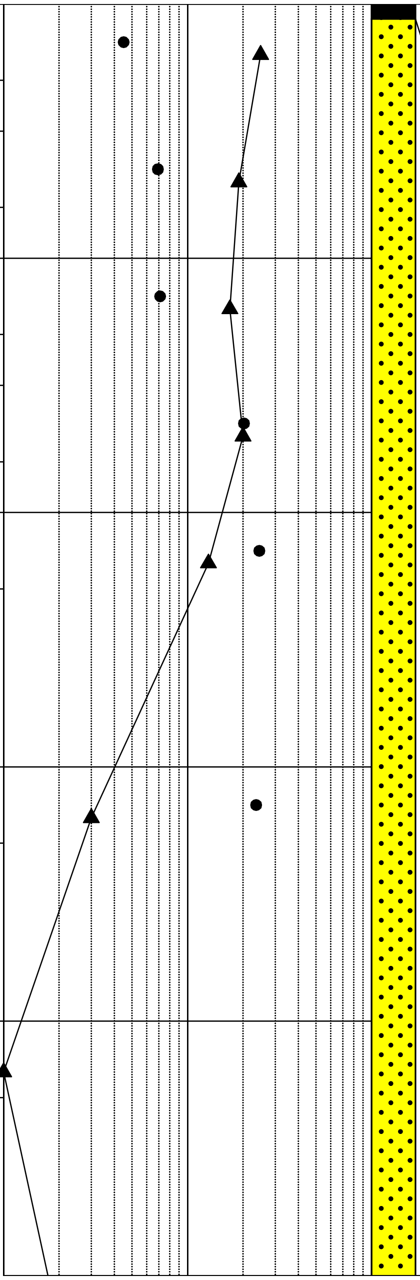
Sheet 1 of 2

| | | |
|---|---|---|
| Project #: **240909-01.01** | Project: **Former Nord Door Cleanup** | Method: **Hollow Stem Auger** |
| Location: **Everett, Washington** | Northing/Latitude: **122°12'43.88"W** | Total Depth (ft): **42** |
| Client: **Jeld-Wen, Inc.** | Easting/Longitude: **48° 0'59.89"N** | Ground Surface Elevation (ft): **7** |
| Collection Date: **8/22/24** | Horiz. Datum: **North American Datum of 1983** | Hammer: **140-lb Auto Hammer** |
| Contractor: **Holocene Drilling, Inc** | Vert. Datum: **North American Vertical Datum 1988** | Rig Model: **GT8 Track Mounted Rig** |
| Logged By: **RBP** | Sampler(s): **Split Spoon Sampler** | |

Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%)

1 2 5 10 20 50 100

Lithology



| Depth (ft) | Elevation (ft) | Samples ID's | **Soil Description**<br>Samples and descriptions are in recovered depths.<br>Classification scheme: USCS | Lab Tests |
|---|---|---|---|---|
| 0 | | GT06-0-1.5 | 0-3 in: Asphalt. | MC |
| | 5 | | 3 in-41.5 ft: Medium dense, moist, tan brown, SAND with trace silt (SP), fine grained sand, shell fragments throughout. | |
| | | GT06-2.5-4 | @0.4 ft: Large gravel piece. | MC |
| 5 | | GT06-5-6.5 | @5-5.2 ft: Brown sand with fine gravel.<br>@5.7 ft: Grades to coarser sand (fine to medium). | MC, SG |
| | 0 | | | |
| | | GT06-7.5-9 | @7.5-7.7 ft: Brown sand with fine gravel.<br>@7.7 ft: Grades to fine sand.<br>@7.9 ft: Grades to medium sand.<br>@8.2 ft: Grades to dark gray, fine to medium grained. | MC |
| 10 | | GT06-10-11.5 | @10 -10.2ft: Tan brown sand with fine gravel. | MC, SG |
| | -5 | | | |
| 15 | | GT06-15-16.5 | @15 ft: Trace sheen on sampler wall.<br>@15.25 ft: Wood piece.<br>@15.4 ft: Coarse sand lens with shell fragments.<br>@15.45 ft: Gray brown fine sandy silt lens.<br>@15.5 ft: Brown gray clay lens. | MC |
| | -10 | | | |
| | | | @18.25 ft: Grades to very loose. | |
| 20 | | No Recovery | | |
| | -15 | | | |
| 25 | | | | |

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▲ SPT N-Value

● Moisture Content (%)

▼ Groundwater Level

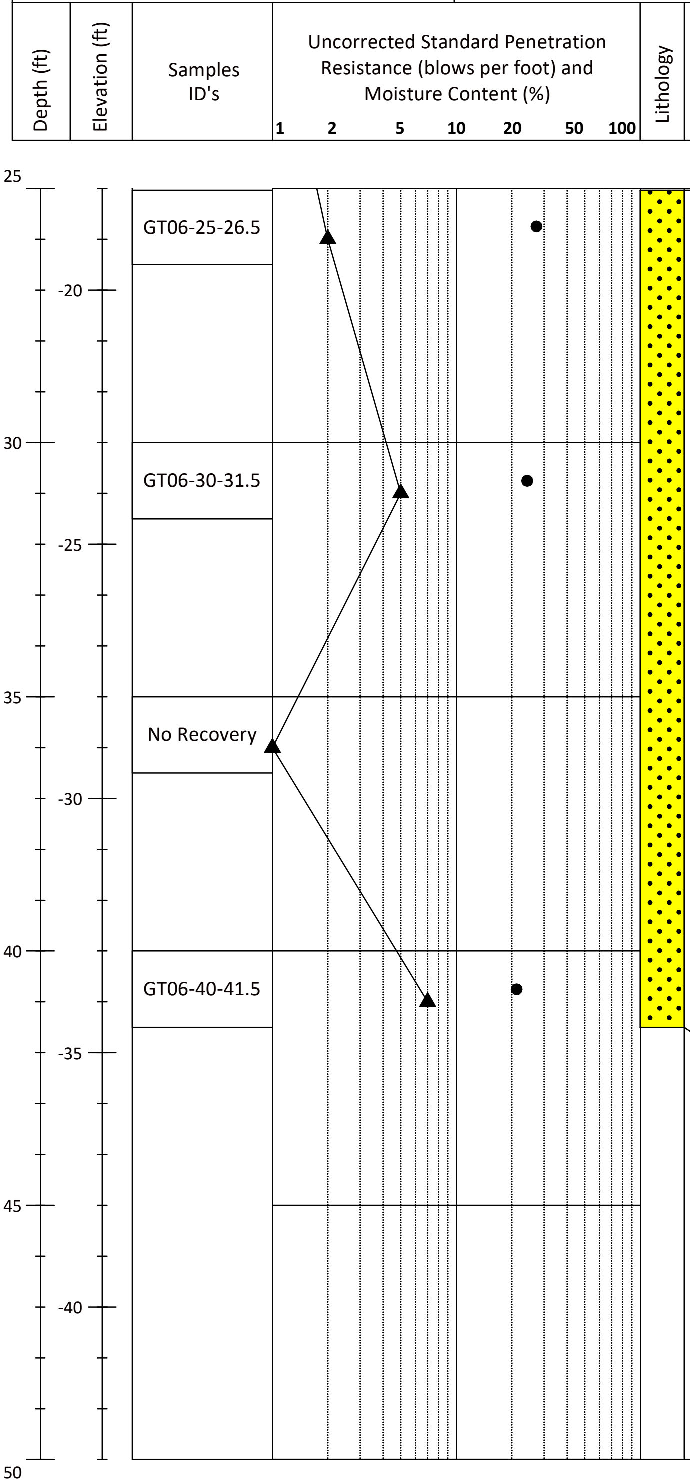
**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

# Soil Boring Log

## GT06

Sheet 2 of 2

Project #: **240909-01.01**
Project: **Former Nord Door Cleanup**
Method: **Hollow Stem Auger**
Location: **Everett, Washington**
Northing/Latitude: **122°12'43.88"W**
Total Depth (ft): **42**
Client: **Jeld-Wen, Inc.**
Easting/Longitude: **48° 0'59.89"N**
Ground Surface Elevation (ft): **7**
Collection Date: **8/22/24**
Horiz. Datum: **North American Datum of 1983**
Hammer: **140-lb Auto Hammer**
Contractor: **Holocene Drilling, Inc**
Vert. Datum: **North American Vertical Datum 1988**
Rig Model: **GT8 Track Mounted Rig**
Logged By: **RBP**
Sampler(s): **Split Spoon Sampler**



**Soil Description**

Samples and descriptions are in recovered depths.
Classification scheme: USCS

3 in-41.5 ft: Very loose, moist, dark gray, SAND with trace silt (SP), fine to medium grained sand, shell fragments throughout.

@25 ft: Trace rainbow sheen on sampler wall, no odor.
@25.6 ft: Clay lens.

@28.25 ft: Grades to mottled clayey sand.

@30.5 ft: Shell fragments.
@31-31.1 ft: Wood pieces.

@36 ft: Wood pieces.

@40.2 ft: Wood piece.
@40.4 ft: Grades to shell gragments throughout.

END OF BORING AT 42 FT

| Samples ID's | Lab Tests |
|---|---|
| GT06-25-26.5 | MC |
| GT06-30-31.5 | MC, GSD |
| No Recovery | |
| GT06-40-41.5 | MC |

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▲ SPT N-Value
● Moisture Content (%)
▼ Groundwater Level

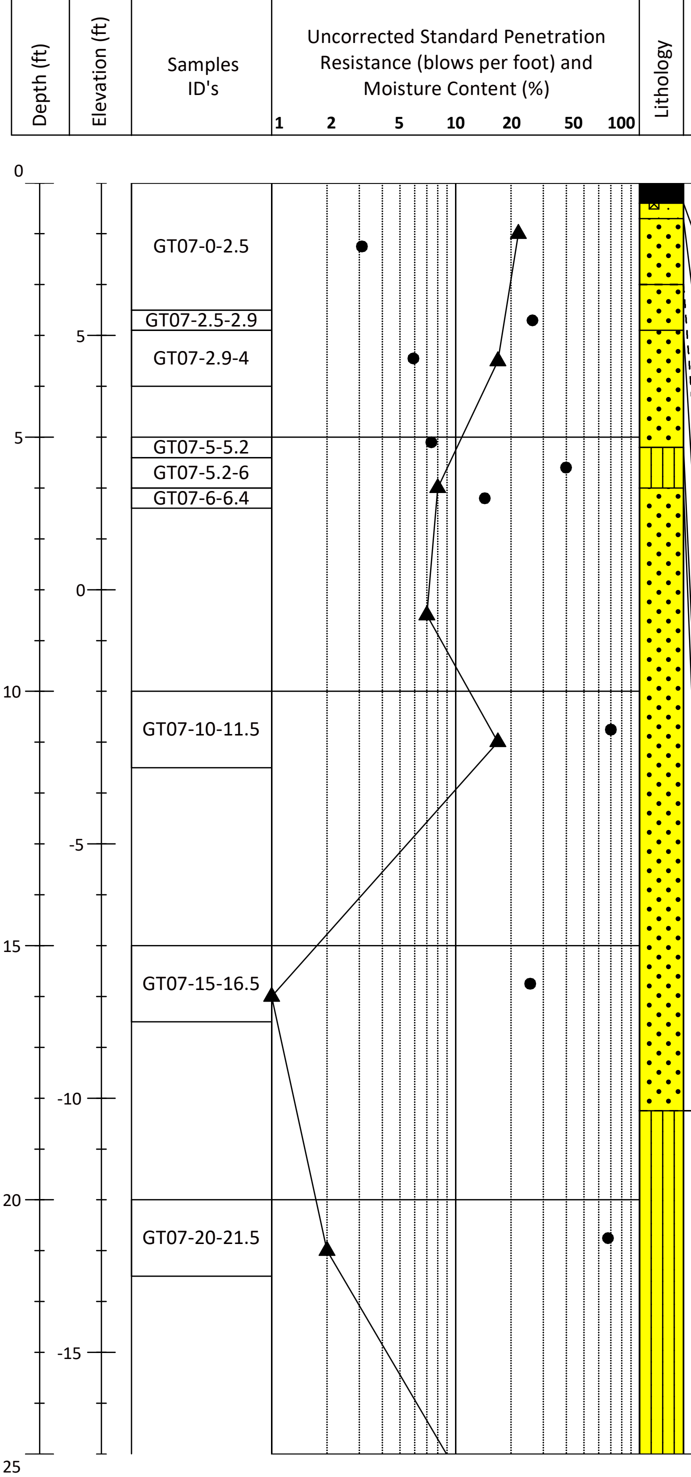
**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

# Soil Boring Log

## GT07

Sheet 1 of 2

| | | |
|---|---|---|
| Project #: **240909-01.01** | Project: **Former Nord Door Cleanup** | Method: **Hollow Stem Auger** |
| Location: **Everett, Washington** | Northing/Latitude: **122°12'41.94"W** | Total Depth (ft): **41.5** |
| Client: **Jeld-Wen, Inc.** | Easting/Longitude: **48° 0'58.51"N** | Ground Surface Elevation (ft): **8** |
| Collection Date: **8/22/24** | Horiz. Datum: **North American Datum of 1983** | Hammer: **140-lb Auto Hammer** |
| Contractor: **Holocene Drilling, Inc** | Vert. Datum: **North American Vertical Datum 1988** | Rig Model: **GT8 Track Mounted Rig** |
| Logged By: **RBP** | Sampler(s): **Split Spoon Sampler** | |



### Soil Description

Samples and descriptions are in recovered depths.
Classification scheme: USCS

0-0.4 ft: Asphalt.

0.4-0.7 ft: Medium dense, moist, tan brown, sandy GRAVEL (GP), rounded, fine to medium gravel, fine to medium sand, no odor.

0.7-2 ft: Medium dense, moist, light gray, SAND (SP), fine sand, no odor.

@0.9 ft: Grades to tan coloring.

2-2.9 ft: Medium dense, moist, dark gray, SAND (SP), medium to coarse sand,clay pockets throughout, no odor.

2.9-5.2 ft: Medium dense, moist, brown, SAND (SP), fine to medium sand, no odor.
@3.2 ft: Grades to light tan coloring with yellow orange striations.
@4.5 ft: Grades to higher gravel content, wood throughout, brown tan coloring.

5.2-6 ft: Medium stiff, moist, dark gray, SILT (ML), low plasticity, fibers throughout, no odor.

6-18.25 ft: Medium dense, moist, dark gray, SAND (SP), fine to medium sand, faint petroleum-like odor.
@7.5-12 ft: Faint petroleum-like odor and trace sheen (in cuttings).
@7.5-7.6 ft: Tan brown sand lens.
@7.6-7.8 ft: Dark gray silt lens.
@7.8 ft: Tan brown sand lens.
@9.5 ft: Grades to fibers and clay pockets throughout.
@10.5 ft: Wood chunk.
@13.25 ft: Grades to no fiber or clay, trace fine sand.

18.25-25.8 ft: Very soft, moist, dark gray, SILT with sand and clay (ML), fine sand, non-plastic, fibers and wood chunks throughout.

@23.5 ft: Grades to increased sand content, increased wood content.

| Samples ID's | Lab Tests |
|---|---|
| GT07-0-2.5 | MC |
| GT07-2.5-2.9 | MC |
| GT07-2.9-4 | MC |
| GT07-5-5.2 | MC |
| GT07-5.2-6 | MC, ATT |
| GT07-6-6.4 | MC |
| GT07-10-11.5 | MC |
| GT07-15-16.5 | MC, GSD |
| GT07-20-21.5 | MC, ATT, SG |

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▲ SPT N-Value
● Moisture Content (%)
▼ Groundwater Level

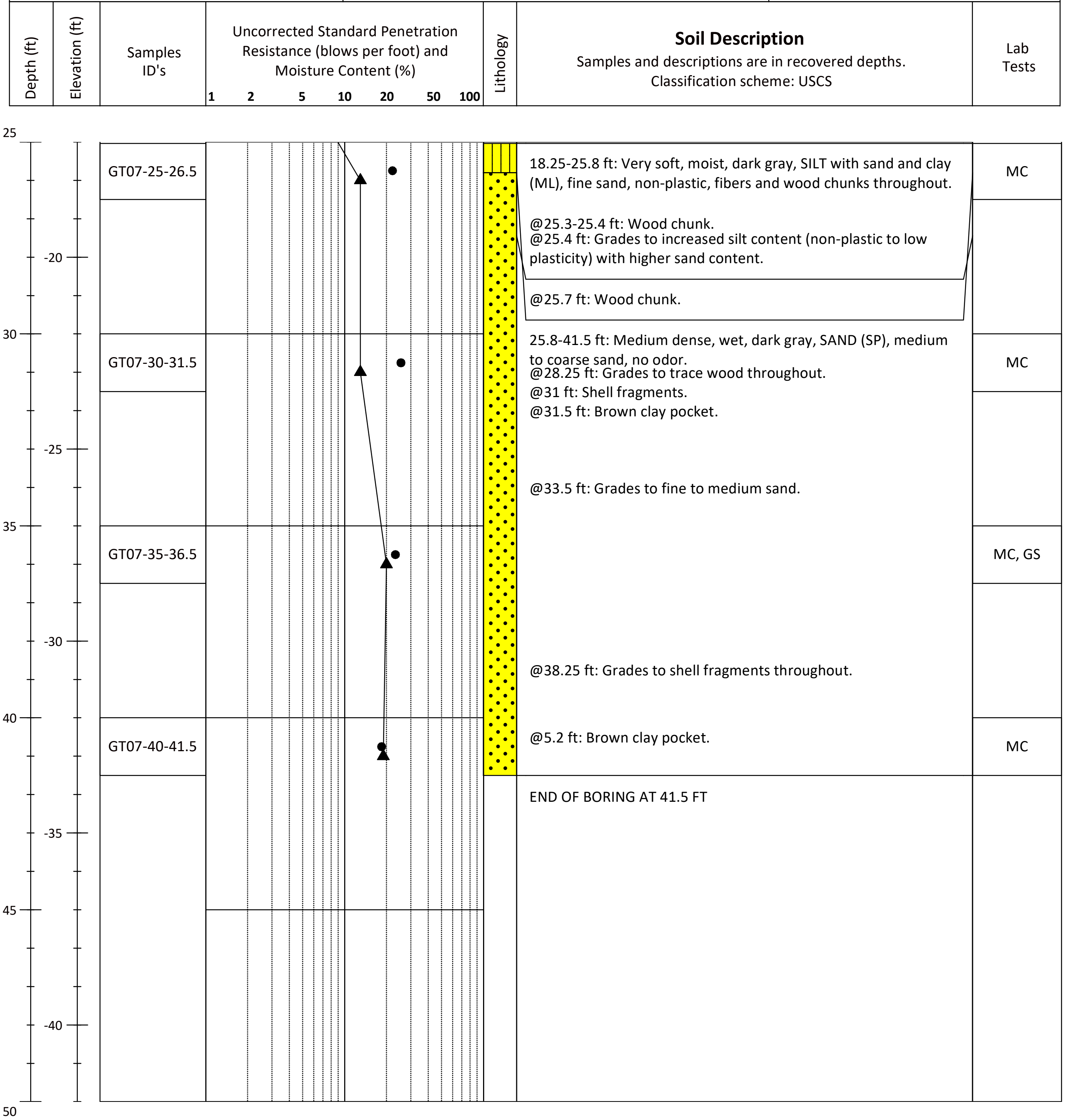
**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

# Soil Boring Log

**Sheet 2 of 2**

## GT07

Project #: **240909-01.01**
Project: **Former Nord Door Cleanup**
Method: **Hollow Stem Auger**
Location: **Everett, Washington**
Northing/Latitude: **122°12'41.94"W**
Total Depth (ft): **41.5**
Client: **Jeld-Wen, Inc.**
Easting/Longitude: **48° 0'58.51"N**
Ground Surface Elevation (ft): **8**
Collection Date: **8/22/24**
Horiz. Datum: **North American Datum of 1983**
Hammer: **140-lb Auto Hammer**
Contractor: **Holocene Drilling, Inc**
Vert. Datum: **North American Vertical Datum 1988**
Rig Model: **GT8 Track Mounted Rig**
Logged By: **RBP**
Sampler(s): **Split Spoon Sampler**



**Soil Description**

Samples and descriptions are in recovered depths.
Classification scheme: USCS

| Soil Description | Lab Tests |
|---|---|
| 18.25-25.8 ft: Very soft, moist, dark gray, SILT with sand and clay (ML), fine sand, non-plastic, fibers and wood chunks throughout.<br>@25.3-25.4 ft: Wood chunk.<br>@25.4 ft: Grades to increased silt content (non-plastic to low plasticity) with higher sand content.<br>@25.7 ft: Wood chunk. | MC |
| 25.8-41.5 ft: Medium dense, wet, dark gray, SAND (SP), medium to coarse sand, no odor.<br>@28.25 ft: Grades to trace wood throughout.<br>@31 ft: Shell fragments.<br>@31.5 ft: Brown clay pocket. | MC |
| @33.5 ft: Grades to fine to medium sand. | MC, GS |
| @38.25 ft: Grades to shell fragments throughout.<br>@5.2 ft: Brown clay pocket. | MC |
| END OF BORING AT 41.5 FT | |

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▲ SPT N-Value
● Moisture Content (%)
▼ Groundwater Level

**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

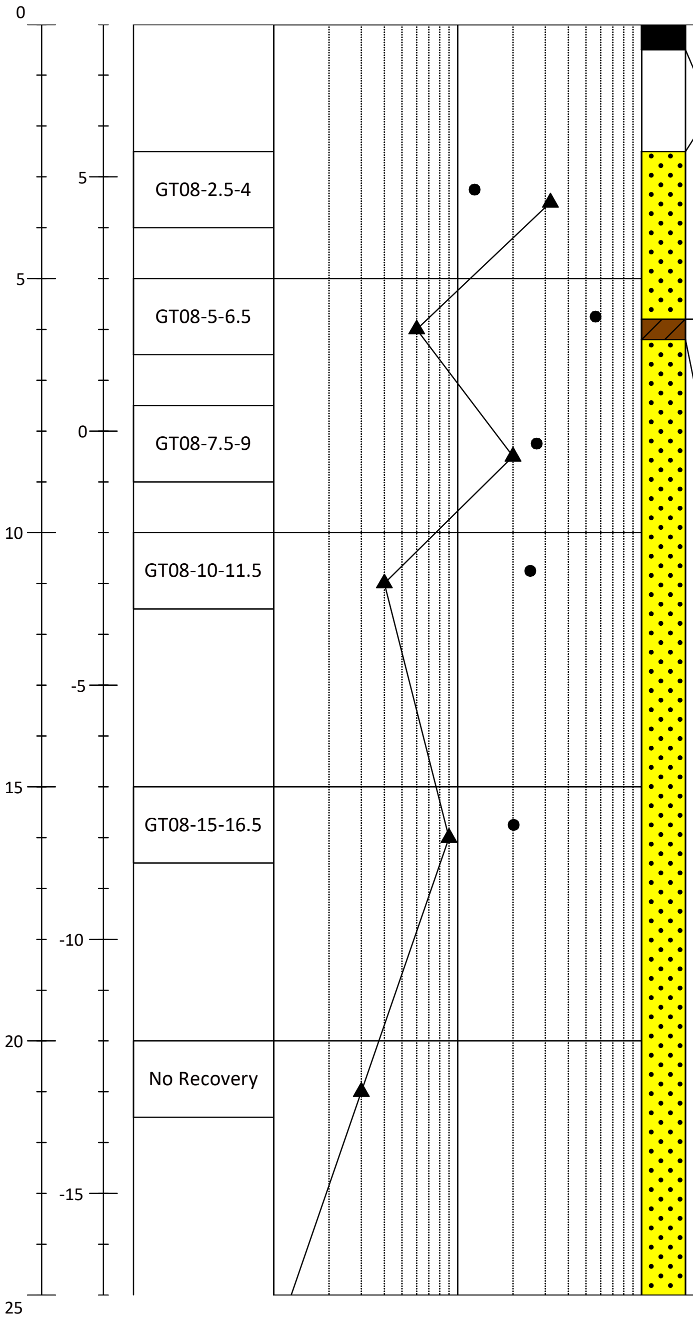
# Soil Boring Log

## GT08

Sheet 1 of 2

| | | |
|---|---|---|
| Project #: **240909-01.01** | Project: **Former Nord Door Cleanup** | Method: **Hollow Stem Auger** |
| Location: **Everett, Washington** | Northing/Latitude: **122°12'35.48"W** | Total Depth (ft): **41.5** |
| Client: **Jeld-Wen, Inc.** | Easting/Longitude: **48° 0'54.89"N** | Ground Surface Elevation (ft): **8** |
| Collection Date: **8/19/24** | Horiz. Datum: **North American Datum of 1983** | Hammer: **140-lb Auto Hammer** |
| Contractor: **Holocene Drilling, Inc** | Vert. Datum: **North American Vertical Datum 1988** | Rig Model: **GT8 Track Mounted Rig** |
| Logged By: **RBP** | Sampler(s): **Split Spoon Sampler** | |

| Depth (ft) | Elevation (ft) | Samples ID's | Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) | Lithology | **Soil Description**<br>Samples and descriptions are in recovered depths.<br>Classification scheme: USCS | Lab Tests |
|---|---|---|---|---|---|---|



| Samples ID's | Lab Tests |
|---|---|
| GT08-2.5-4 | MC |
| GT08-5-6.5 | MC |
| GT08-7.5-9 | MC, GSD, SG |
| GT08-10-11.5 | MC, GSD, SG |
| GT08-15-16.5 | MC |
| No Recovery | |

0-0.5 ft: Asphalt.

@1 ft: Railroad tie.

2.5-5.8 ft: Dense, moist, brown, gravelly SAND with trace silt (SP), medium sand, no odor.

5.8-6.2 ft: Decomposing wood, moderate sulfur/petroleum-like odor.

6.2-41.5 ft: Loose, moist, light gray, SAND with trace silt (SP), medium to coarse sand, wood throughout.

@7 ft: Grades to coarser sand, trace welll graded rounded gravel, medium dense.
@9.5 ft: Grades to very loose to loose.
@10 ft: Interbedded gray fine sand.

@13.25 ft: Grades to loose, wet, medium sand.

@15 ft: Heaving sand noted.

@18.25 ft: Grades to very loose.

ANCHOR QEA
1201 Third Avenue
Suite 2600 Seattle, WA 98101

- ▲ SPT N-Value
- ● Moisture Content (%)
- ▼ Groundwater Level

**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

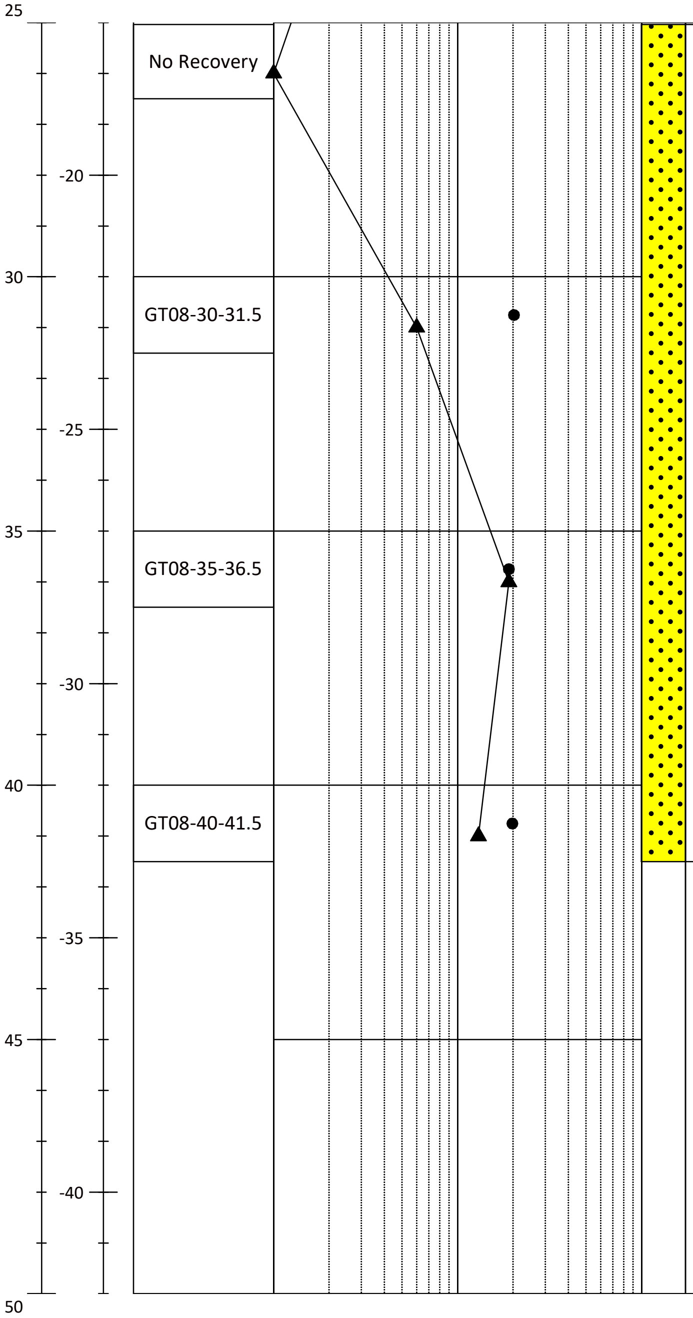
# Soil Boring Log

## GT08

**Sheet 2 of 2**

| | | |
|---|---|---|
| Project #: **240909-01.01** | Project: **Former Nord Door Cleanup** | Method: **Hollow Stem Auger** |
| Location: **Everett, Washington** | Northing/Latitude: **122°12'35.48"W** | Total Depth (ft): **41.5** |
| Client: **Jeld-Wen, Inc.** | Easting/Longitude: **48° 0'54.89"N** | Ground Surface Elevation (ft): **8** |
| Collection Date: **8/19/24** | Horiz. Datum: **North American Datum of 1983** | Hammer: **140-lb Auto Hammer** |
| Contractor: **Holocene Drilling, Inc** | Vert. Datum: **North American Vertical Datum 1988** | Rig Model: **GT8 Track Mounted Rig** |
| Logged By: **RBP** | Sampler(s): **Split Spoon Sampler** | |

| Depth (ft) | Elevation (ft) | Samples ID's | Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%)<br>1 2 5 10 20 50 100 | Lithology | **Soil Description**<br>Samples and descriptions are in recovered depths.<br>Classification scheme: USCS | Lab Tests |
|---|---|---|---|---|---|---|
| | | No Recovery | | | 6.2-41.5 ft: Very loose, wet, light gray, SAND with trace silt (SP), medium sand, wood throughout. | |
| | | | | | @28.25 ft: Grades to fine to medium sand, trace gravel. | |
| | | GT08-30-31.5 | | | @30.6 ft: Grades to trace silt, loose. | MC, SG |
| | | | | | @33.25 ft: Grades to medium dense, fine sand. Coarse sand lens. | |
| | | GT08-35-36.5 | | | @35.6 ft: Grades to moist. | MC, GSD |
| | | | | | @38.25 ft: Grades to coarse sand, wet. | |
| | | GT08-40-41.5 | | | @40.2 ft: Grades to fine sand. | MC |
| | | | | | END OF BORING AT 41.5 FT | |



ANCHOR QEA
1201 Third Avenue
Suite 2600 Seattle, WA 98101

▲ SPT N-Value
● Moisture Content (%)
▼ Groundwater Level

**Notes:** GSD: Grain Size Distribution; MC: Moisture Content; SG: Specific Gravity; ATT: Atterberg Limits

# Attachment B-2

# Laboratory Results

MATERIALS TESTING & CONSULTING, INC.

| | | | |
|---|---|---|---|
| **Client:** | Anchor QEA, LLC. | **Date:** | December 4, 2024 |
| **Address:** | 1201 3rd Avenue, Suite 2600 | **Project:** | Q.C. - Former Nord Door Cleanup |
| | Seattle, WA 98101 | **Project #:** | 24B105-03 |
| **Attn:** | Jason Cornetta | **Sample #:** | B24-1819 - 1843 |
| **Revised On:** | | **Date sampled:** | August 19 & 20, 2024 |
| | | **Control No:** | 12042024 |

As requested and authorized by the Client, MTC has performed the following test(s) on the sample number referenced above. The testing was performed in accordance with current, applicable AASHTO, ASTM, and/or WSDOT standards, which are referenced on the correlating test report pages. The results obtained in our laboratory are as detailed below and/or on the following pages:

| | **Test(s) Performed:** | **Test Results** | | **Test(s) Performed:** | **Test Results** |
|---|---|---|---|---|---|
| X | Sieve Analysis | See Attached Reports | | Sulfate Soundness | |
| | Proctor | | | Bulk Density & Voids | |
| | Sand Equivalent | | | WSDOT Degradation | |
| | Fracture Count | | | LA Abrasion | |
| X | Moisture Content | See Attached Report | | Cation Exchange Capacity | |
| | Specific Gravity, Coarse | | X | Specific Gravity, Soils | See Attached Report |
| | Specific Gravity, Fine | | | | |
| | Hydrometer Analysis | | | | |
| X | Atterberg Limits | See Attached Reports | | | |
| | | | | | |
| | | | | | |

If you have any questions concerning the test results, the procedures used, or if we can be of any further assistance please call the number below and ask to speak with your Project Manager or the Laboratory Manager.

Alex Eifrig

Respectfully Submitted,
Alex Eifrig
WABO Supervising Laboratory Technician

MTC

MATERIALS TESTING & CONSULTING, INC.

