Attachment 14.B

WEST BAY DEVELOPMENT GROUP, LLC
WEST BAY YARDS PROJECT

RESTORATION AND MITIGATION PLAN

PREPARED FOR:

WEST BAY DEVELOPMENT GROUP, LLC
P.O. BOX 1376
SUMNER, WA 98390
(253) 720-2813

PREPARED BY:

FARALLON CONSULTING, L.L.C. DBA GRETTE ASSOCIATES
2709 JAHN AVENUE NW, SUITE H-5
GIG HARBOR, WASHINGTON 98335
(253) 573-9300

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FARALLON CONSULTING | Grette Associates ENVIRONMENTAL CONSULTANTS

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1 INTRODUCTION

West Bay Development Group, LLC (the developer) proposes to construct a mixed-use/multi-family development and shoreline restoration project (the "Project") at its site in Olympia, WA. The property is located at 1210 West Bay Drive NW on Budd Inlet in Thurston County, Washington (Figure 1). The subject property parcel numbers are 72600200101, 72600200102, 72600200103, 72600200104, and 72600200105. The project includes work above and below the ordinary high water mark (OHWM). Work above the OHWM includes the construction of a 478-unit development with five buildings placed at street level as well as a plaza with surface and structured parking below. A waterfront esplanade with beach access would also be constructed. Work below the OHWM includes the placement of select substrate materials to restore a natural beach gradient, removal of derelict piling and concrete debris, planting of saltmarsh and riparian vegetation, and the addition of large woody debris, nest boxes, and standing snags.

The shoreline restoration action will enhance and restore the West Bay shoreline based on the conceptual restoration alternative developed in the City of Olympia's 2016 West Bay Environmental Restoration Assessment - Final Report (CHE, 2016). Proposed shoreline enhancement/restoration actions include creating intertidal beach, saltmarsh areas, riparian plantings, installation of large woody debris, removal of debris and concrete structures, and creation of an esplanade waterfront trail with public access points.

The following shoreline restoration and mitigation plan has been prepared to satisfy the requirements of the City of Olympia Municipal Code (OMC), OMC 18.32 Critical Areas Ordinances (CAO), and OMC 18.20 Shoreline Master Program (SMP) regulations. This plan includes an analysis of potential impacts and mitigation efforts for the project, including the required restoration and mitigation efforts for the Vegetation Conservation Area (VCA), per OMC 18.20.492-18.20.496. Please also refer to the Shoreline Restoration Design Report – Alternatives Analysis (Moffatt & Nichol et al. 2025) for additional details for this voluntary shoreline restoration project.

Figure 1. Vicinity map

2 PROJECT DESCRIPTION

2.1 Upland Development

The proposed Mixed Use Multi Family upland development of the site is a 478-unit development with five buildings placed in a street-level plaza with surface and structured parking below totaling 823 parking stalls, along with 401 long term and 62 short term bike parking spaces. The proposed approximately 7-acre development is located on 19.5 acres along West Bay Drive. Along with the 478 residential units are cafés, restaurants, and building amenities for the residents including a recreational facility. The street-level plaza allows for vehicle and pedestrian access onto the site and to the lower-level esplanade trail and amenities.

Landscaping per OMC 18.36 and the Shoreline Master Plan has been provided to include a 30-foot VCA totaling 37,112 square feet located landward of the OHWM planted with native vegetation including a tree tract containing 50% of the required tree density.

Open Space is provided throughout the project with a large waterfront esplanade, parks, a recreational facility with a pool, and exterior patios. Many of the units have private balconies where they will be able to enjoy the surrounding waterfront and forested hillside views.

2.2 Shoreline Restoration

As part of the March 31, 2021, development agreement between the developer and the City, the developer is required to enhance and restore the West Bay shoreline. The design of the shoreline restoration action is based on the restoration alternative for the Hardel site in the City's 2016 West Bay Environmental Restoration Assessment - Final Report (CHE 2016). Additionally, the restoration goals and objectives described herein are informed by

the City's Shoreline Restoration Plan (Appendix A in Olympia Shoreline Master Program 2012), Shoreline Inventory (TRPC 2009), and the Lacey, Olympia, and Tumwater Shoreline Analysis & Characterization Report (ESA Adolfson 2008). Further information on how this proposed restoration aligns with the City's environmental goals and objectives can be found in the Shoreline Restoration Design Report – Alternatives Analysis (Moffatt & Nichol et al. 2025).

Prior to the restoration of the shoreline, derelict concrete debris, pilings, and metal beams will be removed from the shoreline mudflat and disposed of at an appropriate upland facility. This will include the removal of approximately 200 timber piling along with several large concrete structures in the lower intertidal.

Shoreline enhancement/restoration elements described in the City's West Bay Environmental Restoration Assessment and incorporated into the West Bay Yards project include the creation of intertidal beach and saltmarsh areas through substrate placement, transitional plantings along the backshore, and removal and restoration of the intertidal structures and debris. The enhancement/restoration design concept maintains the existing uplands and shoreline plan form while creating fronting intertidal beach and saltmarsh areas primarily through placing beach substrates offshore of the existing revetment.

Gravel fill would be placed along the face of the existing riprap slope, extending offshore at a slope of 4H:1V. This material will provide bedding for the placement of the beach material. Sand and gravel beach material will be placed over the gravel bed at a slope of 8H:1V, extending offshore from the OHWM approximately 100-150 feet. Saltmarsh (e.g., gumweed, pickleweed, jaumea, plantain) and transitional riparian plantings (e.g., oceanspray, willow, silverweed, tufted hairgrass) would be established along the top of the beach below the OHWM. Large woody debris would be incorporated into the upper intertidal and transition zones to enhance shoreline stability and habitat.

Construction of the shoreline restoration would entail the placement of approximately 32,813 cubic yards (cy) of select fill material over approximately 165,000 square feet of the aquatic substrate below the OHWM.

2.2.1 Debris Removal

Debris removal will include the removal of derelict structures, including 200 treated piles, the outline of a dilapidated timber dock, and an old concrete structure. In addition, various debris, including concrete debris, metal iron beams, and iron pipe, will also be removed. Four abandoned culverts will be plugged and removed. It is anticipated that up to 300 cy of concrete, 200 treated timber piles, and 0.5 cy of metal will be removed from over approximately 0.25 acre. Debris removal will be completed using land-based excavators at low tide to minimize impacts to water quality. A dozer and loader could also be used to remove large pieces of debris from the site. Haul trucks will be used to dispose of materials. Debris will be collected and disposed of at an appropriately authorized waste disposal facility. Debris removal is anticipated to take ten weeks.

2.2.2 Sand and Gravel Beach

The existing shoreline will be expanded by the placement of sand and gravel waterward of the OHWM. The purpose of the expansion to the existing sand and gravel beach is to cover the existing armored shoreline with more natural sand and gravel substrate fill, which will improve intertidal habitat function as well as waterfront access for the public. To minimize

the placement of fill below the OHWM, the top portion of the existing riprap revetment will be cut back, creating a bench. This will entail the removal of approximately 4,180 cy of riprap and underlying material. Up to 24,965 cy of mixed sand and gravel fill and 7,290 cy of washed gravel fill (2.5-inch minus) will be added to the shoreline to improve habitat. The newly constructed beach will be sloped at approximately 8H:1V. The washed gravel will be placed below OHWM by land-based equipment. The mixed sand and gravel will be placed over the washed gravel to form the naturally-sloped beach. Approximately 2,175 cy of topsoil will be placed over the beach material at approximately +17 feet mean lower low water (MLLW), sloping up to the finish grade of the uplands at approximately +21 feet MLLW. Material placement atop existing grade will result in the conversion of 0.42 acre of degraded aquatic habitat to upland habitat.

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

2.2.3 Intertidal and Riparian Plantings

Up to approximately 680 square feet of concrete/asphalt will be removed from below the OHWM and replaced with new vegetated area. The 8,762 square feet of salt marsh plantings will occur from +12 to +15.5 feet MLLW. Saltmarsh plants may include pickleweed, fleshy jaumea, Puget Sound gumweed, and saltmarsh plantain. A transitional planting zone from approximately +15.5 to +17 feet MLLW will provide a gradual transition between saltmarsh habitats and upland habitats. Plants within this zone may include pacific silver weed, deschampsia, willow, and oceanspray. The riparian zone will occur at elevation +15.5 feet MLLW and above. Riparian plants will include a variety of conifers, deciduous trees, and shrubs. Topsoil will be placed over the area cut back on the slope, providing appropriate planting media for the native riparian vegetation

2.3 Construction Sequencing

Two phases are proposed for site development and three phases are proposed for building construction. The first phase of site development (estimated to commence in summer of 2026), on the southern half of the property, will include construction of the frontage improvements on West Bay Drive from the southern property boundary to the north of the Woodard Trail pedestrian crossing, completion of a portion of shoreline restoration, construction of the waterfront esplanade, and installation of public utility infrastructure. The second phase of site development (estimated to commence in spring of 2029), on the north half of the property, will include construction of remaining frontage improvements on West Bay Drive, completion of shoreline restoration, and installation of remaining public utility infrastructure and site improvements. Buildings 2 and 3 will be constructed as part of phase 1 (estimated to commence in spring of 2027), which generally aligns with phase 1 of site development. Buildings 4 and 5 will be constructed as part of phase 2 of site development (estimated to commence in fall of 2029). Building 1 will be constructed in phase 3 (estimated

to commence in summer of 2030). Any remaining build out will be completed in the summer of 2031.

2.4 Site Demobilization

Demobilization will consist of dismantling temporary guides and platforms, removal of best management practice (BMP) measures as necessary, and site cleanup. As mentioned, all debris will be transported offsite to an approved disposal facility or recycled, as appropriate. Equipment and remaining construction materials would be transported back to their points of origin.

2.5 Construction Staging and Access

Construction staging will be established to avoid contaminants or other construction materials from entering West Bay. A temporary staging and access point will be established in the northernly upland area, which will not require additional improvements for construction activities. Access within the site will occur from this upland area. To be conservative about the amount of area needed, it was estimated that the construction equipment would also use approximately 1.5 acres of existing upland area. Temporary construction fencing around active work areas and temporary restrictions to the property will be implemented. An area for stockpiling will also be established within the upland staging area, to be located a minimum distance of 100 feet from the OHWM.

2.6 Operations and Maintenance

There will be the need for some monitoring and potential maintenance, including the collection of debris and trash that may end up on the shoreline, to maintain a welcoming beach environment and prevent degradation of habitat.

The mixed sand and gravel beach will be visually monitored annually after construction to assess whether long-term maintenance is required. If visual monitoring indicates changes in the beach (i.e., erosion or accretion of materials), survey transects may be conducted to document the beach profile. Beach performance (minimum thickness, slopes, grades) will be established during the design to provide a benchmark for determining the need for maintenance. Periodic long-term maintenance of the beach may be required which could include placement of supplemental beach fill.

2.7 Project Timing

Project construction is planned to begin in 2026. The work will begin with the construction of a portion of the beach and grading of the uplands. BMPs will be implemented to minimize impacts from in-water work during beach construction and upland work (see Section 3.4). Construction of the beach is planned to occur during the in-water construction period of July 16- February 15 (USACE 2017). Additionally, forage fish (surf smelt) are mapped as spawning on this beach. The U.S. Army Corps of Engineer's (USACE) work window for surf smelt is April 1 – June 30. Since these work windows do not align, forage fish spawn surveys may be required prior to work, in lieu of adherence to the forage fish work window. Project construction is expected to be completed within 12 to 16 weeks.

2.8 Project Purpose and Need

The shoreline restoration project is a voluntary restoration action as part of a larger development plan in the uplands. Because the site is the location of one of the recommended shoreline restoration sites presented in CHE 2016, the applicant voluntarily included completing this restoration action as part of a larger development agreement. Restoration in West Bay is a local priority due to the legacy of degradation and industrial development along the shoreline (CHE 2016). Coast and Harbor Engineering (CHE) prepared a restoration assessment to inform prioritization of restoration projects by interested parties, including the City of Olympia, Port of Olympia, and Squaxin Island Tribe (CHE 2016). The document identified shoreline industrial development as having substantially degraded nearshore and riparian habitat, recommends several potential restoration actions to reverse these impacts (CHE 2016) and has been incorporated into the City's adopted Shoreline Master Program (OMC 18.20.850) as providing "conceptual restoration approaches for some reaches." The Hardel site is within Reach 5 of the study area. The document recommends restoration of the site shoreline involving placement of fill over the existing riprap, planting of salt marsh and riparian vegetation, and establishing an Olympia oyster reef (CHE 2016). The restoration proposed herein is based on this concept. Additionally, the shoreline restoration project will also provide a clean sediment cap to eliminate or minimize potential aquatic exposures to known chemical constituents in West Bay sediment (e.g., dioxins/furans, polycyclic aromatic hydrocarbons) that may be present near the property. For further information on the purpose and need for this project, as well as how it furthers the environmental goals and objectives of the City of Olympia, please refer to the Shoreline Restoration Design Report – Alternatives Analysis (Moffatt & Nichol et al. 2025).

The nearshore ecosystem and upland areas of the site have ecological and economic significance for the community, and the existing state of the site is degraded. The elements of the voluntary shoreline restoration will facilitate the transition towards enhanced shoreline uses and improve the existing degraded shoreline area. The proposed voluntary restoration would occur through the placement of sand and gravel over the existing riprap. This will lead to 0.42 acres of unavoidable loss of aquatic habitat. Though shoreline restoration by fill placement is not ideal, this is the only feasible restoration option at this site (Moffatt & Nichol et al. 2025). Because of the historic industrial uses and contamination present in the uplands, beach restoration by excavation into the uplands is not possible without removing existing riprap armoring, which would unacceptably threaten the integrity of the remedial action. Without removing the riprap, the only feasible option for shoreline restoration at the site is the placement of habitat fill over the top of the riprap. With regard to the uplands and maintaining the integrity of the riprap armoring, installing and maintaining an upland cap/cover as well as a sediment cap/cover will likely be a requirement of the selected Model Toxics Control Act (MTCA) remedy for the site (Pioneer 2021; Moffatt & Nichol et al. 2025).

To comply with OMC 18.20.833, an analysis of alternatives was conducted to identify the shoreline restoration design that results in the minimum amount of fill material necessary to accomplish the purpose and need of the proposed restoration action (Moffatt & Nichol et al. 2025). The preferred alternative includes cutting back the top of the existing riprap revetment at the existing OHWM. This cutback will result in less beach fill required below OHW to match the grade of the restored beach slope with the fill material placed over the

uplands for protection of the development against sea level rise. This cutback will create an 8-foot-wide bench located at approximately +17 feet MLLW, above which topsoil will be placed at a 4H:1V slope to connect to the uplands at +21 feet MLLW.

The proposed upland improvements will enhance existing site conditions and create functional use of the property. The proposed use is permitted at the site and will only enhance the property and existing area. Overall, the existing site is degraded and holds areas of sparse low-quality vegetation. The existing use of the site offers no viable ecosystem functions or advantageous services for habitat or the community. The voluntary shoreline restoration and upland improvements will promote ecosystem services and community enhancement, consistent with the goals and objectives of the City's Shoreline Master Program (Appendix A of Olympia SMP) and the Thurston Regional Planning Council's Lacey, Olympia, and Tumwater Shoreline Analysis & Characterization Report (ESA Adolfson 2008).

With respect to review under OMC 18.05.855, the only amenities that will be located within the "new" uplands resulting from the in-water restoration project are planted native vegetation within a riparian corridor and public access to the shoreline (providing a public benefit). The 30-foot VCA for the site will extend landward from the existing OHWM. The uplands being created through the addition of fill material on the riprap armored slope are incidental to the completion of the shoreline restoration project, which is the only option for this area, and not for purposes of creating developable land.

2.9 Proposed Aquatic Conditions

The proposed Project would effectively eliminate existing riprap and anthropogenic debris through the placement of sand and gravel, as well as select removal of structural material. The new shoreline would create a gently-sloping (~8H:1V) intertidal beach below OHW. The newly created beach area would consist of 2.5-inch minus washed gravel over approximately 3.79 acres. Of that 3.79 acres, approximately 0.2 acre would be planted with salt marsh vegetation, and 0.2 acre would be planted with native transitional riparian vegetation, which would extend from approximately +12 feet up to +15.5 feet MLLW. The remaining 3.39 acres of aquatic habitat would be unvegetated sand/gravel intertidal habitat, sloped at 8H:1V.

Proposed salt marsh vegetation would substantially improve the productivity of nearshore habitat. Marsh vegetation is recognized as enhancing the productivity of animals and plants living in and on the sediment, providing a more complex community structure, providing refuge habitat for juvenile salmonids and other fishes, and generating valuable detritus to the ecosystem (NOAA Fisheries 2013).

Existing and proposed aquatic site conditions are presented in Table 1 below.

Table 1. Existing versus proposed aquatic site conditions

	Existing (ac)	Proposed (ac)
Riprap (below OHW)	0.59	0[1]
Piles	0.30	0
Concrete debris	0.25	0
Sand or gravel	2.65	3.39
Salt marsh	0	0.20
Riparian (below OHW)	0	0.20

[1] The existing riprap below OHW will not be physically removed. It will be covered by the sand and gravel fill to form the gently sloping beach. Therefore, the riprap will be functionally removed.

In summary, the Project will substantially reduce anthropogenic debris and armoring in the aquatic environment—covering of 1.14 acres of riprap and the removal of piles and concrete debris. The project will increase the acreage of moderate- to highly-functioning intertidal habitat (sand/gravel, salt marsh, or riparian) from 3.20 to 3.79 acres. The Project will install 0.2 acre of highly productive salt marsh vegetation, and 0.2 acre of transitional vegetation below OHW, neither of which currently exist at the site. The Project will eliminate steeply-sloped shoreline riprap at the site. Overall, though the acreage of aquatic habitat will be reduced by 0.42 acre, the action will result in a substantial improvement of the nearshore habitat at the site. Please refer to the Shoreline Restoration Design Report for additional information on the project design, approach, considerations, and alternatives (Moffatt & Nichol et al. 2025).