# Moisture Content ASTM C-566, ASTM D-2216

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Date Received:** November 22, 2024
**Date Tested:** November 26, 2024

**Client:** Anchor QEA, LLC.
**Sampled by:** Client
**Tested by:** S. Boesenberg
**Control No.:** 12042024

| Sample # | Location | Tare | Wet + Tare | Dry + Tare | Wgt. Of Moisture | Wgt. Of Soil | % Moisture |
|---|---|---|---|---|---|---|---|
| B24-1819 | GT02 - 0 - 1.5 | 380.0 | 1168.2 | 1141.8 | 26.4 | 761.8 | 3.5% |
| B24-1820 | GT02 - 2.5 - 2.9 | 215.2 | 318.5 | 314.6 | 3.9 | 99.4 | 3.9% |
| B24-1821 | GT02 - 2.9 - 4 | 303.8 | 444.2 | 424.9 | 19.3 | 121.1 | 15.9% |
| B24-1822 | GT02 - 5 - 6.5 | 306.5 | 393.8 | 386.7 | 7.1 | 80.2 | 8.9% |
| B24-1823 | GT02 - 7.5 - 9 | 229.5 | 266.9 | 264.2 | 2.7 | 34.7 | 7.8% |
| B24-1824 | GT02 - 10 - 11.5 | 222.4 | 446.0 | 428.5 | 17.5 | 206.1 | 8.5% |
| B24-1825 | GT02 - 15 - 16.5 | 221.0 | 738.3 | 627.6 | 110.7 | 406.6 | 27.2% |
| B24-1826 | GT02 - 20 - 21.5 | 419.2 | 1625.5 | 1421.7 | 203.8 | 1002.5 | 20.3% |
| B24-1827 | GT02 - 25 - 27 | 414.4 | 1417.0 | 1246.9 | 170.1 | 832.5 | 20.4% |
| B24-1828 | GT02 - 30 - 32 | 498.5 | 1784.2 | 1541.7 | 242.5 | 1043.2 | 23.2% |
| B24-1829 | GT03 - 0 - 1.5 | 301.0 | 883.2 | 862.3 | 20.9 | 561.3 | 3.7% |
| B24-1830 | GT03 - 3.1 - 4 | 224.9 | 243.3 | 240.4 | 2.9 | 15.5 | 18.7% |
| B24-1831 | GT03 - 5 - 6.5 | 301.0 | 461.4 | 437.7 | 23.7 | 136.7 | 17.3% |
| B24-1832 | GT03 - 7.5 - 9 | 208.6 | 519.2 | 451.2 | 68.0 | 242.6 | 28.0% |
| B24-1833 | GT03 - 10 - 11.5 | 232.9 | 388.5 | 360.4 | 28.1 | 127.5 | 22.0% |
| B24-1834 | GT03 - 20 - 21.5 | 223.8 | 1016.0 | 852.5 | 163.5 | 628.7 | 26.0% |
| B24-1835 | GT03 - 25 - 27 | 222.9 | 1126.6 | 969.1 | 157.5 | 746.2 | 21.1% |
| B24-1836 | GT03 - 30 - 31.5 | 234.5 | 401.0 | 368.3 | 32.7 | 133.8 | 24.4% |
| B24-1837 | GT04 - 0.5 - 1.4 | 269.0 | 873.8 | 821.2 | 52.6 | 552.2 | 9.5% |
| B24-1838 | GT04 - 1.4 - 2 | 303.3 | 534.8 | 520.3 | 14.5 | 217.0 | 6.7% |
| B24-1839 | GT04 - 5 - 6.5 | 423.9 | 854.9 | 801.7 | 53.2 | 377.8 | 14.1% |
| B24-1840 | GT04 - 7.5 - 8 | 310.9 | 502.9 | 489.8 | 13.1 | 178.9 | 7.3% |
| B24-1841 | GT04 - 8 - 9 | 270.1 | 309.3 | 294.6 | 14.7 | 24.5 | 60.0% |
| B24-1842 | GT04 - 10.3 - 11.5 | 423.4 | 638.3 | 592.7 | 45.6 | 169.3 | 26.9% |
| B24-1843 | GT04 - 15 - 16.5 | 260.2 | 582.6 | 521.1 | 61.5 | 260.9 | 23.6% |

**Comments:**

Reviewed by: Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT02 - 2.9 - 4
**Sample#:** B24-1821

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 2-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12042024

**Unified Soil Classification System, ASTM-2487**
SM, Silty Sand with Gravel
**Sample Color:**
Brown

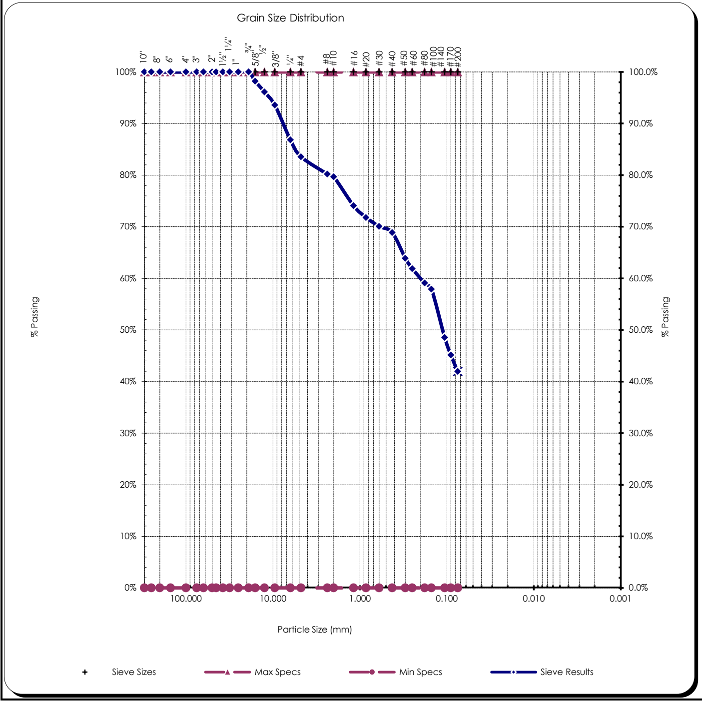
**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** N/A

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $D_{(5)}$ = | 0.009 | mm | % Gravel = | 16.4% | Coeff. of Curvature, $C_C$ = | 0.79 |
| $D_{(10)}$ = | 0.018 | mm | % Sand = | 41.6% | Coeff. of Uniformity, $C_U$ = | 11.35 |
| $D_{(15)}$ = | 0.027 | mm | % Silt & Clay = | 41.9% | Fineness Modulus = | 1.77 |
| $D_{(30)}$ = | 0.054 | mm | Liquid Limit = | n/a | Plastic Limit = | n/a |
| $D_{(50)}$ = | 0.113 | mm | Plasticity Index = | n/a | Moisture %, as sampled = | n/a |
| $D_{(60)}$ = | 0.203 | mm | Sand Equivalent = | n/a | Req'd Sand Equivalent = | |
| $D_{(90)}$ = | 7.808 | mm | Fracture %, 1 Face = | n/a | Req'd Fracture %, 1 Face = | |
| Dust Ratio = | 53/87 | | Fracture %, 2+ Faces = | n/a | Req'd Fracture %, 2+ Faces = | |

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size US | Sieve Size Metric | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 98% | 100.0% | 0.0% |
| 1/2" | 12.50 | 96% | 96% | 100.0% | 0.0% |
| 3/8" | 9.50 | 94% | 94% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 87% | 100.0% | 0.0% |
| #4 | 4.75 | 84% | 84% | 100.0% | 0.0% |
| #8 | 2.36 | | 80% | 100.0% | 0.0% |
| #10 | 2.00 | 80% | 80% | 100.0% | 0.0% |
| #16 | 1.18 | | 74% | 100.0% | 0.0% |
| #20 | 0.850 | | 72% | 100.0% | 0.0% |
| #30 | 0.600 | | 70% | 100.0% | 0.0% |
| #40 | 0.425 | 69% | 69% | 100.0% | 0.0% |
| #50 | 0.300 | | 64% | 100.0% | 0.0% |
| #60 | 0.250 | | 62% | 100.0% | 0.0% |
| #80 | 0.180 | | 59% | 100.0% | 0.0% |
| #100 | 0.150 | 58% | 58% | 100.0% | 0.0% |
| #140 | 0.106 | | 49% | 100.0% | 0.0% |
| #170 | 0.090 | | 45% | 100.0% | 0.0% |
| #200 | 0.075 | 41.9% | 41.9% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig
Alex Eifrig
WABO Supervising Laboratory Technician

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT02 - 5 - 6.5
**Sample#:** B24-1822

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 2-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12042024

**Unified Soil Classification System, ASTM-2487**
SP-SM, Poorly graded Sand with Silt and Gravel
**Sample Color:**
Gray-Brown

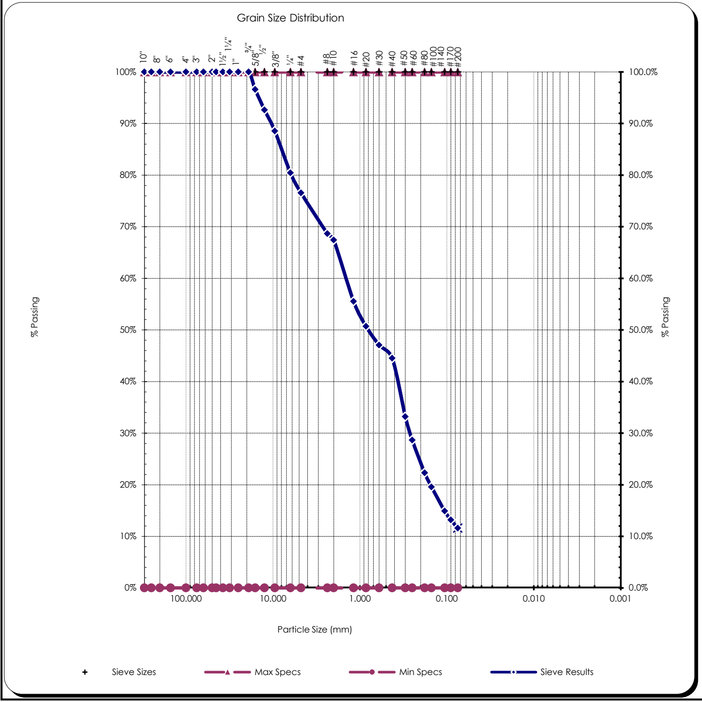
**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** N/A

| | | | | |
|---|---|---|---|---|
| $D_{(5)}$ = 0.032 mm | % Gravel = 23.4% | Coeff. of Curvature, $C_C$ = 0.73 |
| $D_{(10)}$ = 0.065 mm | % Sand = 65.0% | Coeff. of Uniformity, $C_U$ = 23.01 |
| $D_{(15)}$ = 0.107 mm | % Silt & Clay = 11.6% | Fineness Modulus = 3.11 |
| $D_{(30)}$ = 0.265 mm | Liquid Limit = n/a | Plastic Limit = n/a |
| $D_{(50)}$ = 0.802 mm | Plasticity Index = n/a | Moisture %, as sampled = n/a |
| $D_{(60)}$ = 1.488 mm | Sand Equivalent = n/a | Req'd Sand Equivalent = |
| $D_{(90)}$ = 10.573 mm | Fracture %, 1 Face = n/a | Req'd Fracture %, 1 Face = |
| Dust Ratio = 25/96 | Fracture %, 2+ Faces = n/a | Req'd Fracture %, 2+ Faces = |

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size | | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| US | Metric | | | | |
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 97% | 100.0% | 0.0% |
| 1/2" | 12.50 | 93% | 93% | 100.0% | 0.0% |
| 3/8" | 9.50 | 89% | 89% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 80% | 100.0% | 0.0% |
| #4 | 4.75 | 77% | 77% | 100.0% | 0.0% |
| #8 | 2.36 | | 69% | 100.0% | 0.0% |
| #10 | 2.00 | 67% | 67% | 100.0% | 0.0% |
| #16 | 1.18 | | 56% | 100.0% | 0.0% |
| #20 | 0.850 | | 51% | 100.0% | 0.0% |
| #30 | 0.600 | | 47% | 100.0% | 0.0% |
| #40 | 0.425 | 45% | 45% | 100.0% | 0.0% |
| #50 | 0.300 | | 33% | 100.0% | 0.0% |
| #60 | 0.250 | | 29% | 100.0% | 0.0% |
| #80 | 0.180 | | 22% | 100.0% | 0.0% |
| #100 | 0.150 | 20% | 20% | 100.0% | 0.0% |
| #140 | 0.106 | | 15% | 100.0% | 0.0% |
| #170 | 0.090 | | 13% | 100.0% | 0.0% |
| #200 | 0.075 | 11.6% | 11.6% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig
Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

# Specific Gravity of Soils, ASTM D-854

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Date Received:** November 22, 2024
**Date Tested:** December 2, 2024

**Client:** Anchor QEA, LLC.
**Sampled by:** Client
**Tested by:** Z. Romney
**Control. No.:** 12042024

| Sample # | Location | Tare | Dry Soil + Tare | Mass of Dry Soil | Pycno ID | Mass of Pycno | Volume of Pycno | Density of Water @ Tx | Mass of Pycno filled w/ water & soils | Mass of Pycno filled w/ water | Temp. of Water, 0.1 *C | SpG of Soils | Temp. Correction Factor | Corrected SpG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B24-1822 | GT02 - 5 - 6.5 | 357.38 | 420.51 | 63.13 | SA-050 (B-1) | 91.89 | 249.27 | 0.99712 | 380.40 | 340.44 | 24.7 | 2.724397 | 0.99892 | 2.72145438 |
| B24-1827 | GT02 - 25 -27 | 356.75 | 406.33 | 49.58 | SA-050 (B-2) | 92.08 | 249.31 | 0.99732 | 372.18 | 340.72 | 23.9 | 2.735924 | 0.99912 | 2.73351627 |
| B24-1831 | GT03 - 5 - 6.5 | 358.16 | 407.74 | 49.58 | SA-050 (B-1) | 91.9 | 249.3 | 0.99700 | 371.96 | 340.41 | 25.2 | 2.749527 | 0.99879 | 2.74620044 |

**Comments:**

Reviewed by: Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT02 - 30 - 32
**Sample#:** B24-1828

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 2-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12042024

**Unified Soil Classification System, ASTM-2487**
SM, Silty Sand
**Sample Color:**
Gray-Brown

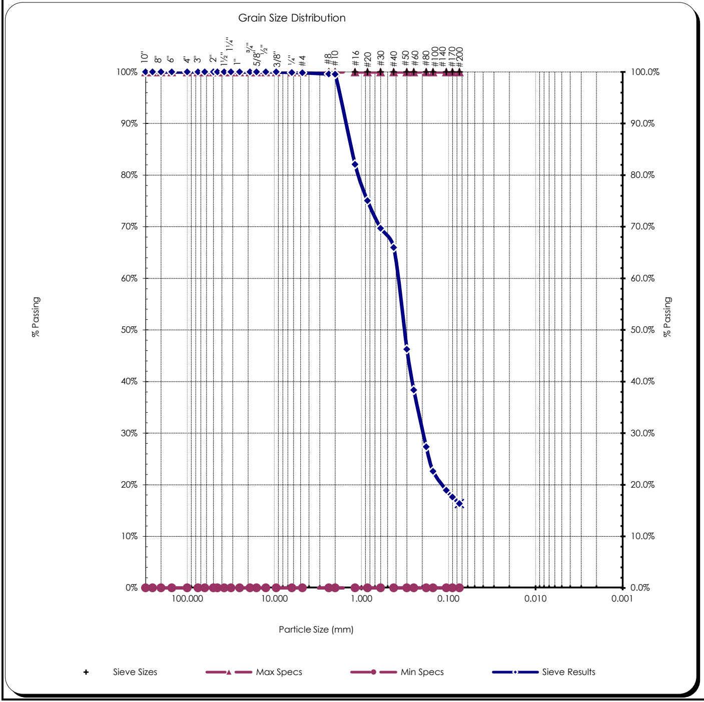
**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** **N/A**

| | | | | | |
|---|---|---|---|---|---|
| $D_{(5)}$ = 0.023 mm | % Gravel = 0.2% | Coeff. of Curvature, $C_C$ = 2.18 |
| $D_{(10)}$ = 0.046 mm | % Sand = 83.5% | Coeff. of Uniformity, $C_U$ = 8.44 |
| $D_{(15)}$ = 0.069 mm | % Silt & Clay = 16.4% | Fineness Modulus = 1.80 |
| $D_{(30)}$ = 0.197 mm | Liquid Limit = n/a | Plastic Limit = n/a |
| $D_{(50)}$ = 0.324 mm | Plasticity Index = n/a | Moisture %, as sampled = n/a |
| $D_{(60)}$ = 0.387 mm | Sand Equivalent = n/a | Req'd Sand Equivalent = |
| $D_{(90)}$ = 1.552 mm | Fracture %, 1 Face = n/a | Req'd Fracture %, 1 Face = |
| Dust Ratio = 1/4 | Fracture %, 2+ Faces = n/a | Req'd Fracture %, 2+ Faces = |

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size US | Sieve Size Metric | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 100% | 100.0% | 0.0% |
| 1/2" | 12.50 | 100% | 100% | 100.0% | 0.0% |
| 3/8" | 9.50 | 100% | 100% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 100% | 100.0% | 0.0% |
| #4 | 4.75 | 100% | 100% | 100.0% | 0.0% |
| #8 | 2.36 | | 100% | 100.0% | 0.0% |
| #10 | 2.00 | 100% | 100% | 100.0% | 0.0% |
| #16 | 1.18 | | 82% | 100.0% | 0.0% |
| #20 | 0.850 | | 75% | 100.0% | 0.0% |
| #30 | 0.600 | | 70% | 100.0% | 0.0% |
| #40 | 0.425 | 66% | 66% | 100.0% | 0.0% |
| #50 | 0.300 | | 46% | 100.0% | 0.0% |
| #60 | 0.250 | | 38% | 100.0% | 0.0% |
| #80 | 0.180 | | 27% | 100.0% | 0.0% |
| #100 | 0.150 | 23% | 23% | 100.0% | 0.0% |
| #140 | 0.106 | | 19% | 100.0% | 0.0% |
| #170 | 0.090 | | 18% | 100.0% | 0.0% |
| #200 | 0.075 | 16.4% | 16.4% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig
Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

# ASTM D-4318 Liquid Limit, Plastic Limit & Plasticity Index of Soils

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT03 - 3.1 - 4
**Sample #:** B24-1830

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 2-Dec-24
**Tested By:** Z. Romney
**Control No.:** 12042024

**Unified Soils Classification System, ASTM D-2487**
OL, Organic Silt with Clay
**Sample Color**
Brown

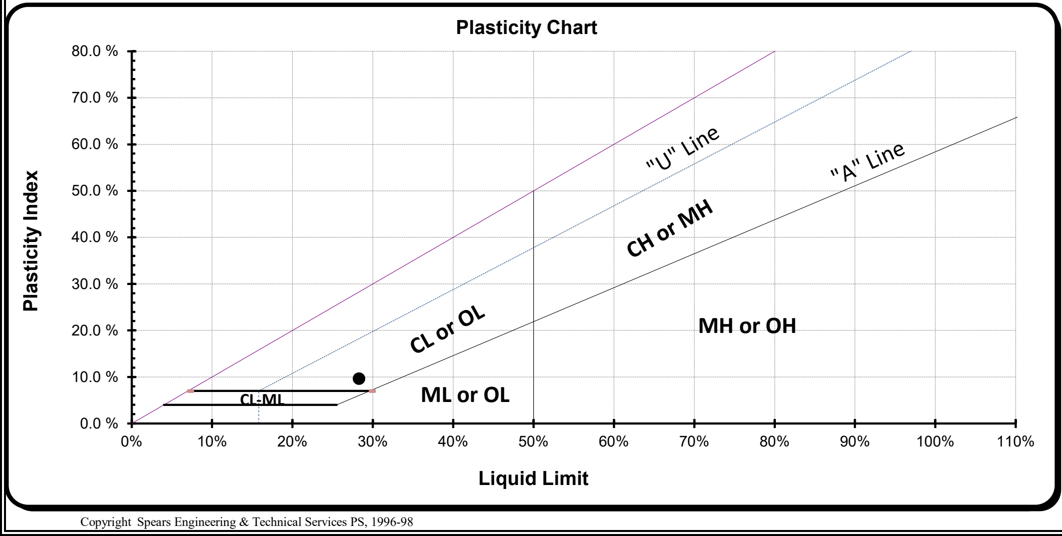
## Liquid Limit Determination

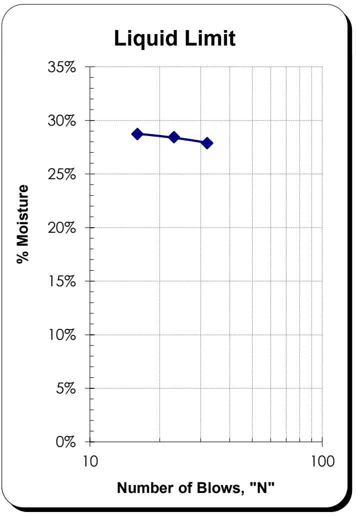
| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | 32.63 | 29.79 | 37.19 | | | |
| **Weight of Dry Soils + Pan:** | 29.80 | 26.33 | 33.27 | | | |
| **Weight of Pan:** | 19.65 | 14.16 | 19.62 | | | |
| **Weight of Dry Soils:** | 10.15 | 12.17 | 13.65 | | | |
| **Weight of Moisture:** | 2.83 | 3.46 | 3.92 | | | |
| **% Moisture:** | 27.9 % | 28.4 % | 28.7 % | | | |
| **Number of Blows:** | 32 | 23 | 16 | | | |

**Liquid Limit @ 25 Blows:** 28.3 %
**Plastic Limit:** 18.6 %
**Plasticity Index, $I_P$:** 9.7 %

## Plastic Limit Determination

| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | 26.10 | 26.91 | | | | |
| **Weight of Dry Soils + Pan:** | 24.98 | 25.67 | | | | |
| **Weight of Pan:** | 18.96 | 19.01 | | | | |
| **Weight of Dry Soils:** | 6.02 | 6.66 | | | | |
| **Weight of Moisture:** | 1.12 | 1.24 | | | | |
| **% Moisture:** | 18.6 % | 18.6 % | | | | |





**Comments:**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MTC
MATERIALS TESTING & CONSULTING, INC.

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT04 - 5 - 6.5
**Sample#:** B24-1839

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 2-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12042024

**Unified Soil Classification System, ASTM-2487**
SM, Silty Sand
**Sample Color:**
Brown

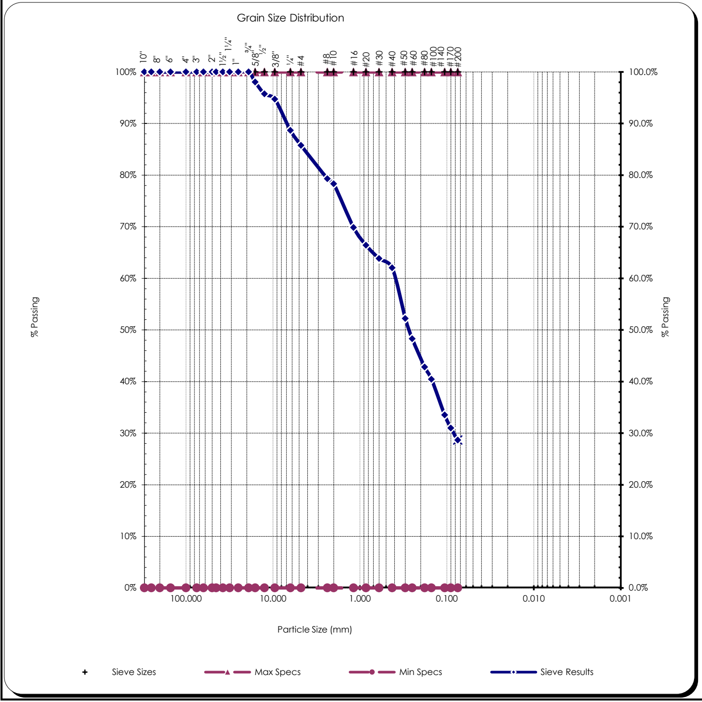
**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** N/A

| | | | | | | |
|---|---|---|---|---|---|---|
| $D_{(5)}$ = 0.013 | mm | % Gravel = | 14.2% | Coeff. of Curvature, $C_C$ = | 0.67 |
| $D_{(10)}$ = 0.026 | mm | % Sand = | 57.1% | Coeff. of Uniformity, $C_U$ = | 15.25 |
| $D_{(15)}$ = 0.039 | mm | % Silt & Clay = | 28.6% | Fineness Modulus = | 2.14 |
| $D_{(30)}$ = 0.084 | mm | Liquid Limit = | n/a | Plastic Limit = | n/a |
| $D_{(50)}$ = 0.272 | mm | Plasticity Index = | n/a | Moisture %, as sampled = | n/a |
| $D_{(60)}$ = 0.399 | mm | Sand Equivalent = | n/a | Req'd Sand Equivalent = | |
| $D_{(90)}$ = 7.001 | mm | Fracture %, 1 Face = | n/a | Req'd Fracture %, 1 Face = | |
| Dust Ratio = 6/13 | | Fracture %, 2+ Faces = | n/a | Req'd Fracture %, 2+ Faces = | |

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size US | Sieve Size Metric | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 98% | 100.0% | 0.0% |
| 1/2" | 12.50 | 96% | 96% | 100.0% | 0.0% |
| 3/8" | 9.50 | 95% | 95% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 89% | 100.0% | 0.0% |
| #4 | 4.75 | 86% | 86% | 100.0% | 0.0% |
| #8 | 2.36 | | 79% | 100.0% | 0.0% |
| #10 | 2.00 | 78% | 78% | 100.0% | 0.0% |
| #16 | 1.18 | | 70% | 100.0% | 0.0% |
| #20 | 0.850 | | 66% | 100.0% | 0.0% |
| #30 | 0.600 | | 64% | 100.0% | 0.0% |
| #40 | 0.425 | 62% | 62% | 100.0% | 0.0% |
| #50 | 0.300 | | 52% | 100.0% | 0.0% |
| #60 | 0.250 | | 48% | 100.0% | 0.0% |
| #80 | 0.180 | | 43% | 100.0% | 0.0% |
| #100 | 0.150 | 40% | 40% | 100.0% | 0.0% |
| #140 | 0.106 | | 34% | 100.0% | 0.0% |
| #170 | 0.090 | | 31% | 100.0% | 0.0% |
| #200 | 0.075 | 28.6% | 28.6% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

# ASTM D-4318 Liquid Limit, Plastic Limit & Plasticity Index of Soils

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT04 - 8 - 9
**Sample #:** B24-1841

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 2-Dec-24
**Tested By:** Z. Romney
**Control No.:** 12042024

**Visual Soils Classification**
Silt with Clayey Sand
**Sample Color**
Brown

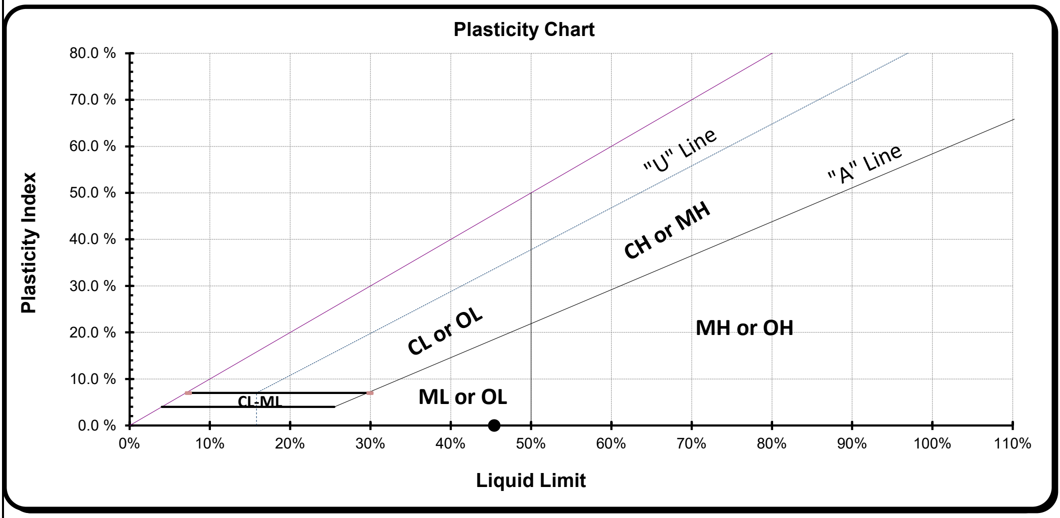
### Liquid Limit Determination

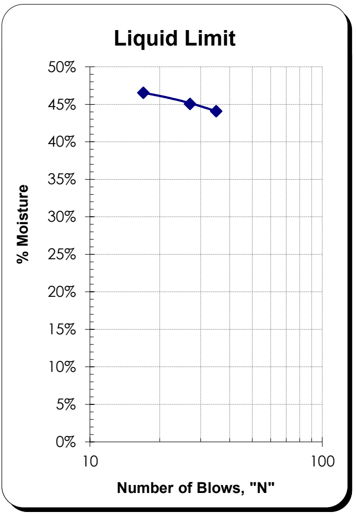
| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | 30.08 | 30.17 | 33.04 | | | |
| **Weight of Dry Soils + Pan:** | 26.65 | 25.19 | 28.77 | | | |
| **Weight of Pan:** | 18.87 | 14.14 | 19.60 | | | |
| **Weight of Dry Soils:** | 7.78 | 11.05 | 9.17 | | | |
| **Weight of Moisture:** | 3.43 | 4.98 | 4.27 | | | |
| **% Moisture:** | 44.1 % | 45.1 % | 46.6 % | | | |
| **Number of Blows:** | 35 | 27 | 17 | | | |

**Liquid Limit @ 25 Blows:** 45.4 %
**Plastic Limit:** N/A
**Plasticity Index, $I_P$:** N/A

### Plastic Limit Determination

| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | | | | | | |
| **Weight of Dry Soils + Pan:** | | | **Non-Plastic** | | | |
| **Weight of Pan:** | | | | | | |
| **Weight of Dry Soils:** | | | | | | |
| **Weight of Moisture:** | | | | | | |
| **% Moisture:** | | | | | | |





**Comments:** **Sample was deemed to be non-plastic due to it not being workable down to 1/8" rolls/ribbons without breaking apart.**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

| | | | |
|---|---|---|---|
| **Client:** | Anchor QEA, LLC. | **Date:** | December 9, 2024 |
| **Address:** | 1201 3rd Avenue, Suite 2600 | **Project:** | Q.C. - Former Nord Door Cleanup |
| | Seattle, WA 98101 | **Project #:** | 24B105-03 |
| **Attn:** | Jason Cornetta | **Sample #:** | B24-1844 - 1870 |
| **Revised On:** | | **Date sampled:** | August 19 & 21, 2024 |
| | | **Control No:** | 12092024 |

As requested and authorized by the Client, MTC has performed the following test(s) on the sample number referenced above. The testing was performed in accordance with current, applicable AASHTO, ASTM, and/or WSDOT standards, which are referenced on the correlating test report pages. The results obtained in our laboratory are as detailed below and/or on the following pages:

| | **Test(s) Performed:** | **Test Results** | | **Test(s) Performed:** | **Test Results** |
|---|---|---|---|---|---|
| X | Sieve Analysis | See Attached Reports | | Sulfate Soundness | |
| | Proctor | | | Bulk Density & Voids | |
| | Sand Equivalent | | | WSDOT Degradation | |
| | Fracture Count | | | LA Abrasion | |
| X | Moisture Content | See Attached Report | | Cation Exchange Capacity | |
| | Specific Gravity, Coarse | | X | Specific Gravity, Soils | See Attached Report |
| | Specific Gravity, Fine | | | | |
| | Hydrometer Analysis | | | | |
| X | Atterberg Limits | See Attached Reports | | | |
| | | | | | |
| | | | | | |

If you have any questions concerning the test results, the procedures used, or if we can be of any further assistance please call the number below and ask to speak with your Project Manager or the Laboratory Manager.

Alex Eifrig

Respectfully Submitted,
Alex Eifrig
WABO Supervising Laboratory Technician

MTC
MATERIALS TESTING & CONSULTING, INC.

# Moisture Content ASTM C-566, ASTM D-2216

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Date Received:** November 22, 2024
**Date Tested:** December 2, 2024

**Client:** Anchor QEA, LLC.
**Sampled by:** Client
**Tested by:** S. Boesenberg
**Control No.:** 12092024

| Sample # | Location | Tare | Wet + Tare | Dry + Tare | Wgt. Of Moisture | Wgt. Of Soil | % Moisture |
|---|---|---|---|---|---|---|---|
| B24-1844 | GT04 - 20 - 21.5 | 419.2 | 1303.3 | 1157.1 | 146.2 | 737.9 | 19.8% |
| B24-1845 | GT04 - 25 - 26.5 | 234.5 | 987.0 | 849.5 | 137.5 | 615.0 | 22.4% |
| B24-1846 | GT08 - 2.5 - 4 | 222.9 | 660.1 | 611.9 | 48.2 | 389.0 | 12.4% |
| B24-1847 | GT08 - 5 - 6.5 | 233.0 | 326.5 | 292.8 | 33.7 | 59.8 | 56.4% |
| B24-1848 | GT08 - 7.5 - 9 | 380.0 | 970.1 | 845.0 | 125.1 | 465.0 | 26.9% |
| B24-1849 | GT08 - 10 - 11.5 | 423.4 | 689.1 | 636.1 | 53.0 | 212.7 | 24.9% |
| B24-1850 | GT08 - 15 - 16.5 | 208.6 | 712.4 | 627.9 | 84.5 | 419.3 | 20.2% |
| B24-1851 | GT08 - 30 - 31.5 | 416.9 | 1023.5 | 921.2 | 102.3 | 504.3 | 20.3% |
| B24-1852 | GT08 - 35 - 36.5 | 379.8 | 1216.5 | 1083.0 | 133.5 | 703.2 | 19.0% |
| B24-1853 | GT08 - 40 - 41.5 | 224.9 | 1212.8 | 1048.9 | 163.9 | 824.0 | 19.9% |
| B24-1855 | GT05 - 5 - 5.3 | 221.0 | 318.6 | 315.2 | 3.4 | 94.2 | 3.6% |
| B24-1856 | GT05 - 5.3 - 6.5 | 392.1 | 880.8 | 833.1 | 47.7 | 441.0 | 10.8% |
| B24-1857 | GT05 - 7.5 - 9 | 222.4 | 1113.5 | 961.9 | 151.6 | 739.5 | 20.5% |
| B24-1858 | GT05 - 10 - 10.5 | 229.3 | 466.9 | 427.5 | 39.4 | 198.2 | 19.9% |
| B24-1860 | GT05 - 15 - 15.7 | 215.4 | 689.2 | 585.1 | 104.1 | 369.7 | 28.2% |
| B24-1861 | GT05 - 15.7 - 16.5 | 270.0 | 310.9 | 299.4 | 11.5 | 29.4 | 39.1% |
| B24-1862 | GT05 - 20 - 21.1 | 310.9 | 829.6 | 722.8 | 106.8 | 411.9 | 25.9% |
| B24-1863 | GT05 - 21.1 - 22 | 303.3 | 432.1 | 410.7 | 21.4 | 107.4 | 19.9% |
| B24-1864 | GT05 - 25 - 27 | 268.9 | 486.1 | 436.2 | 49.9 | 167.3 | 29.8% |
| B24-1865 | GT05 - 30 - 32 | 300.9 | 761.6 | 687.2 | 74.4 | 386.3 | 19.3% |
| B24-1866 | GT05 - 35 - 36.5 | 413.7 | 879.2 | 761.2 | 118.0 | 347.5 | 34.0% |
| B24-1867 | GT05 - 40 - 42 | 414.3 | 764.1 | 699.3 | 64.8 | 285.0 | 22.7% |
| B24-1868 | GT01 - 0 - 1.5 | 260.2 | 851.5 | 831.4 | 20.1 | 571.2 | 3.5% |
| B24-1869 | GT01 - 2.5 - 3.9 | 415.4 | 1388.5 | 1232.9 | 155.6 | 817.5 | 19.0% |
| B24-1870 | GT01 - 3.9 - 4.5 | 417.7 | 798.3 | 788.0 | 10.3 | 370.3 | 2.8% |

**Comments:**

Reviewed by: Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MTC
MATERIALS TESTING & CONSULTING, INC.

# Specific Gravity of Soils, ASTM D-854

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Date Received:** November 22, 2024
**Date Tested:** December 5 & 6, 2024

**Client:** Anchor QEA, LLC.
**Sampled by:** Client
**Tested by:** S. Boesenberg
**Control. No.:** 12092024

| Sample # | Location | Tare | Dry Soil + Tare | Mass of Dry Soil | Pycno ID | Mass of Pycno | Volume of Pycno | Density of Water @ Tx | Mass of Pycno filled w/ water & soils | Mass of Pycno filled w/ water | Temp. of Water, 0.1 *C | SpG of Soils | Temp. Correction Factor | Corrected SpG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B24-1844 | GT04 - 20 - 21.5 | 360.02 | 410.03 | 50.01 | SA-050 (B-2) | 92.08 | 249.31 | 0.99697 | 372.26 | 340.63 | 25.3 | 2.720213 | 0.99876 | 2.71683979 |
| B24-1848 | GT08 - 7.5 - 9 | 357.40 | 407.06 | 49.66 | SA-050 (B-1) | 91.89 | 249.27 | 0.99697 | 372.22 | 340.40 | 25.3 | 2.782897 | 0.99876 | 2.77944648 |
| B24-1851 | GT08 - 30 - 31.5 | 584.01 | 632.98 | 48.97 | SA-050 (B-2) | 92.08 | 249.31 | 0.99689 | 371.48 | 340.61 | 25.6 | 2.704831 | 0.99868 | 2.70126021 |
| B24-1856 | GT05 - 5.3 - 6.5 | 601.31 | 649.52 | 48.21 | SA-050 (B-1) | 91.89 | 249.27 | 0.99702 | 370.89 | 340.42 | 25.1 | 2.718020 | 0.99881 | 2.7147857 |
| B24-1867 | GT05 - 40 - 42 | 319.76 | 369.32 | 49.56 | SA-050 (B-2) | 92.08 | 249.31 | 0.99712 | 372.20 | 340.67 | 24.7 | 2.748449 | 0.99892 | 2.74548083 |
| B24-1869 | GT01 - 2.5 - 3.9 | 300.94 | 350.98 | 50.04 | SA-050 (B-1) | 91.89 | 249.27 | 0.99712 | 372.34 | 340.44 | 24.7 | 2.758225 | 0.99892 | 2.7552461 |

**Comments:**

Reviewed by: Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT08 - 10 - 11.5
**Sample#:** B24-1849

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 6-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12092024

**Unified Soil Classification System, ASTM-2487**
SM, Silty Sand
**Sample Color:**
Brown

**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** N/A

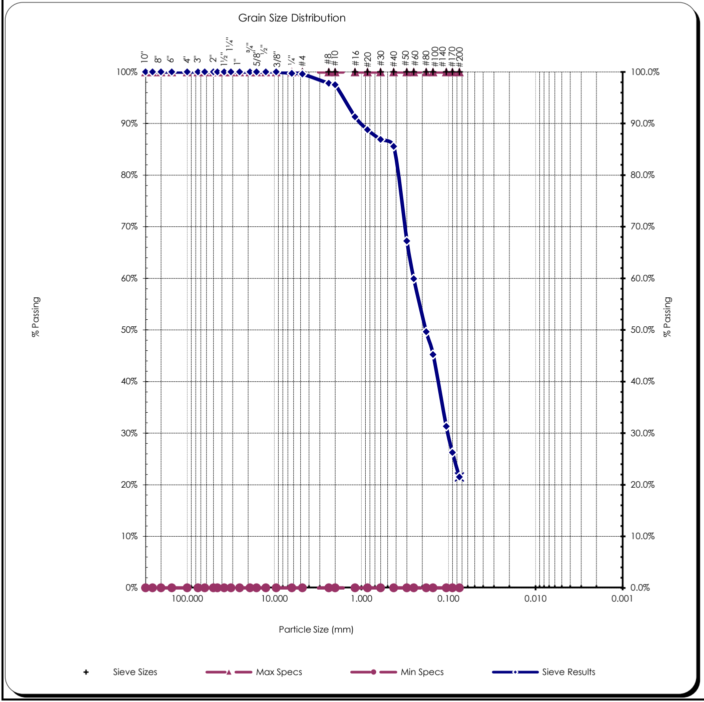
$D_{(5)}$ = 0.017 mm
$D_{(10)}$ = 0.035 mm
$D_{(15)}$ = 0.052 mm
$D_{(30)}$ = 0.102 mm
$D_{(50)}$ = 0.183 mm
$D_{(60)}$ = 0.251 mm
$D_{(90)}$ = 1.010 mm
Dust Ratio = 1/4

% Gravel = 0.4%
% Sand = 78.1%
% Silt & Clay = 21.5%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, $C_C$ = 1.19
Coeff. of Uniformity, $C_U$ = 7.18
Fineness Modulus = 1.12
Plastic Limit = n/a
Moisture %, as sampled = n/a
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size US | Sieve Size Metric | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 100% | 100.0% | 0.0% |
| 1/2" | 12.50 | 100% | 100% | 100.0% | 0.0% |
| 3/8" | 9.50 | 100% | 100% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 100% | 100.0% | 0.0% |
| #4 | 4.75 | 100% | 100% | 100.0% | 0.0% |
| #8 | 2.36 | | 98% | 100.0% | 0.0% |
| #10 | 2.00 | 98% | 98% | 100.0% | 0.0% |
| #16 | 1.18 | | 91% | 100.0% | 0.0% |
| #20 | 0.850 | | 89% | 100.0% | 0.0% |
| #30 | 0.600 | | 87% | 100.0% | 0.0% |
| #40 | 0.425 | 86% | 86% | 100.0% | 0.0% |
| #50 | 0.300 | | 67% | 100.0% | 0.0% |
| #60 | 0.250 | | 60% | 100.0% | 0.0% |
| #80 | 0.180 | | 50% | 100.0% | 0.0% |
| #100 | 0.150 | 45% | 45% | 100.0% | 0.0% |
| #140 | 0.106 | | 31% | 100.0% | 0.0% |
| #170 | 0.090 | | 26% | 100.0% | 0.0% |
| #200 | 0.075 | 21.5% | 21.5% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT08 - 35 - 36.5
**Sample#:** B24-1852

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 6-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12092024

**Unified Soil Classification System, ASTM-2487**
SM, Silty Sand
**Sample Color:**
Brown

**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** **N/A**

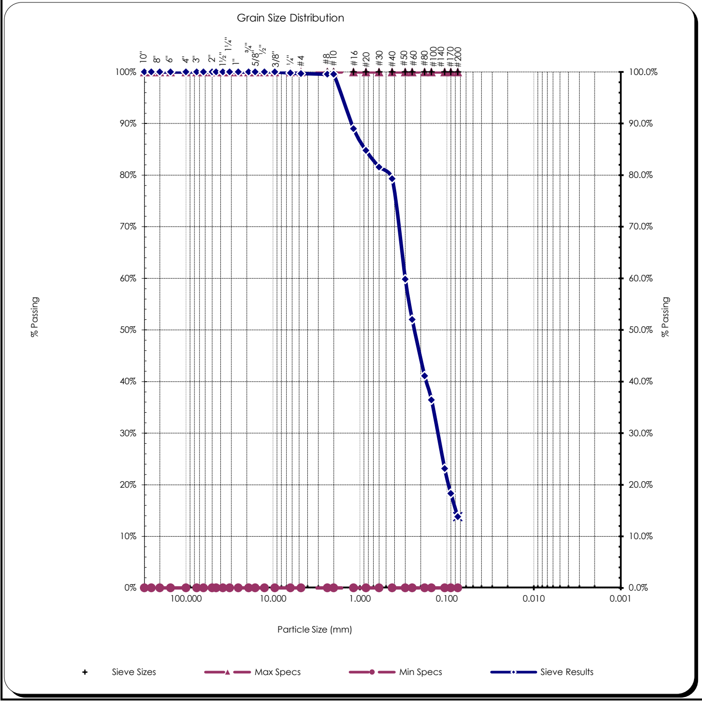
$D_{(5)}$ = 0.027 mm
$D_{(10)}$ = 0.054 mm
$D_{(15)}$ = 0.079 mm
$D_{(30)}$ = 0.129 mm
$D_{(50)}$ = 0.237 mm
$D_{(60)}$ = 0.301 mm
$D_{(90)}$ = 1.258 mm
Dust Ratio = 4/23

% Gravel = 0.3%
% Sand = 85.9%
% Silt & Clay = 13.8%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, $C_C$ = 1.01
Coeff. of Uniformity, $C_U$ = 5.54
Fineness Modulus = 1.34
Plastic Limit = n/a
Moisture %, as sampled = n/a
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size | | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| US | Metric | | | | |
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 100% | 100.0% | 0.0% |
| 1/2" | 12.50 | 100% | 100% | 100.0% | 0.0% |
| 3/8" | 9.50 | 100% | 100% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 100% | 100.0% | 0.0% |
| #4 | 4.75 | 100% | 100% | 100.0% | 0.0% |
| #8 | 2.36 | | 100% | 100.0% | 0.0% |
| #10 | 2.00 | 100% | 100% | 100.0% | 0.0% |
| #16 | 1.18 | | 89% | 100.0% | 0.0% |
| #20 | 0.850 | | 85% | 100.0% | 0.0% |
| #30 | 0.600 | | 82% | 100.0% | 0.0% |
| #40 | 0.425 | 79% | 79% | 100.0% | 0.0% |
| #50 | 0.300 | | 60% | 100.0% | 0.0% |
| #60 | 0.250 | | 52% | 100.0% | 0.0% |
| #80 | 0.180 | | 41% | 100.0% | 0.0% |
| #100 | 0.150 | 36% | 36% | 100.0% | 0.0% |
| #140 | 0.106 | | 23% | 100.0% | 0.0% |
| #170 | 0.090 | | 18% | 100.0% | 0.0% |
| #200 | 0.075 | 13.8% | 13.8% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig
Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT05 - 2.5 - 4
**Sample#:** B24-1854

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 6-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12092024

**Unified Soil Classification System, ASTM-2487**
SP-SM, Poorly graded Sand with Silt
**Sample Color:**
Gray-Brown

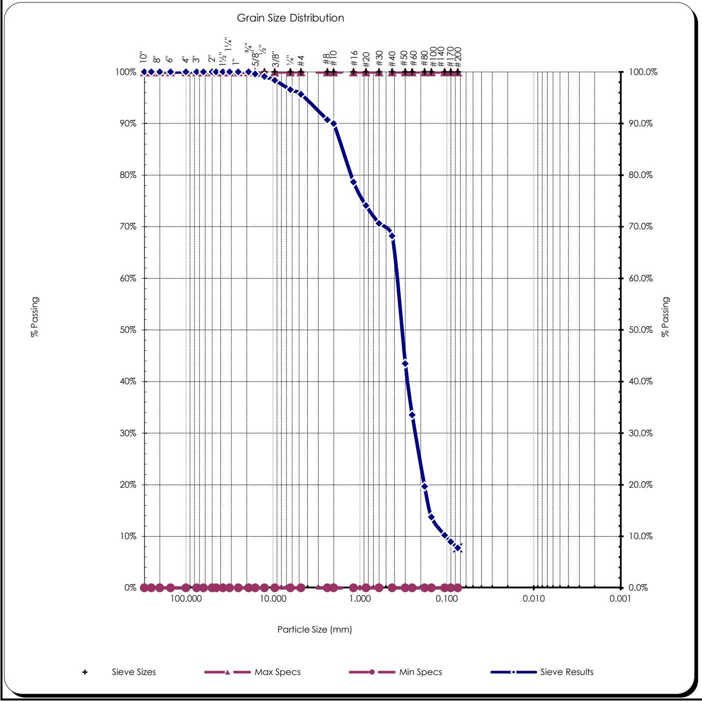
**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** N/A

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $D_{(5)}$ = | 0.048 | mm | % Gravel = | 4.3% | Coeff. of Curvature, $C_C$ = | 1.36 |
| $D_{(10)}$ = | 0.103 | mm | % Sand = | 87.9% | Coeff. of Uniformity, $C_U$ = | 3.71 |
| $D_{(15)}$ = | 0.157 | mm | % Silt & Clay = | 7.8% | Fineness Modulus = | 2.09 |
| $D_{(30)}$ = | 0.232 | mm | Liquid Limit = | n/a | Plastic Limit = | n/a |
| $D_{(50)}$ = | 0.333 | mm | Plasticity Index = | n/a | Moisture %, as sampled = | n/a |
| $D_{(60)}$ = | 0.383 | mm | Sand Equivalent = | n/a | Req'd Sand Equivalent = | |
| $D_{(90)}$ = | 2.016 | mm | Fracture %, 1 Face = | n/a | Req'd Fracture %, 1 Face = | |
| Dust Ratio = | 5/44 | | Fracture %, 2+ Faces = | n/a | Req'd Fracture %, 2+ Faces = | |

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size | | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs | Specs |
|---|---|---|---|---|---|
| US | Metric | | | Max | Min |
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 100% | 100.0% | 0.0% |
| 1/2" | 12.50 | 99% | 99% | 100.0% | 0.0% |
| 3/8" | 9.50 | 98% | 98% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 97% | 100.0% | 0.0% |
| #4 | 4.75 | 96% | 96% | 100.0% | 0.0% |
| #8 | 2.36 | | 91% | 100.0% | 0.0% |
| #10 | 2.00 | 90% | 90% | 100.0% | 0.0% |
| #16 | 1.18 | | 79% | 100.0% | 0.0% |
| #20 | 0.850 | | 74% | 100.0% | 0.0% |
| #30 | 0.600 | | 71% | 100.0% | 0.0% |
| #40 | 0.425 | 68% | 68% | 100.0% | 0.0% |
| #50 | 0.300 | | 43% | 100.0% | 0.0% |
| #60 | 0.250 | | 34% | 100.0% | 0.0% |
| #80 | 0.180 | | 20% | 100.0% | 0.0% |
| #100 | 0.150 | 14% | 14% | 100.0% | 0.0% |
| #140 | 0.106 | | 10% | 100.0% | 0.0% |
| #170 | 0.090 | | 9% | 100.0% | 0.0% |
| #200 | 0.075 | 7.8% | 7.8% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT05 - 10.5 - 12
**Sample#:** B24-1859

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 6-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12092024

**Unified Soil Classification System, ASTM-2487**
SM, Silty Sand
**Sample Color:**
Gray

**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** N/A

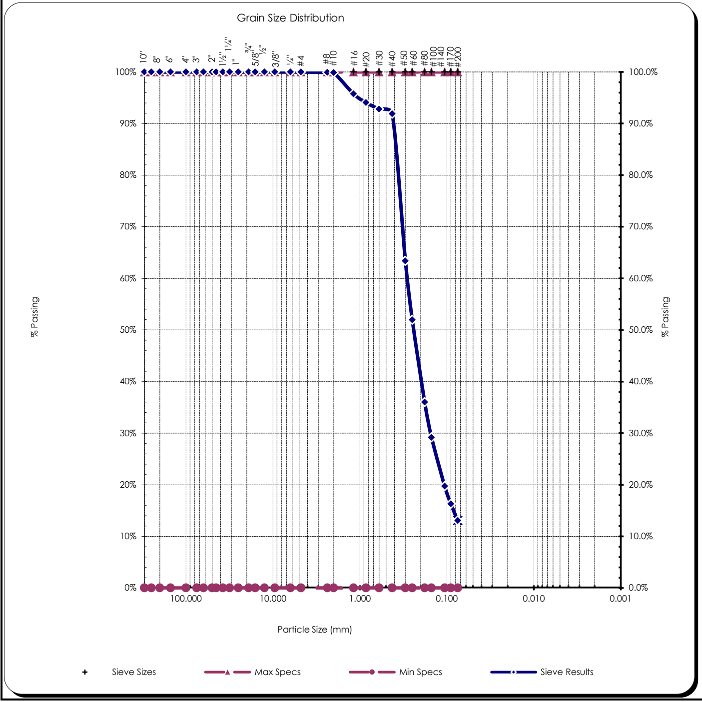
$D_{(5)}$ = 0.029 mm
$D_{(10)}$ = 0.057 mm
$D_{(15)}$ = 0.084 mm
$D_{(30)}$ = 0.154 mm
$D_{(50)}$ = 0.241 mm
$D_{(60)}$ = 0.285 mm
$D_{(90)}$ = 0.417 mm
Dust Ratio = 1/7

% Gravel = 0.0%
% Sand = 86.9%
% Silt & Clay = 13.1%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, $C_C$ = 1.44
Coeff. of Uniformity, $C_U$ = 4.97
Fineness Modulus = 1.19
Plastic Limit = n/a
Moisture %, as sampled = n/a
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size | | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| US | Metric | | | | |
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 100% | 100.0% | 0.0% |
| 1/2" | 12.50 | 100% | 100% | 100.0% | 0.0% |
| 3/8" | 9.50 | 100% | 100% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 100% | 100.0% | 0.0% |
| #4 | 4.75 | 100% | 100% | 100.0% | 0.0% |
| #8 | 2.36 | | 100% | 100.0% | 0.0% |
| #10 | 2.00 | 100% | 100% | 100.0% | 0.0% |
| #16 | 1.18 | | 96% | 100.0% | 0.0% |
| #20 | 0.850 | | 94% | 100.0% | 0.0% |
| #30 | 0.600 | | 93% | 100.0% | 0.0% |
| #40 | 0.425 | 92% | 92% | 100.0% | 0.0% |
| #50 | 0.300 | | 63% | 100.0% | 0.0% |
| #60 | 0.250 | | 52% | 100.0% | 0.0% |
| #80 | 0.180 | | 36% | 100.0% | 0.0% |
| #100 | 0.150 | 29% | 29% | 100.0% | 0.0% |
| #140 | 0.106 | | 20% | 100.0% | 0.0% |
| #170 | 0.090 | | 16% | 100.0% | 0.0% |
| #200 | 0.075 | 13.1% | 13.1% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

# ASTM D-4318 Liquid Limit, Plastic Limit & Plasticity Index of Soils

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT05 - 15.7 - 16.5
**Sample #:** B24-1861

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 6-Dec-24
**Tested By:** Z. Romney
**Control No.:** 12092024

**Visual Soils Classification**
Silt with Sand
**Sample Color**
Gray-Brown

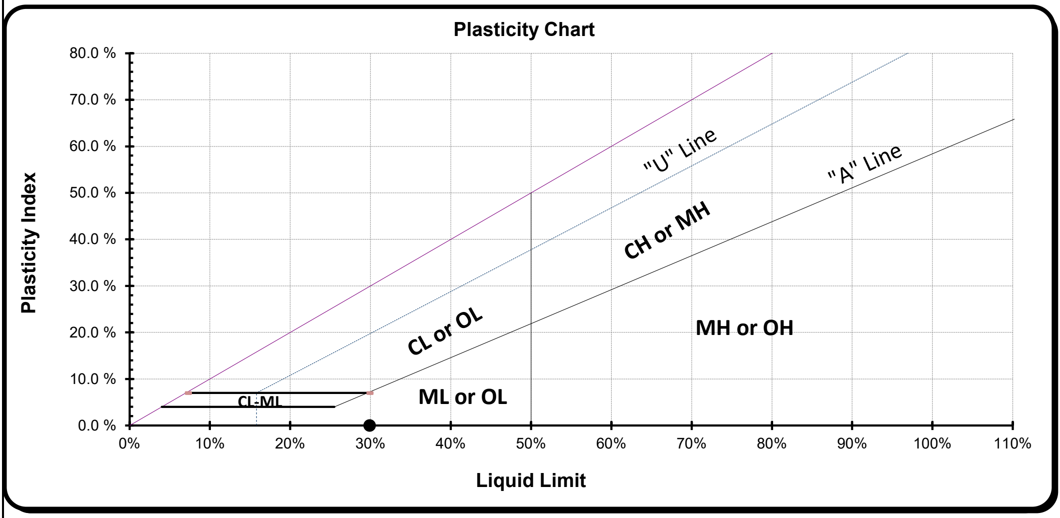
## Liquid Limit Determination

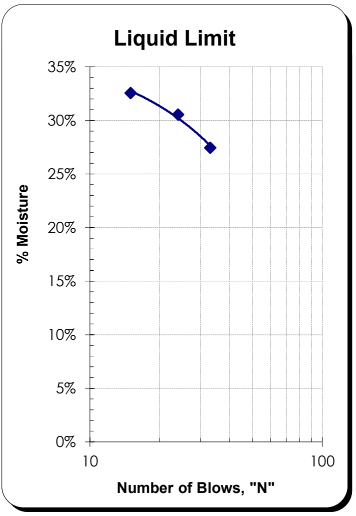
| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | 36.41 | 32.40 | 37.36 | | | |
| **Weight of Dry Soils + Pan:** | 32.53 | 28.13 | 32.84 | | | |
| **Weight of Pan:** | 18.40 | 14.15 | 18.96 | | | |
| **Weight of Dry Soils:** | 14.13 | 13.98 | 13.88 | | | |
| **Weight of Moisture:** | 3.88 | 4.27 | 4.52 | | | |
| **% Moisture:** | 27.5 % | 30.5 % | 32.6 % | | | |
| **Number of Blows:** | 33 | 24 | 15 | | | |

| | |
|---|---|
| **Liquid Limit @ 25 Blows:** | 29.9 % |
| **Plastic Limit:** | N/A |
| **Plasticity Index, $I_P$:** | N/A |

## Plastic Limit Determination

| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | | | | | | |
| **Weight of Dry Soils + Pan:** | | | **Non-Plastic** | | | |
| **Weight of Pan:** | | | | | | |
| **Weight of Dry Soils:** | | | | | | |
| **Weight of Moisture:** | | | | | | |
| **% Moisture:** | | | | | | |





**Comments:** **Sample was deemed to be non-plastic due to the material not being workable down to 1/8" ribbons/rolls without breaking apart.**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT05 - 35 - 36.5
**Sample#:** B24-1866

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 6-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12092024

**Visual Soils Classification**
Silty Sand with Clay
**Sample Color:**
Gray-Brown

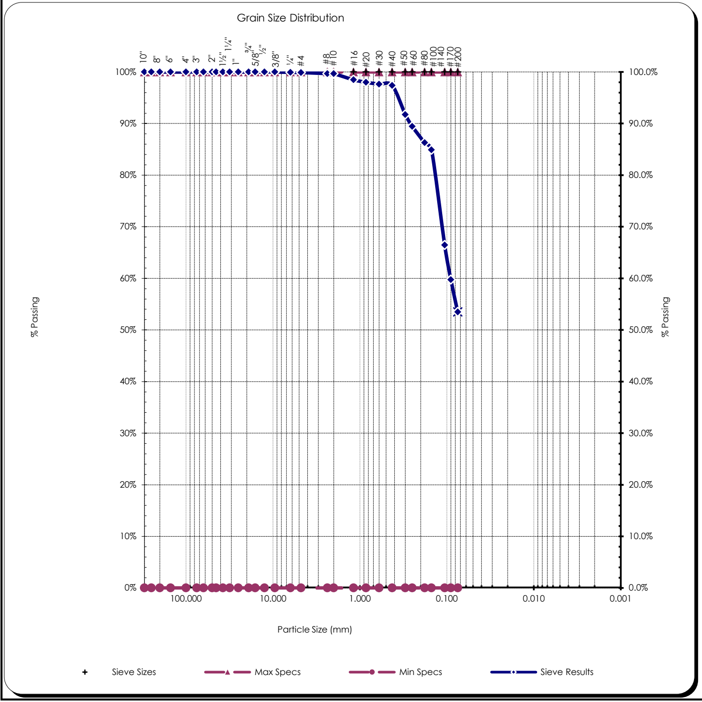
**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** N/A

| | | | | | | |
|---|---|---|---|---|---|---|
| $D_{(5)}$ = | 0.007 | mm | % Gravel = | 0.1% | Coeff. of Curvature, $C_C$ = | 1.39 |
| $D_{(10)}$ = | 0.014 | mm | % Sand = | 46.4% | Coeff. of Uniformity, $C_U$ = | 6.46 |
| $D_{(15)}$ = | 0.021 | mm | % Silt & Clay = | 53.5% | Fineness Modulus = | 0.28 |
| $D_{(30)}$ = | 0.042 | mm | Liquid Limit = | n/a | Plastic Limit = | n/a |
| $D_{(50)}$ = | 0.070 | mm | Plasticity Index = | n/a | Moisture %, as sampled = | n/a |
| $D_{(60)}$ = | 0.091 | mm | Sand Equivalent = | n/a | Req'd Sand Equivalent = | |
| $D_{(90)}$ = | 0.262 | mm | Fracture %, 1 Face = | n/a | Req'd Fracture %, 1 Face = | |
| Dust Ratio = | 28/51 | | Fracture %, 2+ Faces = | n/a | Req'd Fracture %, 2+ Faces = | |

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size | | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| US | Metric | | | | |
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 100% | 100.0% | 0.0% |
| 1/2" | 12.50 | 100% | 100% | 100.0% | 0.0% |
| 3/8" | 9.50 | 100% | 100% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 100% | 100.0% | 0.0% |
| #4 | 4.75 | 100% | 100% | 100.0% | 0.0% |
| #8 | 2.36 | | 100% | 100.0% | 0.0% |
| #10 | 2.00 | 100% | 100% | 100.0% | 0.0% |
| #16 | 1.18 | | 98% | 100.0% | 0.0% |
| #20 | 0.850 | | 98% | 100.0% | 0.0% |
| #30 | 0.600 | | 98% | 100.0% | 0.0% |
| #40 | 0.425 | 97% | 97% | 100.0% | 0.0% |
| #50 | 0.300 | | 92% | 100.0% | 0.0% |
| #60 | 0.250 | | 89% | 100.0% | 0.0% |
| #80 | 0.180 | | 86% | 100.0% | 0.0% |
| #100 | 0.150 | 85% | 85% | 100.0% | 0.0% |
| #140 | 0.106 | | 66% | 100.0% | 0.0% |
| #170 | 0.090 | | 60% | 100.0% | 0.0% |
| #200 | 0.075 | 53.5% | 53.5% | 100.0% | 0.0% |



All results apply only to actual locations and materials tested. As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

**Comments:**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MTC
MATERIALS TESTING & CONSULTING, INC.

# ASTM D-4318 Liquid Limit, Plastic Limit & Plasticity Index of Soils

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT05 - 35 - 36.5
**Sample #:** B24-1866

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 6-Dec-24
**Tested By:** Z. Romney
**Control No.:** 12092024

**Visual Soils Classification**
Silty Sand with Clay
**Sample Color**
Gray-Brown

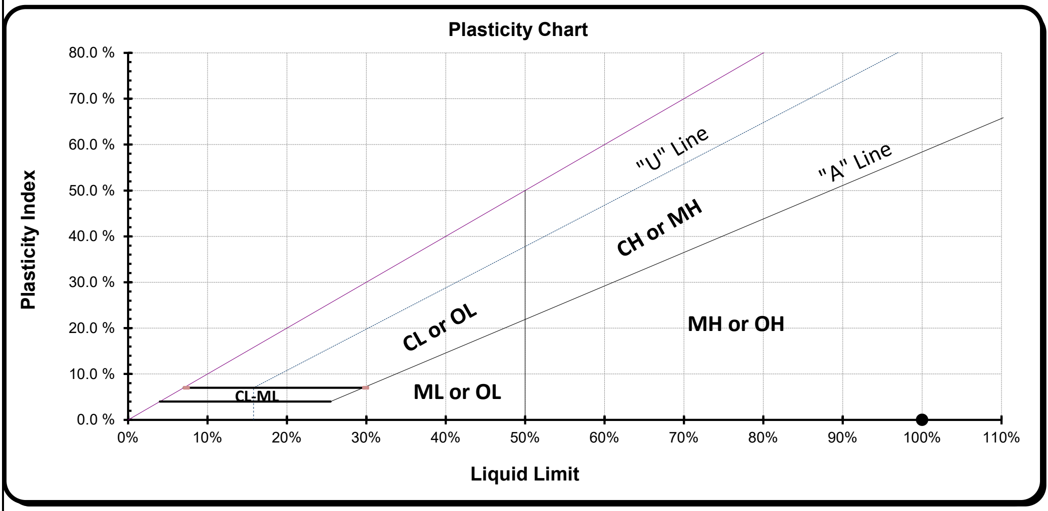
## Liquid Limit Determination

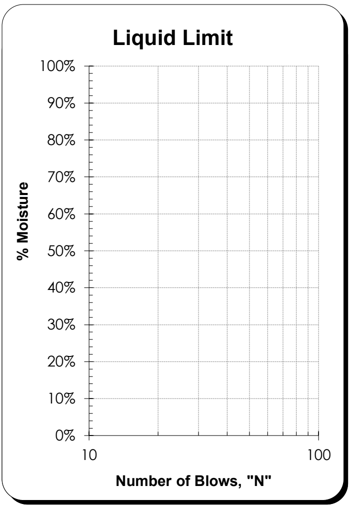
| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | | | | | | |
| **Weight of Dry Soils + Pan:** | | | **Unable to Establish** | | | |
| **Weight of Pan:** | | | | | | |
| **Weight of Dry Soils:** | | | | | | |
| **Weight of Moisture:** | | | | | | |
| **% Moisture:** | | | | | | |
| **Number of Blows:** | | | | | | |

**Liquid Limit @ 25 Blows:** N/A
**Plastic Limit:** N/A
**Plasticity Index, $I_P$:** N/A

## Plastic Limit Determination

| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | | | | | | |
| **Weight of Dry Soils + Pan:** | | | **Non-Plastic** | | | |
| **Weight of Pan:** | | | | | | |
| **Weight of Dry Soils:** | | | | | | |
| **Weight of Moisture:** | | | | | | |
| **% Moisture:** | | | | | | |





**Comments:** **Unable to establish the liquid limit of this sample due to the material not spreading smoothly into the cup, and displaying rapid dilation when subjected to any blows in the cup. The sample was then deemed to be non-plastic due to the material not being workable down to 1/8" ribbons/rolls without breaking apart.**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MTC
MATERIALS TESTING & CONSULTING, INC.

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT05 - 40 - 42
**Sample#:** B24-1867

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 6-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12092024

**Unified Soils Classification System, ASTM D-2487**
SM, Silty Sand
**Sample Color:**
Gray

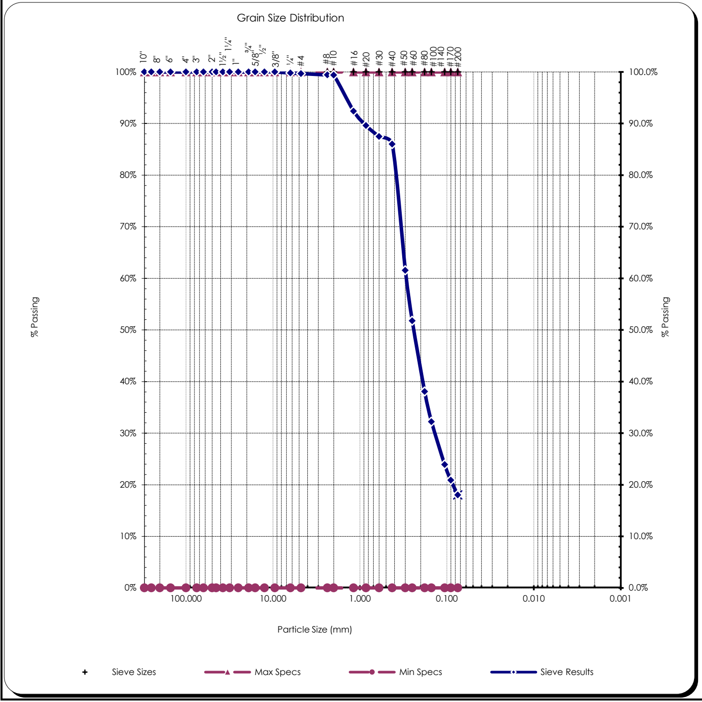
**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** N/A

| | | | | | | |
|---|---|---|---|---|---|---|
| $D_{(5)}$ = 0.021 | mm | % Gravel = | 0.3% | Coeff. of Curvature, $C_C$ = | 1.57 |
| $D_{(10)}$ = 0.042 | mm | % Sand = | 81.6% | Coeff. of Uniformity, $C_U$ = | 7.02 |
| $D_{(15)}$ = 0.062 | mm | % Silt & Clay = | 18.0% | Fineness Modulus = | 1.27 |
| $D_{(30)}$ = 0.138 | mm | Liquid Limit = | n/a | Plastic Limit = | n/a |
| $D_{(50)}$ = 0.241 | mm | Plasticity Index = | n/a | Moisture %, as sampled = | n/a |
| $D_{(60)}$ = 0.292 | mm | Sand Equivalent = | n/a | Req'd Sand Equivalent = | |
| $D_{(90)}$ = 0.896 | mm | Fracture %, 1 Face = | n/a | Req'd Fracture %, 1 Face = | |
| Dust Ratio = 13/62 | | Fracture %, 2+ Faces = | n/a | Req'd Fracture %, 2+ Faces = | |

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size US | Sieve Size Metric | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 100% | 100.0% | 0.0% |
| 1/2" | 12.50 | 100% | 100% | 100.0% | 0.0% |
| 3/8" | 9.50 | 100% | 100% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 100% | 100.0% | 0.0% |
| #4 | 4.75 | 100% | 100% | 100.0% | 0.0% |
| #8 | 2.36 | | 99% | 100.0% | 0.0% |
| #10 | 2.00 | 99% | 99% | 100.0% | 0.0% |
| #16 | 1.18 | | 92% | 100.0% | 0.0% |
| #20 | 0.850 | | 90% | 100.0% | 0.0% |
| #30 | 0.600 | | 87% | 100.0% | 0.0% |
| #40 | 0.425 | 86% | 86% | 100.0% | 0.0% |
| #50 | 0.300 | | 62% | 100.0% | 0.0% |
| #60 | 0.250 | | 52% | 100.0% | 0.0% |
| #80 | 0.180 | | 38% | 100.0% | 0.0% |
| #100 | 0.150 | 32% | 32% | 100.0% | 0.0% |
| #140 | 0.106 | | 24% | 100.0% | 0.0% |
| #170 | 0.090 | | 21% | 100.0% | 0.0% |
| #200 | 0.075 | 18.0% | 18.0% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig
Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT01 - 3.9 - 4.5
**Sample#:** B24-1870

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 6-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12092024

**Unified Soils Classification System, ASTM D-2487**
SM, Silty Sand
**Sample Color:**
Brown

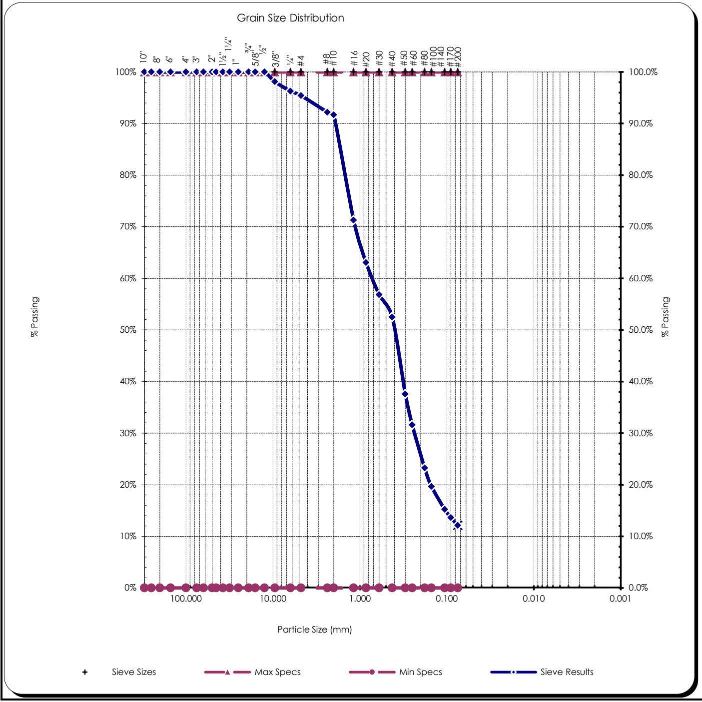
**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** N/A

| | | | | |
|---|---|---|---|---|
| $D_{(5)}$ = 0.031 mm | % Gravel = 4.6% | Coeff. of Curvature, $C_C$ = 1.25 |
| $D_{(10)}$ = 0.062 mm | % Sand = 83.3% | Coeff. of Uniformity, $C_U$ = 11.74 |
| $D_{(15)}$ = 0.104 mm | % Silt & Clay = 12.1% | Fineness Modulus = 2.29 |
| $D_{(30)}$ = 0.237 mm | Liquid Limit = n/a | Plastic Limit = n/a |
| $D_{(50)}$ = 0.404 mm | Plasticity Index = n/a | Moisture %, as sampled = n/a |
| $D_{(60)}$ = 0.726 mm | Sand Equivalent = n/a | Req'd Sand Equivalent = |
| $D_{(90)}$ = 1.931 mm | Fracture %, 1 Face = n/a | Req'd Fracture %, 1 Face = |
| Dust Ratio = 3/13 | Fracture %, 2+ Faces = n/a | Req'd Fracture %, 2+ Faces = |

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size US | Sieve Size Metric | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 100% | 100.0% | 0.0% |
| 1/2" | 12.50 | 100% | 100% | 100.0% | 0.0% |
| 3/8" | 9.50 | 98% | 98% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 96% | 100.0% | 0.0% |
| #4 | 4.75 | 95% | 95% | 100.0% | 0.0% |
| #8 | 2.36 | | 92% | 100.0% | 0.0% |
| #10 | 2.00 | 92% | 92% | 100.0% | 0.0% |
| #16 | 1.18 | | 71% | 100.0% | 0.0% |
| #20 | 0.850 | | 63% | 100.0% | 0.0% |
| #30 | 0.600 | | 57% | 100.0% | 0.0% |
| #40 | 0.425 | 52% | 52% | 100.0% | 0.0% |
| #50 | 0.300 | | 38% | 100.0% | 0.0% |
| #60 | 0.250 | | 32% | 100.0% | 0.0% |
| #80 | 0.180 | | 23% | 100.0% | 0.0% |
| #100 | 0.150 | 20% | 20% | 100.0% | 0.0% |
| #140 | 0.106 | | 15% | 100.0% | 0.0% |
| #170 | 0.090 | | 14% | 100.0% | 0.0% |
| #200 | 0.075 | 12.1% | 12.1% | 100.0% | 0.0% |



**Comments:** ______________________________

**Reviewed by:** Alex Eifrig
Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

| | | | |
|---|---|---|---|
| **Client:** | Anchor QEA, LLC. | **Date:** | December 11, 2024 |
| **Address:** | 1201 3rd Avenue, Suite 2600 | **Project:** | Q.C. - Former Nord Door Cleanup |
| | Seattle, WA 98101 | **Project #:** | 24B105-03 |
| **Attn:** | Jason Cornetta | **Sample #:** | B24-1871 - 1896 |
| **Revised On:** | | **Date sampled:** | August 21 & 22, 2024 |
| | | **Control No:** | 12112024 |

As requested and authorized by the Client, MTC has performed the following test(s) on the sample number referenced above. The testing was performed in accordance with current, applicable AASHTO, ASTM, and/or WSDOT standards, which are referenced on the correlating test report pages. The results obtained in our laboratory are as detailed below and/or on the following pages:

| | Test(s) Performed: | Test Results | | Test(s) Performed: | Test Results |
|---|---|---|---|---|---|
| X | Sieve Analysis | See Attached Reports | | Sulfate Soundness | |
| | Proctor | | | Bulk Density & Voids | |
| | Sand Equivalent | | | WSDOT Degradation | |
| | Fracture Count | | | LA Abrasion | |
| X | Moisture Content | See Attached Reports | | Cation Exchange Capacity | |
| | Specific Gravity, Coarse | | X | Specific Gravity, Soils | See Attached Report |
| | Specific Gravity, Fine | | | | |
| | Hydrometer Analysis | | | | |
| X | Atterberg Limits | See Attached Reports | | | |
| | | | | | |
| | | | | | |

If you have any questions concerning the test results, the procedures used, or if we can be of any further assistance please call the number below and ask to speak with your Project Manager or the Laboratory Manager.

Alex Eifrig

Respectfully Submitted,
Alex Eifrig
WABO Supervising Laboratory Technician

MTC
MATERIALS TESTING & CONSULTING, INC.

# Moisture Content ASTM C-566, ASTM D-2216

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Date Received:** November 22, 2024
**Date Tested:** December 5, 2024

**Client:** Anchor QEA, LLC.
**Sampled by:** Client
**Tested by:** S. Boesenberg
**Control No.:** 12112024

| Sample # | Location | Tare | Wet + Tare | Dry + Tare | Wgt. Of Moisture | Wgt. Of Soil | % Moisture |
|---|---|---|---|---|---|---|---|
| B24-1871 | GT01 - 5 - 6.5 | 222.9 | 264.7 | 264.5 | 0.2 | 41.6 | 0.5% |
| B24-1872 | GT01 - 7.5 - 9 | 234.6 | 653.0 | 626.8 | 26.2 | 392.2 | 6.7% |
| B24-1873 | GT01 - 10 - 11.5 | 224.9 | 475.2 | 456.1 | 19.1 | 231.2 | 8.3% |
| B24-1874 | GT01 - 15 - 16.5 | 229.3 | 887.2 | 754.2 | 133.0 | 524.9 | 25.3% |
| B24-1875 | GT06 - 0 - 1.5 | 222.4 | 592.0 | 576.1 | 15.9 | 353.7 | 4.5% |
| B24-1876 | GT06 - 2.5 - 4 | 215.4 | 867.1 | 830.8 | 36.3 | 615.4 | 5.9% |
| B24-1877 | GT06 - 5 - 6.5 | 220.8 | 342.6 | 334.5 | 8.1 | 113.7 | 7.1% |
| B24-1878 | GT06 - 7.5 - 9 | 232.9 | 574.3 | 516.6 | 57.7 | 283.7 | 20.3% |
| B24-1879 | GT06 - 10 - 11.5 | 208.6 | 286.7 | 271.3 | 15.4 | 62.7 | 24.6% |
| B24-1880 | GT06 - 15 - 16.5 | 303.9 | 453.8 | 425.2 | 28.6 | 121.3 | 23.6% |
| B24-1881 | GT06 - 25 - 16.5 | 306.3 | 756.5 | 660.0 | 96.5 | 353.7 | 27.3% |
| B24-1882 | GT06 - 30 - 31.5 | 300.8 | 951.0 | 823.8 | 127.2 | 523.0 | 24.3% |
| B24-1883 | GT06 - 40 - 41.5 | 268.7 | 767.6 | 680.0 | 87.6 | 411.3 | 21.3% |
| B24-1884 | GT07 - 0 - 2.5 | 260.2 | 620.5 | 609.5 | 11.0 | 349.3 | 3.1% |
| B24-1885 | GT07 - 2.5 - 2.9 | 310.9 | 549.0 | 499.5 | 49.5 | 188.6 | 26.2% |
| B24-1886 | GT07 - 2.9 - 4 | 303.2 | 763.3 | 737.7 | 25.6 | 434.5 | 5.9% |
| B24-1887 | GT07 - 5 - 5.2 | 301.0 | 395.0 | 388.5 | 6.5 | 87.5 | 7.4% |
| B24-1888 | GT07 - 5.2 - 6 | 301.0 | 345.5 | 332.8 | 12.7 | 31.8 | 39.9% |
| B24-1889 | GT07 - 6 - 6.4 | 266.4 | 454.4 | 430.7 | 23.7 | 164.3 | 14.4% |
| B24-1890 | GT07 - 10 - 11.5 | 319.9 | 528.1 | 442.5 | 85.6 | 122.6 | 69.8% |
| B24-1891 | GT07 - 15 - 16.5 | 336.3 | 644.0 | 581.4 | 62.6 | 245.1 | 25.5% |
| B24-1892 | GT07 - 20 - 21.5 | 270.1 | 344.4 | 314.5 | 29.9 | 44.4 | 67.3% |
| B24-1893 | GT07 - 25 - 26.5 | 423.4 | 715.2 | 662.4 | 52.8 | 239.0 | 22.1% |
| B24-1894 | GT07 - 30 - 31.5 | 493.1 | 1282.7 | 1122.1 | 160.6 | 629.0 | 25.5% |
| B24-1895 | GT07 - 35 - 36.5 | 420.5 | 654.1 | 610.1 | 44.0 | 189.6 | 23.2% |

**Comments:**

Reviewed by: Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MTC
MATERIALS TESTING & CONSULTING, INC.