2.10 Proposed Riparian Conditions

Areas above the new OHWM will be planted with an assortment of native riparian species, including trees and shrubs adapted to the conditions anticipated along the shoreline. Native riparian vegetation will extend above OHW (+15.5 feet MLLW) up to the elevation of the finished uplands at +21 feet MLLW. The proposed cutback of the shoreline slope, beginning at OHW, will be covered with topsoil and planted with riparian vegetation. The planted riparian vegetation will extend landward beyond the top of the slope within the 30-foot-wide VCA, creating an approximately 48-foot-wide riparian corridor between the OHWM and the waterward edge of the public esplanade. This combined riparian corridor and VCA will be approximately 55,608 square feet (1.28 acres) in size and will provide numerous beneficial habitat functions that are not currently present on the site.

2.11 Responsible Parties

Project Proponent:
West Bay Development Group, LLC
Brandon Smith
P.O. Box 1376
Scientist
Sumner, WA 98390
(253) 720-2813

Report Preparer:
Farallon Consulting, LLC dba Grette Associates
Scott Maharry, Principal

2709 Jahn Avenue NW,
Suite H-5
Gig Harbor, WA 98335
253-442-6943

3 ENVIRONMENTAL BASELINE

3.1 Project Area

For the purpose of this restoration plan, the "Project Area" includes all locations where construction would occur. The Project Area would be conducted entirely within upland and intertidal aquatic habitat. For the purposes of this restoration plan, intertidal habitat is defined as aquatic habitat located from OHW (+15.5 feet MLLW) to -4.0 feet MLLW. All work related to this project will occur above approximately -+1 feet MLLW. The aquatic Project Area consists entirely of degraded nearshore habitat, including a riprap revetment, derelict structures and concrete, and derelict piles.

The subject parcels are approximately 19.5 acres in size, which had been previously developed as a commercial industrial property (Figure 2). The surrounding neighborhood consists predominantly of residential and commercial properties. The property is bordered to the east by West Bay of Budd Inlet (Puget Sound), and the shoreline has been stabilized with riprap. The subject property's west boundary is adjacent to West Bay Drive. The topography of the subject property is generally flat, though prior surface soil disturbances have left small depressions and mounds throughout the site. Except for the west site boundary, a portion of which was operated as a rail line that sits approximately four feet lower in elevation. Most of the property has been previously paved and/or developed and vegetation is primarily composed of nonnative species such as yellow sweet clover (*Melilotis inducus*) and Himalayan blackberry (*Rubus armeniacus*).

3.1.1 Existing Habitats

Currently, the project site is vacant and provides very little habitat function or contributions to shoreline ecological processes. Past industrial land uses and remediation activities have resulted in much of the site being covered with crushed concrete and asphalt surfacing (Moffatt & Nichol et al. 2025). Few native trees and shrubs are presently scattered throughout the site, providing very little habitat function. While several small trees and shrubs are present along the top of the shoreline bank, no effective riparian corridor is present. The west property boundary of the site, bordering West Bay Drive, does contain areas of dense native vegetation. However, these areas are interspersed with dense Himalayan blackberry and do not connect to other habitat areas or corridors, diminishing the habitat value.

The shoreline of the subject property is degraded and is entirely stabilized by riprap. The top portion of the bank is characterized by invasive plant species growing through fill and asphalt. Invasive shrub species such as Himalayan blackberry and Scotch broom (*Cytisus scoparius*) are present along portions of the top of the slope, with occasional larger shrubs such as red elderberry (*Sambucus racemosa*) also present. In addition, various invasive and non-native forbs are present.

As mentioned above, the property is the site of the former Hardel Mutual Plywood site and is the subject of on-going environmental cleanup. The upland consists of paved areas, crushed concrete cap, and sparse weedy vegetation consistent with a former industrial site.

Below the top of the slope, the upper shoreline consists entirely of riprap and is almost entirely unvegetated. The slope is approximately 1.5H:1V. At the base of the riprap slope, the lower shoreline flattens to a gentler slope. The substrate immediately below the riprap slope consists of gravel and shell hash. Below, the middle intertidal substrate consists of

unconsolidated silt, with sparse wood waste and gravel. As with the upland, the intertidal substrate below the base of the riprap revetment contains varying levels of contamination and is the subject of on-going environmental cleanup evaluation.

Derelict concrete structures and debris are present along the entire shoreline of the site, including large concrete structures in the intertidal that supported past industrial operations and concrete debris and rubble. Creosote-treated pile stubs, wood waste, and metal debris are also scattered throughout the site, contributing to the degraded character and function of the aquatic habitat.

Habitat quality along the shoreline, both marine riparian and aquatic, is low. Vegetation along the shoreline is limited and consists mostly of invasive and non-native species. Habitat along the base of the slope is also limited. Small pockets of gravel and shell hash are present at the base of the riprap, and these pockets could provide spawning habitat for forage fish, depending on the elevation. No salt marsh or other beneficial marine aquatic vegetation was observed along the mid-to-lower intertidal shoreline. As such, the site does not provide quality habitat for juvenile or adult salmonids. For more background information, see CHE 2016 and Moffatt & Nichol et al. 2025.

4 IMPACT ASSESSMENT

4.1 Potential Upland Impacts

4.1.1 Soil Erosion

The upland portion of the proposed project will impact approximately 5.5 acres. The site will be graded to allow construction of the development footprint and associated site improvements including site utilities, asphalt and concrete paving, landscaping, and sidewalks. The estimated fill is approximately 35,000 cy and will meet the standards established within the geotechnical technical memorandum and obtained locally from reputable sources. The possibility for erosion may occur during site clearing and construction; however, standard construction BMPs will be employed to prevent impacts from erosion and sedimentation during construction. At project completion, the site will be stabilized with pavement and vegetation including grass and landscaping. Once these stabilization measures are in place, no erosion is expected due to the use of the completed project improvements.

4.1.2 Upland Water Quality

The project will not discharge waste materials to surface waters or ground waters. Contractors will use erosion control measures during construction to limit any sediment that may reach surface waters as required by City codes and standards as well as the NPDES construction stormwater permit. The completed project will be served by sewer and will not discharge waste material into the groundwater from septic tanks or other sources. There is a potential for runoff from building rooftops and pavement areas during rain events. Project stormwater design will comply with the technical standards and requirements in the City of Olympia 2016 Drainage Design and Erosion Control Manual (DDECM).

4.1.3 Vegetation

The project encompasses the entire property, all vegetation within the project boundary has the potential to be impacted. Very little vegetation exists on the site now from previous construction and clearing activities. The site is mostly asphalt and crushed rock. Patches of Himalayan blackberry, diffuse knapweed, and other noxious and invasive species have been observed on site. Sparse areas of native trees and shrubs are also present along West Bay Drive, and several small trees and shrubs are present along the top of the shoreline revetment.

4.1.4 Animals

Refer to the Important Habitats and Species report; Chinook salmon (*Oncorhynchus tshawytscha*) and bull trout (*Salvelinus confluentus*) are mapped as potentially present at the site. According to US Fish and Wildlife IPaC data, bald eagles, blue heron, lesser yellowlegs, long-billed curlew, Olive-sided flycatcher, red-throated loon, and rufous hummingbird have been known to use this area as a migration route. Fish and Wildlife IPaC (https://ecos.fws.gov/ipac/location/index) threatened species marbled murrelet, streaked horned lark, yellow-billed cuckoo, chinook salmon and bull trout have been known to be near or on the site.

4.1.5 Vegetation Conservation Area

An approximately 30-foot-wide and approximately 37,112-square foot VCA will be established and planted, extending landward from the existing OHWM to the edge of the public esplanade. A mix of native trees and shrubs will be planted in the VCA, including bigleaf maple, Douglas fir, shore pine, and Pacific madrone. Native shrubs would include oceanspray, willow, and elderberry. Native groundcover species to be planted in the VCA include yarrow, coastal strawberry, and sword fern. The VCA will provide a buffer between the esplanade and the shoreline habitat.

The proposed site of the VCA is significantly degraded and holds areas of sparse low-quality vegetation. The VCA will only improve and enhance the existing area through the addition of native trees and shrubs. Furthermore, the buffer that the VCA creates between the esplanade and shoreline will create improved habitat for the upland and shoreline environments.

4.2 Potential Shoreline and Aquatic Impacts

4.2.1 Debris Removal

Debris removal will include the removal of derelict structures, including 200 treated piles, the outline of a dilapidated timber dock, and an old concrete structure. In addition, various debris, including concrete debris, metal iron beams, wood logs, rock, and iron pipes will also be removed. Debris removal will be completed using land-based excavators at low tide to minimize impacts to water quality. A dozer and loader could also be used to remove large pieces of debris from the site. Haul trucks will be used to dispose of materials. Debris will be collected and disposed of at an appropriate authorized waste disposal facility.

4.2.2 Fill Placement

Approximately 4,180 cy of existing riprap and underlying material will be excavated from above the OHWM to create the cutback on the top of the shoreline slope along the entire site. Up to 24,965 cy of mixed sand and gravel fill and 7,290 cy of washed gravel fill (2.5-

inch minus) will then be added to the shoreline to improve habitat. The newly constructed beach will be sloped at approximately 8H:1V. The washed gravel will be placed below OHW by land-based equipment. Topsoil and sand will only be placed on the bench above OHW to reduce material loss due to wave action, reduce maintenance costs, and provide an appropriate planting medium. Material placement atop existing grade will result in the conversion of 0.42 acre of degraded aquatic area to uplands.

In addition, the proposed fill will provide a clean sediment cap to eliminate or minimize potential aquatic exposures to known chemical constituents in West Bay sediment (e.g., dioxins/furans, polycyclic aromatic hydrocarbons) that may be present near the property.

Fill placement along the shoreline is also proposed for the purpose of covering the existing riprap revetment to provide soft-shore erosion protection and habitat benefits. Based on the geologic hazards assessment of the site (LAI 2021), most of the riprap along the shoreline must remain in place in order to preserve the slope stability along the shoreline. As such, restoration of the shoreline habitat is proposed to occur through the placement of select fill on which to provide habitat restoration. Fill placement and project design considerations are discussed further in the West Bay Yards Shoreline Restoration Design Report – Alternatives Analysis (Moffatt & Nichol et al. 2025).

4.2.3 Aquatic Conversion

The riparian planting area consists of a small elevation of topsoil fill which will be placed on the bench and match the grade from the upland fill at +26 feet MLLW to the grade of the shoreline slope at approximately +17 feet MLLW. Below the bench, beach fill material will be placed to cover the existing riprap revetment below OHW. This material placement atop the existing grade will result in the conversion of 0.42 acre of degraded aquatic area to uplands. This proposed action will result in the shift of the OHWM approximately 12-18 feet waterward away from the area of upland fill. The creation of intertidal beaches, salt marsh, and riparian planting will substantially improve substrate quality and enhance ecological functions of existing natural resources, and their buffers. The removal of derelict structures including 200 treated piles, the outline of a dilapidated timber dock, old concrete structures, various concrete debris, metal iron beams, wood logs, rock, and iron pipe will improve habitat function and water quality. The proposed actions will provide improved habitat for fish and other natural resources, and improve ecosystem services, water quality, and improvingly store nutrients to increase ecosystem stability over time.

Conversion of 0.42 acre of degraded aquatic habitat to uplands will not increase the area of developable land on the site. The 30-foot VCA and 100-foot Urban Intensity shoreline setback are measured landward from the existing OHWM. The uplands incidentally created by the placement of fill on the site will be planted with diverse native trees and shrubs to create a restored riparian corridor, which will support the intertidal shoreline restoration. Public access to the shoreline in the form of trails and paths will also occur in this area. The creation of intertidal beaches, salt marsh, and riparian plantings will substantially improve substrate quality and enhance ecological functions of existing natural resources, and their buffers.

Overall, the proposed 0.42-acre aquatic conversion area will result in a substantial improvement to the nearshore habitat, likely resulting in a substrate with higher primary productivity of epibenthic organisms with improved migration habitat.

4.2.4 Shoreline Water Quality

While most shoreline work would occur during low tides and in the dry, there is potential for localized and temporary increases in suspended sediment and associated turbidity during debris removal as well as placement of clean sand and gravel shoreline fill, but this would occur at levels well below those that could result in injury or behavioral effects for juvenile salmonids. There is also potential for accidental spills during construction. BMPs will be implemented to minimize this risk. Additionally, adherence to in-water work windows will ensure that work will be limited to periods when juvenile salmon are unlikely to be present near the project. Over the long term, the removal of 200 treated piles and other debris, along with the placement of clean fill material atop sediments known to contain chemical constituents of concern (e.g., dioxins/furans, polycyclic aromatic hydrocarbons) would improve localized water quality within the project area.

4.2.5 Effects on Nearshore Substrate

The Project would substantially improve substrate quality through the placement of select sand and gravel fill over the top of existing riprap and cobbly intertidal substrate. The slope of the site will decrease from approximately 1.5H:1V to a slope of 8H:1V, resulting in lower wave energy and enhanced substrate habitat benefits. Please refer to the Shoreline Restoration Engineering Design Report – Alternatives Analysis prepared for the project (Moffatt & Nichol 2025). Decreasing substrate grain size and slope along the beach will improve conditions for benthic and epibenthic organisms to colonize the site, which will in turn provide increased foraging opportunities for juvenile salmon and smelt. Additionally, the improved substrate will allow for establishment of saltmarsh in the upper intertidal elevations, further improving habitat conditions along the restored shoreline.

4.3 Potential Effects on Shoreline Ecological Processes

4.3.1 Sediment Generation and Transport

The proposed shoreline restoration is being designed to be relatively stable, with minimal sediment transport occurring offsite. Currently, the shoreline north and south of the site is mostly armored, and sediment generation and transport are minimal. While the shoreline armoring does not allow for erosion of beach material, some finer sediment is deposited on the beach by Schneider Creek immediately north of the project site. However, the steep face of the riprap revetment along the project site reflects wave energy and minimizes the potential for sediment transport up or down the beach. Please refer to the Shoreline Restoration Design Report – Alternatives Analysis prepared for the project (Moffatt & Nichol et al. 2025).

4.3.2 Large Woody Debris

The existing shoreline of the project site consists of small amounts of woody debris along a steepened bank. The proposed project incorporates the placement of large woody debris along the upper shoreline to increase the diversity of habitat structure along the site. Salmonids migrating along the existing shoreline currently encounter a highly degraded nearshore environment consisting of steep riprap, remnant piles and structures, and a shoreline devoid of riparian or salt marsh vegetation. The finished restoration would provide a flatter (8H:1V) upper intertidal zone, natural sand/gravel substrate shoreline with no debris, and highly productive salt marsh and riparian vegetation.

4.3.3 Overwater Structures

There are currently no existing overwater structures on the site. Several large concrete structures are present in the intertidal portion of the site offshore from the shoreline slope, and those are proposed to be removed. No overwater structures are proposed for this project.

The existing project area currently features very little natural cover. Natural cover along the shoreline is limited to a few stunted, native and invasive shrubs at the top of the bank. The project would substantially improve natural cover by planting 55,608 square feet (1.28 acres) of riparian and VCA vegetation and approximately 8,762 square feet (0.2 acre) of salt marsh vegetation. The riparian and transitional plantings would provide shade to the upper intertidal elevations, regulating thermal conditions and providing organic detrital input, while the upland riparian and VCA plantings would protect the shoreline from impacts related to the upland development (i.e., noise, lighting, stormwater runoff, etc.).

4.4 Sea-Level Rise

Due to their location, all shoreline restoration projects can be vulnerable to sea-level rise impacts. However, once all shoreline restoration efforts are completed and vegetation has colonized the shoreline, the area will become an efficient sediment trap. Once the VCA is fully vegetated, the site will be more resilient to the impacts of sea-level rise. Furthermore, the VCA would increase flood protection elements of the project and increase the flood protection for the uplands and community.

According to the NOAA Sea Level Rise Viewer data, the project area is in a medium vulnerability area for community-level impacts due to flooding related to sea-level rise or increased capacity at high tide in shallow coastal flooding areas. In these areas, the height of wave runup is dependent on the characteristics of incoming waves, and the characteristics of the shore barrier. Guidance from FEMA on flood risk states that run-up is primarily influenced by bathymetry seaward of shoreline structure on an engineered shoreline. (FEMA, 2018)

Currently, the project proposes to address the potential impacts of sea-level rise in two ways. First, the entire upland portion of the site will be raised approximately two feet. This will raise the surface elevation of the site to protect against flooding due to sea-level rise affected high-tides and storm event flooding. Second, the restored intertidal and upland beach will be sloped such that the longer wave runup will dissipate energy, reducing the potential for erosion of the upper beach profile. Therefore, the project area is likely to withstand the impacts of sea-level rise.

4.5 Potential Long-Term Impacts

The Project would improve the shoreline habitat through the placement of sand and gravel over the existing armored slope, removal of derelict creosote-treated timber piles and other debris, and planting a robust native riparian corridor along the site.

As discussed above in Section 2.8, full removal of the riprap is not feasible due to the presence of a MTCA cleanup action underway on the uplands. Additionally, a geotechnical assessment completed for the site determined that full removal of the riprap revetment would result in an unacceptable risk of destabilizing the shoreline (LAI 2021). While partial removal of the top of the riprap slope was determined to be feasible, the only option for shoreline improvement is the placement of sand and gravel waterward and over the

existing riprap (Moffatt & Nichol et al. 2025). In order to cover the riprap, material placement waterward of OHW would unavoidably convert approximately 0.42 acre of degraded aquatic area to uplands. In summary, the Action would substantially improve habitat function, but the implementation of this action would result in habitat impacts.

Over the long term, the shoreline restoration would result in significant improvements in habitat quality and quantity over the existing conditions. The reduced slope and improved substrate conditions will improve the site's resilience to sea-level rise, while the planting of native trees, shrubs, and saltmarsh vegetation will provide increased organic material input and thermal regulation. The riparian plantings will also provide habitat for perching and nesting birds and will increase the recruitment potential for large woody debris within the upper intertidal areas of the site. The project's design approach, considerations, and alternatives are discussed further in the West Bay Yards Shoreline Restoration Design Report – Alternatives Analysis (Moffatt & Nichol et al. 2025).