# Moisture Content ASTM C-566, ASTM D-2216

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Date Received:** November 22, 2024
**Date Tested:** December 5, 2024

**Client:** Anchor QEA, LLC.
**Sampled by:** Client
**Tested by:** S. Boesenberg
**Control No.:** 12112024

| Sample # | Location | Tare | Wet + Tare | Dry + Tare | Wgt. Of Moisture | Wgt. Of Soil | % Moisture |
|---|---|---|---|---|---|---|---|
| B24-1896 | GT07 - 40 - 41.5 | 356.9 | 946.9 | 854.9 | 92.0 | 498.0 | 18.5% |

**Comments:**

Reviewed by: Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

MATERIALS TESTING & CONSULTING, INC.

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT01 - 7.5 - 9
**Sample#:** B24-1872

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 10-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12112024

**Unified Soil Classification System, ASTM-2487**
SM, Silty Sand with Gravel
**Sample Color:**
Gray-Brown

**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** **N/A**

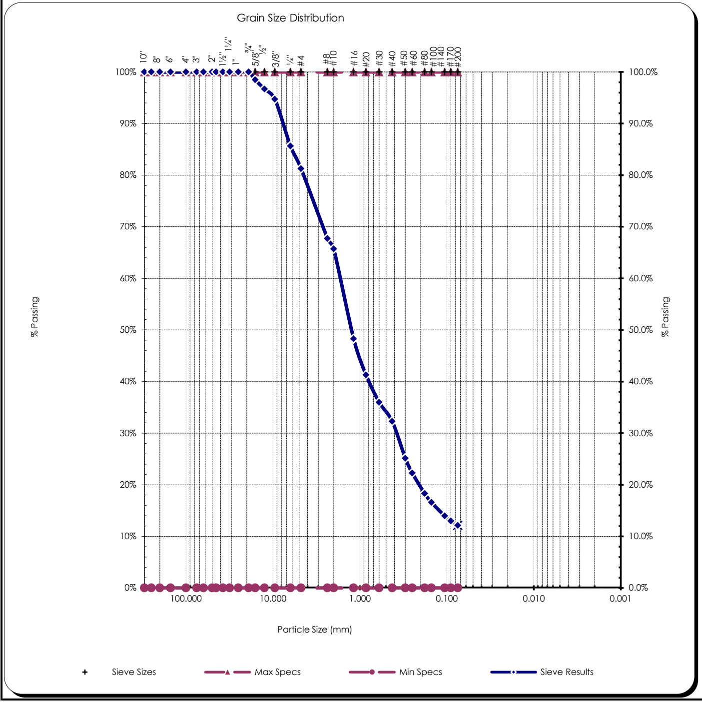
$D_{(5)}$ = 0.031 mm
$D_{(10)}$ = 0.062 mm
$D_{(15)}$ = 0.124 mm
$D_{(30)}$ = 0.385 mm
$D_{(50)}$ = 1.260 mm
$D_{(60)}$ = 1.731 mm
$D_{(90)}$ = 7.834 mm
Dust Ratio = 3/8

% Gravel = 18.7%
% Sand = 69.1%
% Silt & Clay = 12.1%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, $C_C$ = 1.38
Coeff. of Uniformity, $C_U$ = 27.95
Fineness Modulus = 3.30
Plastic Limit = n/a
Moisture %, as sampled = n/a
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size | | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs | Specs |
|---|---|---|---|---|---|
| US | Metric | | | Max | Min |
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 98% | 100.0% | 0.0% |
| 1/2" | 12.50 | 97% | 97% | 100.0% | 0.0% |
| 3/8" | 9.50 | 95% | 95% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 86% | 100.0% | 0.0% |
| #4 | 4.75 | 81% | 81% | 100.0% | 0.0% |
| #8 | 2.36 | | 68% | 100.0% | 0.0% |
| #10 | 2.00 | 66% | 66% | 100.0% | 0.0% |
| #16 | 1.18 | | 48% | 100.0% | 0.0% |
| #20 | 0.850 | | 41% | 100.0% | 0.0% |
| #30 | 0.600 | | 36% | 100.0% | 0.0% |
| #40 | 0.425 | 32% | 32% | 100.0% | 0.0% |
| #50 | 0.300 | | 25% | 100.0% | 0.0% |
| #60 | 0.250 | | 22% | 100.0% | 0.0% |
| #80 | 0.180 | | 18% | 100.0% | 0.0% |
| #100 | 0.150 | 17% | 17% | 100.0% | 0.0% |
| #140 | 0.106 | | 14% | 100.0% | 0.0% |
| #170 | 0.090 | | 13% | 100.0% | 0.0% |
| #200 | 0.075 | 12.1% | 12.1% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

# Specific Gravity of Soils, ASTM D-854

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Date Received:** November 22, 2024
**Date Tested:** December 9 & 10, 2024

**Client:** Anchor QEA, LLC.
**Sampled by:** Client
**Tested by:** S. Boesenberg
**Control. No.:** 12112024

| Sample # | Location | Tare | Dry Soil + Tare | Mass of Dry Soil | Pycno ID | Mass of Pycno | Volume of Pycno | Density of Water @ Tx | Mass of Pycno filled w/ water & soils | Mass of Pycno filled w/ water | Temp. of Water, 0.1 *C | SpG of Soils | Temp. Correction Factor | Corrected SpG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B24-1877 | GT06 - 5 - 6.5 | 303.74 | 353.30 | 49.56 | SA-050 (B-1) | 91.89 | 249.27 | 0.99697 | 371.87 | 340.40 | 25.3 | 2.738922 | 0.99876 | 2.73552549 |
| B24-1879 | GT06 - 10 - 11.5 | 301.05 | 350.71 | 49.66 | SA-050 (B-2) | 92.08 | 249.31 | 0.99702 | 371.80 | 340.65 | 25.1 | 2.683301 | 0.99881 | 2.68010774 |
| B24-1892 | GT07 - 20 - 21.5 | 266.35 | 314.72 | 48.37 | SA-050 (B-1) | 91.89 | 249.27 | 0.99692 | 371.14 | 340.39 | 25.5 | 2.744826 | 0.99871 | 2.74128486 |
| B24-1895 | GT07 - 35 - 36.5 | 260.20 | 309.78 | 49.58 | SA-050 (B-2) | 92.08 | 249.31 | 0.99697 | 372.39 | 340.63 | 25.3 | 2.781551 | 0.99876 | 2.77810142 |

**Comments:**

Reviewed by: Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

# Sieve Report

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT06 - 30 - 31.5
**Sample#:** B24-1882

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 10-Dec-24
**Tested By:** R. Bohler
**Control No.:** 12112024

**Unified Soil Classification System, ASTM-2487**
SC-SM, Silty, Clayey Sand
**Sample Color:**
Brown

**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** N/A

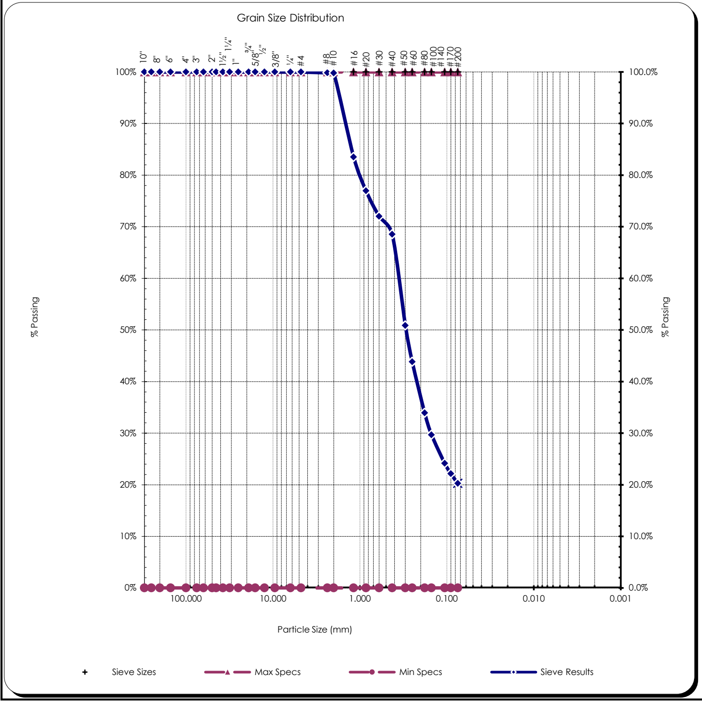
$D_{(5)}$ = 0.019 mm
$D_{(10)}$ = 0.037 mm
$D_{(15)}$ = 0.056 mm
$D_{(30)}$ = 0.152 mm
$D_{(50)}$ = 0.294 mm
$D_{(60)}$ = 0.365 mm
$D_{(90)}$ = 1.506 mm
Dust Ratio = 21/71

% Gravel = 0.0%
% Sand = 79.7%
% Silt & Clay = 20.3%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, $C_C$ = 1.72
Coeff. of Uniformity, $C_U$ = 9.85
Fineness Modulus = 1.64
Plastic Limit = n/a
Moisture %, as sampled = n/a
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size US | Sieve Size Metric | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| 12.00" | 300.00 | | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 | | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 | | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 | | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 | | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 | | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 | | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 | | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 | | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 | | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 | | 100% | 100.0% | 0.0% |
| 1/2" | 12.50 | 100% | 100% | 100.0% | 0.0% |
| 3/8" | 9.50 | 100% | 100% | 100.0% | 0.0% |
| 1/4" | 6.30 | | 100% | 100.0% | 0.0% |
| #4 | 4.75 | 100% | 100% | 100.0% | 0.0% |
| #8 | 2.36 | | 100% | 100.0% | 0.0% |
| #10 | 2.00 | 100% | 100% | 100.0% | 0.0% |
| #16 | 1.18 | | 84% | 100.0% | 0.0% |
| #20 | 0.850 | | 77% | 100.0% | 0.0% |
| #30 | 0.600 | | 72% | 100.0% | 0.0% |
| #40 | 0.425 | 69% | 69% | 100.0% | 0.0% |
| #50 | 0.300 | | 51% | 100.0% | 0.0% |
| #60 | 0.250 | | 44% | 100.0% | 0.0% |
| #80 | 0.180 | | 34% | 100.0% | 0.0% |
| #100 | 0.150 | 30% | 30% | 100.0% | 0.0% |
| #140 | 0.106 | | 24% | 100.0% | 0.0% |
| #170 | 0.090 | | 22% | 100.0% | 0.0% |
| #200 | 0.075 | 20.3% | 20.3% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig
Alex Eifrig
WABO Supervising Laboratory Technician

# ASTM D-4318 Liquid Limit, Plastic Limit & Plasticity Index of Soils

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT07 - 5.2 - 6
**Sample #:** B24-1888

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 10-Dec-24
**Tested By:** Z. Romney
**Control No.:** 12112024

**Unified Soils Classification System, ASTM D-2487**
ML, Clayey Silt with Sand
**Sample Color**
Gray-Brown

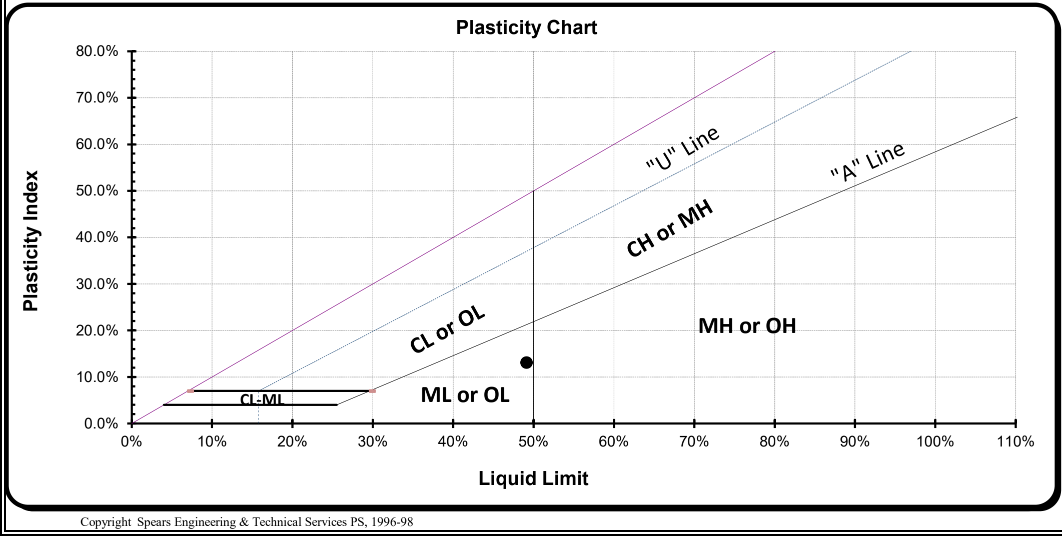
### Liquid Limit Determination

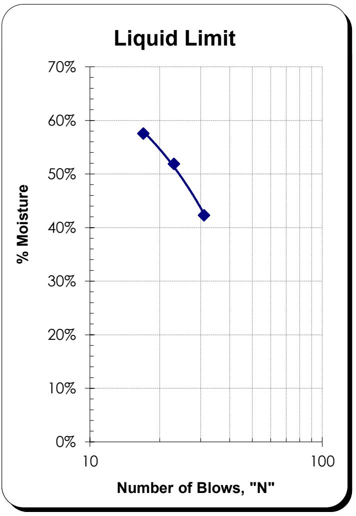
| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | 36.48 | 34.98 | 34.82 | | | |
| **Weight of Dry Soils + Pan:** | 31.30 | 30.60 | 29.26 | | | |
| **Weight of Pan:** | 19.05 | 22.16 | 19.60 | | | |
| **Weight of Dry Soils:** | 12.25 | 8.44 | 9.66 | | | |
| **Weight of Moisture:** | 5.18 | 4.38 | 5.56 | | | |
| **% Moisture:** | 42.3 % | 51.9 % | 57.6 % | | | |
| **Number of Blows:** | 31 | 23 | 17 | | | |

| | |
|---|---|
| **Liquid Limit @ 25 Blows:** | 49.1 % |
| **Plastic Limit:** | 36.0 % |
| **Plasticity Index, $I_P$:** | 13.1% |

### Plastic Limit Determination

| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | 26.35 | 27.22 | | | | |
| **Weight of Dry Soils + Pan:** | 24.53 | 25.21 | | | | |
| **Weight of Pan:** | 19.48 | 19.61 | | | | |
| **Weight of Dry Soils:** | 5.05 | 5.60 | | | | |
| **Weight of Moisture:** | 1.82 | 2.01 | | | | |
| **% Moisture:** | 36.0 % | 35.9 % | | | | |





**Comments:**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

# Sieve Report

|  |  |  |  |
|---|---|---|---|
| **Project:** | Q.C. - Former Nord Door Cleanup | **Date Received:** | 22-Nov-24 |
| **Project #:** | 24B105-03 | **Sampled By:** | Client |
| **Client:** | Anchor QEA, LLC. | **Date Tested:** | 10-Dec-24 |
| **Source:** | GT07 - 15 - 16.5 | **Tested By:** | R. Bohler |
| **Sample#:** | B24-1891 | **Control No.:** | 12112024 |

**Unified Soil Classification System, ASTM-2487**
SP-SM, Poorly graded Sand with Silt
**Sample Color:**
Gray-Brown

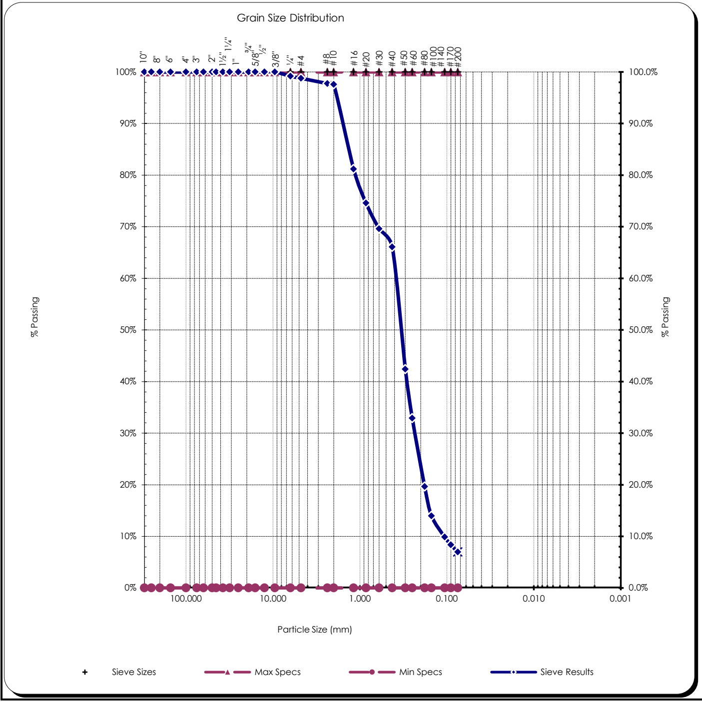
**Method(s) ASTM D-2216, ASTM D-2419, ASTM D4318, ASTM D-5281**

**Specifications**
No Specs
**Sample Meets Specs ?** N/A

|  |  |  |  |
|---|---|---|---|
| $D_{(5)}$ = 0.054 mm | % Gravel = 1.2% | Coeff. of Curvature, $C_C$ = 1.30 |
| $D_{(10)}$ = 0.108 mm | % Sand = 91.8% | Coeff. of Uniformity, $C_U$ = 3.65 |
| $D_{(15)}$ = 0.156 mm | % Silt & Clay = 7.0% | Fineness Modulus = 1.96 |
| $D_{(30)}$ = 0.235 mm | Liquid Limit = n/a | Plastic Limit = n/a |
| $D_{(50)}$ = 0.340 mm | Plasticity Index = n/a | Moisture %, as sampled = n/a |
| $D_{(60)}$ = 0.393 mm | Sand Equivalent = n/a | Req'd Sand Equivalent = |
| $D_{(90)}$ = 1.620 mm | Fracture %, 1 Face = n/a | Req'd Fracture %, 1 Face = |
| Dust Ratio = 2/19 | Fracture %, 2+ Faces = n/a | Req'd Fracture %, 2+ Faces = |

**Method(s) ASTM C-136, ASTM D-6913, ASTM C-117**

| Sieve Size US | Sieve Size Metric | Actual Cumulative Percent Passing | Interpolated Cumulative Percent Passing | Specs Max | Specs Min |
|---|---|---|---|---|---|
| 12.00" | 300.00 |  | 100% | 100.0% | 0.0% |
| 10.00" | 250.00 |  | 100% | 100.0% | 0.0% |
| 8.00" | 200.00 |  | 100% | 100.0% | 0.0% |
| 6.00" | 150.00 |  | 100% | 100.0% | 0.0% |
| 4.00" | 100.00 |  | 100% | 100.0% | 0.0% |
| 3.00" | 75.00 |  | 100% | 100.0% | 0.0% |
| 2.50" | 63.00 |  | 100% | 100.0% | 0.0% |
| 2.00" | 50.00 | 100% | 100% | 100.0% | 0.0% |
| 1.75" | 45.00 |  | 100% | 100.0% | 0.0% |
| 1.50" | 37.50 |  | 100% | 100.0% | 0.0% |
| 1.25" | 31.50 |  | 100% | 100.0% | 0.0% |
| 1.00" | 25.00 | 100% | 100% | 100.0% | 0.0% |
| 3/4" | 19.00 | 100% | 100% | 100.0% | 0.0% |
| 5/8" | 16.00 |  | 100% | 100.0% | 0.0% |
| 1/2" | 12.50 | 100% | 100% | 100.0% | 0.0% |
| 3/8" | 9.50 | 100% | 100% | 100.0% | 0.0% |
| 1/4" | 6.30 |  | 99% | 100.0% | 0.0% |
| #4 | 4.75 | 99% | 99% | 100.0% | 0.0% |
| #8 | 2.36 |  | 98% | 100.0% | 0.0% |
| #10 | 2.00 | 98% | 98% | 100.0% | 0.0% |
| #16 | 1.18 |  | 81% | 100.0% | 0.0% |
| #20 | 0.850 |  | 75% | 100.0% | 0.0% |
| #30 | 0.600 |  | 70% | 100.0% | 0.0% |
| #40 | 0.425 | 66% | 66% | 100.0% | 0.0% |
| #50 | 0.300 |  | 42% | 100.0% | 0.0% |
| #60 | 0.250 |  | 33% | 100.0% | 0.0% |
| #80 | 0.180 |  | 20% | 100.0% | 0.0% |
| #100 | 0.150 | 14% | 14% | 100.0% | 0.0% |
| #140 | 0.106 |  | 10% | 100.0% | 0.0% |
| #170 | 0.090 |  | 8% | 100.0% | 0.0% |
| #200 | 0.075 | 7.0% | 7.0% | 100.0% | 0.0% |



**Comments:**

**Reviewed by:** Alex Eifrig
Alex Eifrig
WABO Supervising Laboratory Technician

MTC
MATERIALS TESTING & CONSULTING, INC.

# ASTM D-4318 Liquid Limit, Plastic Limit & Plasticity Index of Soils

**Project:** Q.C. - Former Nord Door Cleanup
**Project #:** 24B105-03
**Client:** Anchor QEA, LLC.
**Source:** GT07 - 20 - 21.5
**Sample #:** B24-1892

**Date Received:** 22-Nov-24
**Sampled By:** Client
**Date Tested:** 10-Dec-24
**Tested By:** Z. Romney
**Control No.:** 12112024

**Visual Soils Classification**
Silt with Sand and Clay
**Sample Color**
Brown

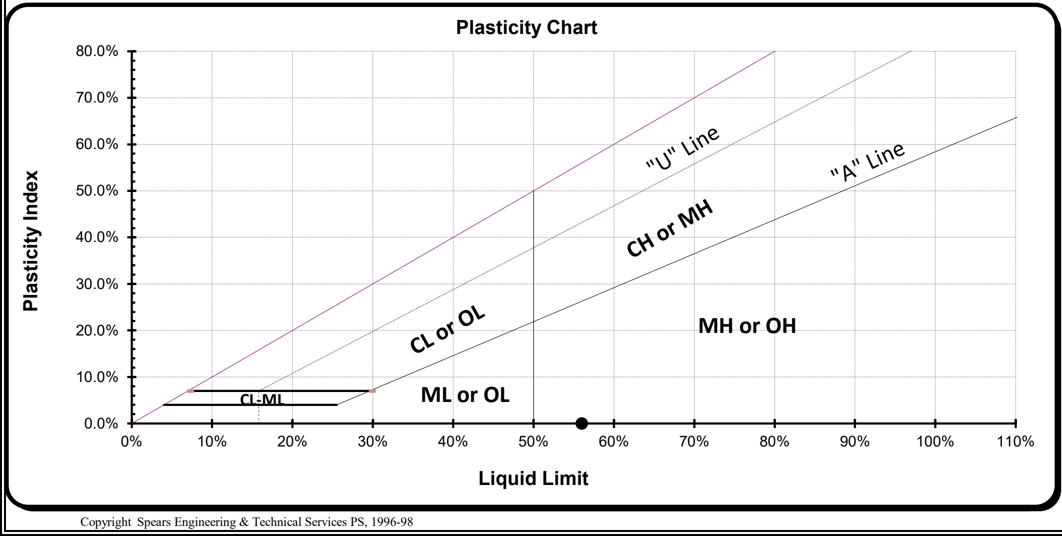
### Liquid Limit Determination

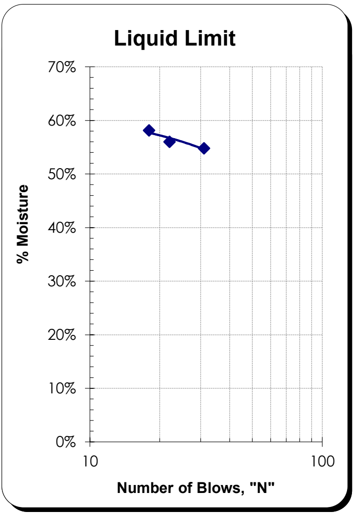
| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | 28.80 | 31.90 | 30.78 | | | |
| **Weight of Dry Soils + Pan:** | 23.61 | 27.25 | 26.61 | | | |
| **Weight of Pan:** | 14.14 | 18.95 | 19.44 | | | |
| **Weight of Dry Soils:** | 9.47 | 8.30 | 7.17 | | | |
| **Weight of Moisture:** | 5.19 | 4.65 | 4.17 | | | |
| **% Moisture:** | 54.8 % | 56.0 % | 58.2 % | | | |
| **Number of Blows:** | 31 | 22 | 18 | | | |

| | |
|---|---|
| **Liquid Limit @ 25 Blows:** | 56.0 % |
| **Plastic Limit:** | N/A |
| **Plasticity Index, $I_P$:** | N/A |

### Plastic Limit Determination

| | #1 | #2 | #3 | #4 | #5 | #6 |
|---|---|---|---|---|---|---|
| **Weight of Wet Soils + Pan:** | | | | | | |
| **Weight of Dry Soils + Pan:** | | | **Non-Plastic** | | | |
| **Weight of Pan:** | | | | | | |
| **Weight of Dry Soils:** | | | | | | |
| **Weight of Moisture:** | | | | | | |
| **% Moisture:** | | | | | | |





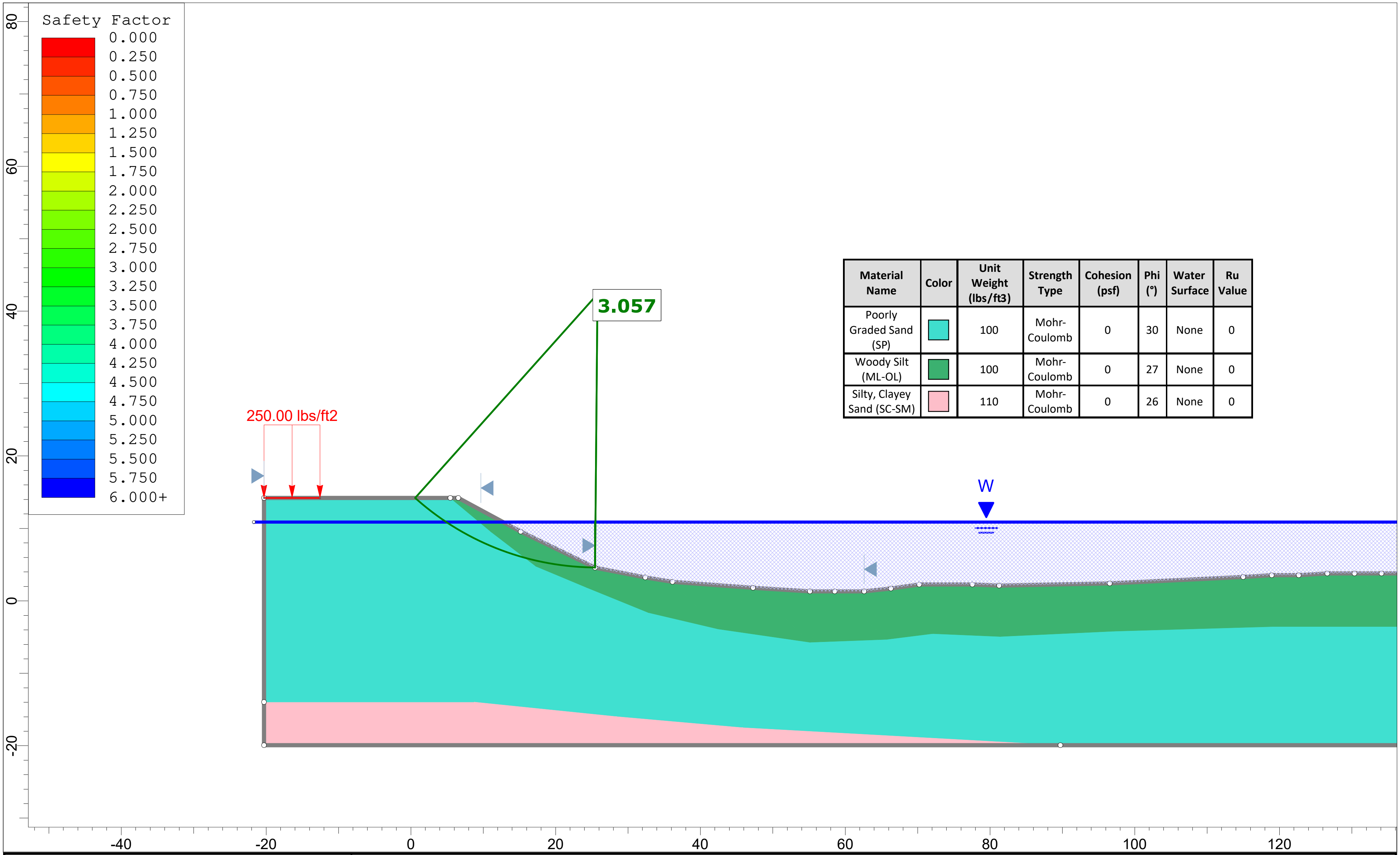
**Comments:** **Sample was deemed to be non-plastic due to the material not being workable down to 1/8" ribbons/rolls without breaking apart.**

**Reviewed by:** Alex Eifrig

Alex Eifrig
WABO Supervising Laboratory Technician

# Attachment B-3

# Slope Stability Modeling Results



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Water Surface | Ru Value |
|---|---|---|---|---|---|---|---|
| Poorly Graded Sand (SP) | 🟦 | 100 | Mohr-Coulomb | 0 | 30 | None | 0 |
| Woody Silt (ML-OL) | 🟩 | 100 | Mohr-Coulomb | 0 | 27 | None | 0 |
| Silty, Clayey Sand (SC-SM) | 🟥 | 110 | Mohr-Coulomb | 0 | 26 | None | 0 |

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SLIDEINTERPRET 9.038

*Project*

Slide2 - An Interactive Slope Stability Program

*Group* Section A-A'- Existing

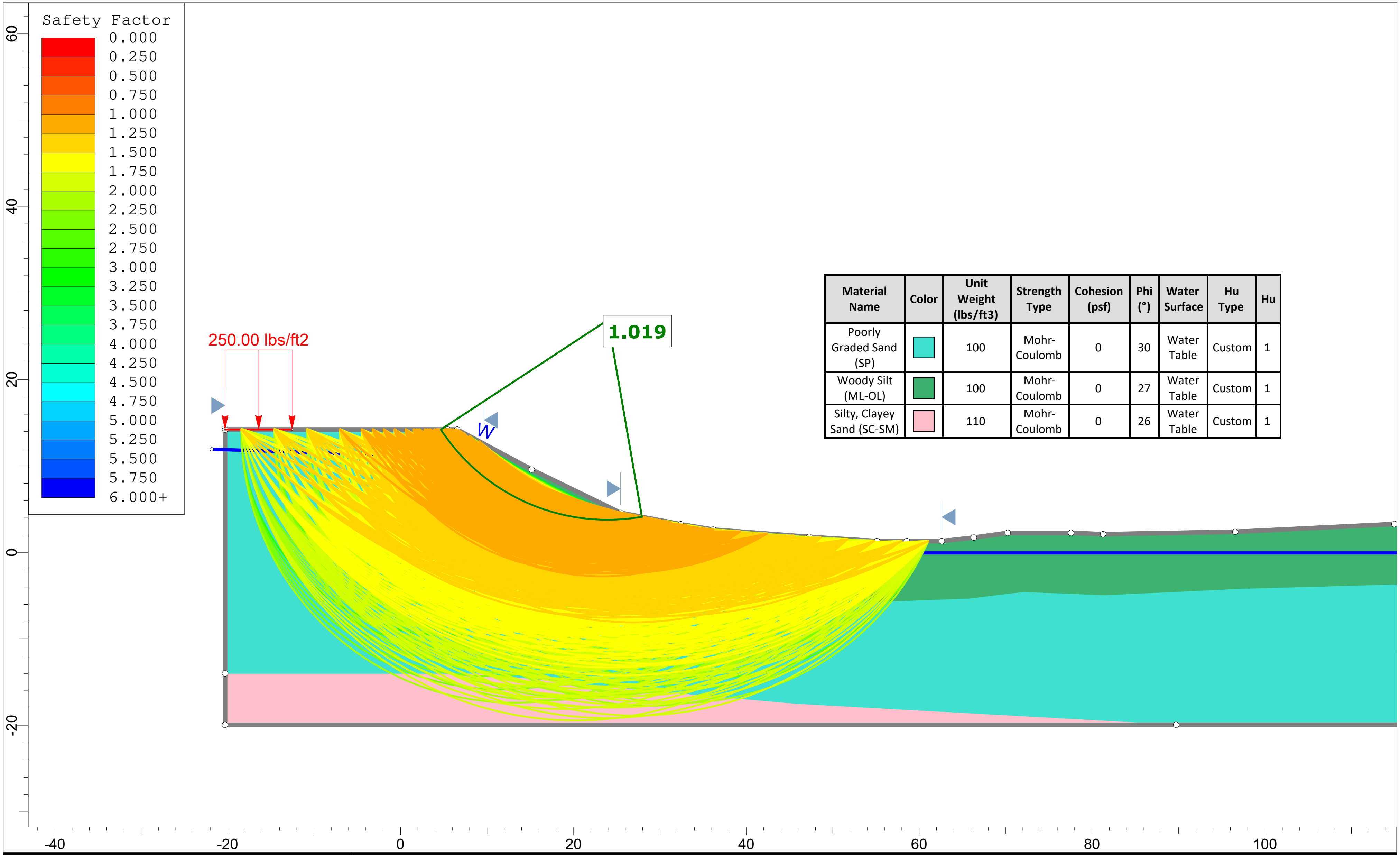
*Scenario* Existing- MHHW

*Drawn By*

*Company*

*Date* 4/18/2025, 10:12:39 AM

*File Name* JeldWenXS_Updated.slmd



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Water Surface | Hu Type | Hu |
|---|---|---|---|---|---|---|---|---|
| Poorly Graded Sand (SP) | 🟦 | 100 | Mohr-Coulomb | 0 | 30 | Water Table | Custom | 1 |
| Woody Silt (ML-OL) | 🟩 | 100 | Mohr-Coulomb | 0 | 27 | Water Table | Custom | 1 |
| Silty, Clayey Sand (SC-SM) | 🟥 | 110 | Mohr-Coulomb | 0 | 26 | Water Table | Custom | 1 |

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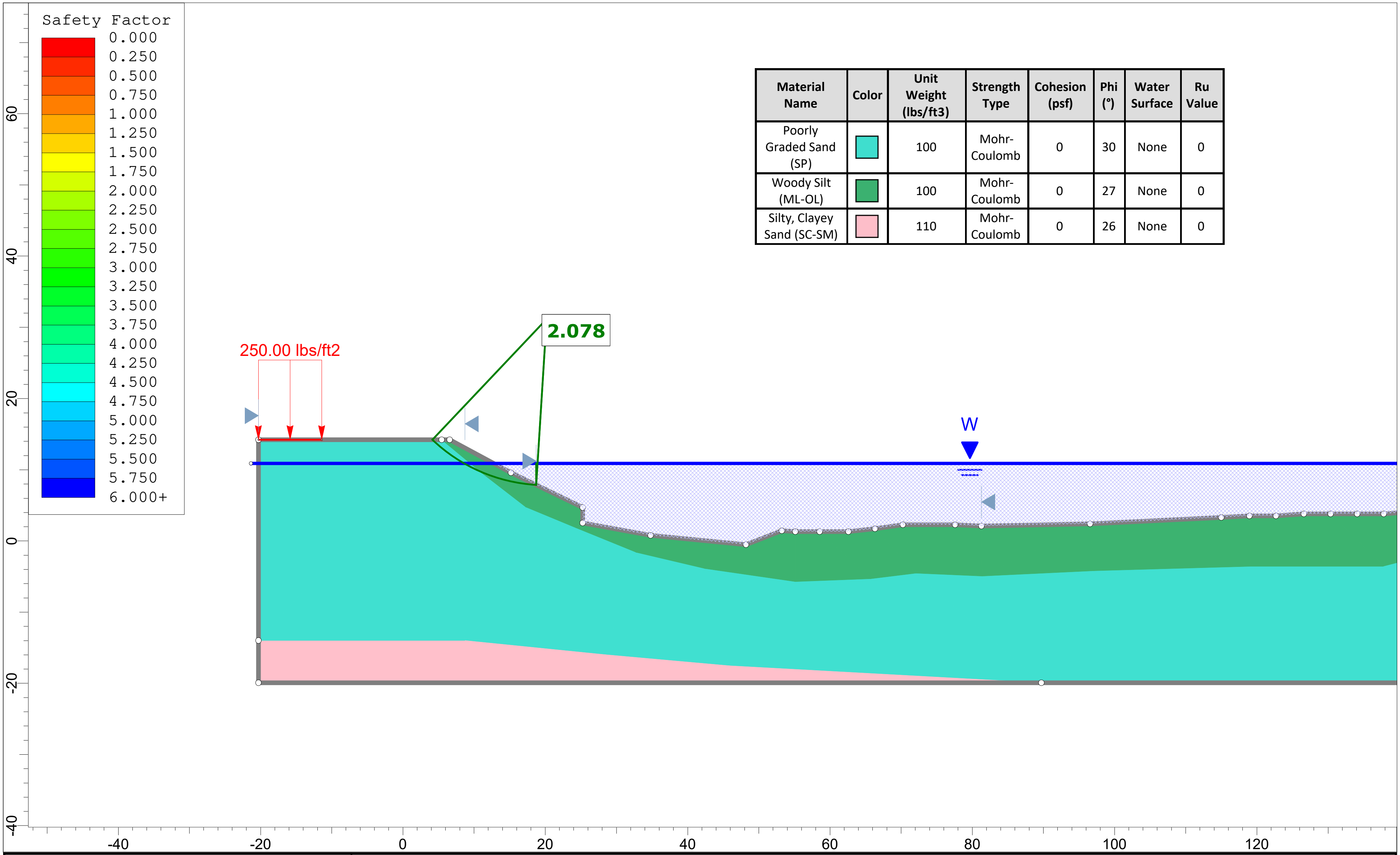
SLIDEINTERPRET 9.038

| | | | |
|---|---|---|---|
| *Project* | Slide2 - An Interactive Slope Stability Program | | |
| *Group* | Section A-A'- Existing | *Scenario* | Existing- MLLW |
| *Drawn By* | | *Company* | |
| *Date* | 4/18/2025, 10:12:39 AM | *File Name* | JeldWenXS_Updated.slmd |



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Water Surface | Ru Value |
|---|---|---|---|---|---|---|---|
| Poorly Graded Sand (SP) | 🟦 | 100 | Mohr-Coulomb | 0 | 30 | None | 0 |
| Woody Silt (ML-OL) | 🟩 | 100 | Mohr-Coulomb | 0 | 27 | None | 0 |
| Silty, Clayey Sand (SC-SM) | 🟥 | 110 | Mohr-Coulomb | 0 | 26 | None | 0 |

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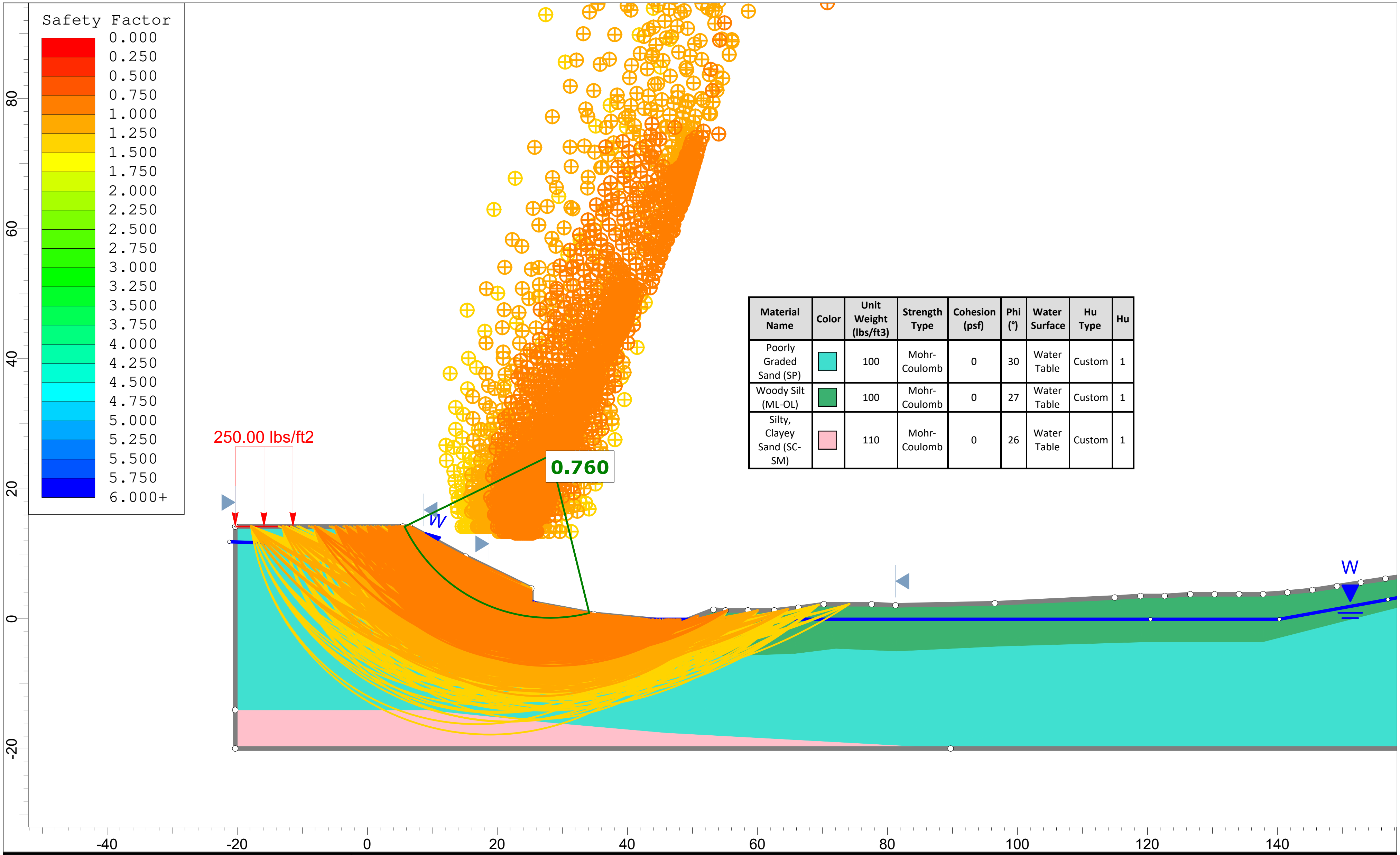
SLIDEINTERPRET 9.038

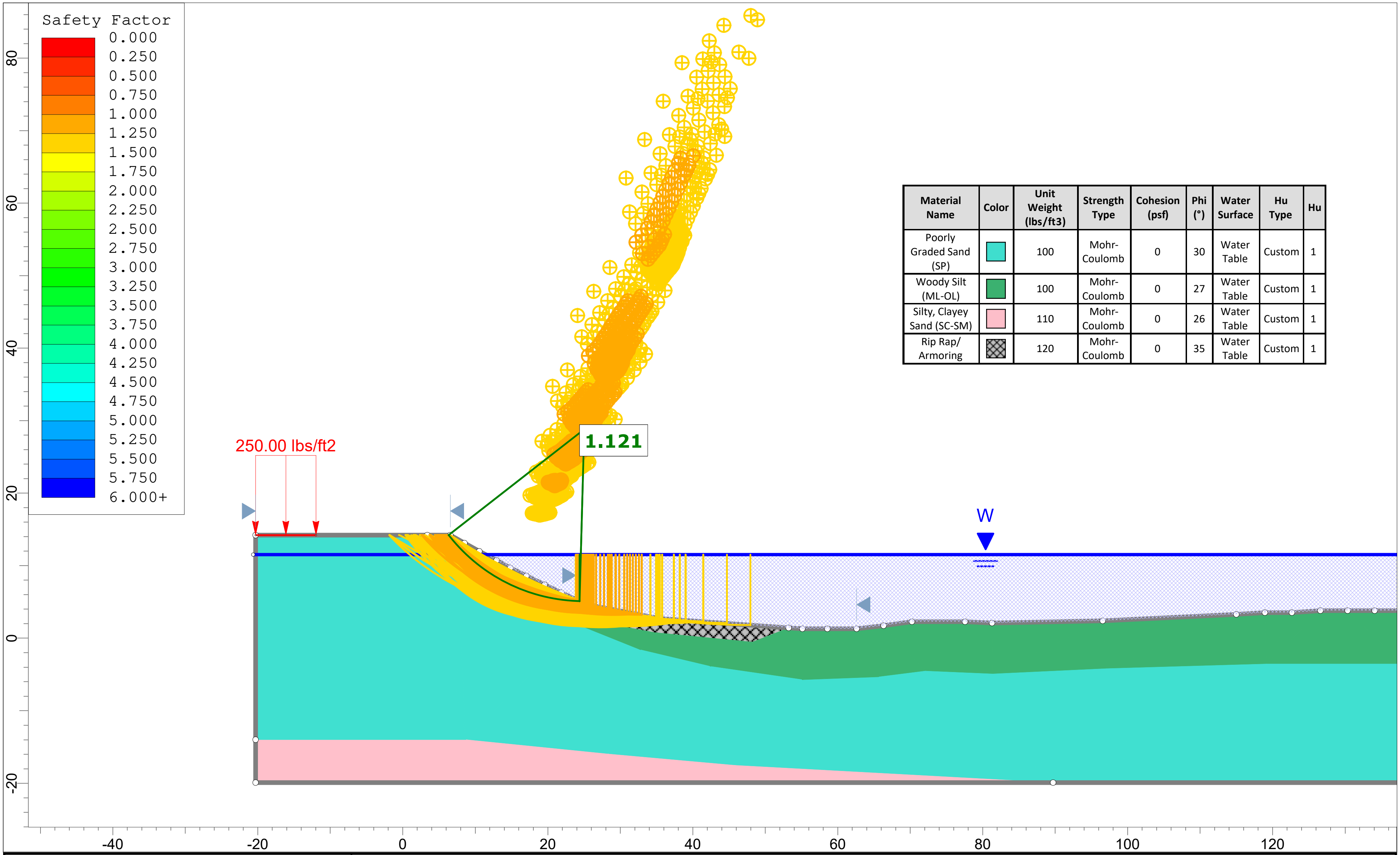
| | | | |
|---|---|---|---|
| *Project* | Slide2 - An Interactive Slope Stability Program | | |
| *Group* | Section A-A' -Dredge Cut | *Scenario* | Dredge Cut- MHHW |
| *Drawn By* | | *Company* | |
| *Date* | 4/18/2025, 10:12:39 AM | *File Name* | JeldWenXS_Updated.slmd |



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Water Surface | Hu Type | Hu |
|---|---|---|---|---|---|---|---|---|
| Poorly Graded Sand (SP) | 🟦 | 100 | Mohr-Coulomb | 0 | 30 | Water Table | Custom | 1 |
| Woody Silt (ML-OL) | 🟩 | 100 | Mohr-Coulomb | 0 | 27 | Water Table | Custom | 1 |
| Silty, Clayey Sand (SC-SM) | 🟥 | 110 | Mohr-Coulomb | 0 | 26 | Water Table | Custom | 1 |

| | |
|---|---|
| *Project* | Slide2 - An Interactive Slope Stability Program |
| *Group* | Section A-A' -Dredge Cut |
| *Scenario* | Dredge Cut- MLLW |
| *Drawn By* | |
| *Company* | |
| *Date* | 4/18/2025, 10:12:39 AM |
| *File Name* | JeldWenXS_Updated.slmd |

SLIDEINTERPRET 9.038



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Water Surface | Hu Type | Hu |
|---|---|---|---|---|---|---|---|---|
| Poorly Graded Sand (SP) | 🟦 | 100 | Mohr-Coulomb | 0 | 30 | Water Table | Custom | 1 |
| Woody Silt (ML-OL) | 🟩 | 100 | Mohr-Coulomb | 0 | 27 | Water Table | Custom | 1 |
| Silty, Clayey Sand (SC-SM) | 🟥 | 110 | Mohr-Coulomb | 0 | 26 | Water Table | Custom | 1 |
| Rip Rap/ Armoring | ▨ | 120 | Mohr-Coulomb | 0 | 35 | Water Table | Custom | 1 |

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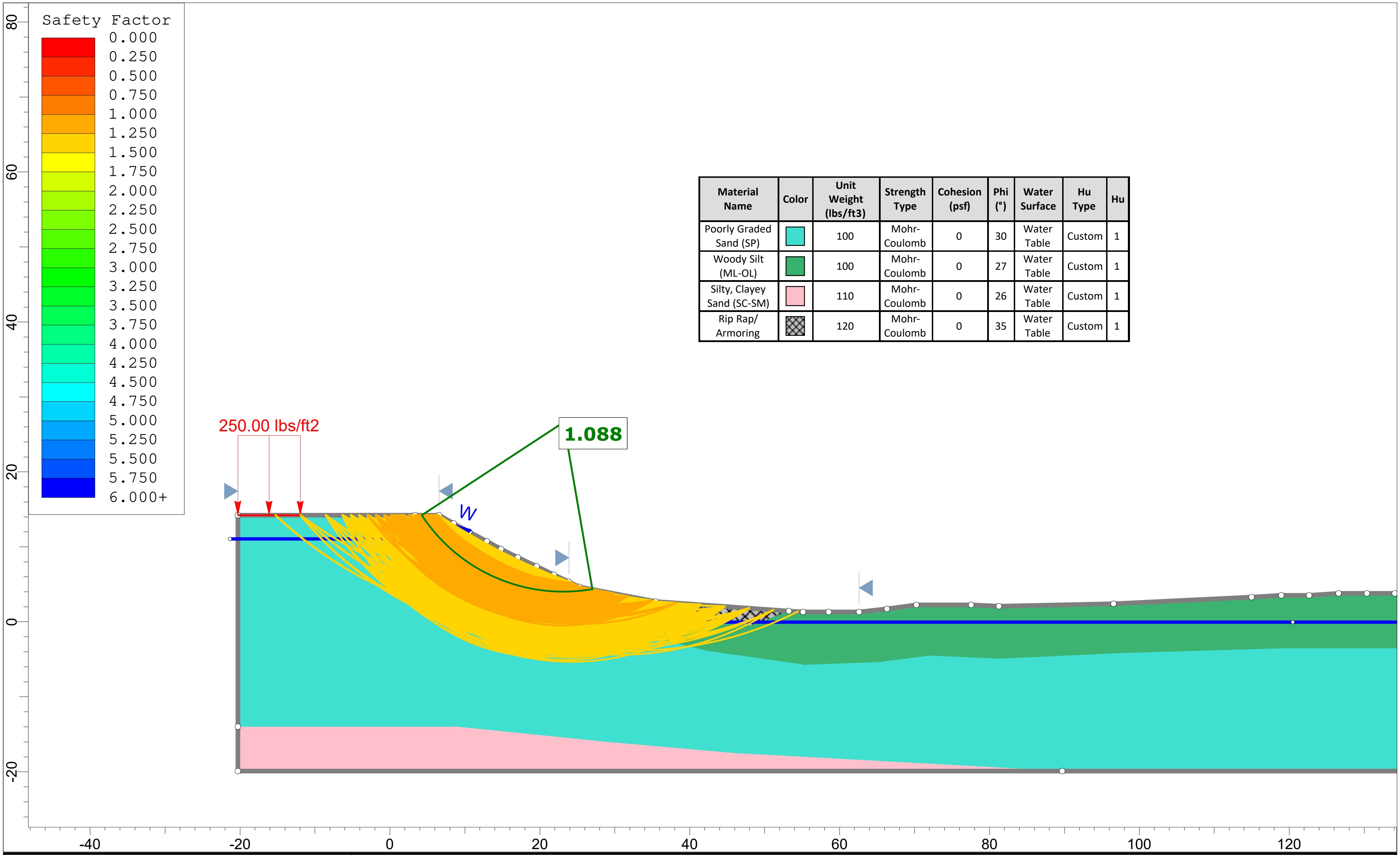
| | | | |
|---|---|---|---|
| *Project* | Slide2 - An Interactive Slope Stability Program | | |
| *Group* | Section A-A' -Cut and Cap | *Scenario* | Cut and Backfill- MHHW |
| *Drawn By* | | *Company* | |
| *Date* | 4/18/2025, 10:12:39 AM | *File Name* | JeldWenXS_Updated.slmd |



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Water Surface | Hu Type | Hu |
|---|---|---|---|---|---|---|---|---|
| Poorly Graded Sand (SP) | 🟦 | 100 | Mohr-Coulomb | 0 | 30 | Water Table | Custom | 1 |
| Woody Silt (ML-OL) | 🟩 | 100 | Mohr-Coulomb | 0 | 27 | Water Table | Custom | 1 |
| Silty, Clayey Sand (SC-SM) | 🟥 | 110 | Mohr-Coulomb | 0 | 26 | Water Table | Custom | 1 |
| Rip Rap/ Armoring | ▨ | 120 | Mohr-Coulomb | 0 | 35 | Water Table | Custom | 1 |

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SLIDEINTERPRET 9.038

*Project*
Slide2 - An Interactive Slope Stability Program

*Group* Section A-A' -Cut and Cap

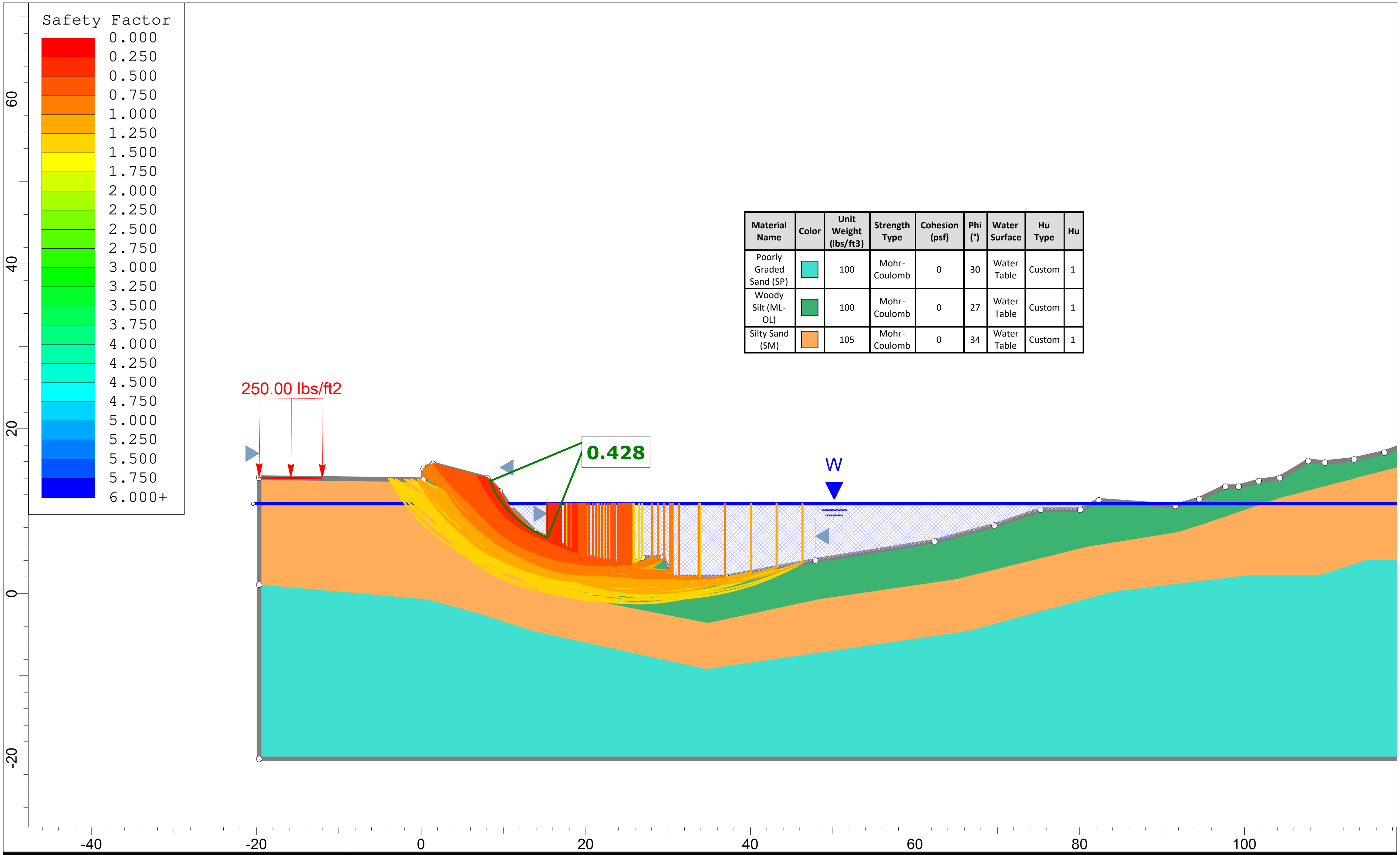
*Scenario* Cut and Backfill- MLLW

*Drawn By*

*Company*

*Date* 4/18/2025, 10:12:39 AM

*File Name* JeldWenXS_Updated.slmd



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Water Surface | Hu Type | Hu |
|---|---|---|---|---|---|---|---|---|
| Poorly Graded Sand (SP) | 🟦 | 100 | Mohr-Coulomb | 0 | 30 | Water Table | Custom | 1 |
| Woody Silt (ML-OL) | 🟩 | 100 | Mohr-Coulomb | 0 | 27 | Water Table | Custom | 1 |
| Silty Sand (SM) | 🟧 | 105 | Mohr-Coulomb | 0 | 34 | Water Table | Custom | 1 |

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SLIDEINTERPRET 9.038

*Project*
Slide2 - An Interactive Slope Stability Program

*Group* Section B-B'- Existing

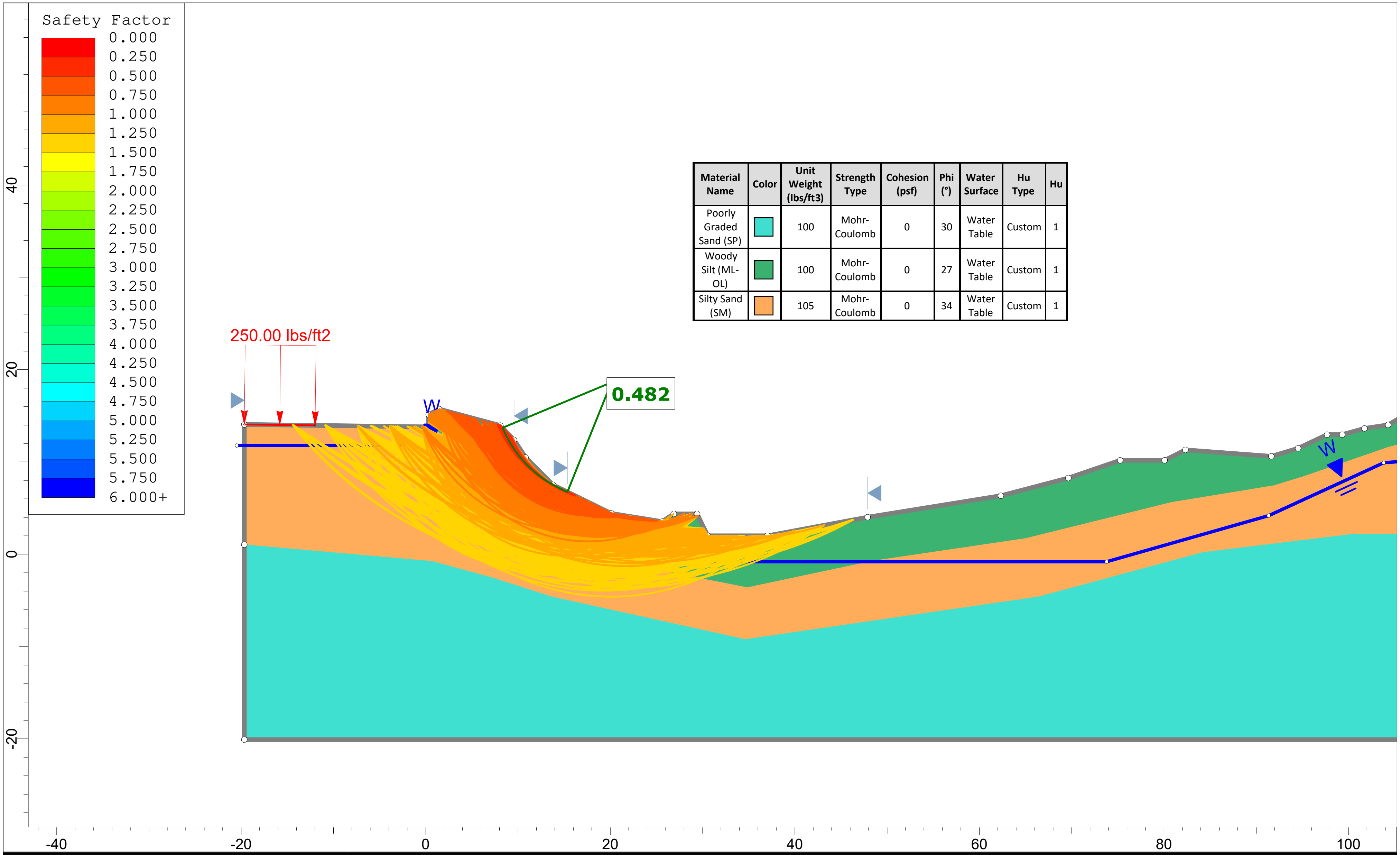
*Scenario* Existing- MHHW

*Drawn By*

*Company*

*Date* 4/18/2025, 10:12:39 AM

*File Name* JeldWenXS_Updated.slmd



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Water Surface | Hu Type | Hu |
|---|---|---|---|---|---|---|---|---|
| Poorly Graded Sand (SP) | 🟦 | 100 | Mohr-Coulomb | 0 | 30 | Water Table | Custom | 1 |
| Woody Silt (ML-OL) | 🟩 | 100 | Mohr-Coulomb | 0 | 27 | Water Table | Custom | 1 |
| Silty Sand (SM) | 🟧 | 105 | Mohr-Coulomb | 0 | 34 | Water Table | Custom | 1 |

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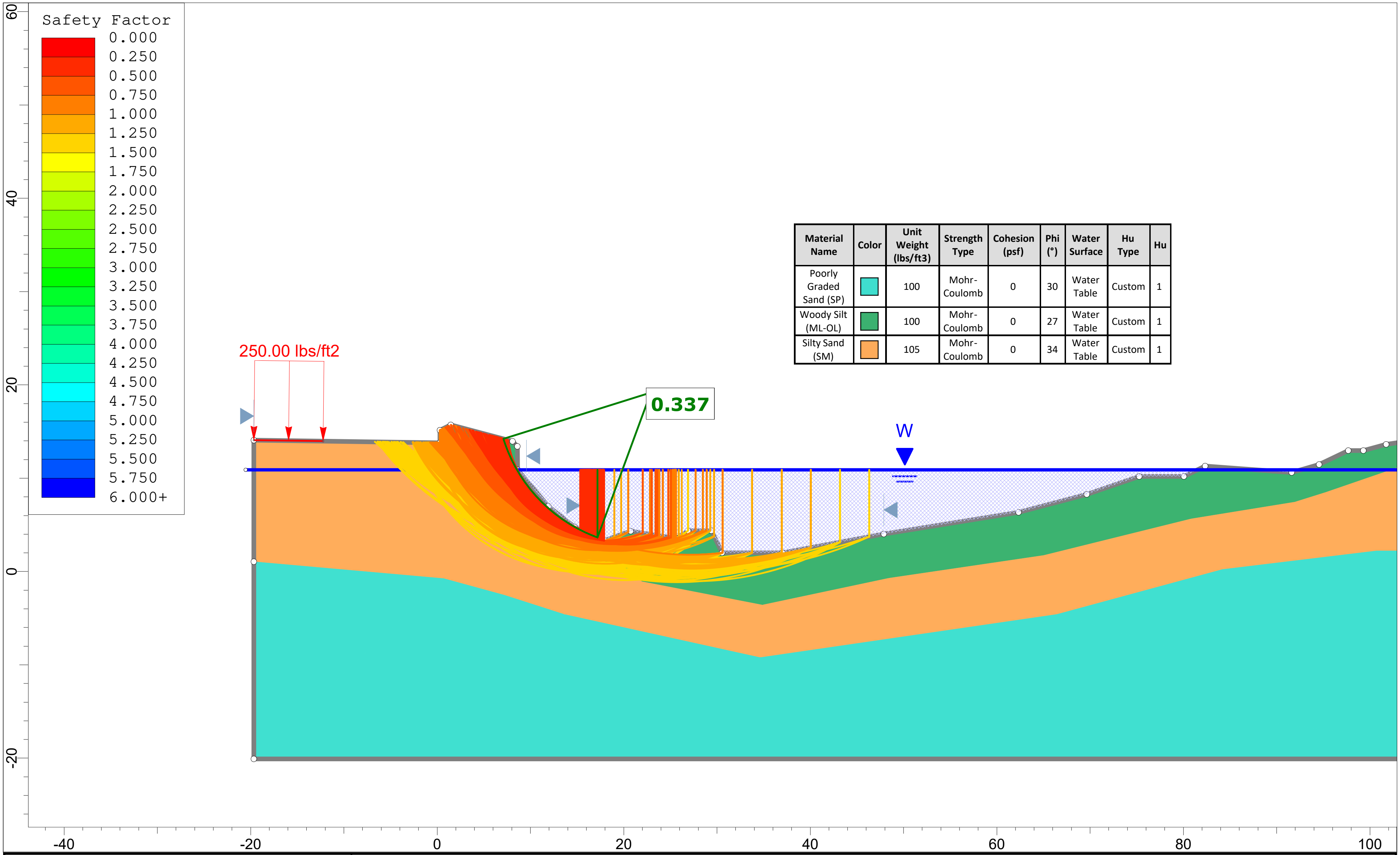
SLIDEINTERPRET 9.038

| | | | |
|---|---|---|---|
| *Project* | Slide2 - An Interactive Slope Stability Program | | |
| *Group* | Section B-B'- Existing | *Scenario* | Existing- MLLW |
| *Drawn By* | | *Company* | |
| *Date* | 4/18/2025, 10:12:39 AM | *File Name* | JeldWenXS_Updated.slmd |



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Water Surface | Hu Type | Hu |
|---|---|---|---|---|---|---|---|---|
| Poorly Graded Sand (SP) | 🟦 | 100 | Mohr-Coulomb | 0 | 30 | Water Table | Custom | 1 |
| Woody Silt (ML-OL) | 🟩 | 100 | Mohr-Coulomb | 0 | 27 | Water Table | Custom | 1 |
| Silty Sand (SM) | 🟧 | 105 | Mohr-Coulomb | 0 | 34 | Water Table | Custom | 1 |

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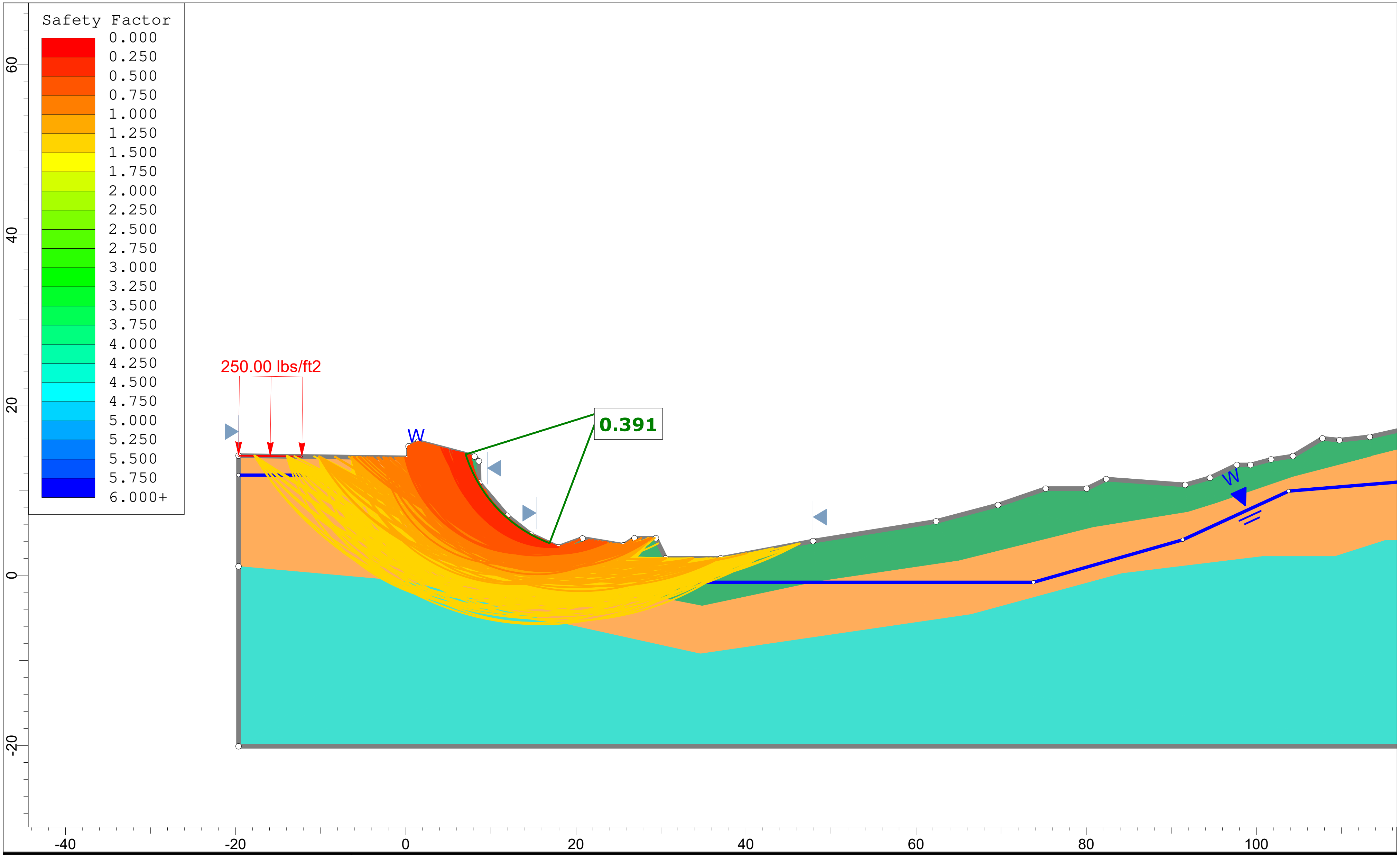
SLIDEINTERPRET 9.038

| | | | |
|---|---|---|---|
| *Project* | Slide2 - An Interactive Slope Stability Program | | |
| *Group* | Section B-B' -Dredge Cut | *Scenario* | Dredge Cut- MHHW |
| *Drawn By* | | *Company* | |
| *Date* | 4/18/2025, 10:12:39 AM | *File Name* | JeldWenXS_Updated.slmd |



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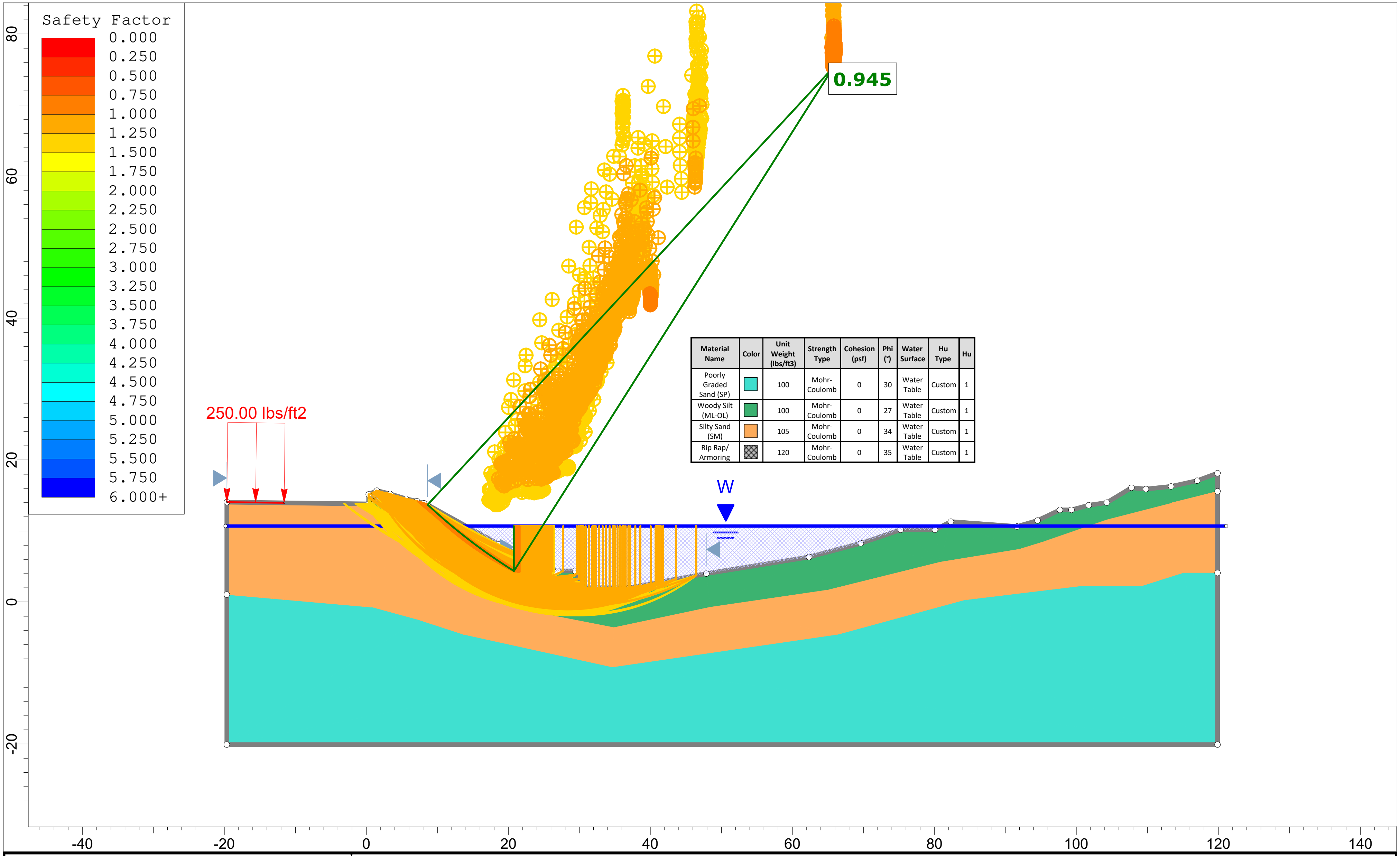
SLIDEINTERPRET 9.038

| | |
|---|---|
| *Project* | Slide2 - An Interactive Slope Stability Program |

| | | | |
|---|---|---|---|
| *Group* | Section B-B' -Dredge Cut | *Scenario* | Dredge Cut- MLLW |
| *Drawn By* | | *Company* | |
| *Date* | 4/18/2025, 10:12:39 AM | *File Name* | JeldWenXS_Updated.slmd |