5 MITIGATION PLAN

The Mitigation Plan outlined below is presented to comply with the OMC as it relates to disturbances within the VCA. However, the goals and objectives, performance standards, and monitoring methods and schedule include all of the elements of the shoreline restoration action, including the actions within the restored VCA.

Please refer to the landscape plans for the VCA and shoreline restoration prepared by J.A. Brennan Associates.

5.1 City of Olympia Regulatory Requirements

The proposed project and mitigation approach is designed on a sequence of impact avoidance and minimization actions as outlined in OMC 18.20.410 f and OMC 18.32.136 (Grette Associates 2024; Moffatt & Nichol et al. 2025). The following summarization demonstrates that the project will adhere to the requirements of the mitigation plan as defined in OMC 18.20.410 f and OMC 18.32.136, which states that the adherence to the following mitigation measures and requirements be implemented.

- **OMC 18.20.410 f (1)** *The quality and quantity of the replaced, enhanced, or substituted resources shall be the same or better than the affected resources*.

The existing riprap revetment provides little to no habitat quality. The lower intertidal areas below the revetment contain concrete and metal debris along with creosote-treated piles. The lower intertidal substrate contains chemical contaminants of concern at levels above the State Sediment Quality Standards. Furthermore, there is no functional riparian corridor along the top of the shoreline. The proposed shoreline restoration addresses all of these functional deficiencies, significantly enhancing the functioning of the resources on the site beyond their existing condition.

The prepared planting schedule outlines the amounts and species to be planted and provides a detailed outline of the plantings in the VCA. The VCA encompasses the entirety of the outlined riparian planting and a portion of the transitional planting zone.

The riparian planting zone ranges from approximately 42 feet to 48 feet wide (12-18 feet of riparian area and 30 feet of VCA), where space allows, with potential slopes ranging from 4H:1V to 50H:1V. Within this zone, there will be a variety of native conifers,

deciduous trees, and large and small shrubs planted in the existing barren area. This planting area will provide habitat improvement and enhanced ecosystem services through the provision of overhanging vegetation along the shoreline, which will create a natural leaf litter area attracting insects into the nearshore. The newly created riparian function of this area will provide food for juvenile salmon and a wide variety of other species. The plantings and the inclusion of bird boxes and snags will provide habitat for a variety of birds and mammals.

Therefore, once completed the project will result in an increase in function quality and quantity over the existing conditions.

- **OMC 18.20.410 f (2):** *The mitigation site and associated vegetative planting shall be nurtured and maintained such that healthy native plant communities can grow and mature over time.*

The project biologist(s) will submit a monitoring report to the City of Olympia by December 31 each year in which monitoring occurs detailing the results of that year's progress and monitoring activities. The report will document site conditions, provide a summary of the maintenance actions conducted within the VCA and along the shoreline, and provide a pre- and post-project comparison of conditions. The report will also describe any potential problems observed and recommend changes to the maintenance or monitoring protocols if necessary. The shoreline restoration will be monitored over a 10-year period and will follow a prescribed monitoring schedule, reporting, and contingency plan, which is further detailed in Section 7 of this report.

- **OMC 18.20.410 f (3):** *The mitigation shall be informed by pertinent scientific and technical studies, including but not limited to the Shoreline Inventory (TRPC, June 2009), Shoreline Analysis and Characterization Report (ESA Adolfson, December 2008), Olympia's Shoreline Restoration Plan (Appendix A to the Master Program) and that of other jurisdictions, and other background studies prepared in support of this Program.*

The provided mitigation is guided, referenced, and informed by pertinent scientific and technical studies that constitute Best Available Science (BAS). These studies are referenced throughout this document and include the documents mentioned in this code section, as well as the City's 2016 West Bay Environmental Restoration Assessment - Final Report (CHE 2016), the Shoreline Restoration Design Report – Alternatives Analysis (Moffatt & Nichol et al. 2025), along with other pertinent BAS.

- **OMC 18.20.410 f (4):** *The mitigation plan shall include contingencies should the mitigation fail during the monitoring/maintenance period.*

The project proponent will provide regular irrigation to the planted vegetation based on prescribed methods to ensure the successful establishment and development of the riparian corridor and VCA. Monitoring will require coordination between the project biologist, landscape architect, and landscaping personnel to ensure that the riparian area and VCA are adequately prepared and plantings are installed appropriately. The details of the maintenance and monitoring, including contingency plans are further outlined in Section 7 of this plan.

- **OMC 18.20.410 f (5)**: *Compensatory mitigation shall be done prior to or at the same time as the impact*

While compensatory mitigation is not required for this project, all restoration activities completed for this project will occur prior to or concurrent with the proposed upland development.

- **OMC 18.20.410 f (6)**: *The mitigation activity shall be monitored and maintained to ensure that it achieves its intended functions and values. Mitigation sites shall be monitored for ten (10) years in accordance with the provisions of OMC 18.32.*

All on-site mitigation and restoration activities shall be monitored for ten (10) years in accordance with the provisions in OMC 18.32 and are further outlined in Section 7 of this plan.

5.2 Mitigation Sequencing

Mitigation sequencing is a set of steps demonstrating how a project prevents and/or minimizes and restores avoidable impacts to the environment and is provided per OMC 18.32.136.C.(1). The mitigation sequencing plan developed for this project achieves no net loss of shoreline ecological functions. A detailed description of how the proposed shoreline restoration addresses mitigation sequencing and complies with the no-net loss requirements of the OMC is presented in the *Shoreline Master Program Consistency Narrative* technical memorandum prepared for this project (Grette Associates 2025).

5.3 Goals and Objectives

The restoration and mitigation goals outlined here, per OMC 18.32.136.A(1), are to preserve and enhance the natural habitat and ecosystem function of the shoreline and riparian areas. One measure which will further this goal is the placement of sand and gravel over the existing riprap. Due to the existing degraded character of the shoreline, the placement of substrate will provide beach nourishment and enhance the shoreline and riparian zone. Beach nourishment, also referred to as beach replenishment or beach feeding, is defined as "the natural or artificial supply of sand or gravel to a beach" (Bird 2005).

In addition to the nourishment of the beach sediments through the placement of sand and gravel substrates, the upper intertidal zone will be planted with native saltmarsh vegetation. Above the saltmarsh, transition vegetation consisting of native shrubs and trees will be installed, along with large woody debris. The goal of these restoration features is to provide a significant increase in habitat quality and function over the existing conditions.

5.3.1 Resource Functions

The following section describes the resources and functions of the shoreline restoration actions per OMC 18.32.136.A(1). The beach nourishment actions, through the placement of sand and gravel and intertidal and riparian plantings, will enhance habitat and serve as an enhanced functional resource for aquatic life. The proposed project would functionally isolate existing riprap and anthropogenic debris through the placement of sand and gravel, as well as select removal of structural material. The new shoreline would create a gently-sloping (8H:1V) intertidal beach. The newly-created beach area would consist of sand and gravel over 3.79 acres. Of that 3.79 acres, approximately 0.2 acre would be planted with salt marsh vegetation, and 0.2 acre would be planted with native transitional riparian vegetation, which would extend into the upland in a band approximately 42-48 feet wide.

The remaining 3.39 acres of aquatic habitat would be unvegetated sand/gravel intertidal habitat, sloped at 8H:1V.

Proposed salt marsh vegetation would substantially improve the productivity of nearshore habitat and function of natural resources. Marsh vegetation is recognized as enhancing the productivity of animals and plants living in and on the sediment, providing a more complex community structure, providing refuge habitat for juvenile salmonids and other fishes, and generating valuable detritus to the ecosystem (Brennan 2007).

5.3.2 Best Available Science

Beach nourishment and restoration projects in Puget Sound have a history of significantly increasing habitat contributing to a net increases in habitat viability or function. Beach nourishment is a common technique used for shore protection, and applications of beach nourishment have increased in recent decades as hard armor has become less desirable due to negative habitat impacts, down-drift sediment reduction, and increasing costs (Finkl and Walker 2005). Beach nourishment has most often been used in the Puget Sound region to reestablish broad beach profiles that act as buffers against wave attack, and to mitigate erosion of the upper beach and backshore areas and typically range from several thousand feet for larger projects. The project length is highly relevant to the overall approach and performance of nourishment (Johannessen et al. 2014).

Long beach nourishment projects appear to experience greater longevity in retaining nourishment sediment (Leonard et al. 1990). An example is North Beach Orcas Island, which had nourishment placed above +4.0 feet MLLW along 4 properties for a total length of 510 ft. Although there are multiple factors involved, length was a benefit to relative stability (Johannessen et al. 2014). The length of the proposed West Bay Yards shoreline restoration is approximately 1,100 feet.

Additional considerations for using beach nourishment and fill as part of this project are addressed in detail by Moffatt & Nichol et al. (2025).

5.4 Performance Standards

Performance standards provide a straightforward means of evaluating the success of mitigation actions. The following performance standards reflect the goals and functional objectives of this plan. The success of the VCA plantings regarding species richness is based upon the survival rate of the planted shrubs. In addition, invasive weed species coverage will be monitored to evaluate the habitat value of the conservation area.

If the site fails a Performance Standard, the project biologist, project owner, Ecology, and City staff will evaluate the potential causes for the failing Performance Standard(s) and determine an appropriate contingency action or actions.

Table 2. Performance standards for Shoreline Restoration and VCA Enhancement

Restoration Goal	Functional Objective	Performance Standard	Parameter Measured	Year Inspected	Sampling Method
Restore functioning shoreline ecosystem processes	Create gently-sloping mixed gravel/sand beach	Create an ~8H:1V sloping beach	As-Built: Slope	0	N/A – Beach constructed according to plans & specifications
		Create mixed sand/ gravel beach appropriate for forage fish spawning	As-Built: Substrate	0	N/A – Beach constructed according to plans & specifications
	Plant approx. 55,608 square feet of VCA/riparian area with native trees, shrubs, and herbaceous vegetation	Installation of native riparian vegetation	As-Built: Plant Installation	0	N/A – Plants installed according to plans & specifications
		100% survival of planted vegetation at Year 1	Survivorship	1	Plant census
		Minimum 80% survival of planted vegetation at the end of the monitoring period	Survivorship	2, 3, 5, 7 and 10	Plant census
		Year 3: minimum 30% tree/shrub aerial coverage, 60% groundcover	Aerial coverage, groundcover	1, 2, 3, 5, 7 and 10	Line intercept, quadrat
		Year 7: minimum 50% tree/shrub aerial coverage, 80% groundcover	Aerial coverage, groundcover		Line intercept, quadrat

		Year 10: minimum 60% tree/shrub aerial coverage, 80% groundcover	Aerial coverage, groundcover		Line intercept, quadrat
		No more than 10% areal coverage by invasive weed species[1] within the planted buffer area	Areal coverage	1, 2, 3, 5, 7 and 10	Combination: visual/qualitative, line intercept, quadrat
	Provide Large Woody Debris Habitat Structure	Install Minimum of 15 Large Woody Debris logs	As-Built: Log Placement	0	N/A – Installed according to plans & specifications
	Plant minimum of 8,762 square feet of intertidal beach with native saltmarsh vegetation	Installation of native saltmarsh species within intertidal elevations	As-Built: Plant Installation	0	N/A – Installed according to plans & specifications
		Overall patch dimensions and percent areal cover of native saltmarsh will be stable or increasing within areas planted with saltmarsh	Patch perimeter, Areal coverage	1, 2, 3, 5, 7 and 10	dGPS delineation, quadrat
		Percent areal cover of nonnative and invasive species shall not exceed 5%	Areal coverage	1, 2, 3, 5, 7 and 10	Quadrat

[1] Weed species are those on the most recent Washington State Noxious Weed Control Board Class A, B, or C lists. A zero-tolerance policy will be adhered to for all invasive knotweed species, purple loosestrife, and *Spartina* sp. All occurrences of these species/genera will be removed.

5.5 Best Management Practices

BMPs will be implemented throughout construction to minimize potential temporary impacts from the Project. Although construction contractors will determine specific implementation means and methods, the following BMPs are proposed. These measures include standard BMPs, water quality measures, noise control, concrete control, and sediment and erosion control features per OMC 18.32.136 C (2).

5.5.1 Standard BMPs

- The contractor shall adhere to conditions identified in the Project permits, restoration, and mitigation plan, Biological Assessment, agency concurrence letters, and biological opinions. Permits and Project conditions will be obtained prior to commencing work in the shoreline or in-water.
- Project staging and storage areas shall be located a minimum of 100 feet from surface waters or in currently developed areas, such as the existing parking lot.
- The contractor shall use high-visibility fencing to clearly mark adjacent habitats to be avoided in the construction area.
- All equipment to be used for construction activities shall be cleaned and inspected prior to arriving at the project site to ensure no potentially hazardous materials are exposed, no leaks are present, and the equipment is functioning properly.
- Proposed measures anticipated during construction are the use of dust control to prevent fugitive dust as required by City codes and standards and avoiding unnecessary idling of construction equipment for extended periods of time
- Construction equipment will be inspected daily to ensure there are no leaks of hydraulic fluids, fuel, lubricants, or other petroleum products. Should a leak be detected on heavy equipment used for the Project, the equipment shall be immediately removed from the area and not used again until adequately repaired.
- A Temporary Erosion and Sediment Control (TESC) Plan and a Source Control Plan will be developed and implemented for all clearing, vegetation removal, grading, ditching, filling, soil compaction, or excavation. The BMPs in the plans will be used to control sediments from all vegetation removal or ground-disturbing activities.
- The contractor will designate at least one employee as the erosion and spill control (ESC) lead. The ESC lead will be responsible for installing and monitoring erosion control measures and maintaining spill containment and control equipment. The ESC lead will also be responsible for ensuring compliance with all local, state, and federal erosion and sediment control requirements.
- Construction activities will be limited to hours allowed by the City of Olympia ordinances and will not exceed allowable City noise limits. Construction equipment will, to the extent feasible, be equipped with mufflers to reduce noise impacts.

5.5.2 Sediment/Erosion Control Measures

- All temporary and permanent erosion and sedimentation control measures will be inspected, maintained, and repaired regularly to ensure the continued performance of their intended function. Silt fences will be inspected immediately after each rainfall, and at least daily during prolonged rainfall. Sediment will be removed as it collects behind the silt fences and prior to their final removal.
- Erosion control blankets will be installed on steep slopes that are susceptible to erosion and where ground-disturbing activities have occurred. This will prevent erosion and assist with the establishment of native vegetation.

- All exposed soils will be stabilized during the first available period, and no soils shall remain unstabilized for more than two days from October 1 to April 30, and for more than seven days from May 1 to September 30.
- Should any BMPs not function as intended, the contractor shall take additional action to minimize erosion, maintain water quality, and achieve the intended environmental performance.

5.5.2.1 Water Quality and In-Water Work Control Measures

- The contractor shall implement construction BMPs (e.g., silt fencing or sedimentation ponds) to avoid disturbing sensitive areas during construction and use of staging areas and access roads.
- In-water work will occur within the Corps-approved work window from July 16-February 15. An additional in-water work window from April 1 – June 30 is applicable to this site due to the potential for forage fish (surf smelt) spawning activity. As these two windows do not align, forage fish spawning surveys may be required during construction.
- In-water work will also avoid impacts to the tribal fishing seasons, to the extent practical. Consultation with the Squaxin Island Tribe will occur to prevent any unintended interruptions to Tribal fishing in the area.
- Within 300 feet of waters known to contain listed fish, all temporary project lighting will be minimized between sunset and sunrise from November 1 to January 15 and March 15 to May 15.
- During construction, the contractor shall control all stormwater.
- Thinners and solvents will not be used to wash oil, grease, or similar substances from heavy machinery or machine parts.
- The contractor will be required to designate a washdown area for equipment and concrete trucks located more than 300 ft from a water body or in an already developed area (i.e., parking lot). No wash-down water will be allowed to flow into unprotected catch basins or otherwise allowed to reenter Puget Sound untreated.
- When practicable, all fueling and maintenance of equipment will occur more than 300 feet landward from OHW in a specifically designated location. No refueling of equipment will occur within 100 feet of OHW.
- Runoff from roofs will be collected and conveyed to Puget Sound. Runoff from pollution-generating impervious surfaces will be collected and conveyed to an enhanced water quality system prior to discharging to Puget Sound. Off-site runoff from West Bay Drive will be collected and conveyed around the site and discharged to Puget Sound. Project stormwater design will comply with the technical standards and requirements in the City of Olympia's 2016 Drainage Design and Erosion Control Manual (DDECM). No waste materials are anticipated to enter ground or surface waters from this site.

- The proposed development will collect and convey stormwater around the proposed development and will follow the existing drainage patterns and discharge to the Puget Sound

5.5.2.2 Concrete Control Measures

- A concrete truck chute cleanout area shall be established to properly contain wet concrete.
- Water generated during concrete saw cutting will be contained and treated as process water prior to discharge.
- If warranted, an impervious material will be placed over concrete or asphalt after pouring to avoid direct contact with stormwater as the pavement cures.
- Washout from concrete trucks will not be dumped into storm drains or onto soil or pavement that carries stormwater runoff.

5.5.2.3 Noise Control Measures

- The contractor shall limit the noisiest construction activities to between 7 AM and 8 PM to reduce construction noise levels during sensitive nighttime hours unless a noise variance is approved by the City.
- The contractor shall equip construction equipment engines with adequate mufflers, intake silencers, and engine enclosures to reduce their noise by 5 to 10 dBA (EPA 1971).
- The contractor shall turn off construction equipment during prolonged periods of nonuse to eliminate noise.
- The contractor shall maintain all equipment, and train equipment operators in good practices, to reduce noise levels.
- The contractor shall require resilient bed liners in dump trucks to be loaded on-site to reduce noise.
- The contractor shall require contractors to use Occupational Safety and Health Administration (OSHA)-approved ambient sound-sensing backup alarms that could reduce disturbances during quieter periods.