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Water Surface | Hu Type | Hu |
|---|---|---|---|---|---|---|---|---|
| Poorly Graded Sand (SP) | 🟦 | 100 | Mohr-Coulomb | 0 | 30 | Water Table | Custom | 1 |
| Woody Silt (ML-OL) | 🟩 | 100 | Mohr-Coulomb | 0 | 27 | Water Table | Custom | 1 |
| Silty Sand (SM) | 🟧 | 105 | Mohr-Coulomb | 0 | 34 | Water Table | Custom | 1 |
| Rip Rap/ Armoring | ▨ | 120 | Mohr-Coulomb | 0 | 35 | Water Table | Custom | 1 |

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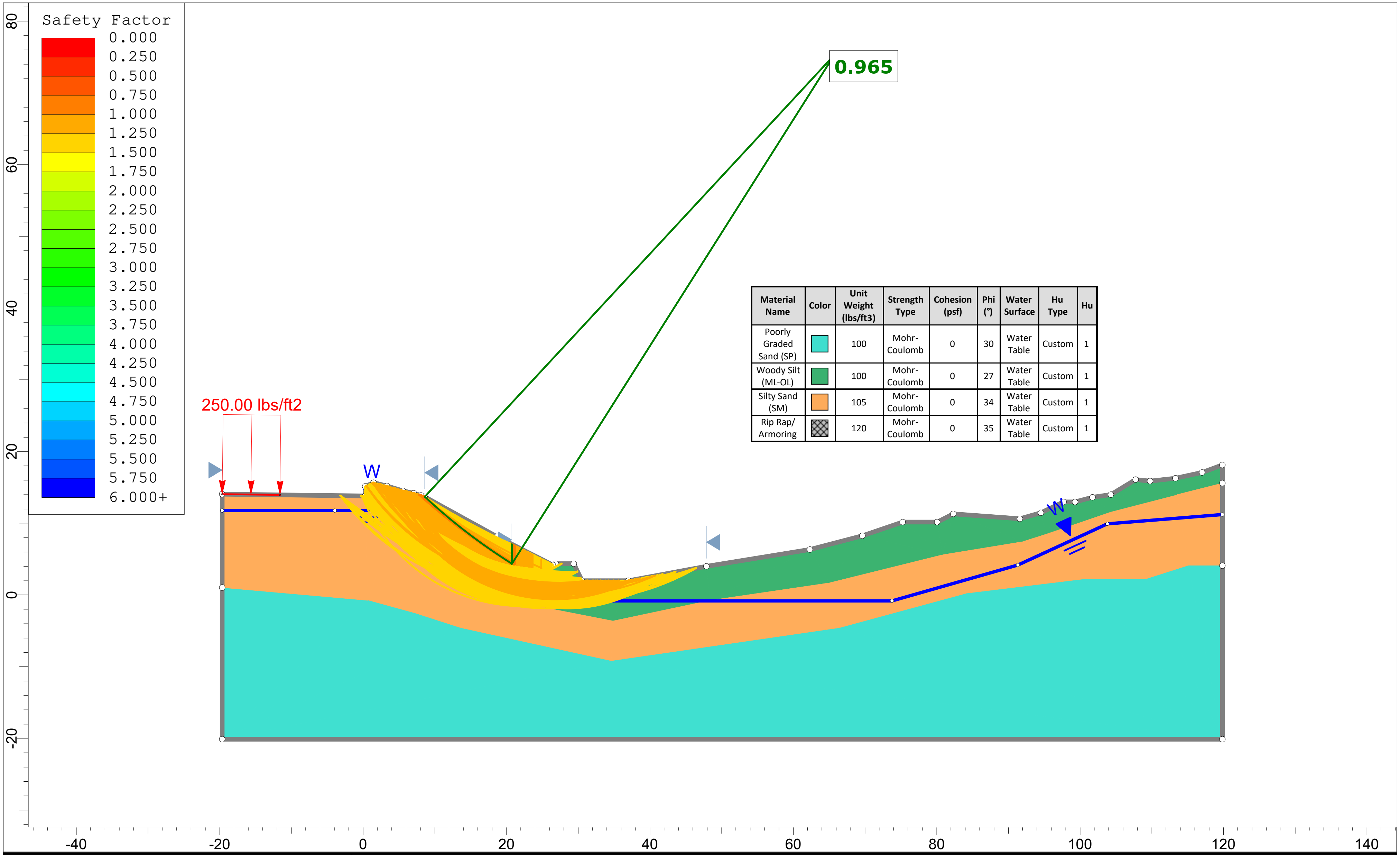
SLIDEINTERPRET 9.038

| | | | |
|---|---|---|---|
| *Project* | Slide2 - An Interactive Slope Stability Program | | |
| *Group* | Section B-B' -Cut and Cap | *Scenario* | Cut and Backfill- MHHW |
| *Drawn By* | | *Company* | |
| *Date* | 4/18/2025, 10:12:39 AM | *File Name* | JeldWenXS_Updated.slmd |



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Water Surface | Hu Type | Hu |
|---|---|---|---|---|---|---|---|---|
| Poorly Graded Sand (SP) | 🟦 | 100 | Mohr-Coulomb | 0 | 30 | Water Table | Custom | 1 |
| Woody Silt (ML-OL) | 🟩 | 100 | Mohr-Coulomb | 0 | 27 | Water Table | Custom | 1 |
| Silty Sand (SM) | 🟧 | 105 | Mohr-Coulomb | 0 | 34 | Water Table | Custom | 1 |
| Rip Rap/ Armoring | ▨ | 120 | Mohr-Coulomb | 0 | 35 | Water Table | Custom | 1 |

SLIDEINTERPRET 9.038

*Project*
Slide2 - An Interactive Slope Stability Program

*Group*
Section B-B' -Cut and Cap

*Scenario*
Cut and Backfill- MLLW

*Drawn By*

*Company*

*Date*
4/18/2025, 10:12:39 AM

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JeldWenXS_Updated.slmd

# Appendix C

# Coastal Engineering Analysis

DRAFT

1201 3rd Avenue, Suite 2600
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# Memorandum

June 19, 2025

To: Washington State Department of Ecology and JELD-WEN, Inc.

From: Sebastião Appleton Figueira, EIT; Alyssa Cannon; and Ryan Burke, PE, Anchor QEA

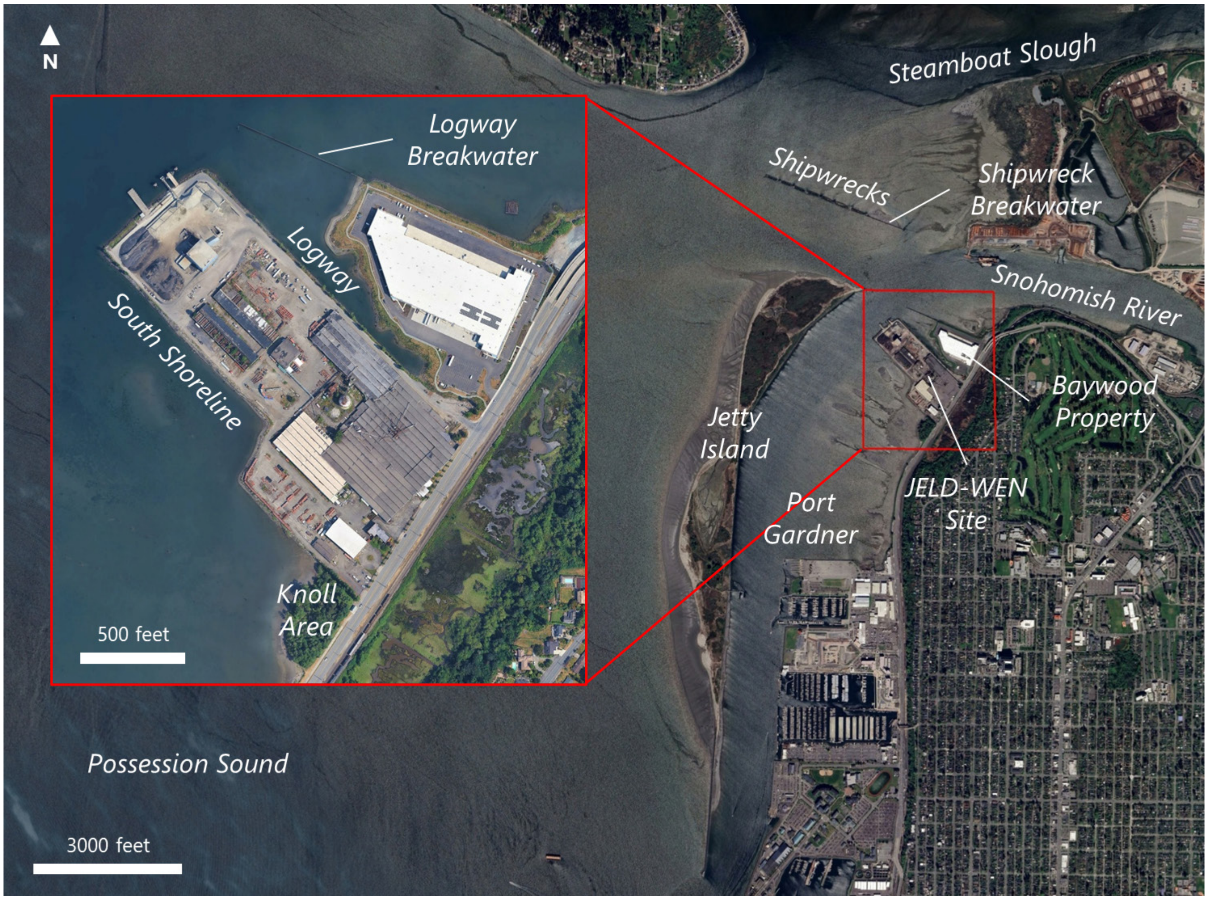
cc: Gavin Casson, Anchor QEA

**Re: JELD-WEN Site Coastal Engineering Analysis**

## Overview

This memorandum summarizes the coastal engineering analysis supporting the shoreline armoring and marine sediment capping design at the JELD-WEN Site (Site) at 300 West Marine View Drive, Everett, Washington, 98201. The analysis considers wind-driven wave generation, sea level rise (SLR), and projected flood conditions to develop conservative rock sizing recommendations for shoreline armoring and engineered caps. The Site is at the confluence of the Snohomish River to the north and Port Gardner Bay (Possession Sound) to the west. Figure 1 shows the location of the Site and the surrounding area.

**Figure 1**
**Project Site Location**



Source: Google Earth (detailed view: May 2025; background map: April 2024).

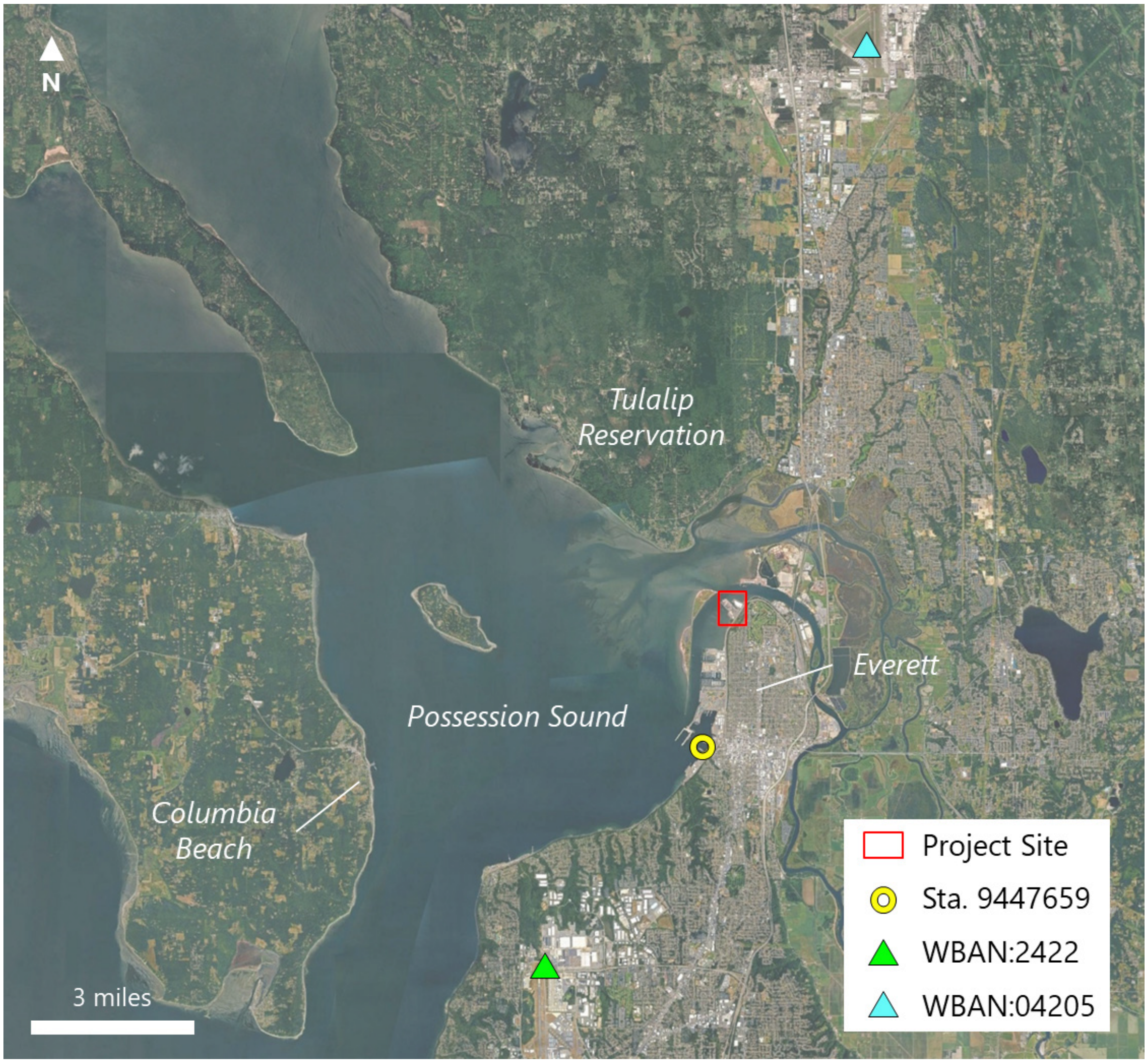
The marine portions of the Site have been divided into three subareas (i.e., the Logway, South Shoreline, and Knoll Area) based on their physical location, characteristics, and cleanup actions (Figure 1). The Logway is defined as the channel along the northern edge of the property boundary, separating the Site and the neighboring Baywood property. The Logway is a tidally influenced, narrow, flat inlet bordered landward with a steep armored slope. Engineered caps and shoreline armoring are proposed in the Logway. The South Shoreline is defined as the marine area along the Site's southern shoreline, and shoreline armoring is being considered for this shoreline. The Knoll Area is an approximately 2-acre vegetated knoll at the southern end of the Site and is not addressed in this analysis.

The purpose of this analysis is to estimate wind-driven wave impacts on the shoreline and proposed sediment caps under present and future sea levels and define coastal engineering design criteria for the Site. Anchor QEA developed a stationary wind-wave model to assess Site-specific wave exposure under varying water levels and wind conditions using guidance from the Washington State Department of Ecology (Ecology; Asher et al. 2017) climate resilience framework. The results of this analysis were used to determine appropriate stone sizing using guidance from the Coastal Engineering Manual (CEM; USACE 2002).

## Coastal Setting

The Site is situated within tidal flats at the confluence of the Snohomish River to the north and Port Gardner Bay (part of Possession Sound) to the west. Although no water level gauges are located directly at the Site, the National Oceanic and Atmospheric Administration (NOAA) tidal station in Everett (Station No. 9447659) provides representative datums (NOAA 2025a; see Figure 2). Wind data were collected from the National Centers for Environmental Information (NCEI) wind gauges at the Everett Snohomish County Airport, Washington (WBAN: 24222; NOAA 2025b) and Arlington Municipal Airport, Washington (WBAN:04205; NOAA 2025c). The Site is potentially exposed to wave energy generated across the long fetch of Possession Sound, as well as from shorter fetches within Port Gardner Bay and the Snohomish River. Projected SLR data for the Site under Representative Concentration Pathways (RCP) 4.5 and 8.5 scenarios are available through the Washington Coastal Hazards Resilience Network’s visualization tool (Lavin et al. 2018).

**Figure 2**
**Tide and Wind Stations**



Source: Google Earth (May 2025).

## Water Levels

Tidal datums for the area were sourced from the NOAA Tides and Currents database, Tidal Station 9447659: Everett (NOAA 2025a). In addition to tidal data, this analysis also accounts for extreme water levels from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map for Snohomish County, Washington (FEMA 2020). The Site is in an AE-designated zone with a base flood elevation (BFE) or 100-year water level of +15.03 feet mean lower low water (MLLW) (+13.00 feet North American Vertical Datum of 1988 [NAVD88]). Table 1 lists the tidal datums and water levels of interest to this analysis relative to MLLW and NAVD88 for the current 19-year tidal epoch from 1983 to 2001.

### Table 1
### Potential Water Levels at the Site

| Water Level | Elevations Relative to MLLW | | Elevations Relative to NAVD88 | |
|---|---|---|---|---|
| | Feet | Meters | Feet | Meters |
| FEMA BFE | 15.0 | 4.6 | 13.0 | 4.0 |
| MHHW | 11.1 | 3.4 | 9.0 | 2.8 |
| MSL | 6.5 | 2.0 | 4.5 | 1.4 |
| MLLW | 0.0 | 0.0 | -2.0 | -0.6 |

Notes:
MHHW: mean higher high water
MSL: mean sea level

Asher et al. (2017), prepared for Ecology, provides guidelines to assess the vulnerability of a project site to several risk factors related to climate change, namely flooding, wildfire, landslide and erosion, drought, and SLR. The SLR memorandum prepared for this project (Anchor QEA 2020) designated the project as a long-term or high-risk remedial site that requires the consideration of SLR at the high end of the projections assumed for the end of the century, as well as inundation under both the BFE and mean higher high water (MHHW; Table 1).

The Washington Coastal Hazards Resilience Network's visualization tool (Lavin et al. 2018) was used to access SLR data for Snohomish County. The tool includes SLR projections for RCPs 4.5 and 8.5. RCP 4.5 is a low estimate in which greenhouse gas estimates stabilize by mid-century and decrease thereafter. RCP 8.5 is a high scenario in which there is a continued increase in greenhouse gases until the end of the twenty-first century. Table 2 summarizes the low and high estimates of relative SLR applicable to the Site.

### Table 2
### Projected Feet of SLR Relative to Percent Likelihood for Low (RCP 4.5) and High (RCP 8.5) Scenarios

| Year | Low (RCP 4.5) Percent Likelihood | | | | | High (RCP 8.5) Percent Likelihood | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1% | 17% | 50% | 83% | 99% | 1% | 17% | 50% | 83% | 99% |
| 2030 | 0.6 | 0.5 | 0.4 | 0.2 | 0.1 | 0.6 | 0.5 | 0.4 | 0.3 | 0.1 |
| 2040 | 0.9 | 0.7 | 0.5 | 0.4 | 0.1 | 1.0 | 0.7 | 0.5 | 0.4 | 0.2 |
| 2050 | 1.3 | 0.9 | 0.7 | 0.5 | 0.2 | 1.4 | 1.0 | 0.8 | 0.5 | 0.2 |
| 2060 | 1.8 | 1.2 | 0.9 | 0.6 | 0.3 | 1.9 | 1.3 | 1.0 | 0.7 | 0.4 |
| 2070 | 2.3 | 1.5 | 1.1 | 0.8 | 0.3 | 2.5 | 1.6 | 1.3 | 0.9 | 0.5 |
| 2080 | 2.9 | 1.7 | 1.3 | 0.9 | 0.4 | 3.3 | 2.0 | 1.5 | 1.1 | 0.6 |
| 2090 | 3.5 | 2.0 | 1.5 | 1.0 | 0.4 | 4.0 | 2.4 | 1.8 | 1.3 | 0.7 |
| 2100 | 4.3 | 2.4 | 1.7 | 1.2 | 0.4 | 5.0 | 2.9 | 2.2 | 1.6 | 0.7 |
| 2110 | 5.0 | 2.7 | 1.9 | 1.3 | 0.4 | 5.6 | 3.1 | 2.3 | 1.7 | 1.0 |

| Year | Low (RCP 4.5) Percent Likelihood | | | | | High (RCP 8.5) Percent Likelihood | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1% | 17% | 50% | 83% | 99% | 1% | 17% | 50% | 83% | 99% |
| 2120 | 5.9 | 3.0 | 2.1 | 1.4 | 0.5 | 6.7 | 3.6 | 2.7 | 1.9 | 1.1 |
| 2130 | 6.7 | 3.3 | 2.3 | 1.5 | 0.4 | 7.8 | 4.1 | 3.0 | 2.1 | 1.1 |
| 2140 | 7.8 | 3.7 | 2.5 | 1.6 | 0.3 | 8.9 | 4.6 | 3.3 | 2.3 | 1.2 |
| 2150 | 8.7 | 4.0 | 2.7 | 1.7 | 0.4 | 10.2 | 5.2 | 3.7 | 2.5 | 1.3 |

Notes:
Orange shading represents the likely range of SLR estimates suggested by Miller et al. (2018).
Blue shading represents the selected SLR scenario for this analysis.

Miller et al. (2018) states that the likely range of SLR is considered to fall between 83% and 17%. In this case, by 2100, SLR could reach 1.6 to 2.9 feet (0.49 to 0.88 meters) under RCP 8.5, which are shaded in orange in Table 2. Due to the high-risk categorization of the Site determined using Ecology guidance, at a minimum, the upper end of this range should be considered. Rather than accounting solely for the end-of-century estimate, this coastal engineering analysis will account for the 100-year SLR estimate using the RCP 8.5 50% likelihood estimate for 2130 of 3.0 feet (0.91 meters), shaded in blue in Table 2.

## Winds

Wind data for the area were sourced from the NOAA NCEI online climate database. The Site lies between two wind stations: Everett Snohomish County Airport, Washington (WBAN:24222), and Arlington Municipal Airport, Washington (WBAN:04205). Both stations had a 20-year period of record from January 2005 to present. However, the Arlington Municipal Airport station is farther inland and east of the densely wooded Tulalip Reservation, so the Everett Snohomish County Airport station was selected for further analysis.

To estimate extreme winds, the annual maximum series method was applied by extracting the highest recorded wind speeds for each year within eight directional wind bins. A generalized extreme value distribution was then fitted to the data to predict wind speeds corresponding to various return periods. Figure 3 shows the resulting wind rose, and Table 3 lists the return-period winds for the Everett Snohomish County Airport station.

## Figure 3
## Everett Snohomish County Airport Wind Rose

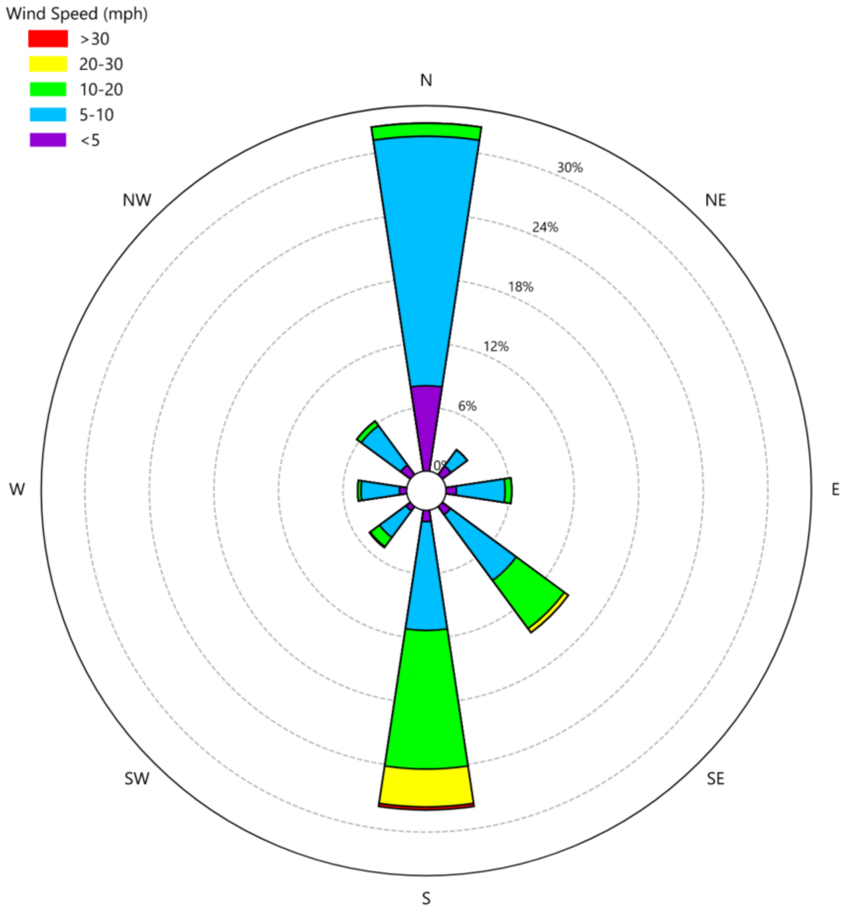


**Table 3**
**Return-Period Winds for Everett Snohomish County Airport, Washington (WBAN:24222)**

| Direction (degrees) | 1 Year (mph) | 2 Year (mph) | 10 Year (mph) | 20 Year (mph) | 50 Year (mph) | 100 Year (mph) |
|---|---|---|---|---|---|---|
| 0 | 12.6 | 15.3 | 17.5 | 18.2 | 19.0 | 19.6 |
| 45 | 7.6 | 10.7 | 13.3 | 14.1 | 15.0 | 15.6 |
| 90 | 8.7 | 16.9 | 20.9 | 22.4 | 24.3 | 25.8 |
| 135 | 17.4 | 23.4 | 31.5 | 34.5 | 38.1 | 40.6 |
| 180 | 30.3 | 37.8 | 44.0 | 46.0 | 48.2 | 49.7 |
| 225 | 15.8 | 25.0 | 32.4 | 34.8 | 37.5 | 39.3 |
| 270 | 13.7 | 15.7 | 20.4 | 22.5 | 25.2 | 27.2 |
| 315 | 12.3 | 16.4 | 19.8 | 20.9 | 22.1 | 23.0 |

Notes:
Only the 100-year return-period winds were used for wave estimation.
mph: mile per hour

Analysis of the station's wind records revealed that the predominant wind direction originated from the northern and southern bins. However, wind-induced wave generation is highly dependent on fetch length, or the distance over which wind blows uninterrupted across a body of water. The Site is exposed to wave energy generated from the west-northwest (285°) across the long fetch of Possession Sound, as well as from shorter fetches within Port Gardner and the Snohomish River originating from south-southwest (202.5°). Additionally, Jetty Island provides typical protection from direct wave action originating from the west; however, at the FEMA BFE, portions of Jetty Island are anticipated to be inundated, which could diminish its protective capacity. To account for future events, as per Ecology guidelines, this coastal engineering analysis will use the 100-year return-period winds originating from the west-northwest (WNW) and south-southwest (SSW) for all water level conditions, and an additional scenario with wind originating from the west (W; 270°) for the FEMA BFE. The corresponding wind speeds are shaded in Table 3.

## Topography/Bathymetry

Topographic and bathymetric data for the analysis in this study were gathered from various sources, as outlined in Table 4. Four topography and bathymetry datasets were available for the Site and surrounding region. Anchor QEA conducted Light Detection and Ranging (LiDAR) and multibeam echosounder (MBES) surveys of the Site's northern and southern shoreline in November 2024. The U.S. Army Corps of Engineers (USACE) public hydrographic survey data (USACE 2024) was used for the Snohomish River ship channel, and the NOAA Continuously Updated Digital Elevation Model (CUDEM; NOAA 2025d) was used for the remaining areas surrounding the Site.

**Table 4**
**Bathymetric and Topographic Sources**

| Source | Date Collected | Description |
|---|---|---|
| NOAA CUDEM | Varies, accessed March 2025 | Continuously updated coarse resolution bathymetry data |
| USACE hydrographic survey | April 4, 2024 | Hydrographic survey of the Snohomish River ship channel |
| Anchor QEA North Survey (LiDAR and MBES) | November 15 and 18, 2024 | Northern shoreline of Site |
| Anchor QEA South Survey (LiDAR) | November 15 and 18, 2024 | Southern shoreline of Site |

## Wave Model

A 2D wind-wave growth model was developed with the 2D Delft3D-WAVE (WAVE) model to simulate wind-generated waves and their propagation to the Site. The WAVE model is based on the Simulating Waves Nearshore (SWAN) wave model. The SWAN model simulates depth-induced wave refraction and shoaling, depth- and steepness-induced wave breaking, diffraction, wave growth from wind input, and wave-wave interaction(Deltares 2025). The model was forced with a uniform water level and steady extreme wind conditions, defined by a fixed wind magnitude and direction. Wave generation and propagation were driven purely by the applied wind forcing under stationary conditions.

This model relies on inputs using the international system of units, so the metric system will be used to describe model setup and inputs.

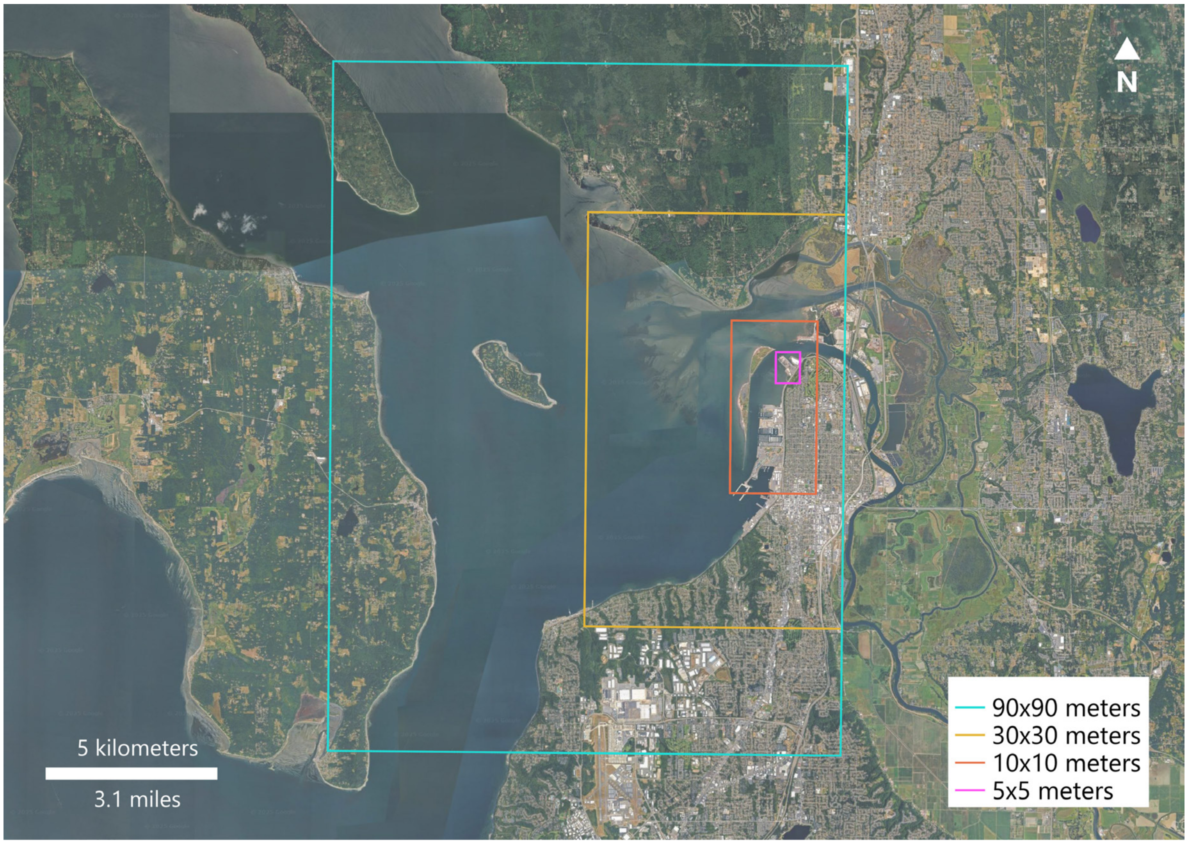
### Model Development

A series of nested WAVE grids with variable resolution were developed for the overall model domain. The resolution of the nested wave grids starts at 90 by 90 meters in the far-field region and transitions incrementally down to 5 by 5 meters in the vicinity of the Site. The higher resolution near the Site was developed to adequately represent the existing conditions. Table 5 outlines the resolution of the nested grids, and Figure 4 shows them spatially.

**Table 5**
**Nested WAVE Grid Resolution**

| Grid Resolution (meters) | Description |
|---|---|
| 90 by 90 | Possession Sound |
| 30 by 30 | Shallow areas of the Possession Sound and Steamboat Slough delta |
| 10 by 10 | Port Gardner Bay, Snohomish River, and major inlets |
| 5 by 5 | Project Site |

**Figure 4**
**Nested WAVE Grids**



Bathymetric and topographic data for the Delft3D model were gathered from various sources, as outlined in the Coastal Setting section. The data were converted into meters NAVD88 and assimilated to develop a model surface encompassing the full grid extents. The shipwrecks found north of the Site were not present in the existing bathymetric data, so they were manually added to the model surface by creating polygons with a set elevation of 3.0 meters NAVD88 (slightly above MHHW). Two wooden breakwaters were also identified near the Site—one extending from the shipwrecks and another constricting the Logway Inlet—neither of which were represented in the existing bathymetric data. It was assumed that these breakwaters will be maintained in the future and, accordingly, were included in the modeled conditions for this analysis.

No information was available regarding the design or cross section of the breakwaters, so a visual analysis was conducted using Google Earth imagery to approximate input characteristics. The two breakwaters were added to the model domain as obstacles with a crest height of 3.0 meters NAVD88. To account for wave transmission and reflection, the breakwaters were modeled as vertical thin walls with reflection coefficients selected based on their apparent porosity using methodology set forth by Allsop and Hettiarachchi (1989) for reflection off of single wave screens.

Figure 5 shows the overall model surface developed for this analysis, and Table 6 outlines the input characteristics selected for each breakwater.

**Figure 5**
**Model Surface (meters NAVD88) and Obstacles**

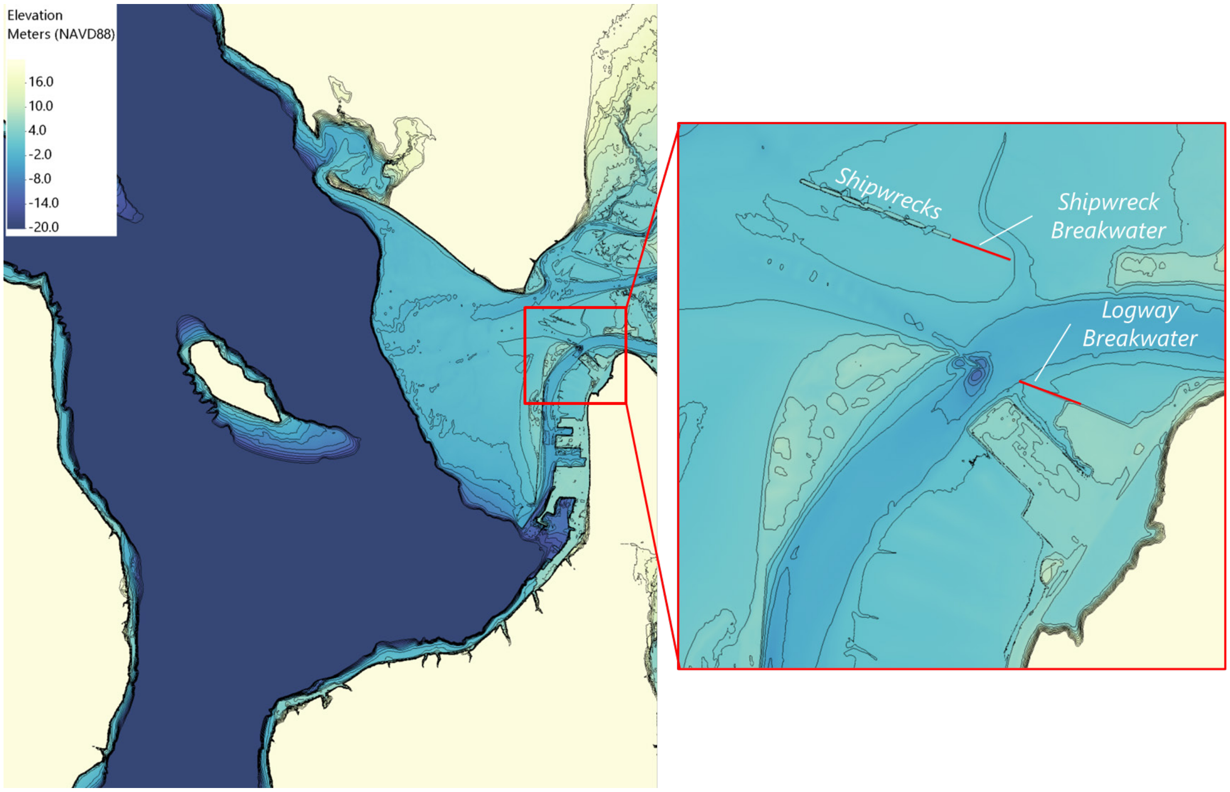


**Table 6**
**Obstacle Characteristics**

| Obstacle | Crest Height (meters NAVD88) | Obstacle Type | Reflection Coefficient |
|---|---|---|---|
| Shipwreck breakwater | 3.0 | Vertical thin wall | 0.3 |
| Logway breakwater | 3.0 | Vertical thin wall | 0.4 |

Note:
The obstacle type is used by the model to define a transmission coefficient based on the water depth, crest height, and incoming wave height using methodology developed by Goda et al. (1967). Hence, the transmission coefficient changes based on the input conditions, while the reflection coefficient remains constant.