6 VEGETATION CONSERVATION AREA

6.1 Purpose

Currently, the project site is vacant and provides very little habitat function or contributions to shoreline ecological processes. Much of the site is covered with crushed concrete and asphalt surfacing and very few native trees and shrubs are present on the site. The result is a lack of habitat function and ecosystem services on the site. No effective riparian corridor is present on the site. The west property boundary of the site, bordering West Bay Drive contains areas of dense native vegetation interspersed with dense Himalayan blackberry. This vegetation is isolated and does not connect to other habitat areas or corridors. All of these factors contribute to diminished habitat function on the site.

Per permitting requirements, a VCA of 30 feet is required along the shoreline. The VCA will extend landward 30 feet from the existing location of the OHWM. A riparian corridor will be planted that extends landward from the location of the new OHWM to the waterward edge of the VCA. This will create an approximately 42-48-foot-wide planted riparian area between the new OHWM and the landward extent of the VCA, covering approximately 55,608 square feet. This will be shown on the shoreline section and plans. Along with the VCA, trees in a tree tract on-site are a requirement. Two identified tree tracts along the shoreline are along the northern and southern portions of the shoreline. This is to preserve the required viewsheds from the site across the bay and towards the capital.

The proposed shoreline restoration has been designed to address the ecological limiting factors for Budd Inlet and West Bay described in City's 2016 West Bay Environmental Restoration Assessment - Final Report (CHE 2016), the City's Shoreline Restoration Plan (Appendix A in Olympia Shoreline Master Program 2012), Shoreline Inventory (TRPC 2009), and the Lacey, Olympia, and Tumwater Shoreline Analysis & Characterization Report (ESA Adolfson 2008). The 30-foot-wide, 37,112-square foot VCA will be established and planted, extending landward from the existing OHWM to the esplanade (Appendix A). A mix of native trees and shrubs will be planted in the VCA, including bigleaf maple, Douglas fir, shore pine, and Pacific madrone. Native shrubs would include oceanspray, willow, and elderberry. Native groundcover species to be planted in the VCA include yarrow, coastal strawberry, and sword fern. The VCA, in combination with the planted riparian corridor between the new and existing OHWM, will provide a buffer between the esplanade and the shoreline habitat.

The presence of three public beach access points will encroach within the VCA a total of 540 square feet. To compensate for this minor encroachment, the VCA will be expanded landward 540 square feet at the south end of the VCA. The small size of the access points (6 feet wide), dense native plantings along their margins, and the commensurate expansion of the VCA will ensure there is no degradation of shoreline functions due to the presence of these access points.

Immediately north of Building 5, the original design proposed a combined pedestrian path and vehicle assess ramp. However, the City is requiring relocation of the pedestrian path, as the combined pedestrian path and vehicle access ramp present a potential safety concern. This change will require a separate pedestrian path that connects to West Bay Drive, while also ensuring the vehicular ramp is wide enough to accommodate emergency medical service and garbage vehicles. To achieve this, the revised realignment will shift the pedestrian path to the north, resulting in an 8–10-foot (at most) encroachment in the VCA over 1,233 square feet. The encroachment is not anticipated to impact habitat functions from the riparian zone. Northwest of the encroachment, the current habitat conditions are degraded, consisting of invasive species and crushed concrete surfacing. To compensate for the VCA encroachment, the VCA will be expanded by 1,467 square feet into that degraded area. The VCA expansion will include a densely planted native riparian zone to increase the habitat quality for bird species, as well as remove the existing debris and invasive species. The improvement in habitat quality over a larger area of VCA than the proposed reduction will result in no net loss of shoreline ecological function.

6.2 Ecological Processes

As part of the March 31, 2021 Development Agreement between the developer and the City, the developer is required to enhance and restore the West Bay shoreline based on the restoration alternative for the Hardel site in the City's 2016 West Bay Environmental Restoration Assessment – Final Report (CHE 2016).

Before shoreline restoration, derelict concrete debris, pilings, and metal beams will be removed from the shoreline mudflat and disposed of at an appropriate upland facility. This will include the removal of approximately 200 timber piling along with several large concrete structures in the lower intertidal.

Shoreline enhancement/restoration elements incorporated into the West Bay Yards project include the creation of intertidal beach and saltmarsh areas through substrate placement, transitional plantings along the backshore, and removal and restoration of the intertidal structure areas. The enhancement/restoration design concept maintains the existing uplands and shoreline plan form while creating fronting intertidal beach and saltmarsh areas primarily through placing beach substrates offshore of the existing revetment (Moffatt & Nichol et al. 2025).

The top of the existing riprap revetment would be cut back above the OHWM to minimize the amount of fill required to construct the beach. Gravel fill would be placed along the face of the existing riprap slope and extending offshore at a slope of 4H:1V. This material will provide bedding for the placement of the beach material. Sand and gravel beach material will be placed over the gravel bed at a slope of 8H:1V, extending offshore from the OHWM approximately 100-150 feet. Saltmarsh (e.g., gumweed, pickleweed, jaumea, plantain) and transitional riparian plantings (e.g., oceanspray, willow, silverweed, tufted hairgrass) would be established along the top of the beach below the OHWM. Large woody debris would be incorporated into the upper intertidal bench and transition zones to enhance shoreline stability and habitat.

Construction of the shoreline restoration would entail the placement of approximately 32,813 cy of select fill material over approximately 165,000 square feet of the aquatic substrate below the OHWM.

6.3 Native Vegetation Restoration

Installation of native shrubs and herbaceous vegetation will occur in either the spring or late fall planting season. Plant installation should not occur during or immediately before freezing weather, and planting in Spring should occur before the increasing occurrence of precipitation events. If planting were to occur in the fall, specific measures should be taken to ensure that the planting area contains sufficient erosion protection. The measures would implement methods to limit soil degradation and to ensure no displacement of the upper layer of soil occurs.

The proposed transitional planting zone is a transition from the upland plantings in the riparian to the more halophytic plants in the salt marsh zone. This is an important ecotone zone to allow for the gradual transition between habitats. This zone will consist of the most salt-tolerant of upland plantings and the least inundation-required plantings in the salt marsh zone. Some potential plantings could include:

- Pacific Silverweed

- Deschampsia
- Willow
- Ocean spray
- A salt spray tolerant meadow seed mix

6.3.1 Saltmarsh Planting Zone (+12 ft to +15.5 ft MLLW)

The saltmarsh zone consists of plants such as pickleweed, tufted hairgrass, and saltgrass. This zone ranges in slope from a maximum of 8H:1V to a very gentle gradient where space allows. The proposed slope is 8H:1V. Where the saltmarsh is low (approximately +12 feet MLLW) plant with bare root and plug plant materials or potentially colonized naturally with seeds brought in by the tides (depending on species and proximity to existing seed sources).

- Identified at West Bay Park near the site (ecological reference):
  - Pickleweed
  - Salt-marsh plantain
  - Puget Sound Gumweed
  - Fleshy Jaumea
- Identified in the City's West Bay Restoration Assessment:
  - Pickleweed
  - Puget Sound Gumweed
  - Seacoast bulrush
  - Saltgrass
  - Spear saltbrush
  - Fleshy Jaumea
  - Baltic rush
  - Salt-marsh plantain
  - Pacific Silverweed
  - Lyngby Sedge
  - American Three-square

Table 3. Proposed native saltmarsh plant schedule

Saltmarsh Plantings			
Common Name	**Scientific Name**	**Size**	**Spacing**
Plugs			
Fleshy Jaumea	*Jaumea carnosa*	4" Pot	18" O.C.
Pickleweed	*Salicornia virginica*	4" Pot	18" O.C.
Puget Sound Gumweed	*Grindelia integrifolia*	4" Pot	18" O.C.
Salt-marsh Plantain	*Plantago maritima*	4" Pot	18" O.C.

6.3.2 Transitional Planting Zone (+15.5 to +16.5 ft MLLW)

This VCA planting zone occurs within the elevational transition from the upland plantings in the riparian zone to the more halophytic plants in the saltmarsh zone. This is an important ecotone that allows for the gradual transition between habitats. This zone will consist of the most salt-tolerant of upland plantings and the least inundation-requiring plantings in the saltmarsh zone.

Table 4. Proposed native transition zone plant schedule

Transition Plantings			
Common Name	**Scientific Name**	**Size**	**Spacing**
Shrubs			
Hooker's Willow	*Salix hookeriana*	5 gal, live stake	5' O.C.
Oceanspray	*Holodiscus discolor*	1 gal	5' O.C.
Groundcover			
Pacific Silver weed	*Argentina pacifica*	4" Pot	18" O.C.
Tufted Hairgrass	*Deschampsia cespitosa*	4" Pot	18" O.C.
*Seed Mix			Seeded

6.3.3 Riparian Planting Zone

Riparian plantings along the shoreline will occur along slopes from 4H:1V to 50H:1V. The riparian planting zone ranges from approximately 42 feet wide to 48 feet wide, where space allows. A variety of native conifers, deciduous trees, and large and small shrubs will be planted in this zone. Overhanging vegetation along the shoreline will drop leaf litter and insects into the nearshore, providing food for juvenile salmon and a wide variety of other species. The thickets of the planting and the inclusion of bird boxes and snags will provide habitat for a variety of birds and mammals. The upland planting zone provides a multitude of ecological benefits to people, wildlife, and the local environment.

Small, containerized plants (1-gallon and 2-gallon size) are used to plant shrubs and small trees to control costs and improve survival rates. Some 4-foot to 6-foot tall conifers and deciduous trees are mixed in with the smaller plants to accelerate the visual and habitat impact of the riparian planting.

Plants species identified at the ecological reference site at West Bay Park include:

- Bigleaf Maple
- Douglas Fir
- Nootka Rose
- Hooker's Willow
- Snowberry

The riparian planting zone (combined with the VCA) will encompass approximately 55,608 square feet and will contain a mix of native seeding and container or bare-root plantings.

Table 5. Proposed native riparian plant schedule

Riparian Plantings			
Common Name	**Scientific Name**	**Size**	**Spacing**
Trees			
Bigleaf Maple	*Acer macrophyllum*	2" cal	12' O.C.
Cascara	*Rhamnus purshiana*	2" cal	12' O.C.
Douglas Fir	*Pseudotsuga menziesii*	2" cal	12' O.C.
Garry Oak	*Quercus garryana*	2" cal	12' O.C.
Pacific Madrone	*Arbutus menziesii*	5 gal	12' O.C.
Red Alder	*Alnus rubra*	2" cal	12' O.C.
Vine Maple	*Acer circinatum*	6' – 8'	12' O.C.
Shrubs			
Hooker's Willow	*Salix hookeriana*	5 gal, Live Stake	5' O.C.
Nootka Rose	*Rose nutkana*	1 gal	5' O.C.
Oceanspray	*Holodiscus discolor*	1 gal	5' O.C.
Red Elderberry	*Sambucus racemosa*	1 gal	5' O.C.
Snowberry	*Symphoricarpos albus*	1 gal	5' O.C.
Tall Oregon Grape	*Mahonia aquifolium*	1 gal	5' O.C.
Groundcover			
Coastal Strawberry	*Fragaria chiloensis*	1 gal	18" O.C.
Common Yarrow	*Achillea millefolium*	1 gal	18" O.C.
Sword Fern	*Polystichum munitum*	1 gal	18" O.C.

Total area of Riparian Planting: 55,608 square feet

7 MONITORING AND ADAPTIVE MANAGEMENT PLAN

The following sections outline the project's proposed monitoring schedule, methods, and deliverables for the shoreline restoration and VCA monitoring program.

7.1 Monitoring Plan

7.1.1 Monitoring Duration and Frequency

As described below, the developer will monitor the site for a total of 10 years, with monitoring events occurring in years 0 (as-built), 1, 2, 3, 5, 7, and 10. As part of Year 0, the developer will conduct an as-built survey of the shoreline restoration and VCA following final construction to document the installation of the restoration features, and to describe any deviations from the approved, permitted construction plans. For clarification, the year within which construction of the shoreline restoration and VCA is complete (including plant installation) will be Year 0.

7.1.2 Monitoring During Construction

The project biologist, landscape and design engineers, City officials, and regulatory personnel will meet prior to the start of construction to review this plan and the associated

permits and approvals for the work to ensure all parties understand the construction activities, and to ensure efficient lines of communication are established.

Throughout the course of construction, including during debris removal, fill placement, and plant installation, the developer will monitor shoreline and VCA construction activities to ensure the requirements of this plan and the associated permits and permit conditions are adhered to. The intent of this monitoring is to identify any field conditions that may differ from those contemplated in this plan and in design plans and to inform responses to those differing conditions. Any changes to the plan must be communicated to and approved by the City of Olympia and the relevant state and federal agencies prior to implementation.

The project biologist or landscape architect will also inspect and approve the planting stock and review the plans with the field crew to ensure they both recognize the species selected for installation and understand the staking in the VCA.

7.1.3 Post-Construction Inspection

Compliance monitoring will consist of evaluating the plantings immediately after installation to confirm the plan was followed and plants were installed appropriately. A walk-through survey will be conducted to serve as the "as-built survey," including inspection of all planted vegetation to verify that all design features agreed to in this plan have been correctly and fully implemented. Any changes made in the field will be consistent with the overall objective of the plan. In addition, permanent photo points will be established within the enhancement area to be used during the long-term monitoring.

A qualified biologist will conduct compliance monitoring by walking the area, observing and documenting parameters such as plant health and vigor, mulching, plant spacing, and installation issues. In addition, photographic documentation will be collected at the permanent photo points. After completing the compliance monitoring, the qualified biologist will prepare a summary technical memorandum verifying that all design features have been correctly implemented. Any changes to the planting plan will also be discussed in the technical memorandum.

7.1.1 Long-Term Monitoring

Long-term monitoring will be conducted over a ten-year period, with observations conducted following the Monitoring Schedule (monitoring visits in years 1, 2, 3, 5, 7, and 10). The purpose of the long-term monitoring program will be to evaluate the biological and physical attributes within the restoration areas to determine if the goals and objectives of this plan have been met. Photos will be taken at photo points to document the status of the restoration.

Monitoring will be conducted using the techniques and procedures described in Section 7.2 to quantify the survival, relative health, and growth of the installed plant material, as well as the physical attributes of the restored shoreline. A stratified monitoring approach will be used for long-term vegetation monitoring of the site. A stratified approach evaluates the various levels (strata) of vegetation within a community (i.e., forest, shrub, groundcover/saltmarsh) using separate monitoring techniques. Using this approach allows for the evaluation of the success of each vegetation strata independently. Monitoring will be conducted according to the schedule in Table 2, with reports submitted by December 31

of each monitoring years' activity describing and quantifying the status of the shoreline restoration and VCA.

7.2 Monitoring Methods

The methods described below will be employed to quantitatively and qualitatively document the health and development of the riparian plantings in the VCA as well as along the upper elevations of the restored beach.

7.2.1 Vegetation

Vegetation surveys will be conducted in accordance with the monitoring schedule to compare results against the Performance Standards described above. Inspections of the planted material to determine the health and vigor of the installation will occur during each monitoring visit. Vegetation monitoring will occur in July/August of each monitoring year, to capture the height of the growing season.

Vegetation monitoring will include the collection of quantitative data during each monitoring visit. The quantitative data collection methods will be selected based on the size and layout of the planted areas, as well as the height of the vegetation. Detailed descriptions of the methods to be used are attached for reference in Appendix B (*WSDOT Wetland Mitigation Site Monitoring Methods*, 2008). These sampling procedures are designed for the efficient and consistent collection of information so that the data can be compared among monitoring years to identify changes over time. If different protocols are selected for long-term monitoring, they should be described in the monitoring report.

Transects for long-term monitoring will be established within the VCA and saltmarsh plantings during the As-Built monitoring described above.

7.2.2 Fauna

Visual observations of all wildlife species observed during the monitoring will be recorded. Birds, mammals, amphibians, and reptiles found within the VCA and restored shoreline will be identified to species (where possible), and observations of any breeding or nesting activity in the restoration areas will be recorded. Observations will be limited to the annual monitoring inspections.

7.2.3 Photographic Documentation

As described above, permanent photo points will be established during the As-Built inspection in order to obtain representative photographs of the restoration areas. Photo-points will be established to document restoration vegetation success and development over time. Photographs will be taken from the same locations (and facing the same direction) yearly to document the project's appearance and progress. Photo-point documentation should occur at the height of the growing season.

7.3 Monitoring Reports

As part of the shoreline restoration and VCA monitoring program, the project biologist will prepare and submit annual reports describing the results of the restoration site monitoring and comparisons to the performance standards. These reports will be submitted to the City of Olympia, WA State Department of Ecology, and the USACE (the "permitting agencies").

7.3.1 As-Built Memorandum

Within 90 days of completion of the shoreline and VCA restoration, the developer will submit an As-Built Memorandum to the permitting agencies. This memorandum will be prepared by a qualified scientist to document the implementation of the restoration actions and describe any deviations from the plan. The report will also describe any potential problems identified during construction and any recommended remedies to be proposed to the permitting agencies. Photographs will be taken at the established photo points to further document the baseline conditions within the restored areas.

7.3.2 Annual Monitoring Reports

The developer will submit an annual monitoring report by December 31 to the permitting agencies detailing the results of that year's monitoring activities. The report will be prepared by a qualified scientist and will document site conditions, provide a summary of the maintenance actions conducted on the site, and describe any deviations from the monitoring protocols prescribed in this plan. The report will also describe any potential problems observed and recommend changes to the maintenance of monitoring protocols to improve site performance.

7.3.3 Monitoring Schedule

The compliance inspection and As-Built Memorandum will be completed and submitted by the developer within 90 days after completion of construction. Long-term monitoring of the shoreline and VCA will be conducted by a qualified scientist in years 1, 2, 3, 5, 7, and 10, post-construction. Vegetation monitoring is to be conducted in July/August, during the height of the growing season. Monitoring reports will be submitted to the permitting agencies no later than December 31.