## Model Scenarios

The stationary wave model requires an input water level and wind case for analysis. As discussed in the Coastal Setting section, Ecology requires the consideration of SLR and inundation under both the BFE and MHHW for long-term or high-risk sites. Hence, the water levels selected were MHHW,

MHHW with 100 years of SLR, BFE, and BFE with 100 years of SLR. To account for future events per Ecology guidelines, the model will use 100-year return-period winds originating from WNW and SSW for all water level conditions, and an additional scenario with wind originating from W for the BFE and BFE with SLR scenarios. Table 7 lists the 10 resulting model scenarios.

**Table 7**
**Model Scenarios**

| Scenario | WSE Case | Water Level (meters NAVD88) | Return-Period Wind Case | Wind Direction (degrees) | Wind Speed (m/s) |
|---|---|---|---|---|---|
| 1 | MHHW | 2.8 | WNW 100 year | 285.0 | 12.2 |
| 2 | MHHW | 2.8 | SSW 100 year | 202.5 | 22.2 |
| 3 | MHHW + SLR | 3.7 | WNW 100 year | 285.0 | 12.2 |
| 4 | MHHW + SLR | 3.7 | SSW 100 year | 202.5 | 22.2 |
| 5 | FEMA BFE | 4.0 | WNW 100 year | 285.0 | 12.2 |
| 6 | FEMA BFE | 4.0 | SSW 100 year r | 202.5 | 22.2 |
| 7 | FEMA BFE | 4.0 | W 100 year | 270.0 | 12.2 |
| 8 | FEMA BFE + SLR | 4.9 | WNW 100 year | 285.0 | 12.2 |
| 9 | FEMA BFE + SLR | 4.9 | SSW 100 year | 202.5 | 22.2 |
| 10 | FEMA BFE + SLR | 4.9 | W 100 year | 270.0 | 12.2 |

Notes:
WSE: water surface elevation
m/s: meter per second

## Model Results

Observation points were set around the northern and southern shorelines of the Site to collect significant wave heights and periods for each model scenario (Figure 6). Of the 26 observation points, six were found within the areas where the Site may require shoreline armoring or capping. Points N3, N6, and N8 were selected for the Logway, and points S4, S7, and S8 were selected for the South Shoreline. Table 8 lists the highest resulting wave heights and periods across all scenarios for each input water surface elevation at the six observation points.

**Figure 6**
**Observation Points**

**Table 8**
**Model Results**

| Observation Point | WSE Case | Return-Period Wind Case | Significant Wave Height (meters) | Wave Period (seconds) |
|---|---|---|---|---|
| N3 | MHHW | WNW 100 year | 0.2 | 1.5 |
| | MHHW + SLR | WNW 100 year | 0.3 | 1.6 |
| | FEMA BFE | WNW 100 year | 0.3 | 1.7 |
| | FEMA BFE + SLR | SSW 100 year | 0.4 | 1.6 |
| N6 | MHHW | WNW 100 year | 0.1 | 1.4 |
| | MHHW + SLR | WNW 100 year | 0.2 | 1.5 |
| | FEMA BFE | WNW 100 year | 0.2 | 1.5 |
| | FEMA BFE + SLR | SSW 100 year | 0.4 | 1.8 |
| N8 | MHHW | WNW 100 year | 0.1 | 1.3 |
| | MHHW + SLR | WNW 100 year | 0.1 | 1.4 |
| | FEMA BFE | WNW 100 year | 0.1 | 1.4 |
| | FEMA BFE + SLR | SSW 100 year | 0.3 | 1.7 |
| S4 | MHHW | SSW 100 year | 0.6 | 2.1 |
| | MHHW + SLR | SSW 100 year | 0.7 | 2.3 |
| | FEMA BFE | SSW 100 year | 0.8 | 2.3 |
| | FEMA BFE + SLR | SSW 100 year | 0.9 | 2.4 |
| S7 | MHHW | SSW 100 year | 0.6 | 2.0 |
| | MHHW + SLR | SSW 100 year | 0.6 | 2.1 |
| | FEMA BFE | SSW 100 year | 0.6 | 2.1 |
| | FEMA BFE + SLR | SSW 100 year | 0.8 | 2.4 |
| S8 | MHHW | SSW 100 year | 0.5 | 2.0 |
| | MHHW + SLR | SSW 100 year | 0.5 | 2.0 |
| | FEMA BFE | SSW 100 year | 0.6 | 2.1 |
| | FEMA BFE + SLR | SSW 100 year | 0.8 | 2.4 |

## Design/Rock Sizing

The results of the stationary wave model were used to define coastal engineering design criteria for shoreline armoring along select sections of the South Shoreline and Logway and capping for select sediment management areas in the Logway. The USACE CEM (USACE 2002) outlines a variety of empirical rock sizing methods for submerged, overtopped, and non-overtopped structures, all of which were analyzed for applicability for each of the design scenarios.

## Rock Sizing Methodology

This analysis requires a variety of rock sizing methods due to the variation in input water levels, resulting wave heights and periods, and rock structure geometry. The crest height of the revetment used for shoreline armoring was estimated to be 3.7 meters NAVD88 based on the LiDAR data collected by Anchor QEA in November 2024. The slope for the South Shoreline armoring is designed to be 3 horizontal to 1 vertical (H:V), and the slope for the Logway shoreline armoring is to be 3H:1V near point N6, but a steeper slope of 2H:1V is designed near point N8 due to spatial restrictions. The engineered cap elevation was set between 0.0 to 0.3 meters (0.0 to 1.0 foot) above existing ground.

For the shoreline armoring at the South Shoreline and Logway, a crest elevation of 3.7 meters NAVD88 requires rock sizing using methods for submerged structures for the FEMA BFE and BFE with SLR scenarios, overtopped structures for MHHW with SLR, and non-overtopped structures for MHHW.

For the engineered cap at the Logway, the Hydraulic Design of Flood Control Channels Manual (EM 1110-2-1601), as referenced in the CEM (USACE 2002), was considered for the analysis of "blanket stability in current fields." This method incorporates wave-induced bottom currents captured in the model output as orbital velocities at the seabed to evaluate the potential for sediment mobilization beneath the wave action. However, the resulting orbital velocities at the Logway were too small, and this method was deemed inapplicable. Instead, the methodology for rock sizing for submerged structures was employed.

The specific empirical rock sizing methods defined in the CEM (USACE 2002) applied to each scenario are listed in Table 9. These were chosen based on their applicability and level of conservatism.

**Table 9**
**Rock Sizing Methods**

| Armor Type | WSE Case | Rock Sizing Case | Selected Methodology from CEM |
|---|---|---|---|
| Shoreline armoring | MHHW | Non-overtopped | Hudson (1961) or Van der Meer (1988) shallow water (at higher ground elevations) |
| | MHHW + SLR | Overtopped | Average of Kramer and Burcharth (2004),<br>Van der Meer (1992), and Burcharth (2006) |
| | FEMA BFE | Submerged | Van der Meer (1992) |
| | FEMA BFE + SLR | | |
| Engineered cap | MHHW | Submerged | Van der Meer (1992) |
| | MHHW + SLR | | |
| | FEMA BFE | | |
| | FEMA BFE + SLR | | |

## Rock Sizing Design

The stable median rock diameter ($D_{50}$) sizes resulting from this analysis are listed in Tables 10, 11, and 12. The model scenarios were selected based on which water level and wind combination resulted in the highest wave heights at that point. This analysis ignores wave direction and assumes all waves propagate perpendicular to the structure.

**Table 10**
**South Shoreline Armoring**

| Observation Point | WSE Case | Return-Period Wind Case | $D_{50}$ (feet) | $D_{50}$ (inches) |
|---|---|---|---|---|
| S4 | MHHW | SSW 100 year | 0.69[a] | 8.3[a] |
| | MHHW + SLR | SSW 100 year | 0.92 | 11.0 |
| | FEMA BFE | SSW 100 year | 0.51 | 6.2 |
| | FEMA BFE + SLR | SSW 100 year | 0.46 | 5.5 |
| S7 | MHHW | SSW 100 year | 0.87[a] | 10.4[a] |
| | MHHW + SLR | SSW 100 year | 0.78 | 9.4 |
| | FEMA BFE | SSW 100 year | 0.40 | 4.8 |
| | FEMA BFE + SLR | SSW 100 year | 0.41 | 4.9 |
| S8 | MHHW | SSW 100 year | 0.57[a] | 6.9[a] |
| | MHHW + SLR | SSW 100 year | 0.66 | 7.9 |
| | FEMA BFE | SSW 100 year | 0.40 | 4.8 |
| | FEMA BFE + SLR | SSW 100 year | 0.40 | 4.8 |

Note:
a. Values were calculated using the Hudson equation.

**Table 11**
**Logway Shoreline Armoring**

| Observation Point | WSE Case | Return-Period Wind Case | $D_{50}$ (feet) | $D_{50}$ (inches) |
|---|---|---|---|---|
| N6 | MHHW | WNW 100 year | 0.13[a] | 1.5 [a] |
| | MHHW + SLR | WNW 100 year | 0.28 | 3.4 |
| | FEMA BFE | WNW 100 year | 0.15 | 1.8 |
| | FEMA BFE + SLR | SSW 100 year | 0.22 | 2.7 |
| N8 | MHHW | WNW 100 year | 0.15[a] | 1.8 [a] |
| | MHHW + SLR | WNW 100 year | 0.14[b] | 1.6[b] |
| | FEMA BFE | WNW 100 year | 0.09 | 1.1 |
| | FEMA BFE + SLR | SSW 100 year | 0.16 | 1.9 |

Notes:
Point N3 is found in an area that will not require shoreline armoring but does require capping.
a. Values were calculated using Van der Meer's shallow water equation (Van der Meer 1988).
b. Burcharth (2006) was not applicable under these conditions.

### Table 12
### Logway Engineered Cap Armoring

| Observation Point | WSE Case | Return-Period Wind Case | $D_{50}$ (feet) | $D_{50}$ (inches) |
|---|---|---|---|---|
| N3 | MHHW | WNW 100 year | 0.05 | 0.6 |
| | MHHW + SLR | WNW 100 year | 0.06 | 0.8 |
| | FEMA BFE | WNW 100 year | 0.06 | 0.8 |
| | FEMA BFE + SLR | SSW 100 year | 0.07 | 0.9 |
| N6 | MHHW | WNW 100 year | 0.03 | 0.4 |
| | MHHW + SLR | WNW 100 year | 0.04 | 0.6 |
| | FEMA BFE | WNW 100 year | 0.04 | 0.6 |
| | FEMA BFE + SLR | SSW 100 year | 0.07 | 0.9 |
| N8 | MHHW | WNW 100 year | 0.03 | 0.4 |
| | MHHW + SLR | WNW 100 year | 0.03 | 0.4 |
| | FEMA BFE | WNW 100 year | 0.03 | 0.4 |
| | FEMA BFE + SLR | SSW 100 year | 0.05 | 0.7 |

The results of this analysis indicate that the most conservative design conditions do not always correlate with the largest waves. The FEMA BFE and FEMA BFE with SLR fully submerge the structures, but the relatively deep water and small waves result in little impact to the structure itself. This is especially evident in the resulting rock sizing for the engineered cap; it is too deep to be severely impacted by any of the incident waves regardless of water surface elevation (WSE).

The design scenario selected for the South Shoreline armoring was the rock size resulting from the 100-year wind-induced waves originating from SSW at MHHW with SLR. Though conservative, this armor stone size accounts for future impacts and accommodates Ecology requirements. The design armor stone selected will have a $D_{50}$ of approximately 11 inches.

For the Logway, the shoreline armoring rock size resulting from the 100-year wind-induced waves originating from WNW at MHHW with SLR was selected. This armor stone would have $D_{50}$ of roughly 3 inches. A similar $D_{50}$ is recommended for the engineered cap at this location to be conservative. The Logway is shallow and protected, so coastal impacts may not be the leading design criteria for armor stone and engineered cap in this area of the Site. Additional analysis should be conducted to determine if runoff velocities resulting from existing stormwater outfalls would increase the recommended stone size.

## Bedding and Filter Layer

The shoreline armoring may require a bedding layer, and the engineered cap may require a filter layer between the armor stone and underlying sediment. The filter and bedding layer $D_{50}$ were defined using requirements from the CEM (USACE 2002).

For the South Shoreline armoring, the bedding layer should have a $D_{50}$ of 3 inches and can fit the same gradation as the armor stone for the Logway. For the Logway armoring and engineered cap, the bedding or filter layer should have a $D_{50}$ of 3/8 inches.

These stone sizes may be adjusted based on the size and availability of stone at local quarries.

# Conclusion

This memorandum summarizes the coastal engineering analysis supporting the shoreline armoring and sediment capping design at the JELD-WEN Site. The analysis considered wind-driven wave generation, SLR, and projected flood conditions to simulate wave loads using a stationary WAVE model. Wave heights and periods were used to develop conservative rock sizing recommendations for different Site features. The results indicate that future conditions with SLR will increase wave exposure at the Site, particularly along the South Shoreline. The final design will consider local quarry stone availability and may refine stone sizing based on constructability and Site-specific constraints.

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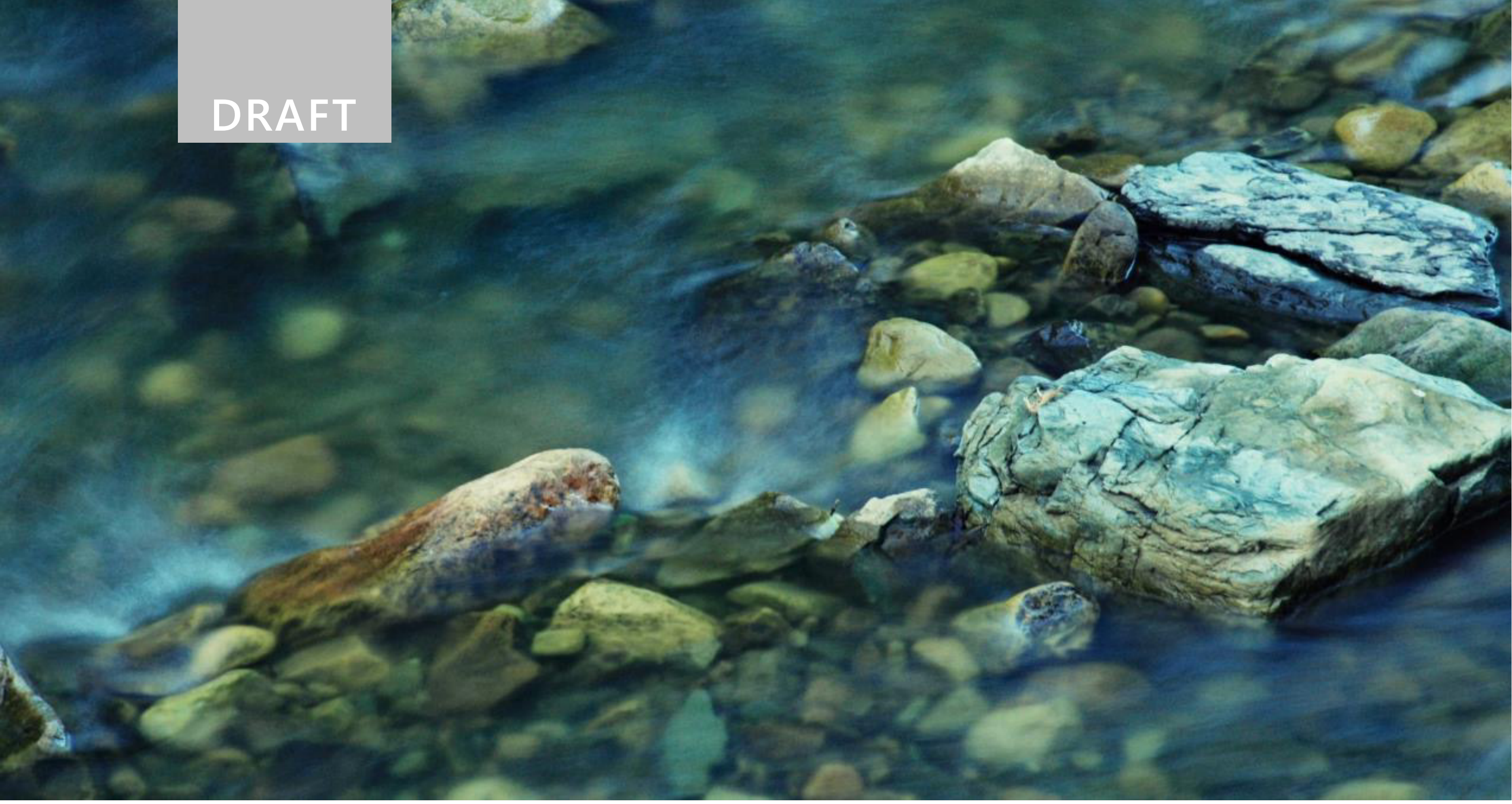
# Appendix D

# Preliminary Sediment Cap Chemical Isolation Layer Design Analysis


DRAFT

June 2025
JELD-WEN Site

# Preliminary Sediment Cap Chemical Isolation Layer Design Analysis

Prepared for Washington State Department of Ecology and JELD-WEN, Inc.

DRAFT

June 2025
JELD-WEN Site

# Preliminary Sediment Cap Chemical Isolation Layer Design Analysis

Project Number: 250909-01.01

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# ABBREVIATIONS

| | |
|---|---|
| µg/L | microgram per liter |
| cm | centimeter |
| cm/hr | centimeter per hour |
| cm/yr | centimeter per year |
| $cm^2/s$ | square centimeter per second |
| $cm^2/yr$ | square centimeter per year |
| COC | constituent of concern |
| D/F | dioxin/furan |
| EMNR | Enhanced Monitored Natural Recovery |
| $f_{OC}$ | fraction organic carbon |
| ft/day | foot per day |
| ft/ft | foot per foot |
| $g/cm^3$ | gram per cubic centimeter |
| hr | hour |
| $K_d$ | equilibrium partition coefficient |
| $K_{OC}$ | organic carbon partition coefficient |
| L/kg | liter per kilogram |
| L/T | length per time |
| ng/kg | nanogram per kilogram |
| Site | 300 West Marine View Drive, Everett, Washington, 98201 |
| TEQ | toxicity equivalence |
| USEPA | U.S. Environmental Protection Agency |
| $yr^{-1}$ | per year |

# 1 Introduction

This appendix to the Marine Engineering Design Report describes design evaluations of a sediment cap chemical isolation layer for the JELD-WEN Site at 300 West Marine View Drive, Everett, Washington, 98201 (Site). The Site is along the Snohomish River to the north and Port Gardner Bay (Possession Sound) to the west. Capping is specified as the remedial approach to address contaminated sediment in the logway portion of the Site, which is along the northern edge of the property (Figure 1). More specifically, the cleanup action specifies 2 feet of dredging followed by placement of an engineered cap in the logway portion of the Site to address dioxins/furans (Ds/Fs) in the sediment. D/F concentrations in this area exceed the sediment cleanup objective criterion of 5 nanograms per kilogram (ng/kg) dry weight on a total D/F toxicity equivalence (TEQ) basis.

**Figure 1**
**Site Map**

Notes
1. Aerial imagery: Esri (2022)
2. SMA-1 = surface sediment areas within the Marine Site Boundary <8 ng/kg dw D/F TEQ (u=1/2) and <117 ug/kg dw total PCBs (u=0)
3. SMA-2 = surface sediment areas exceeding the RALs for EMNR, 8 to 15 ng/kg dw D/F TEQ (u=1/2) and 117 to 130 ug/kg dw total PCB (u=0)
4. SMA-3 = surface sediment areas exceeding the RALs for capping/removal, 15 ng/kg dw D/F TEQ u=1/2 and 130 ug/kg dw total PCB (u=0)

This appendix describes chemical transport modeling conducted to evaluate the design of an engineered cap to address D/F in Site sediment. The modeling analyses described herein were performed in accordance with guidance on cap design set forth by the U.S. Environmental Protection Agency (USEPA), and the U.S. Army Corps of Engineers (Palermo et al. 1998) and the Interstate Technology and Regulatory Council (ITRC 2014, 2023). The primary goal of this modeling was to simulate the transport of dissolved-phase D/F compounds within an engineered cap to identify a chemical isolation layer design configuration (i.e., thickness and composition, including whether sorptive amendments would be included and, if so, the amounts) that would provide long-term effectiveness in limiting concentrations at the cap surface to which the aquatic food chain can be exposed.

# 2 Approach

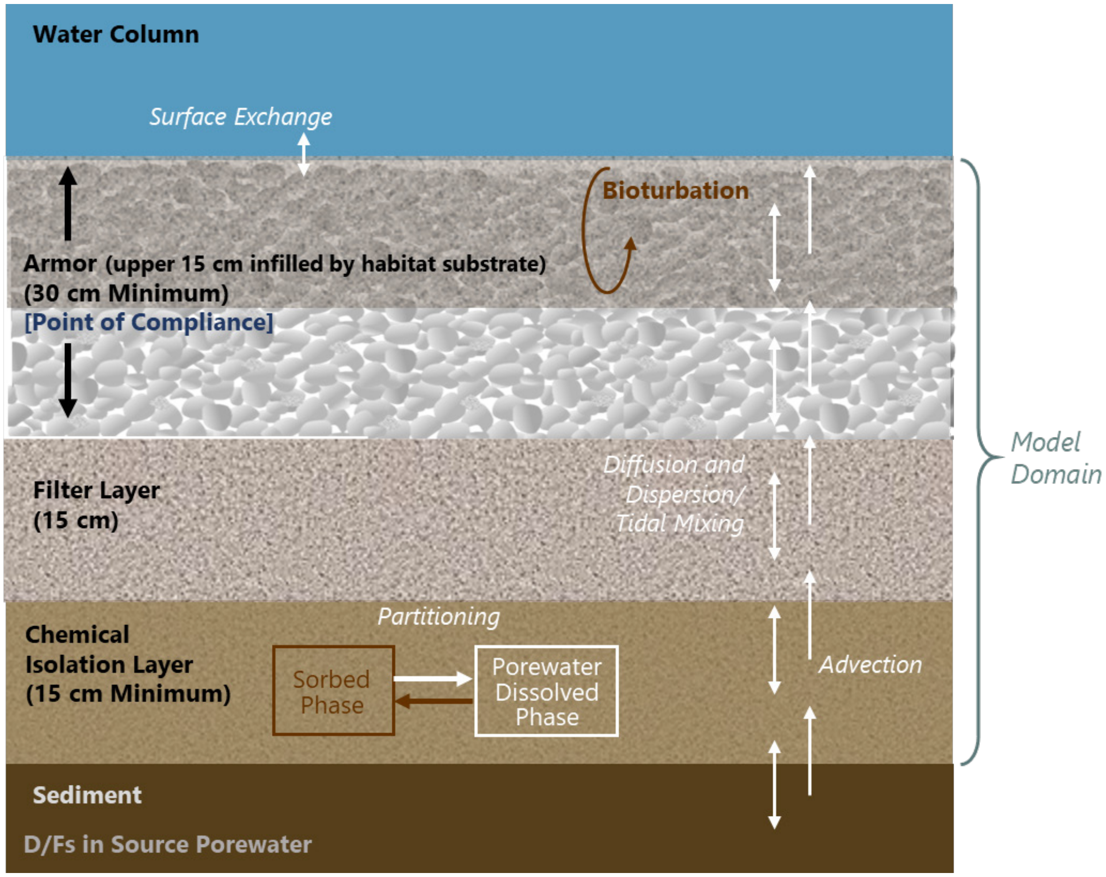
## 2.1 Model Framework

The widely used model of chemical transport within sediment caps, CapSim (version 4.2; Reible 2023), was used for this evaluation. This model simulates the time variable fate and transport of chemicals (dissolved and sorbed phases, including partitioning between these phases) under the processes of advection, diffusion/dispersion, biodegradation, bioturbation/bioirrigation, and exchange with the overlying surface water vertically within a sediment cap. Details on the model structure and underlying theory and equations are provided in Lampert and Reible (2009), Go et al. (2009), and Shen et al. (2018). CapSim and its predecessors have been used to support the evaluation and design of sediment caps at numerous domestic and international sites.

## 2.2 Model Domain and Layers

The model was configured to represent the presence of a multilayer cap placed atop the sediment surface. The cap design consisted of the following three basic layers, listed from top to bottom: 1) an armor stone layer to resist erosive forces; 2) a filter layer to prevent intermixing of the armor and chemical isolation layer materials; and 3) a chemical isolation layer to address dissolved-phase contaminant transport. Furthermore, as part of the Enhanced Monitored Natural Recovery (EMNR) remedy for the Site, a layer of sand is to be placed on top of the cap areas (in addition to being placed on top of sediment elsewhere at the Site). This sand layer, which will serve as habitat substrate, is expected to infill the armor stone. Figure 2 is a schematic showing the cap layers represented in the model and the processes simulated by the model.

**Figure 2**
**Cap Layer Represented in the Model and Processes Simulated**



Note: Not to scale

## 2.3 Design Target Concentrations and Compliance Depth

The vertical point of compliance for assessing cap performance is within the surface sediments and specifically within the biologically active zone. The biologically active zone is the depth in surface sediments where the species critical to the function, diversity, and integrity of the benthic community are located. As described in Ecology (2023), although most organisms burrow to a depth of 10 centimeters (cm), soft-shell crab have been identified in the tidal flat areas near the Site and can burrow as deep as 30 cm. In cap areas, where an armor layer is present, soft-shell crab are not likely to burrow as deep as they would in tidal flat muds. The rock would limit their burrow depth and in cap areas. That said, conservatively, the point of compliance at this Site is the top 30 cm. Model-predicted concentrations within the cap surface over time were compared to the 5 ng/kg total D/F TEQ criterion to evaluate protectiveness of candidate cap configurations. Each of the 17 D/F congeners that have a 2,3,7,8 substitution pattern was simulated by the model. The TEQ is calculated from the model-predicted concentrations of each congener multiplied by its toxic equivalency factor and then summed for comparison to the criterion. For the purposes of this evaluation, long-term cap effectiveness was based on maintaining model-predicted vertically averaged concentrations in the top 30 cm of the cap to values less than the design target for a minimum of 100 years.

# 3 Model Inputs

The model uses several input parameters that describe chemical-specific properties, cap material properties, and chemical mass transfer rates. These parameters are based on Site-specific data, information from literature, and experience with cap design at other similar sites. The model input parameters, the values used for this modeling assessment, and the source(s) from which they were derived are provided in Table 2. More details describing certain key model inputs are provided in Sections 3.1 through 3.3.

## Table 1
## Input Parameter Values for the Chemical Isolation Cap Model

| Model Input Parameter | Value | Data Source |
|---|---|---|
| **Chemical-Specific Properties** | | |
| Partitioning coefficient (L/kg) | See Table 2 | Literature-based $K_{OC}$ values from Aberg (2008). See Section 3.1 for more details. |
| Porewater D/F concentrations (µg/L) | See Table 3 | Sediment concentrations converted to porewater using equilibrium partitioning. See Section 3.2 for more details. |
| Molecular diffusivity ($cm^2/s$) | Varies by D/F congener, from $3.5 \times 10^{-6}$ to $4.6 \times 10^{-6}$ | Calculated based on the molecular weight of the chemical compound (i.e., individual D/F congeners) using the correlation identified from Schwarzenbach et al. (1993). The model calculates an effective diffusion coefficient using the chemical-specific input value for the molecular diffusivity multiplied by a tortuosity factor that is a function of the material porosity (Lampert and Reible 2009). |
| Chemical biodegradation rate ($yr^{-1}$) | 0 | Assumed no degradation |
| **Chemical Isolation Layer Properties** | | |
| Thickness (cm) | 15 | Design parameter; started with a chemical isolation layer thickness of 15 cm and increased, if necessary, to maintain predicted D/F TEQ concentrations in the top 30 cm of the cap less than the 5 ng/kg criterion |
| Dry bulk density ($g/cm^3$) | 1.6 | Calculated based on typical particle density of 2.6 $g/cm^3$ and porosity of 0.4 for sand (see next row) |
| Total porosity | 0.4 | Based on typical value of 0.4 for sand (e.g., Domenico and Schwartz 1990) |
| Fraction organic carbon of sand ($f_{OC}$; %) | 0.1 | A lower-bound estimate typically used to represent quarry sand in which sorption to mineral fractions can also occur (Karickhoff 1984; USEPA 2000) |
| **Filter Layer** | | |
| Thickness (cm) | 15 | Minimum thickness of the filter layer |
| Dry bulk density ($g/cm^3$) | 1.7 | Calculated based on typical particle density of 2.6 $g/cm^3$ and porosity of 0.35 (see next row) |
| Total porosity | 0.35 | Value for a sand/gravel filter layer (e.g., Domenico and Schwartz 1990) |

| Model Input Parameter | Value | Data Source |
|---|---|---|
| $f_{OC}$ (%) | 1% | A value of 1% in the top 30 cm (bioturbation zone) was selected based on experience from other sites and the assumption that, over time, the $f_{OC}$ at the cap surface will increase toward levels of the sediment. |
| **Lower Portion of Armor Layer** | | |
| Thickness (cm) | 15 | Lower half of a 30-cm-minimum thickness armor layer |
| Dry bulk density (g/cm$^3$) | 1.7 | Calculated based on typical particle density of 2.6 g/cm$^3$ and porosity of 0.30 (see next row) |
| Total porosity | 0.30 | Value for armor stone that is cobble-sized (e.g., Domenico and Schwartz 1990) |
| $f_{OC}$ (%) | 0.1% | A lower-bound estimate typically used to represent quarry material in which sorption to mineral fractions can also occur (Karickhoff 1984; USEPA 2000) |
| **Upper Portion of Armor Layer (Infilled by Habitat Substrate)** | | |
| Thickness (cm) | 15 | Upper half of a 30-cm-minimum thickness armor layer |
| Dry bulk density (g/cm$^3$) | 1.7 | Calculated based on typical particle density of 2.6 g/cm$^3$ and porosity of 0.35 (see next row) |
| Total porosity | 0.35 | Value for armor stone infilled with sand habitat substrate (placed as part of EMNR) or depositing sediment (e.g., Kamann et al. 2007) |
| $f_{OC}$ (%) | 1% | A value of 1% in the top 15 cm (bioturbation zone) was selected based on experience from other sites and the assumption that, over time, the $f_{OC}$ at the cap surface will increase toward levels of the sediment. |
| **Mass Transport Properties** | | |
| Boundary layer mass transfer coefficient (cm/hr) | 0.3 | Midpoint of range of values compiled from laboratory and field measurements reported in the literature (e.g., Thibodeaux et al. 2001) and values calibrated as part of models of sediment/water exchange at other sites (e.g., USEPA 2006) |
| Groundwater seepage rate (cm/yr) | 300 | Calculated based on a horizontal hydraulic gradient of 0.003 ft/ft (SLR and Anchor QEA 2021) and an upper-bound hydraulic conductivity of 10 ft/day (SLR 2025). See Section 3.3 for more details. |

| Model Input Parameter | Value | Data Source |
|---|---|---|
| Tortuosity factor for molecular diffusion | Millington and Quirk | Model uses an empirical relationship with porosity to calculate a tortuosity factor. The tortuosity factor is multiplied by the chemical-specific molecular diffusion coefficient to result in an effective diffusion coefficient associated with porous media flow. The Millington and Quirk (1961) relationship was used because it is applicable to granular (sand and gravel) materials. |
| Net sedimentation rate (cm/yr) | 0 | Conservatively, no net sedimentation was assumed in the model. That is, the model domain thickness was held constant. |
| Dispersion length (cm) | 9.0 | Dispersion length was assumed to be 20% of the domain length. An assumed domain length of 45 cm (1.5 feet) was used in this calculation. See Section 3.4 for more details. |
| Bioturbation depth (cm) | 15 | As described in Ecology (2023), soft-shell crab burrowing has been identified in tidal flats at the Site, which can extend as deep as 30 cm. However, in the cap areas where armor stone will be placed, the armor stone will limit the depth over which soft-shell crab can burrow, and they are not likely to burrow as deep as they would in tidal flat muds. Therefore, mixing due to bioturbation is limited to the top 15 cm. |
| Porewater biodiffusion coefficient ($cm^2$/yr) | 600 | Parameter represents the bioturbation rate applied to the dissolved phase; typical value for estuarine systems (e.g., Thibodeaux and Mackay 2011) |
| Particle biodiffusion coefficient ($cm^2$/yr) | 6 | Parameter represents the bioturbation rate applied to the particulate phase; typical value for estuarine systems (e.g., Thibodeaux and Mackay 2011) |
| Consolidation thickness (cm) and time (years) to reach 90% consolidation for underlying sediment | None | The effects of consolidation of sediment beneath the cap, which can result in an additional upward flux of porewater, were excluded. Dredging to accommodate the cap would occur prior to capping, so consolidation, if any, would be nominal. |

## 3.1 Partition Coefficients

Linear partitioning of chemicals between the dissolved and sorbed phases (i.e., between porewater and unamended cap material) is described in the model by the chemical-specific equilibrium partition coefficient ($K_d$). The partition coefficient is calculated in the model based on the customary $K_d = f_{OC} * K_{OC}$ approach (e.g., Karickhoff 1984), where $K_{OC}$ is the compound's organic carbon partition coefficient, and $f_{OC}$ is the organic carbon fraction of the solid phase (e.g., unamended cap material). Literature-based $K_{OW}$ values were obtained from Aberg et al. (2008) for the individual D/F compounds simulated in the model. Log $K_{OC}$ values were then calculated from the widely used Di Toro (1985) empirical relationship (log $K_{OC}$ = 0.00028 + (0.983 * log $K_{OW}$). These literature-derived $K_{OC}$ values are listed in Table 4.

**Table 2**
**Partition Coefficients Used in the Model**

| Chemical Name | Log $K_{OC}$ (log L/kg) |
|---|---|
| 1,2,3,4,6,7,8,9-OCDF | 7.7 |
| 1,2,3,4,6,7,8,9-OCDD | 8.2 |
| 1,2,3,4,6,7,8-HpCDF | 7.3 |
| 1,2,3,4,6,7,8-HpCDD | 7.9 |
| 1,2,3,4,7,8,9-HpCDF | 7.3 |
| 1,2,3,4,7,8-HxCDF | 6.9 |
| 1,2,3,4,7,8-HxCDD | 7.3 |
| 1,2,3,6,7,8-HxCDF | 6.9 |
| 1,2,3,6,7,8-HxCDD | 7.3 |
| 1,2,3,7,8,9-HxCDD | 7.3 |
| 1,2,3,7,8,9-HxCDF | 6.9 |
| 1,2,3,7,8-PeCDF | 6.5 |
| 1,2,3,7,8-PeCDD | 6.9 |
| 2,3,4,6,7,8-HxCDF | 6.9 |
| 2,3,4,7,8-PeCDF | 6.5 |
| 2,3,7,8-TCDF | 6.1 |
| 2,3,7,8-TCDD | 6.4 |

## 3.2 Porewater Concentrations

The constituent of concern (COC) concentrations of the porewater in sediment beneath the cap define the source term in the cap model. Porewater concentrations were calculated from bulk sediment contaminant concentrations using equilibrium partitioning formulae. Literature-derived $K_{OC}$

values (Table 2), sample-specific fraction organic carbon ($f_{OC}$) values[1], and sediment sample concentrations were used to calculate porewater concentrations for each individual D/F compound. Sediment core and surface composite samples were collected throughout the Site from 2009 through 2024. Sediment samples in the logway, offshore from the bulkhead wall, were used in the evaluation.

The maximum sediment concentration was observed at the head of the logway, and D/F concentrations generally decreased with distance from the head of the logway toward the Snohomish River. Concentrations in two areas defined by the marine Site boundary within the logway were evaluated: 1) the head of the logway; and 2) the outlet of the logway (see Figure 3).