7.4 Maintenance and Adaptive Management Plan

7.4.1 Restoration Maintenance

The project proponent will provide regular irrigation to the VCA for the first two growing seasons following the installation of plant materials. Irrigation should commence by June 1 and should stop on September 15 each year during the monitoring period, as specified by the project biologist. The project proponent may use any feasible method to supply supplemental irrigation provided that any associated irrigation infrastructure is removed after two years or after installed native plants are mature enough to survive without supplemental irrigation.

Maintenance of the VCA and saltmarsh planting areas for the duration of the monitoring period will be the project proponent's responsibility. Yearly maintenance visits should be conducted by maintenance staff. All litter, including paper, plastic, bottles, debris, etc., will be removed during each maintenance visit. Invasive plant species (such as Scotch broom and blackberry) require removal during site maintenance. Work to be completed on the first maintenance visit (one year after plant installation) should include replacing dead or failed plant materials with plantings of the same species, size, and location as original plantings. Replacement plantings are to be installed during the dormant period.

Maintenance should also include annual inspections of the goose grid saltmarsh protection system. Sisal rope should be replaced as necessary to maintain functionality and prevent herbivory of saltmarsh by waterfowl.

7.4.2 Adaptive Management Plan

If the monitoring results indicate that any of the performance standards are not being met, it may be necessary to implement an adaptive management plan. Careful attention to maintenance is essential in ensuring that problems do not arise. Should any portion of the planting in the VCA fail to meet the success criteria, an adaptive management plan will be developed and implemented with the City's approval. Such plans are prepared on a case-by-case basis to reflect the failed aspect of the restoration.

Adaptive management activities may include, but are not limited to:

- Replacing all plants lost to vandalism, drought, or disease, as necessary.
- Replacing any plant species with a 20% or greater mortality rate after three growing seasons with the same species or similar species approved by the project biologist and the permitting agencies.
- Increased irrigation in the restoration area only as necessary during dry weather if plants appear to be too dry, with an appropriate quantity of water.

8 BIOLOGIST QUALIFICATIONS

8.1 Scott Maharry

Scott Maharry is a Principal Scientist at Grette Associates, a division of Farallon Consulting, LLC. He has an extensive background in wetland and marine science and permitting and is trained in the use of all applicable wetland regulatory manuals and supplements. Scott has over 20 years of experience permitting marine and freshwater impact projects, including many throughout South Puget Sound. He regularly prepares mitigation plans that meet the requirements of local, state, and federal regulations and also designs and participates in long-term monitoring programs of restoration and mitigation projects.

Scott earned a Bachelor of Science degree in Biology from Central Washington University, with an emphasis in Fisheries and Wildlife Ecology.

For a list of representative projects, please contact him at Grette Associates.

9 REFERENCES

Bird, E.C.F., 2005. Drift and swash alignments. In Encyclopedia of Coastal Science. Edited by M.L. Schwartz. Springer, Dordecht, Netherlands. p. 395–397.

Brennan, J.S. 2007. Marine Riparian Vegetation Communities of Puget Sound. Puget Sound Nearshore Partnership Report No. 2007-02. Published by Seattle District, U.S. Army Corps of Engineers, Seattle, Washington.

City of Olympia. 2012. Shoreline Master Program Appendix A: Restoration Plan. Prepared with funding from WA State Department of Ecology. June 12, 2012.

Coast & Harbor Engineering (CHE). 2016. City of Olympia West Bay Environmental Restoration Assessment – Final Report. Prepared by Coast & Harbor Engineering, a Division of Hatch Mott MacDonald; in association with JA Brennan Associates,

GeoEngineers, Davido Consulting Group, and Environmental Science Associates. February 26, 2016.

ESA Adolfson. 2008. Lacey, Olympia, and Tumwater Shoreline Analysis and Characterization Report. Prepared for the Thurston Regional Planning Council. December 2008.

Federal Emergency Management Agency (FEMA). 2018. Guidance for Flood Risk Analysis and Mapping; Coastal Wave Runup and Overtopping. Section 2.0. pp. 2-5.

Finkl, C.W., and Walker, H.J., 2005. Beach nourishment. In Encyclopedia of Coastal Science. Edited by M.L. Schwartz. Springer, Dordecht, Netherlands. p. 147–161.

Grette Associates. 2025. West Bay Yards: Shoreline Master Program Consistency Narrative. Prepared for the City of Olympia. Revised May 30, 2025.

Johannessen, J., A. MacLennan, A. Blue, J. Waggoner, S. Williams, W. Gerstel, R. Barnard, R. Carman, and H. Shipman. 2014. Marine Shoreline Design Guidelines. Washington Department of Fish and Wildlife, Olympia, Washington.

Landau Associates, Inc. (LAI). 2021. Geologic Hazards Assessment – West Bay Mixed-Use Development. Project No. 1912001.020.021. Prepared for Milestone Companies West Bay Development Group. October 29, 2021.

Leonard, L., Dixon, K., and Pilkey, O., 1990. A comparison of beach replenishment on the US Atlantic, Pacific, and Gulf Coasts, Journal of Coastal Research, Special Issue 6, p. 127–140.

Moffatt & Nichol. 2022. Shoreline Restoration Engineering Design Report – West Bay Yards Project. Prepared for West Bay Development Group, LLC. March 2022.

Moffatt & Nichol, Grette Associates, J. A. Brennan, and Landau Associates Inc. 2025. West Bay Yards Shoreline Restoration Design – Alternatives Analysis. Prepared for City of Olympia. July 2025.

National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries). 2013. Final Lower Duwamish River NRDA Restoration Plan and Programmatic Environmental Impact Statement. Prepared on behalf of the Lower Duwamish River Natural Resource Damage Assessment Trustee Council. June 2013.

PIONEER Technologies Corporation (Pioneer). 2021. Remedial Investigation Data Gap Report - Hardel Mutual Plywood Corporation Site. Prepared for West Bay Development Group, LLC, August 2021.

Thurston Regional Planning Council (TRPC). 2009. Shoreline Inventory for the Cities of Lacey, Olympia, and Tumwater and their Urban Growth Areas. Prepared with funding from WA State Department of Ecology. June 2009.

U.S. Army Corps of Engineers (USACE). 2017. Approved Work Windows for Fish Protection for All Marine/Estuarine Areas Excluding the Mouth of the Columbia River (Baker Bay) – By Tidal Reference Area. August 21, 2017. URL: https://www.nws.usace.army.mil/Portals/27/docs/regulatory2/Marine%20Fish%20Work%20Windows%208-21-17.pdf?ver=2017-08-22-094810-250

Washington State Department of Transportation (WSDOT). 2008. WSDOT Wetland Mitigation Site Monitoring Methods. Prepared by WSDOT Environmental Services. Updated June 6, 2008.

Attachment 14.B

WEST BAY DEVELOPMENT GROUP, LLC
WEST BAY YARDS PROJECT

RESTORATION AND MITIGATION PLAN

APPENDIX A: SITE PLANS

Attachment 14.B

TIDAL AND GEODETIC DATUMS:

HIGHEST OBSERVED WATER LEVEL (12/15/1977)	+17.94'
MEAN HIGHER HIGH WATER (MHHW)	+14.56'
MEAN HIGH WATER (MHW)	+13.55'
MEAN SEA LEVEL (MSL)	+8.35'
MEAN TIDE LEVEL (MTL)	+8.31'
NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)	+3.99'
MEAN LOW WATER (MLW)	+3.07'
MEAN LOWER LOW WATER (MLLW)	+0.00'
LOWEST OBSERVED WATER LEVEL (1/2/1977)	-4.33'

REFERENCE: NOAA STATION 946969

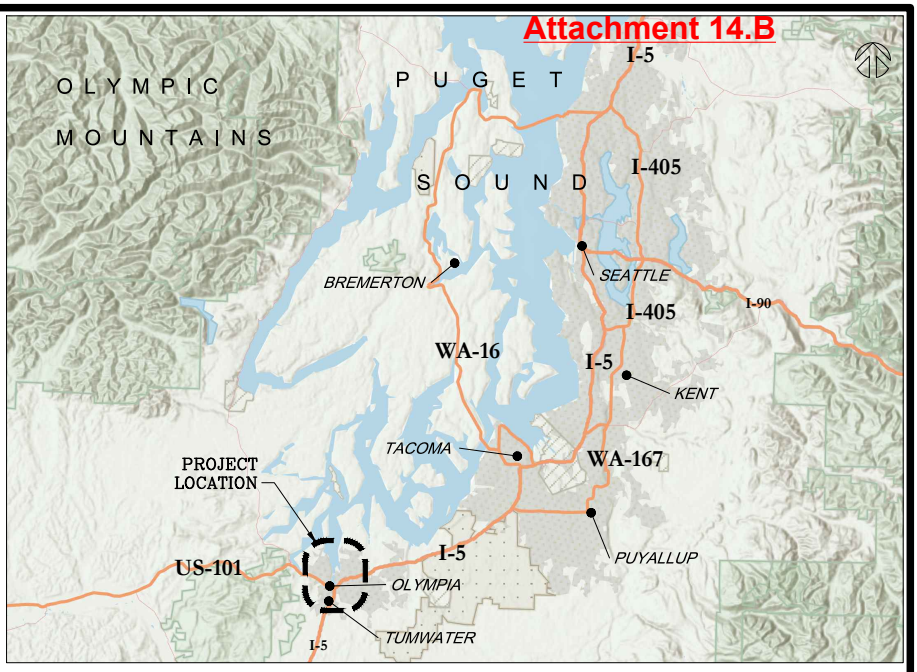
WATER LEVELS:

HIGH TIDE LINE (HTL)	+15.90'
ORDINARY HIGH WATER MARK (OHWM)	+15.50'

REFERENCE: FIELD DELINEATION BY A MARINE BIOLOGIST ON APRIL 28th, 2021 AND TIDAL DATA

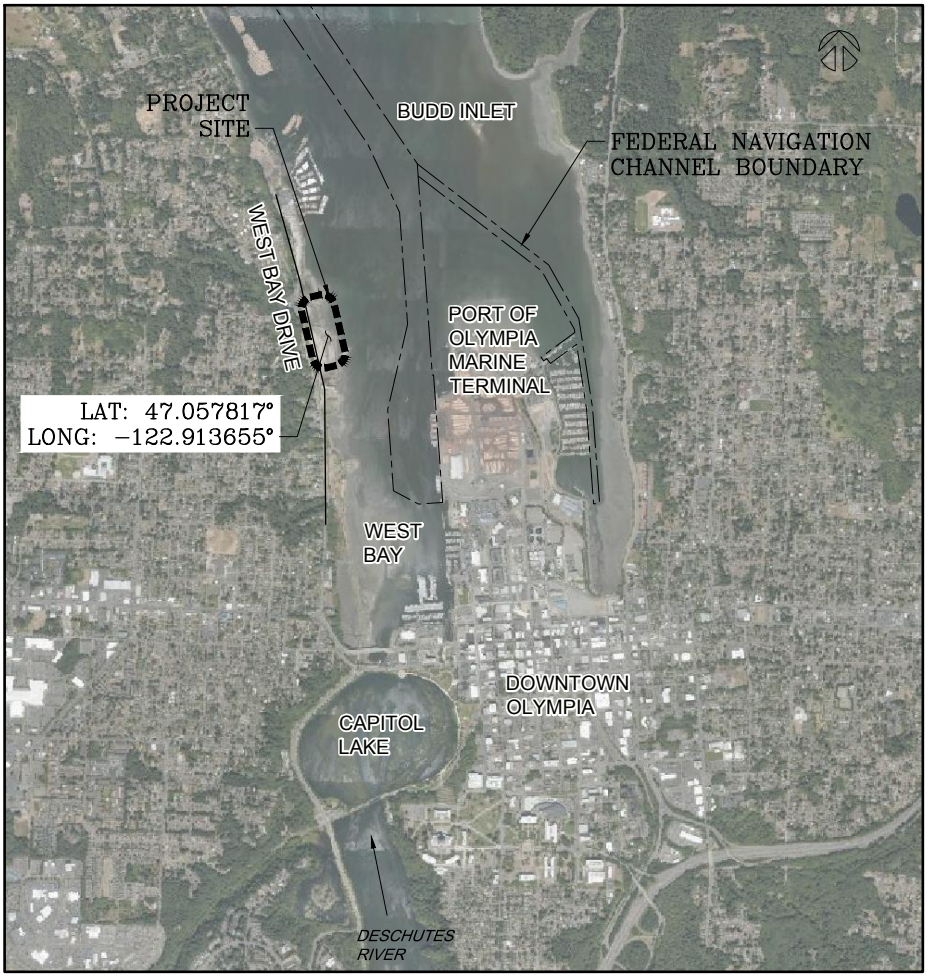
LIST OF DRAWINGS

SHEET NUMBER	SHEET TITLE
FIG-001	COVER SHEET
FIG-002	EXISTING SITE PLAN
FIG-003	DEBRIS REMOVAL AND DEMOLITION
FIG-004	PROPOSED GRADING PLAN
FIG-005	PROPOSED PLANTING PLAN
FIG-006	SECTIONS SHEET 1
FIG-007	SECTIONS SHEET 2



VICINITY MAP

SCALE: NTS



LOCATION PLAN

SCALE: NTS

PURPOSE: SHORELINE ENHANCEMENT AND RESTORATION

ADJACENT PROPERTY OWNERS:
1) DELTA ILLAHEE LIMITED PARTNERSHIP
2) SQUAXIN ISLAND TRIBE
3) DROGBA LLC

APPLICANT: WEST BAY DEVELOPMENT

USACE REFERENCE # NWS-2022-428
LOCATION ADDRESS: 1210 WEST BAY DRIVE
NORTHWEST OLYMPIA,
WA 98502

PROPOSED PROJECT: OLYMPIA WEST BAY - SHORELINE ENHANCEMENT AND RESTORATION
IN: OLYMPIA, WA
DATUM: MLLW = 0.0ft
SEC: 1 T: 32 N R: 1 E
COUNTY: THURSTON COUNTY STATE: WA
SHEET: 1 OF 7 DATE: JULY 11, 2025

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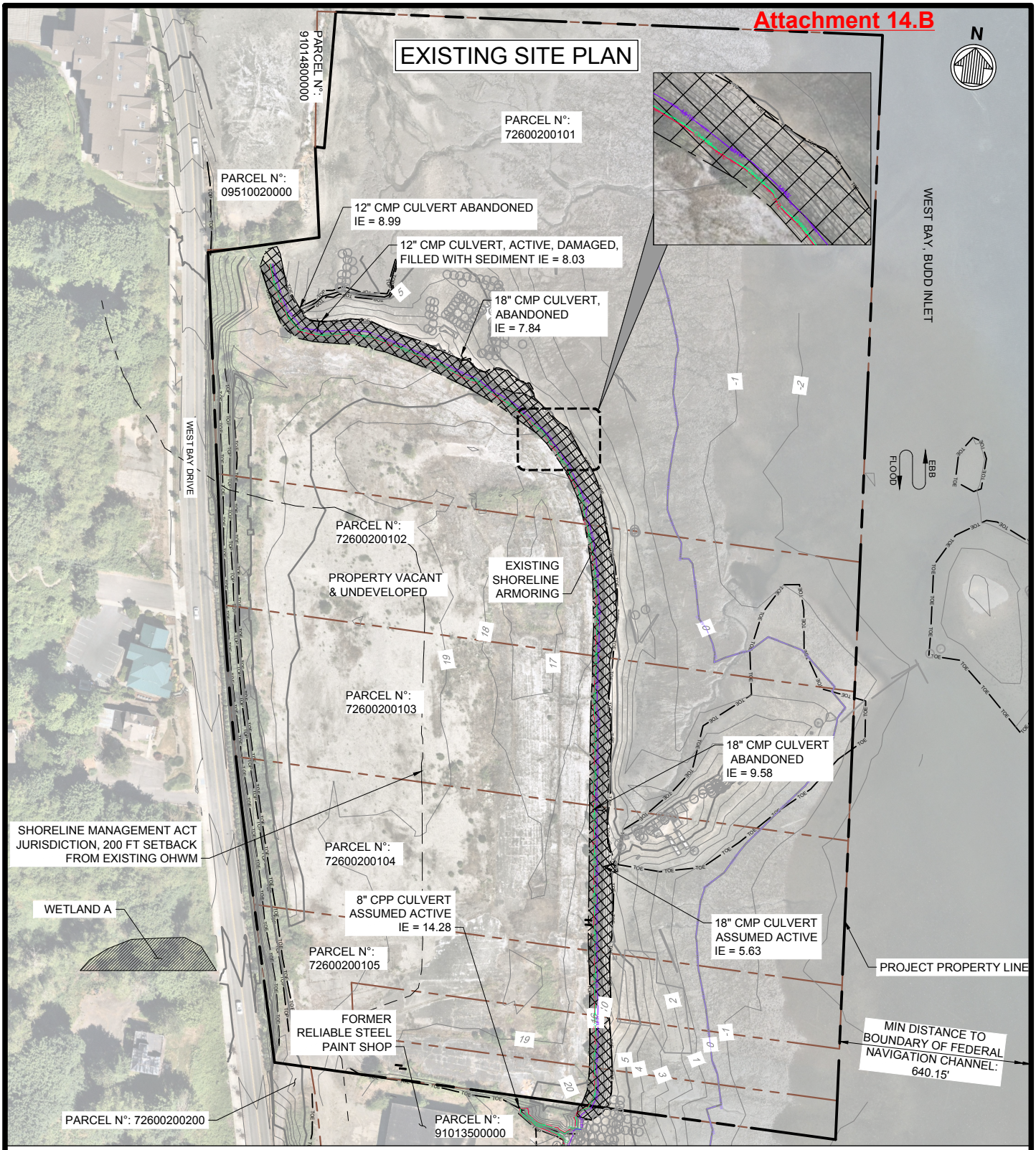
Attachment 14.B

EXISTING SITE PLAN



NOTES

1. EXISTING CONDITIONS (INCLUDING ELEVATION CONTOURS AND DEBRIS DELINEATION) BASED ON A TOPOGRAPHIC SURVEY PROVIDED BY MTN 2 COAST LLC DATED 2020-06-08.
2. AERIAL: NEARMAP 2019-06-25.
3. PARCEL LINES ARE FROM THURSTON COUNTY GEODATA CENTER.
4. VERTICAL DATUM AND UNIT: MEAN LOWER LOW WATER (MLLW) AND FT.

160' 0' 160' 320'

SCALE: 1"=160'

LEGEND

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

PURPOSE: SHORELINE ENHANCEMENT AND RESTORATION

ADJACENT PROPERTY OWNERS:
1) DELTA ILLAHEE LIMITED PARTNERSHIP
2) SQUAXIN ISLAND TRIBE
3) DROGBA LLC

APPLICANT: WEST BAY DEVELOPMENT

USACE REFERENCE # NWS-2022-428
LOCATION ADDRESS: 1210 WEST BAY DRIVE NORTHWEST OLYMPIA, WA 98502

PROPOSED PROJECT: OLYMPIA WEST BAY - SHORELINE ENHANCEMENT AND RESTORATION
IN: OLYMPIA, WA
DATUM: MLLW = 0.0ft
SEC: 1 T: 32 N R: 1 E
COUNTY: THURSTON COUNTY STATE: WA
SHEET: 2 OF 7 DATE: JULY 11, 2025

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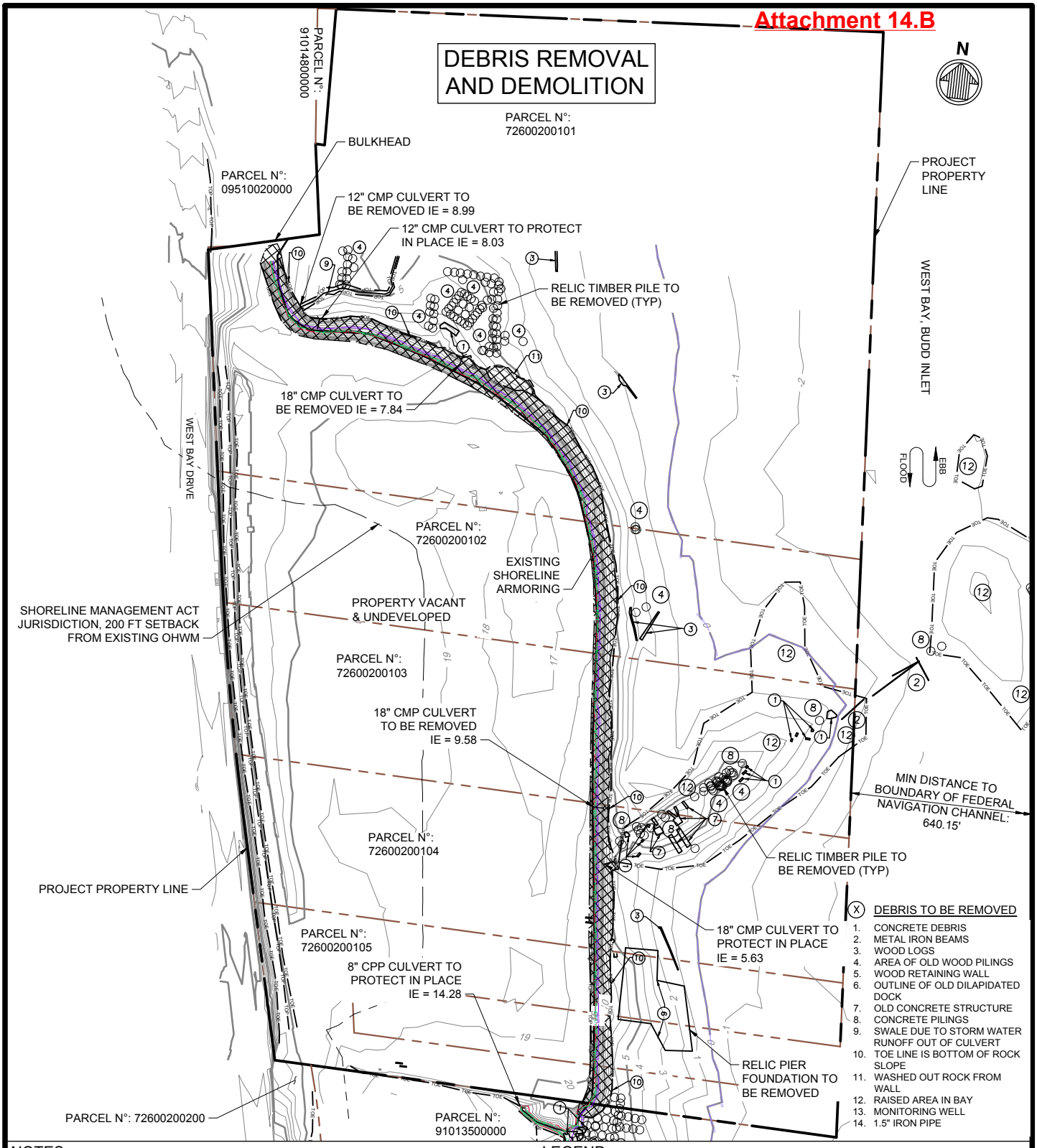
Attachment 14.B

DEBRIS REMOVAL AND DEMOLITION



DEBRIS TO BE REMOVED

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

NOTES

1. EXISTING CONDITIONS (INCLUDING ELEVATION CONTOURS AND DEBRIS DELINEATION) BASED ON A TOPOGRAPHIC SURVEY PROVIDED BY MTN 2 COAST LLC DATED 2020-06-08.
2. PARCEL LINES ARE FROM THURSTON COUNTY GEODATA CENTER.
3. VERTICAL DATUM AND UNIT: MEAN LOWER LOW WATER (MLLW) AND FT.

160' 0' 160' 320'

SCALE: 1"=160'

LEGEND

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

PURPOSE: SHORELINE ENHANCEMENT AND RESTORATION

ADJACENT PROPERTY OWNERS:
1) DELTA ILLAHEE LIMITED PARTNERSHIP
2) SQUAXIN ISLAND TRIBE
3) DROGBA LLC

APPLICANT: WEST BAY DEVELOPMENT

USACE REFERENCE # NWS-2022-428
LOCATION ADDRESS: 1210 WEST BAY DRIVE NORTHWEST OLYMPIA, WA 98502

PROPOSED PROJECT: OLYMPIA WEST BAY - SHORELINE ENHANCEMENT AND RESTORATION
IN: OLYMPIA, WA
DATUM: MLLW = 0.0ft
SEC: 1 T: 32 N R: 1 E
COUNTY: THURSTON COUNTY STATE: WA
SHEET: 3 OF 7 DATE: JULY 11, 2025

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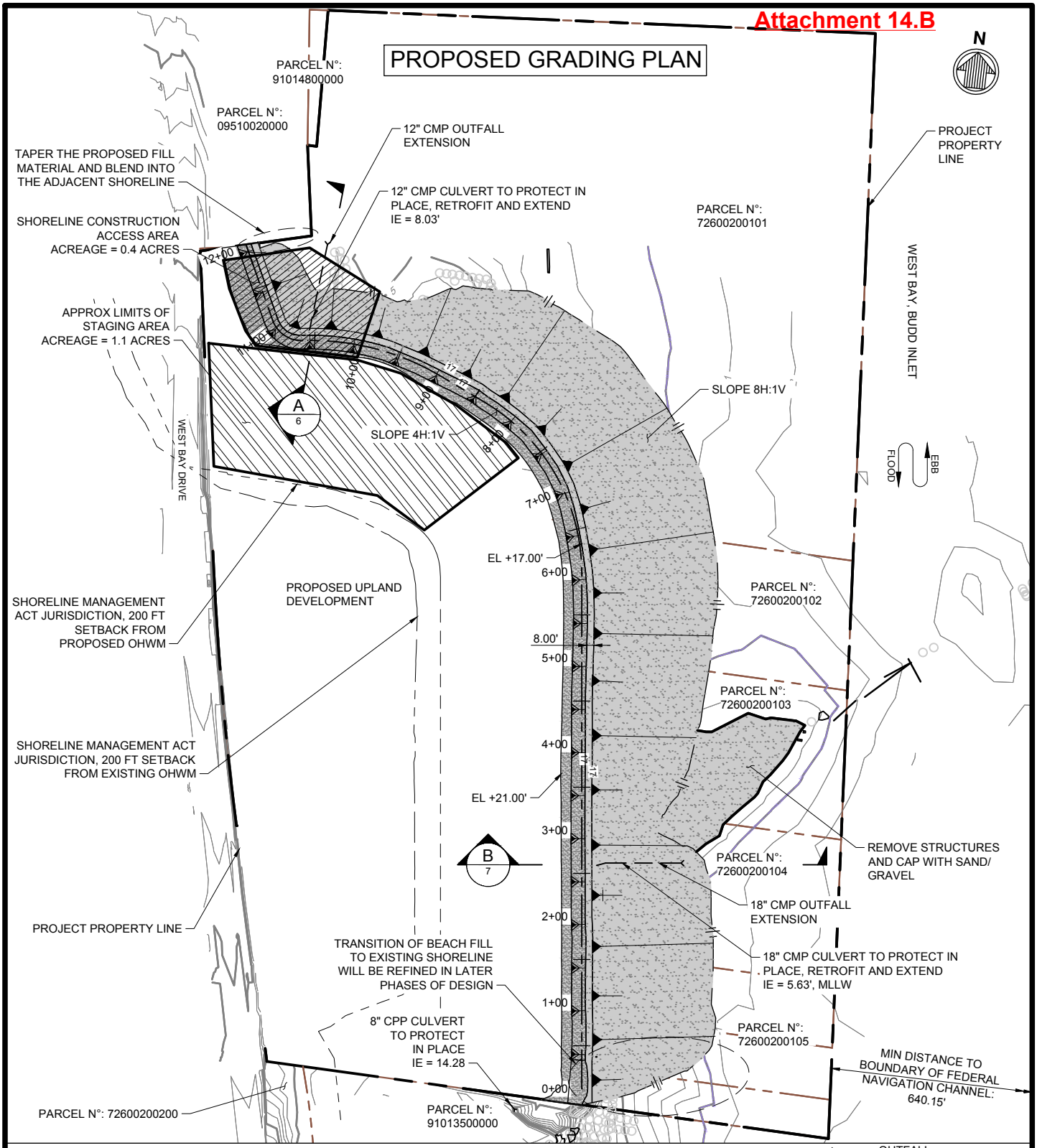
Attachment 14.B

PROPOSED GRADING PLAN



NOTES

1. EXISTING CONDITIONS (INCLUDING ELEVATION CONTOURS AND DEBRIS DELINEATION) BASED ON A TOPOGRAPHIC SURVEY PROVIDED BY MTN 2 COAST LLC DATED 2020-06-08.
2. PARCEL LINES ARE FROM THURSTON COUNTY GEODATA CENTER.
3. VERTICAL DATUM AND UNIT: MEAN LOWER LOW WATER (MLLW) AND FT.

160' 0' 160' 320'

SCALE: 1"=160'

LEGEND

- TOP SOIL
- MIXED SAND/ GRAVEL FORESHORE
- SHORELINE CONSTRUCTION ACCESS AREA
- APPROX LIMITS OF STAGING AREA
- OUTFALL PARCEL LINE
- PROPERTY LINE
- EXISTING CONTOUR (ELEVATION FT, MLLW)
- HTL (+15.90 FT MLLW)
- OHWM (+15.50 FT MLLW)
- MHW (+13.55 FT MLLW)
- MLLW (0.00 FT MLLW)

PURPOSE: SHORELINE ENHANCEMENT AND RESTORATION

ADJACENT PROPERTY OWNERS:
1) DELTA ILLAHEE LIMITED PARTNERSHIP
2) SQUAXIN ISLAND TRIBE
3) DROGBA LLC

APPLICANT: WEST BAY DEVELOPMENT

USACE REFERENCE # NWS-2022-428
LOCATION ADDRESS: 1210 WEST BAY DRIVE NORTHWEST OLYMPIA, WA 98502

PROPOSED PROJECT: OLYMPIA WEST BAY - SHORELINE ENHANCEMENT AND RESTORATION
IN: OLYMPIA, WA
DATUM: MLLW = 0.0ft
SEC: 1 T: 32 N R: 1 E
COUNTY: THURSTON COUNTY STATE: WA
SHEET: 4 OF 7 DATE: JULY 11, 2025

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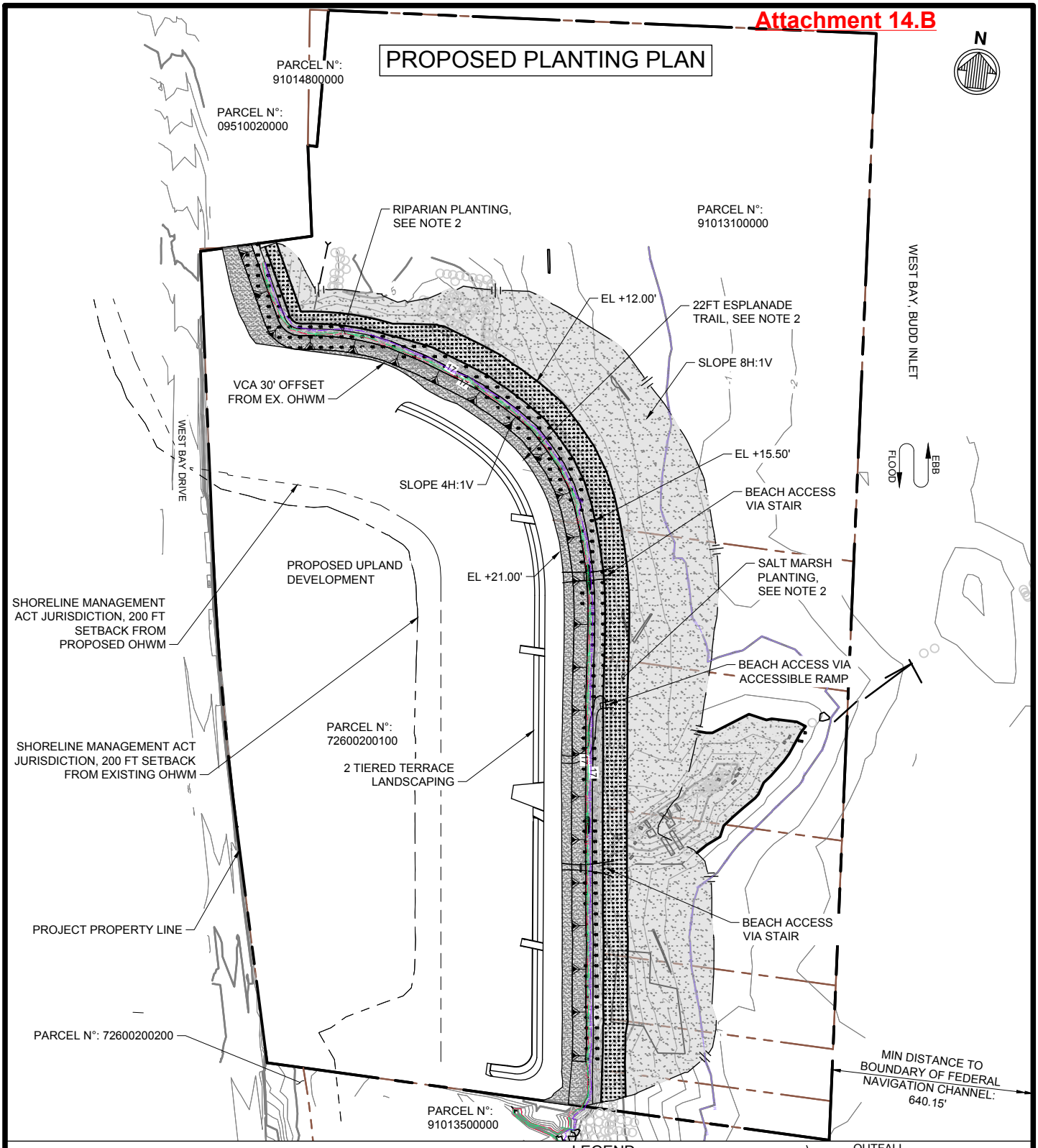
Attachment 14.B

PROPOSED PLANTING PLAN



NOTES

1. PARCEL LINES ARE FROM THURSTON COUNTY GEODATA CENTER ACCORDING TO: THURSTON COUNTY GEODATA CENTER.
2. SEE LANDSCAPE ARCHITECTURE DRAWINGS FOR DETAILS.