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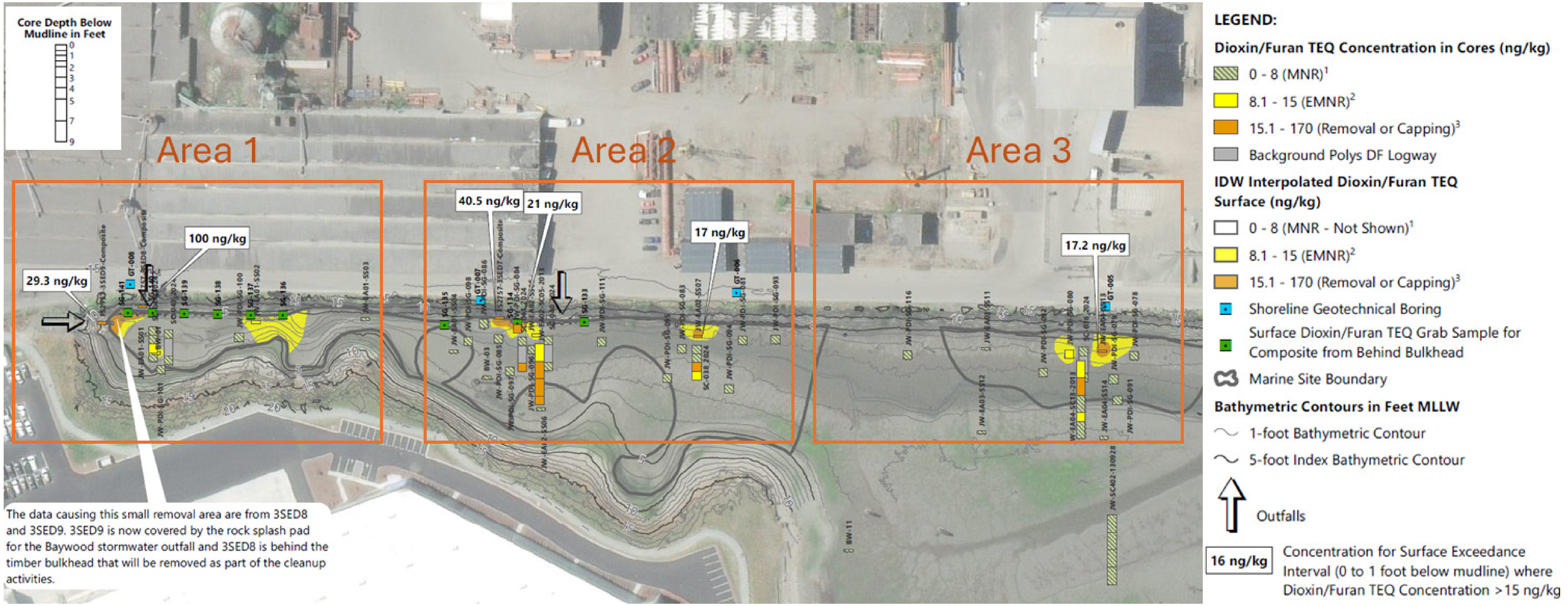
[1] Not all sediment samples were analyzed for $f_{OC}$. In these cases, because there was no clear trend in $f_{OC}$ with depth, the average $f_{OC}$ value of 3% was used for samples in which a measurement was missing.

**Figure 3**
**Evaluation Areas**



The data causing this small removal area are from 3SED8 and 3SED9. 3SED9 is now covered by the rock splash pad for the Baywood stormwater outfall and 3SED8 is behind the timber bulkhead that will be removed as part of the cleanup activities.

Conservatively, the maximum porewater concentration calculated from the full set of available sediment concentrations from each given area was selected for each individual D/F compound. Porewater concentrations are listed in Table 3.

**Table 3**
**Porewater COC Concentrations Used in the Model by Area**

| COC | Porewater Concentration (µg/L) | | |
|---|---|---|---|
| | Area 1 | Area 2 | Area 3 |
| 1,2,3,4,6,7,8,9-OCDF | 3.0E-06 | 5.7E-07 | 3.1E-07 |
| 1,2,3,4,6,7,8,9-OCDD | 1.9E-05 | 5.1E-06 | 9.4E-07 |
| 1,2,3,4,6,7,8-HpCDF | 1.8E-06 | 6.4E-07 | 4.2E-07 |
| 1,2,3,4,6,7,8-HpCDD | 2.2E-06 | 9.2E-07 | 2.5E-07 |
| 1,2,3,4,7,8,9-HpCDF | 8.0E-08 | 3.6E-08 | 1.7E-08 |
| 1,2,3,4,7,8-HxCDF | 1.1E-07 | 6.7E-08 | 4.3E-08 |
| 1,2,3,4,7,8-HxCDD | 2.9E-08 | 1.9E-08 | 1.5E-08 |
| 1,2,3,6,7,8-HxCDF | 9.1E-08 | 5.0E-08 | 5.1E-08 |
| 1,2,3,6,7,8-HxCDD | 1.8E-07 | 2.0E-07 | 1.1E-07 |
| 1,2,3,7,8,9-HxCDD | 1.0E-07 | 7.8E-08 | 3.6E-08 |
| 1,2,3,7,8,9-HxCDF | 4.7E-09 | 1.1E-08 | 5.1E-09 |
| 1,2,3,7,8-PeCDF | 4.5E-08 | 7.7E-08 | 3.9E-08 |
| 1,2,3,7,8-PeCDD | 2.9E-08 | 3.1E-08 | 2.6E-08 |
| 2,3,4,6,7,8-HxCDF | 6.5E-08 | 8.8E-08 | 8.7E-08 |
| 2,3,4,7,8-PeCDF | 6.9E-08 | 8.4E-08 | 1.0E-07 |
| 2,3,7,8-TCDF | 1.5E-07 | 2.7E-07 | 2.7E-07 |
| 2,3,7,8-TCDD | 1.2E-08 | 1.3E-08 | 1.7E-08 |
| 1,2,3,4,6,7,8,9-OCDF | 3.0E-06 | 5.7E-07 | 3.1E-07 |
| 1,2,3,4,6,7,8,9-OCDD | 1.9E-05 | 5.1E-06 | 9.4E-07 |
| 1,2,3,4,6,7,8-HpCDF | 1.8E-06 | 6.4E-07 | 4.2E-07 |
| 1,2,3,4,6,7,8-HpCDD | 2.2E-06 | 9.2E-07 | 2.5E-07 |
| Total D/F | 2.7E-05 | 8.3E-06 | 2.7E-06 |
| D/F TEQ | 1.8E-04 | 1.7E-04 | 1.5E-04 |

Notes:
Values are rounded to two significant figures.
As described in Section 2.3, individual D/F congeners were simulated by the model. Total D/F and D/F TEQ were not simulated in the model; these are included in this table for reference.

## 3.3 Groundwater Seepage Rates

Seepage rates were calculated using data collected from upland monitoring wells adjacent to the Site. Seepage rate is expressed as a Darcy flux, with units of length per time (L/T), and was calculated from hydraulic gradient and hydraulic conductivity values estimated from data collected in upland monitoring wells using Equation 1.

**Equation 1**

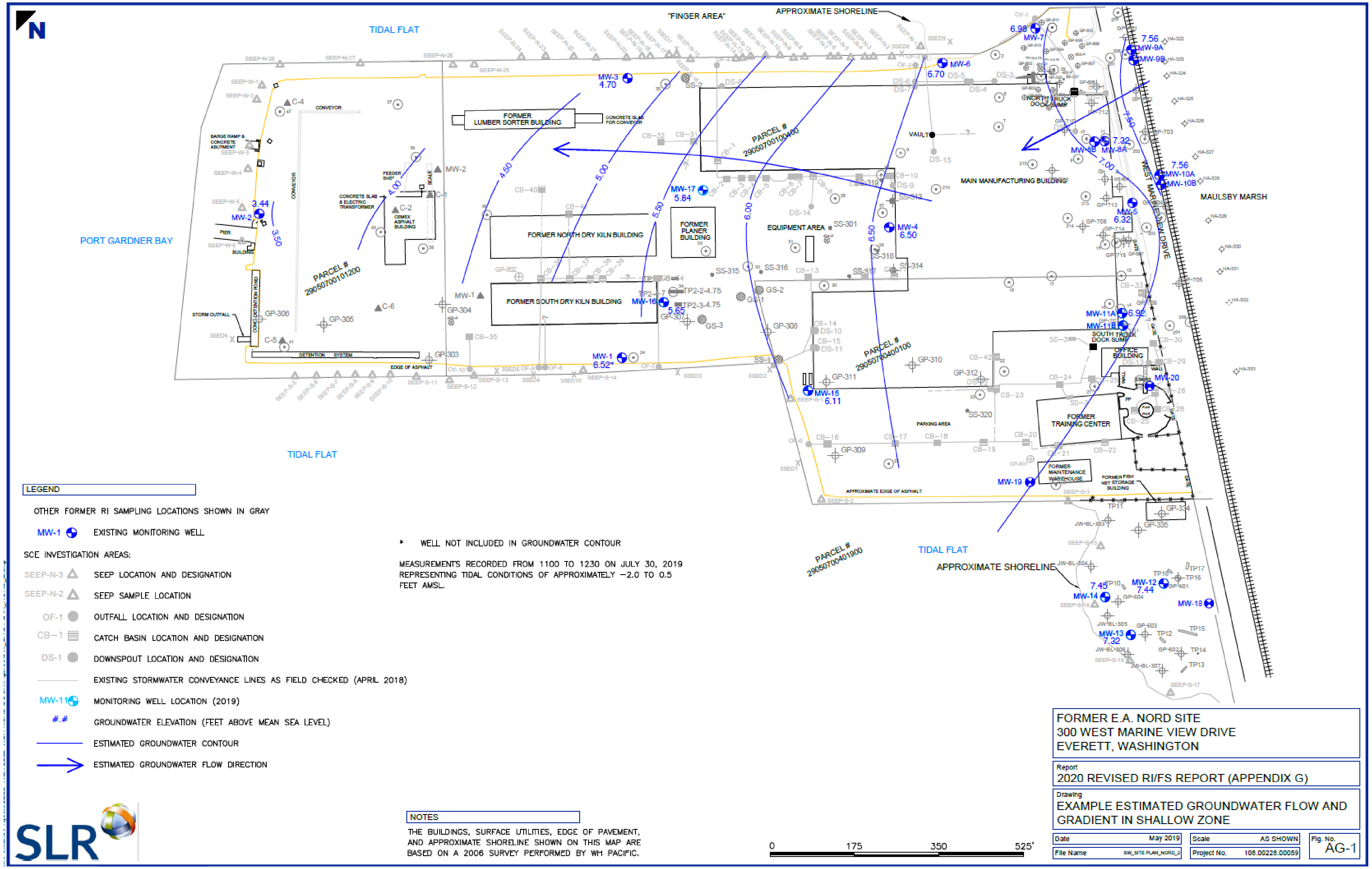
$$q = K \times i$$

where:

q = seepage rate (L/T)
K = hydraulic conductivity (L/T)
i = hydraulic gradient (L/L)

Based on the example groundwater contours shown in Figure 4, the horizontal hydraulic gradient from uplands to the offshore, including in the area between MW-9A and MW-7 toward the logway, is approximately 0.003 foot per foot (ft/ft).

**Figure 4**
**Example Groundwater Flow Contours**



Note: Figure AG-1 is from Appendix G of SLR and Anchor QEA (2021)

Slug tests were conducted in 2024 at wells MW-7 and MW-8A. Geometric mean hydraulic conductivities range from 2.8 to 30 feet per day (ft/day) for MW-7 and 0.11 to 0.60 ft/day for MW-8A, depending on the method used to interpret the slug test drawdown versus time curves. These two wells are located less than 300 feet away from one another; the order of magnitude difference in hydraulic conductivity between these two wells could indicate heterogeneity at the Site. Given the uncertainty in these values, an upper-end value of 10 ft/day was selected.

**Table 4**
**Summary of Hydraulic Conductivity Estimates from Slug Tests**

| Well | Statistic | Hydraulic Conductivity by Method (ft/day) | | | |
|---|---|---|---|---|---|
| | | Bouwer and Rice (1976) | Hvorslev (1951) | Dagan (1978) Partially Submerged | KGS Model (Hyder et al. 1994) |
| MW-7 | Geometric mean | 2.8 | 4.1 | 3.3 | 30 |
| | Minimum | 0.27 | 0.27 | 0.27 | 22 |
| | Maximum | 9.7 | 15 | 11 | 39 |
| MW-8A | Geometric mean | 0.11 | 0.16 | 0.13 | 0.60 |
| | Minimum | 0.020 | 0.020 | 0.020 | 0.33 |
| | Maximum | 0.42 | 0.54 | 0.45 | 1.1 |

Note:
Values are rounded to two significant figures.

Using Equation 1, the product of the hydraulic gradient of 0.003 ft/ft and a hydraulic conductivity of 10 ft/day results in a seepage rate of 300 centimeters per year (cm/yr; after applying unit conversions). This seepage rate reflects horizontal seepage (based on the horizontal hydraulic gradients). Groundwater, as it flows toward and through the sediment, will move vertically into the surface water, resulting in a lower seepage rate than the calculated horizontal Darcy flux as it spreads across the sloped surface of the tidal flats. Conservatively, the calculated horizontal seepage rate was used in the model to represent seepage in the sediment.

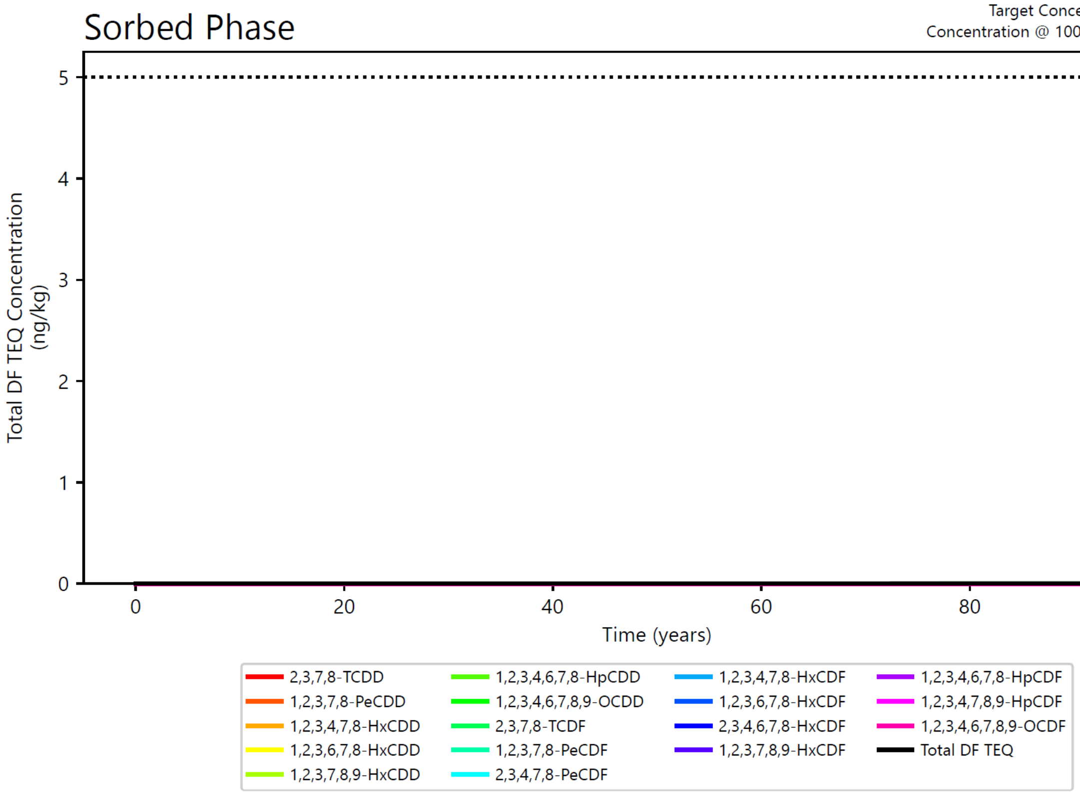
## 3.4 Dispersion Coefficient

Dissolved-phase transport within the cap may be influenced by tidal dynamics in the Snohomish River and Port Gardner Bay, which can result in twice daily fluctuations and even reversals in hydraulic gradient and seepage rates. At low tides, seepage rates are likely greater than the daily average, and at high tides, seepage rates are likely less than the daily average. These flow variations, when evaluated over longer timescales, can act as a mixing process for dissolved-phase constituents. Representing such tidal mixing with a dispersion coefficient is a common approach in groundwater modeling (e.g., La Licata et al. 2011). Dispersivity values for flow in porous media over relatively short distances (i.e., the scale of a cap) are typically in the range of 1% of the evaluation domain length (consistent with typical values recommended by Reible [2012]). Over very large scales, such as those associated with large groundwater plumes, dispersivity values are on the order of 10% of the evaluation domain length (Gelhar et al. 1992; Neuman 1990). The hydrodynamic dispersivity was set to a higher value of 20% of the cap thickness to represent hydraulic gradient variations and potential reversals from tidal fluctuations as a dispersion process. This dispersivity value (i.e., 20% of the domain length) is consistent with values used in the final cap designs conducted at other tidally influenced sites in the Pacific Northwest, such as the Former Portland Gas Manufacturing Site (on the Lower Willamette River just upstream of Portland Harbor, Oregon), where dispersivity was estimated based on the comparative strengths of tidal signals in hourly seepage meter measurements (Appendix C of Anchor QEA 2020), and Gloucester Harbor, Massachusetts, where dispersivity was derived from model calibrations to vertical profiles of salinity in porewater (Anchor QEA and GZA 2015; Reidy et al. 2015).

# 4 Model Results

The model was used to simulate the transport of D/Fs within a cap and assess the ability of a 6-inch sand chemical isolation layer with 0.1% $f_{OC}$ to maintain D/F TEQ concentrations in the top 30 cm of the overlying cap material (as a vertical average) less than the criterion of 5 ng/kg for more than 100 years. Model results show that concentrations in the top 30 cm of the cap are predicted to remain near zero for 100 years in each area evaluated. Model results for Area 1, which had the highest concentrations, are shown as an example in Figure 5.

**Figure 5**
**Model-Predicted Sorbed Phase Concentrations (Average over Top 30 cm of Cap) over the 100 Years Simulation in Area 1**



Note: The horizontal dotted line at 5 ng/kg represents the target concentration.

# 5 Summary

Numerical modeling was conducted to assess the design of engineered caps to address dissolved-phase D/F flux from logway sediment by evaluating the long-term performance of a cap's chemical isolation layer. Modeling was conducted with conservative assumptions (e.g., upper-end seepage rate [based on the upper-end range of hydraulic conductivity from slug tests] and maximum D/F concentrations). Modeling showed that a 6-inch sand chemical isolation layer with assumed 0.1% $f_{OC}$ is predicted to meet the criterion of 5 ng/kg D/F TEQ in the long term.

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# Appendix E

# Construction Best Management Practices

# 1 Appendix E: Construction Best Management Practices

This appendix presents construction best management practices (BMPs) that will be included in the project specifications. These BMPs will be deployed by the contractor, as needed, to address potential impacts associated with construction activities.

## 1.1 Water Quality Protection

- All activities below mean higher high water (e.g., debris removal, excavation, backfilling, capping, pile driving, and placement of riprap armoring) will be completed at low tide (in the dry) to the maximum extent practicable.
- If excavation work must be conducted below the water line, turbidity will be monitored to ensure construction activities are compliant with Washington State Surface Water Quality Standards (173-201A WAC) and the final Water Quality Monitoring Plan (if required). Water quality monitoring is not expected to be needed during work completed in the dry.

## 1.2 Construction Equipment Spill Control

The following BMPs will be employed to reduce the potential for spillage from construction equipment and to minimize the environmental impact of any spills:

- The contractor will prepare a spill prevention, control, and countermeasures plan and will have a spill kit on site, as well as a marine spill response contractor available on an on-call basis. These precautions will minimize the potential for petroleum products or other deleterious materials to enter surface waters.
- The National Response Center (1-800-424-8802) and the Washington Emergency Management Division (1-800-258-5990 OR 1-800-OILS-911) will be notified immediately if a spill occurs.
- The contractor will inspect fuel hoses, oil or fuel transfer valves, and fittings on a regular basis for drips or leaks to reduce the risk of spills in the surface water.
- On-site fueling of equipment will be limited to locations more than 200 feet from the shoreline.
- The contractor will be required to use environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and readily or inherently biodegradable to the maximum extent practicable.
- When wet materials are transported, haul trucks or containers will be lined or otherwise sealed to prevent release of soil or sediment during transport.

## 1.3 Barge Operations

Barges may be used to transport materials to and from the site or extract piling and debris during higher tides. It is possible that the construction contractor may determine that one or more barges are needed for barge-based equipment or material staging, depending on site conditions encountered and issues that may arise as the remedial design is refined. If this is required, the contractor will be required to moor and manage the barge to prevent grounding. The following BMPs may apply:

- Construction barges shall be restricted to use during tide elevations adequate to prevent grounding of the barge.
- Barge anchors shall not be placed in contaminated sediments or completed capping areas.
- Motorized vessel operation shall be restricted to tidal elevations adequate to prevent prop scour disturbance to the contaminated sediments or completed capping areas.
- Minimal propulsion power shall be used when maneuvering barges or other vessels to prevent prop scour disturbance to the contaminated sediments or completed capping areas.
- All barges transporting contaminated materials will be certified as sealed (watertight) and seaworthy by a marine inspector prior to barge use.
- Loading at the site and offloading at the contractor’s offload facility will occur over a spill plate so sediment or effluent is not dropped into the water.
  - The spill plate will have positive drainage to an easily accessible collection area so spills can be properly cleaned up and spilled sediment can be collected for appropriate disposal.
  - Spillage of sediment or debris during offloading will be promptly cleaned up. If uncontrolled spillage occurs, all offloading operations will cease until the spillage is contained and cleaned up.
  - Free water generated during offloading operations will be collected and treated as necessary to comply with water discharge regulations.
- Barges will be managed such that the contaminated material load does not exceed the capacity of the barge. The load will be placed in the barge to maintain an even keel and avoid listing.
- Haul barges will be loaded evenly to maintain barge stability.
- Once the barge is loaded and stabilized, it will be inspected for sediment adhered to the outside of the barge that could fall off the barge during transport. Contractor personnel will conduct a visual inspection around the entire barge deck area to remove such sediment before moving the barge off site.
- Barges leaving the site will be sealed such that no unfiltered discharge of water or suspended sediment occurs in the receiving waters.
- No petroleum products or other deleterious materials shall enter surface waters.

## 1.4 Excavation

Excavation operations have well-established BMPs to minimize potential recontamination and manage potential water quality impacts. Operational and engineering controls will be defined in the Construction Specifications and project permits, which the contractor will be required to implement.

### *1.4.1 Qualified Contractor*

Bidding contractors will need to meet minimum qualifications that demonstrate experience with projects similar in scope and complexity. Specific requirements will be provided in the construction bid documents. Typically, the contractor will need to demonstrate experience with soil and intertidal sediment excavation in the Pacific Northwest for similar projects (i.e., in-the-dry excavation in tidally influenced areas) within the last 5 to 7 years. In addition, the project superintendent will typically need to demonstrate similar experience. Contractors that cannot demonstrate experience may not be considered responsive to the bid.

### *1.4.2 Real-Time Positioning*

The contractor will be recommended to use real-time positioning controls such as a differential global positioning system electronically displayed in the operator's cabin to provide real-time positioning control for the excavation and material placement equipment. Controlling the position of the excavation and material placement equipment will help accurately achieve the required excavation prism and placement thickness.

### *1.4.3 Minimizing Excavation Below the Water Surface*

The following BMPs will be employed during excavations:

- Excavation shall be conducted in the dry to the extent possible.
- Under no circumstances will excavated materials be stockpiled below the ordinary high water line.
- If work must be conducted in water, turbidity and other water quality parameters (if required) will be monitored in accordance with the requirements of the project Water Quality Certification.

## 1.5 Offloading, Staging, and Stockpile Area Management

Excavated material may be removed via haul truck or barge. BMPs for soil stockpile management and transloading include the following:

- Excess or waste materials will not be disposed of or abandoned waterward of mean higher high water or allowed to enter waters of the state.

- Erosion control measures for the offloading area and staging and stockpile area will be defined in the Construction Specifications and adhered to during construction activities. Unfiltered runoff from temporary upland stockpiles back to surface water will not be allowed.
- Catch basins within the areas will be sealed, and all water will be collected and stored on site for treatment or off-site disposal.
- Trucks will not be overloaded (i.e., appropriate freeboard will be maintained) to prevent loss due to spilling during transport.
- Track-out of potentially contaminated sediment will be managed using a combination of wheel wash decontamination procedures and haul route housekeeping/sweeping.
- The trucks, truck loading area, and access route will be visually inspected to confirm there is no loss of material from the trucks prior to releasing the truck from the temporary upland stockpile to public roads.
- If wet materials are transported, haul trucks, containers, or barges will be lined or otherwise sealed to prevent the release of soil or sediment during transport.
- Excavated material will be placed in a temporary upland stockpile area constructed to contain water generated from sediment dewatering and precipitation unless it is determined that infiltration to upland groundwater will be allowed. Discharge water generated from temporary stockpiles will be treated or infiltrated as required by permits. The dewatered excavated material and all potentially contaminated debris will be properly transported and disposed in an off-site permitted landfill.
- Proposed facilities must be of adequate structural capacity for use for offloading and staging. The maximum structural capacity of these facilities cannot be exceeded by the contractor.
- Equipment will be fueled in a designated area that separates fueling operations and protects the environment from accidental spills during fueling.
- The contractor will maintain a spill kit on site in the event that a leak develops from their equipment. In the event of a spill, all other work will stop until the contractor has adequately cleaned the spill.

## 1.6 Material Placement

The following BMPs will be employed when placing cap, backfill, and Enhanced Monitored Natural Recovery materials:

- Placing the sand with a crane-operated clamshell or excavator bucket. This placement method involves taking sand from a material stockpile, barge, or haul truck and slowly releasing the material from the bucket as the operator methodically moves the bucket in a sweeping motion from side to side. Controlled placement in this manner reduces the disturbance of the sediment upon which the material is being placed.

## 1.7 Structure Removal, Handling, and Disposal

The following creosote-treated structure removal BMPs adapted from U.S. Environmental Protection Agency guidance and the Washington Department of Natural Resources will be employed for piling removal, timber bulkhead removal, the remnant barge structure removal, and any other creosote-treated structures, as applicable:

- Piling and structure removal is assumed to be conducted in the dry, to the extent possible. However, in-water piling removal from shallow draft barges may be necessary depending on access constraints.
- When working in the water. a floating surface boom will be installed around the pile extraction site to capture floating pile debris. Floating pile debris will be removed and deposited in a containment basin constructed on the barge or adjacent upland.
- The floating surface boom will be equipped with absorbent pads to contain any oil sheens. The absorbent pads will be removed and deposited in the containment basin constructed on the barge or adjacent upland.
- Derelict timber piles will be directly pulled or removed using a vibratory driver.
- The contractor will initially vibrate piles with a vibratory hammer to break the friction bond between piles and soil.
- To help minimize turbidity, the contractor will engage the vibrator to the minimum extent required to initiate vertical pile movement and will disengage the vibratory hammer once piles have been mobilized and are moving upward.
- The piles will be removed in a single, slow, and continuous motion to the extent possible.
- Equipment such as a bucket, steel cable, and vibratory hammer will be kept out of the water, and piles will be gripped above the waterline, to the extent possible.
- Piles will be removed slowly and in a direction that is an extension of the longitudinal centerline of each pile to minimize the disturbance of the bed and the suspension of contaminated sediments into the water column.
- Reasonable attempts will be made to completely remove the piling in its entirety; however, pile cut-off will be an acceptable alternative where vibratory extraction or pulling is not feasible, as described as follows. In addition, if a pile is broken or breaks during vibratory extraction, the contractor will employ the following methods:
  - A chain will be used, if practicable, to attempt to entirely remove the broken pile.
  - If a pile cannot be removed or breaks off at or near the mudline in SMA-1 or SMA-2, then the pile will be cut off using a chainsaw approximately 12 inches below the mudline. Areas where piles are cut off will be capped with 12 inches of organoclay-amended sand to contain any remaining contamination associated with the pile.

  - Pile cut-off with the organoclay/sand cap will be an acceptable alternative in areas (e.g., shoreline area) where removal of the existing piles may result in adverse impact to slope stability.
  - If a pile cannot be removed or breaks off at or near the mudline in SMA-3, the piling will be cut off to approximately 12 inches below the removal design surface, and 12 inches of organoclay-amended sand will be placed prior to backfill.
- Cut-off pile stubs will be removed and deposited in the containment basin constructed on the barge or adjacent upland.
- Removed creosote-treated structures will be placed immediately in a containment basin constructed on the adjacent upland (or barge if piling removal is conducted from the water) to capture and contain the extracted piling/timbers, adhering sediments, and water. The containment basin for the removed piles and any adhering sediment may be constructed of durable plastic sheeting with continuous sidewalls supported by hay bales or other support to contain all sediment and return flow that may otherwise be directed back to the waterway. Containment basins will be lined with an oil absorbent boom.
- The removed piling/timbers will not be shaken, hosed off, left hanging to drip, or made subject to any other action intended to clean or remove adhering material from the pile.
- Sawdust from cutting pile stubs or other structures will be captured whenever feasible, removed, and deposited in the containment basin constructed on the barge or adjacent upland.
- The piles, pile stubs, timbers, sawdust, and absorbent pads from the floating surface boom will be removed and disposed of at a permitted upland disposal site in accordance with applicable federal and state regulations.
- The water captured in the containment basin will be removed and disposed of in accordance with applicable federal and state regulations.
- The containment basin will be removed and disposed of in accordance with applicable federal and state regulations.
- Extracted piling/timbers within the containment basin or disposal container will be cut to size as required by container and disposal contractors. All sawdust and cuttings will be contained within the containment basin or disposal container.
- The cut-up piles/timbers, sediments, sawdust, water, absorbent pads from the floating surface boom, and plastic from the containment basin will be packed into a disposal container and transported to an approved upland disposal site.

The use of a boom and other measures listed to contain and properly dispose of debris will also be employed during removal of creosote-treated wooden bulkheads and barge remnants. Specific removal methods for these structures will be appropriate to the structure and location (e.g., a backhoe or clamshell may be used, rather than a vibratory hammer or chain, to remove sections of treated wood from a bulkhead or barge remnants).

### *1.7.1 Pile Installation and Extraction*

- Pile removal and temporary pile installation/removal will be completed at low tide (in the dry) to the greatest extent possible.
- The construction contractor will be limited to use of a vibratory hammer for creosote-treated timber pile removal and installation/removal of temporary steel moorings and sheet piles.
- It is assumed that vibratory driving of up to 10 temporary, 24-inch-diameter steel pipe piles may be needed to support barge use. These piles will be removed following completion of the project.
- It is assumed that vibratory driving of up to 600 linear feet of temporary steel sheet piles may be needed to stabilize shorelines adjacent to excavation areas. These sheet piles will be removed following completion of the project.
- If any in-water pile driving is required, the area of elevated underwater noise levels will be monitored by certified observers for marine mammal species, and work will be temporarily stopped to protect these species as required by applicable permits.
- If needed, block nets will be set prior to high tide to prevent fish from accessing the area behind any sheet pile installation.

# Appendix F

# Inadvertent Discovery Plan

# INADVERTENT DISCOVERY PLAN

## *PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS*

*To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.*

Site Name(s): JELD-WEN/Former Nord Door Location: 300 West Marine View Drive, Everett, WA 98201

Project Lead/Organization: Jason Cornetta, Anchor QEA County: Snohomish

*If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.*

## 1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 21-02 or Section 106).

Once completed, **the IDP should always be kept at the project site** during all project activities. All staff, contractors, and volunteers should be familiar with its contents and know where to find it.

## 2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. ***Always assume these are live and never touch or move***.
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

## 3. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify***. **If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

### STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

### STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

### STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

### STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

#### Project Lead Contacts

Primary Contact

Name: Jason Cornetta
Organization: Anchor QEA
Phone: 253-241-0071
Email: jcornetta@anchorqea.com

Alternate Contact

Name: Nathan Soccorsy
Organization: Anchor QEA
Phone: 480-272-2805
Email: nsoccorsy@anchorqea.com

#### Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager

Name: Frank Winslow
Program: Toxics Cleanup Program
Phone: 509 424-0543
Email: Frank.Winslow@ecy.wa.gov

Alternate or Cultural Resource Contact

Name: Josh Morman
Program: Toxics Cleanup Program
Phone: 360-480-3289
Email: josh.morman@ecy.wa.gov

**STEP E: Ecology will notify DAHP.**

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

**Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.**

DAHP Contacts:

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

**Human Remains/Bones**:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

## 4. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

| | | | |
|---|---|---|---|
| Tribe: | Tulalip | Tribe: | |
| Name: | Gene Enick | Name: | |
| Title: | Assistant Historical Preservation Officer | Title: | |
| Phone: | 360-716-2653 | Phone: | |
| Email: | genick@tulaliptribes-nsn.gov | Email: | |
| Tribe: | | Tribe: | |
| Name: | | Name: | |
| Title: | | Title: | |
| Phone: | | Phone: | |
| Email: | | Email: | |

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

## 5. FURTHER CONTACTS (if applicable)

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

Federal Agency:

Agency:
Name:
Title:
Phone:
Email:

State Agency:

Agency:
Name:
Title:
Phone:
Email:

## 6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under ***Stop-Protect-Notify.*** For specific instructions on how to handle a human remains discovery, see: *RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions*.

**Suggestion**: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist
Guy.Tasa@dahp.wa.gov

(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

   Enter contact information below (required):
   - Local Medical Examiner or Coroner name and phone: J. Matthew Lacy, 425-438-6200
   - Local Law Enforcement main name and phone: Everett Police Department, 425-257-8400
   - Local Non-Emergency phone number (911 if without a non-emergency number): 425-407-3999
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per RCW 27.44.055, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. Organizations may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, RCW 68.50, and RCW 68.60.
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

## 7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law RCW 27.53 and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessment are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

The archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

## 8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

## 9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the sites and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

## 10. ADDITIONAL RESOURCES

### Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

Ecology's IDP Video (https://www.youtube.com/watch?v=ioX-4cXfbDY)

**Informational Resources**

DAHP (https://dahp.wa.gov)

Washington State Archeology (DAHP 2003)
(https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

Association of Washington Archaeologists (https://www.archaeologyinwashington.com)

**Potentially Interested Tribes**

Interactive Map of Tribes by Area
(https://dahp.wa.gov/archaeology/tribal-consultation-information)

WSDOT Tribal Contact Website
(https://wsdot.wa.gov/tribal/TribalContacts.htm)

## 11. ADDITIONAL INFORMATION

Please add any additional contact information or other information needed within this IDP.

**Implement the IDP if you see…**

**Chipped stone artifacts.**

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.

*Stone artifacts from Oregon.*

*Stone artifacts from Washington.*

*Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.*

**Implement the IDP if you see…**

**Ground stone artifacts.**

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.

*Above: Fishing Weight - credit CRITFC Treaty Fishing Rights website.*

*Artifacts from unknown locations (left and right images).*

**Implement the IDP if you see…**

**Bone or shell artifacts, tools, or beads.**

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (dentalium) or tusk.

Upper Left:*Bone Awls from Oregon.*

Upper Center: *Bone Wedge from California.*

Upper Right: *Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, Public Domain.*

Above: *Tooth Pendants. Right: Bone Pendants. Both from Oregon and Washington.*

**Implement the IDP if you see…**

**Culturally modified trees, fiber, or wood artifacts.**

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.

Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP).*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry*.

**Implement the IDP if you see…**

**Strange, different, or interesting looking dirt, rocks, or shells.**

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- “Unusual” accumulations of rock (especially fire-cracked rock).
- “Unusual” shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a “layer cake” appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the “unusual” or out of place (for example, rock piles in areas with otherwise few rocks).

*Shell Midden pocket in modern fill discovered in sewer trench.*

*Underground oven. Courtesy of DAHP.*

*Shell midden with fire cracked rock.*

*Hearth excavated near Hamilton, WA.*

**Implement the IDP if you see…**

**Historic period artifacts (historic archaeology considered older than 50 years).**

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.

Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*

**Implement the IDP if you see…**

**Historic period artifacts (historic archaeology considered older than 50 years).**

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.

Main Image: *Dishes, bottles, workboot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.*

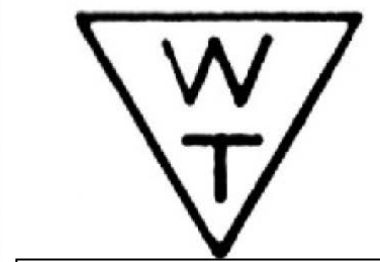
Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

## Implement the IDP if you see…

- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer's technique – maker’s mark, distinct colors such as turquoise, or an older method of opening the container.

Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. Don’t ever touch something like this!
Left: Maker’s mark on bottom of old bottle.

Right: *Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.*



*Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).*

*Can opening dates, courtesy of W.M. Schroeder.*

**Implement the IDP if you see…**

**You see historic foundations or buried structures.**

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.

Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

## Implement the IDP if you see...

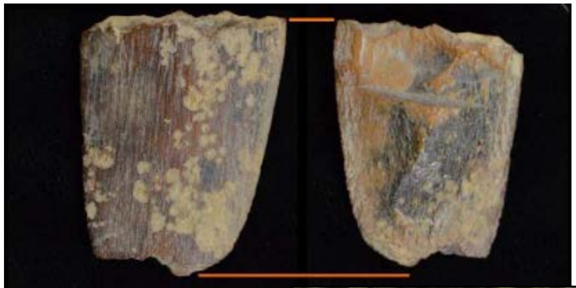
## Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.

Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).*

*Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.*



Directly Above: This is a real discovery at an Ecology sewer project site.

*What would you do if you found these items at a site? Who would be the first person you would call?*

Hint: *Read the plan!*