160' 0' 160' 320'

SCALE: 1"=160'

LEGEND

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

PURPOSE: SHORELINE ENHANCEMENT AND RESTORATION

ADJACENT PROPERTY OWNERS:
1) DELTA ILLAHEE LIMITED PARTNERSHIP
2) SQUAXIN ISLAND TRIBE
3) DROGBA LLC

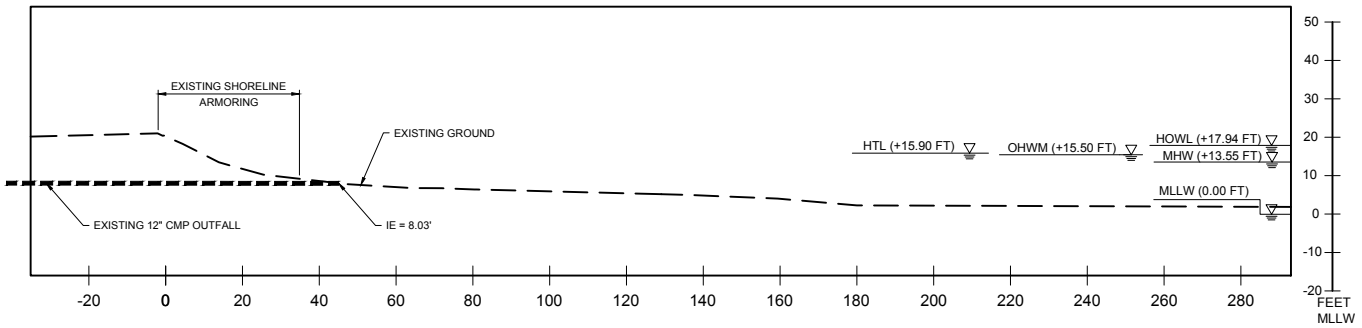
APPLICANT: WEST BAY DEVELOPMENT

USACE REFERENCE # NWS-2022-428
LOCATION ADDRESS: 1210 WEST BAY DRIVE NORTHWEST OLYMPIA, WA 98502

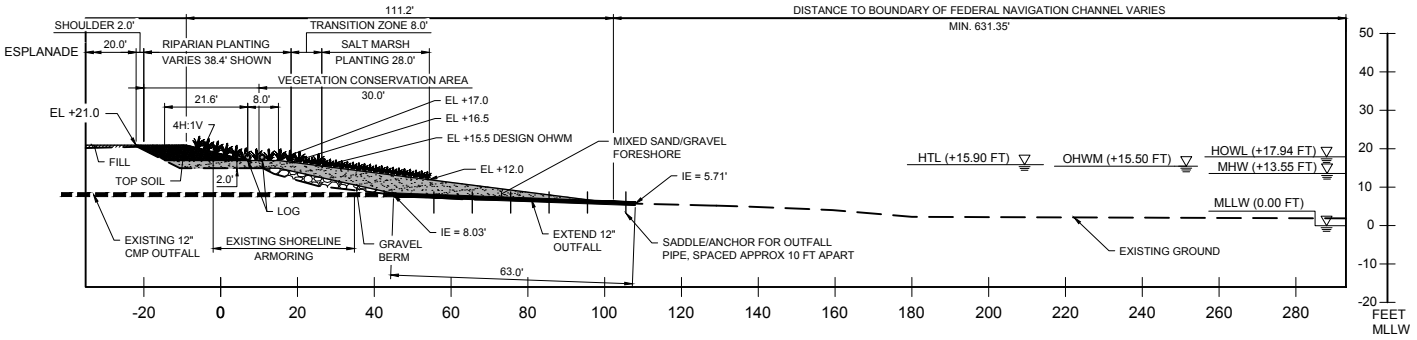
PROPOSED PROJECT: OLYMPIA WEST BAY - SHORELINE ENHANCEMENT AND RESTORATION
IN: OLYMPIA, WA
DATUM: MLLW = 0.0ft
SEC: 1 T: 32 N R: 1 E
COUNTY: THURSTON COUNTY STATE: WA
SHEET: 5 OF 7 DATE: JULY 11, 2025

File: Q:\SEA\201839\CADD_Active_JARPA\FIGURE_005

SECTIONS SHEET 1



A/4 NORTH SECTION - EXISTING
SCALE: 1":50'



A/4 NORTH SECTION - PROPOSED
SCALE: 1":50'

Fill Material/Debris	Estimated Total Volume (yd^3)	Estimated Volume Seaward of HTL (yd^3)	Estimated Volume Seaward of OHWM (yd^3)	Number of Piles
Beach - Topsoil	2,175	-	-	-
Beach - Sand/ Gravel	26,760	25,025	24,965	-
Beach - Gravel Berm	7,290	7,290	7,290	-
Landward Excavation	4,180	-	-	-
Cap after Debris Removal - Sand/ Gravel	558	558	558	-
Debris Removal - Concrete Debris	127	127	127	-
Debris Removal - Old concrete Structure	172	172	172	-
Debris Removal - Timber Treated Piles	465	465	465	200
Outfall Splash Pad - Coarse Gravel	2	2	2	-

NOTES

1. SEE LANDSCAPE ARCHITECTURE DRAWINGS FOR DETAILS.

LEGEND

- × LIMITS OF EXISTING SHORELINE ARMOR
- — — EXISTING GROUND
- —— PROPOSED GRADE
- TOP SOIL
- MIXED SAND/ GRAVEL FORESHORE
- GRAVEL BERM
- FILL

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

PURPOSE: SHORELINE ENHANCEMENT AND RESTORATION

ADJACENT PROPERTY OWNERS:
1) DELTA ILLAHEE LIMITED PARTNERSHIP
2) SQUAXIN ISLAND TRIBE
3) DROGBA LLC

APPLICANT: WEST BAY DEVELOPMENT

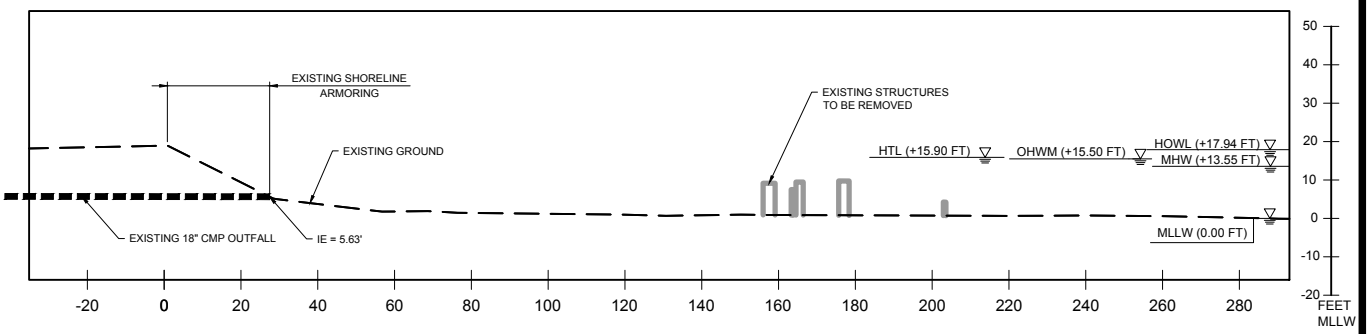
USACE REFERENCE # NWS-2022-428
LOCATION ADDRESS: 1210 WEST BAY DRIVE NORTHWEST OLYMPIA, WA 98502

PROPOSED PROJECT: OLYMPIA WEST BAY - SHORELINE ENHANCEMENT AND RESTORATION
IN: OLYMPIA, WA
DATUM: MLLW = 0.0ft
SEC: 1 T: 32 N R: 1 E
COUNTY: THURSTON COUNTY STATE: WA
SHEET: 6 OF 7 DATE: JULY 11, 2025

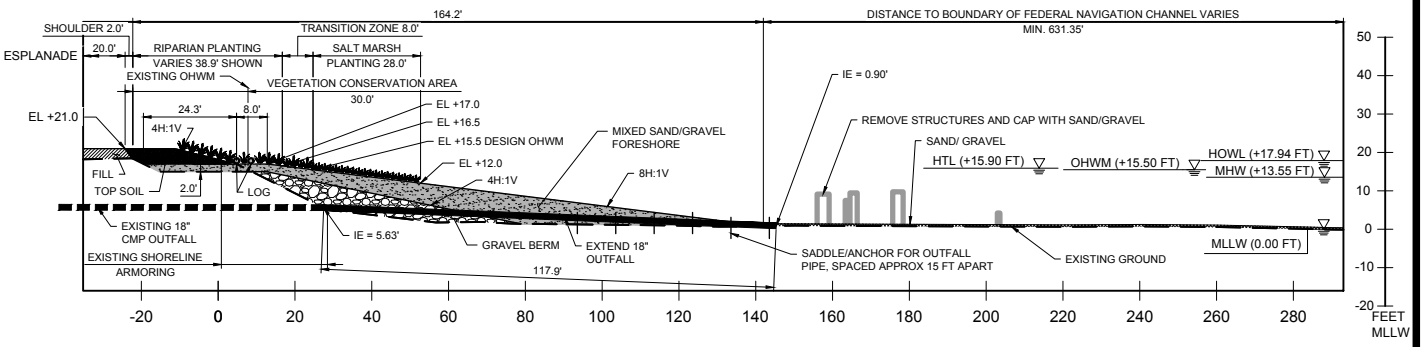
File: Q:\SEA\201839\CADD_Active_JARPA\FIGURE_006

SECTIONS SHEET 2

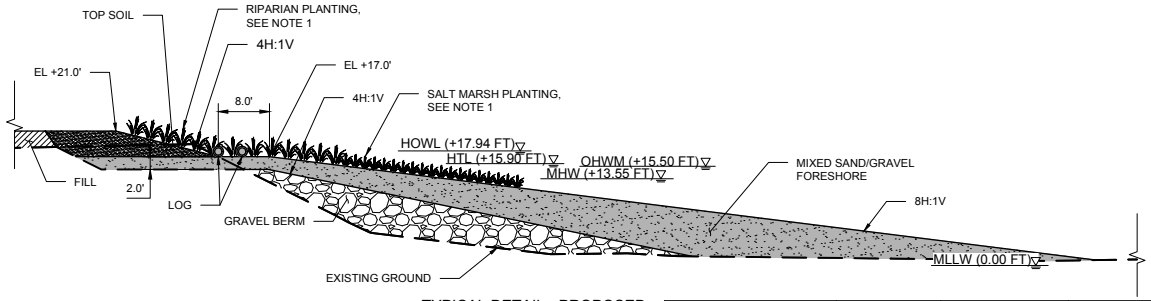
Attachment 14.B



B/4 RELIC PIER SECTION - EXISTING
SCALE: 1":50'



B/4 RELIC PIER SECTION - PROPOSED
SCALE: 1":50'



TYPICAL DETAIL - PROPOSED
SCALE: 1":30'

Fill Material/Debris	Estimated Total Volume (yd^3)	Estimated Volume Seaward of HTL (yd^3)	Estimated Volume Seaward of OHWM (yd^3)	Number of Piles
Beach - Topsoil	2,175	-	-	-
Beach - Sand/ Gravel	26,760	25,025	24,965	-
Beach - Gravel Berm	7,290	7,290	7,290	-
Landward Excavation	4,180	-	-	-
Cap after Debris Removal - Sand/ Gravel	558	558	558	-
Debris Removal - Concrete Debris	127	127	127	-
Debris Removal - Old concrete Structure	172	172	172	-
Debris Removal - Timber Treated Piles	465	465	465	200
Outfall Splash Pad - Coarse Gravel	2	2	2	-

NOTES

1. SEE LANDSCAPE ARCHITECTURE DRAWINGS FOR DETAILS.

LEGEND

- × LIMITS OF EXISTING SHORELINE ARMOR
- — — EXISTING GROUND
- —— PROPOSED GRADE
- TOP SOIL
- MIXED SAND/ GRAVEL FORESHORE
- GRAVEL BERM
- FILL

30' 0' 30' 60'

SCALE: 1"=30'

50' 0' 50' 100'

SCALE: 1"=50'

PURPOSE: SHORELINE ENHANCEMENT AND RESTORATION

ADJACENT PROPERTY OWNERS:
1) DELTA ILLAHEE LIMITED PARTNERSHIP
2) SQUAXIN ISLAND TRIBE
3) DROGBA LLC

APPLICANT: WEST BAY DEVELOPMENT

USACE REFERENCE # NWS-2022-428
LOCATION ADDRESS: 1210 WEST BAY DRIVE NORTHWEST OLYMPIA, WA 98502

PROPOSED PROJECT: OLYMPIA WEST BAY - SHORELINE ENHANCEMENT AND RESTORATION
IN: OLYMPIA, WA
DATUM: MLLW = 0.0ft
SEC: 1 T: 32 N R: 1 E
COUNTY: THURSTON COUNTY STATE: WA
SHEET: 7 OF 7 DATE: JULY 11, 2025

File: Q:\SEA\201839\CADD_Active_JARPA\FIGURE_007

Attachment 14.B

NOTES:

1. ELEVATIONS ARE GIVEN IN NAVD88. TO CONVERT TO MLLW, ADD +4FT.
2. THIS IS A WORK IN PROGRESS DRAFT.
3. SEE PLANT LIST SHEET 1.3 - Planting Schedule FOR PLANT SELECTION

VEGETATION CONSERVATION AREA INFO:

TOTAL AREA: 37,112 SF
NON-VEGETATED AREAS: 540 SF

LEGEND

	VEGETATION CONSERVATION AREA	
	SALT MARSH	ELEV. 8.0 - 11.5 CONTAINER & SEED PLANTING TOTAL ON SITE: 8,762 SF
	GRAVEL BEACH	
	TRANSITIONAL ZONE	TRANSITIONAL PLANTING ZONE ELEV. 11.5 - 12.5 CONTAINER & SEED PLANTING TOTAL ON SITE: 8,903 SF
	RIPARIAN PLANTING ZONE	RIPARIAN PLANTING ZONE ELEV. 12.5 - 17 CONTAINER & B&B PLANTING TOTAL ON SITE: 55,608 SF
	LARGE CONIFEROUS TREE	LARGE CONIFEROUS TREE COUNTS: 20
	LARGE DECIDUOUS TREE	LARGE CONIFEROUS TREE COUNTS: 21
	SMALL TREE	SMALL TREE COUNT: 81

GRAVEL BEACH
ELEV. < 8.0 FT

VCA ADJACENT MITIGATION AREA - 1467 SQ/FT

VCA ENCROACHMENT (<25%) - 1233 SQ/FT

HABITAT LOG, TYP.

SALT MARSH PLANTING ELEV. 8.0 - 11.5 +

TRANSITION ZONE PLANTING ELEV. 11.5 - 12.5 +

RIPARIAN PLANTING ELEV. 12.5 - 17.0 +

PATH

VEHICULAR RAMP

LANDSCAPE

14'

22'

ESPLANADE

30' VEGETATION CONSERVATION AREA

20' WIDE ESPLANADE WITH 2' CRUSHED ROCK SHOULDER, 22' TOTAL RIGHT-OF WAY (R.O.W.) WIDTH, TYP.

TERRACED LANDSCAPING AREA (TO MATCH ADJACENT VEGETATION PLANTING STYLE IN VCA AREA)

BLDG 5W

BLDG 5E

EDGE OF UNDERGROUND PARKING GARAGE

EDGE OF ESPLANADE

SNAG, TYP.

EX. OHWM 11.5

BEACH ACCESS VIA STAIR

BLDG 4W

BLDG 4E

N

SCALE: 1" = 20'

0' 20' 40'

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

PROJECT: WEST BAY YARDS

TITLE: SHORELINE LANDSCAPE PLAN- NORTH

j.a. brennan associates PLLC
Landscape Architects & Planners
2701 First Avenue, Suite 510
Seattle, WA 98121
t. 206.583.0620 f.206.583.0623
www.jabrennan.com

REVISION:

DATE:	DESCRIPTION:

SCALE: AS SHOWN
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DRAWN BY: SS
DESIGNED BY: JB
APPROVED BY:
CAD FILE NO.

SHEET NO. L-1.1

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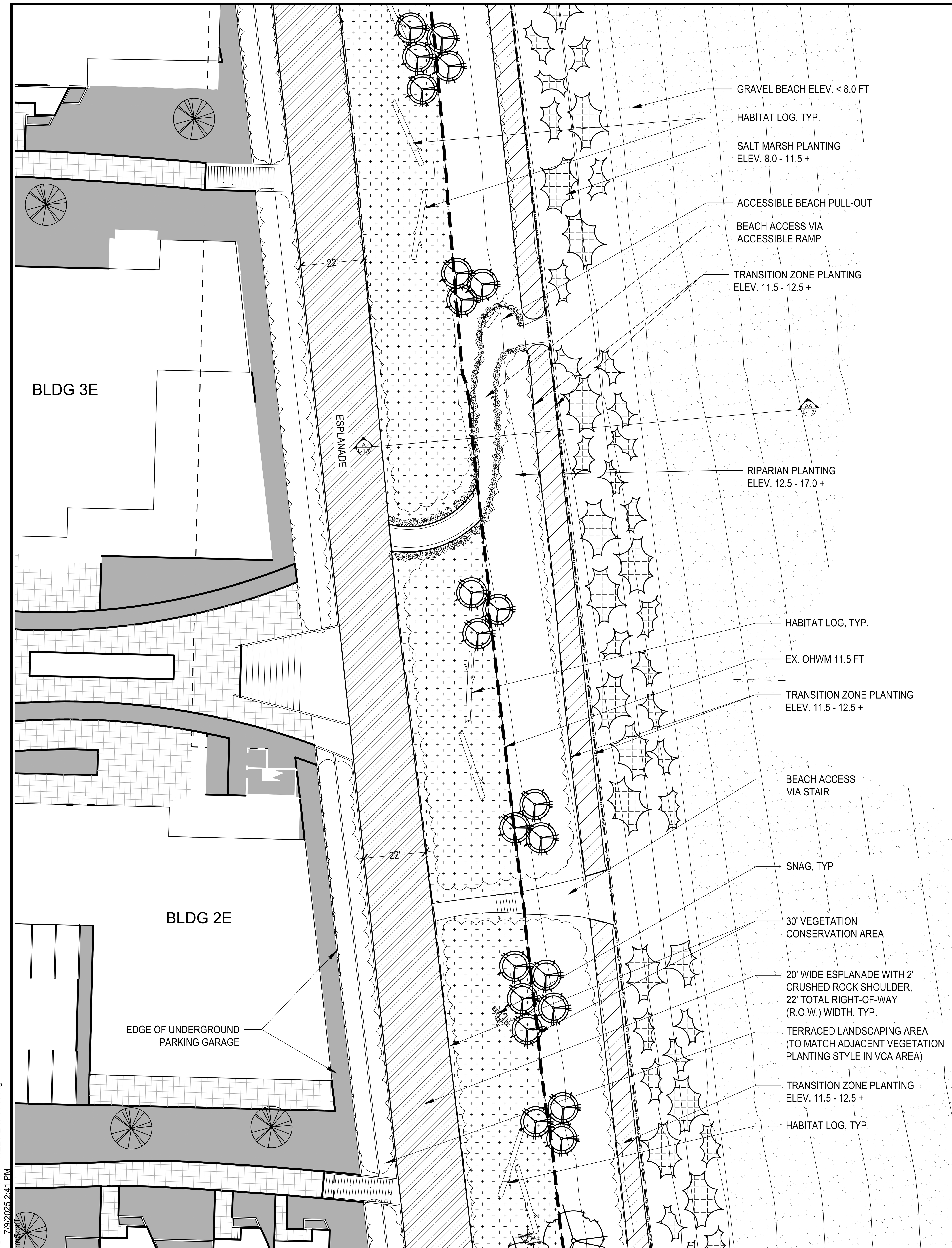
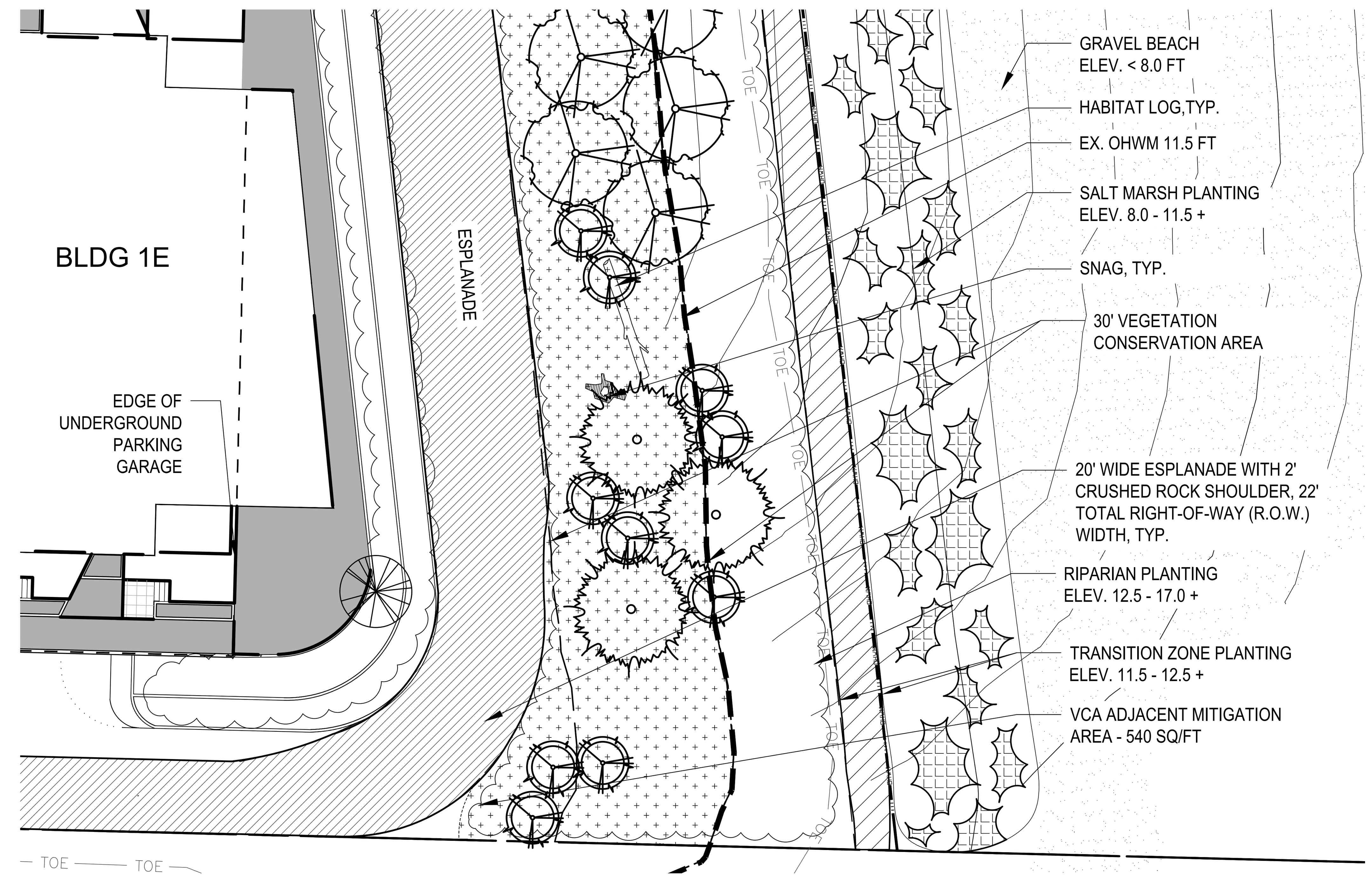
Attachment 14.B





LEGEND

VEGETATION CONSERVATION AREA		
SALT MARSH	ELEV. 8.0 - 11.5 CONTAINER & SEED PLANTING TOTAL ON SITE: 8,762 SF	
GRAVEL BEACH		
TRANSITIONAL ZONE	TRANSITIONAL PLANTING ZONE ELEV. 11.5 - 12.5 CONTAINER & SEED PLANTING TOTAL ON SITE: 8,903 SF	
RIPARIAN PLANTING ZONE	RIPARIAN PLANTING ZONE ELEV. 12.5 - 17 CONTAINER & B&B PLANTING TOTAL ON SITE: 55,608 SF	
LARGE CONIFEROUS TREE	LARGE CONIFEROUS TREE COUNTS: 20	
LARGE DECIDUOUS TREE	LARGE CONIFEROUS TREE COUNTS: 21	
SMALL TREE	SMALL TREE COUNT: 81	

NOTES:

1. ELEVATIONS ARE GIVEN IN NAVD88. TO CONVERT TO MLLW, ADD +4FT.
2. THIS IS A WORK IN PROGRESS DRAFT.
3. SEE PLANT LIST SHEET 1.3 - Planting Schedule FOR PLANT SELECTION

VEGETATION CONSERVATION AREA INFO:

TOTAL AREA: 37,112 SF
NON-VEGETATED AREAS: 540 SF

N

SCALE: 1" = 20'
0' 20' 40'

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

PROJECT: WEST BAY YARDS

TITLE: SHORELINE LANDSCAPE PLAN- SOUTH

j.a. brennan associates PLLC
Landscape Architects & Planners
2701 First Avenue, Suite 510
Seattle, WA 98121
t. 206.583.0620 f.206.583.0623
www.jabrennan.com

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DESIGNED BY: JB
APPROVED BY:
CAD FILE NO.

SHEET NO.
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PLANT SCHEDULE

RIPARIAN PLANTING

TREES						
COUNT	SYM	SCIENTIFIC NAME	COMMON NAME	SIZE	CONDITION	SPACING
-	AC	ACER CIRCINATUM	VINE MAPLE	2" CAL	B&B/CONTAINER	12' O.C.
-	AM	ACER MACROPHYLLUM	BIGLEAF MAPLE	2" CAL	B&B/CONTAINER	12' O.C.
-	AR	ALNUS RUBRA	RED ALDER	2" CAL	B&B/CONTAINER	12' O.C.
-	AME	ARBUTUS MENZIESII	PACIFIC MADRONE	2" CAL	B&B/CONTAINER	12' O.C.
-	PC	PINUS CONTORTA 'CONTORTA'	SHORE PINE	2" CAL	B&B/CONTAINER	12' O.C.
-	PM	PSEUDOTSUGA MENZIESII	DOUGLAS FIR	2" CAL	B&B/CONTAINER	12' O.C.
-	QG	QUERCUS GARRYANA	GARRY OAK	2" CAL	B&B/CONTAINER	12' O.C.
-	RP	RHAMNUS PURSHIANA	CASCARA	2" CAL	B&B/CONTAINER	12' O.C.
SHRUBS						
COUNT	SYM	SCIENTIFIC NAME	COMMON NAME	SIZE	CONDITION	SPACING
-	HD	HOLODISCUS DISCOLOR	OCEANSPRAY	1 GAL	CONTAINER	5' O.C.
-	MA	MAHONIA AQUIFOLIUM	TALL OREGON GRAPE	1 GAL	CONTAINER	5' O.C.
-	RN	ROSE NUTKANA	NOOTKA ROSE	1 GAL	CONTAINER	5' O.C.
-	SR	SAMBUCUS RACEMOSA	RED ELDERBERRY	1 GAL	CONTAINER	5' O.C.
-	SH	SALIX HOOKERIANA	HOOKER'S WILLOW	2" CAL	B&B/CONTAINER	5' O.C.
-	SA	SYMPHORICARPOS ALBUS	SNOWBERRY	1 GAL	CONTAINER	5' O.C.
GROUNDCOVER						
COUNT	SYM	SCIENTIFIC NAME	COMMON NAME	SIZE	CONDITION	SPACING
-	AM	ACHILLEA MILLEFOLIUM	COMMON YARROW	1 GAL	CONTAINER	18" O.C.
-	FC	FRAGARIA CHILOENSIS	COASTAL STRAWBERRY	1 GAL	CONTAINER	18" O.C.
-	PM	POLYSTICHUM MUNITUM	SWORD FERN	1 GAL	CONTAINER	18" O.C.

TRANSITION PLANTING

SHRUBS						
COUNT	SYM	SCIENTIFIC NAME	COMMON NAME	SIZE	CONDITION	SPACING
-	HD	HOLODISCUS DISCOLOR	OCEANSPRAY	1 GAL	CONTAINER	5' O.C.
-	SH	SALIX HOOKERIANA	HOOKER'S WILLOW	2" CAL	B&B/CONTAINER	12' O.C.
GROUNDCOVER						
COUNT	SYM	SCIENTIFIC NAME	COMMON NAME	SIZE	CONDITION	SPACING
-	AP	ARGENTINA PACIFICA	PACIFIC SILVER WEED	4" POT	CONTAINER	12" O.C.
-	TH	TUFTED HAIRGRASS	DESCHAMPSIA CESPITOSA	1 GAL	CONTAINER	18" O.C.
SEEDING						

1. PROVIDE NATIVE SEEDS IN THE MIX AS NOTED BELOW.
   GRASSES 80%; WILDFLOWERS 20%

   TUFTED HAIRGRASS - 25% (BY WEIGHT)
   COASTAL STRAWBERRY - 15%
   SEASHORE LUPIN - 15%
   WHITE YARROW - 15%
   SEA THRIFT - 10%
   GUMWEED - 10%
   BEACH PEA - 10%

SALT MARSH PLANTING

PLUGS						
COUNT	SYM	SCIENTIFIC NAME	COMMON NAME	SIZE	CONDITION	SPACING
-	GI	GRINDELIA INTEGRIFOLIA	PUGET SOUND GUMWEED	4" POT	CONTAINER	18" O.C.
-	JC	JAUMEA CARNOSA	FLESHY JAUMEA	4" POT	CONTAINER	18" O.C.
-	PM	PLANTAGO MARITIMA	SALT-MARSH PLANTAIN	4" POT	CONTAINER	18" O.C.
-	SV	SALICORNIA VIRGINICA	PICKLEWEED	4" POT	CONTAINER	18" O.C.

PROJECT: WEST BAY YARDS

TITLE: PLANTING SCHEDULE

j.a. brennan associates PLLC
Landscape Architects & Planners
2701 First Avenue, Suite 510
Seattle, WA 98121
t. 206.583.0620 f.206.583.0623
www.jabrennan.com

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CAD FILE NO.

SHEET NO. L-1.3

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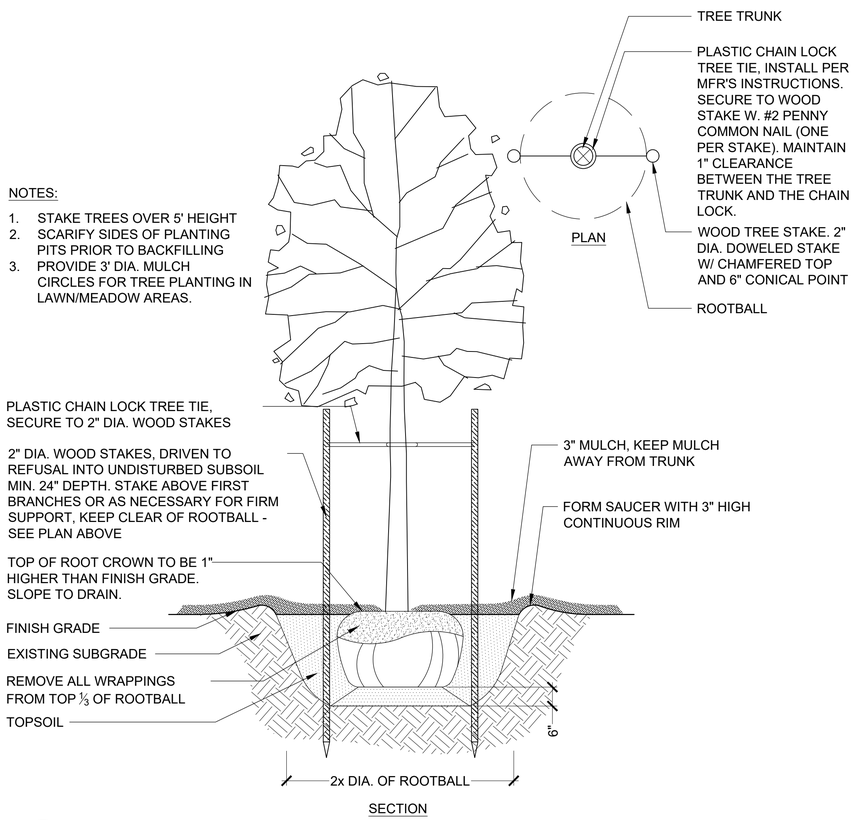
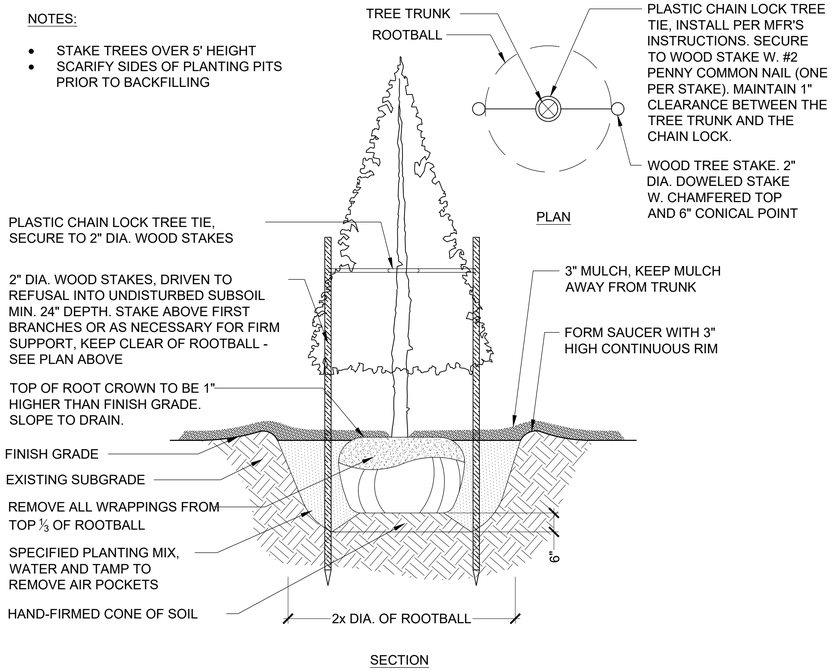


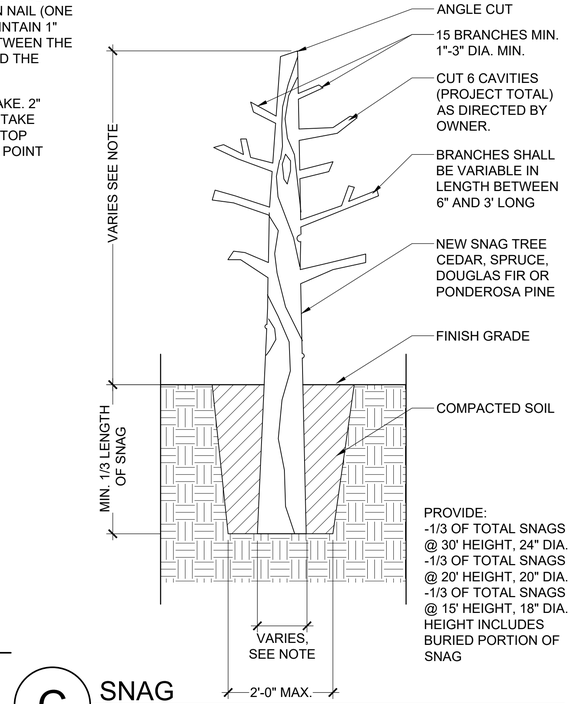
A DECIDUOUS TREE PLANTING

1/2" = 1' - 0"



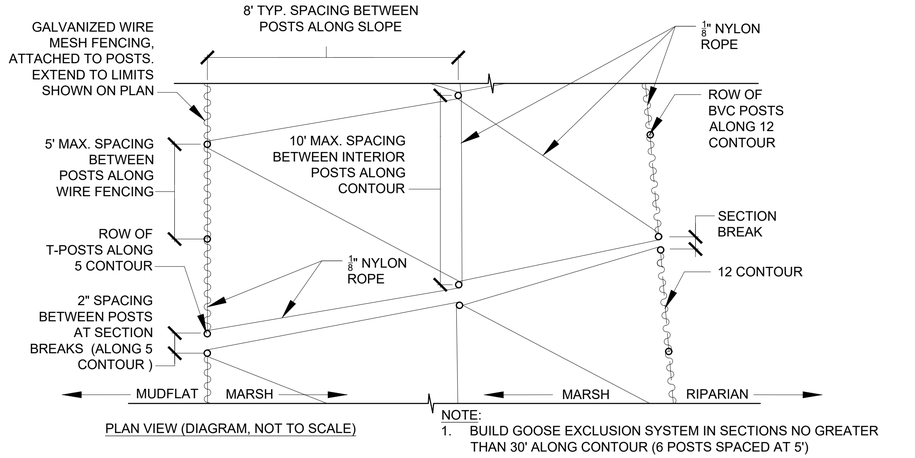
B CONIFEROUS TREE PLANTING

1/2" = 1' - 0"



C SNAG

1/2" = 1' - 0"

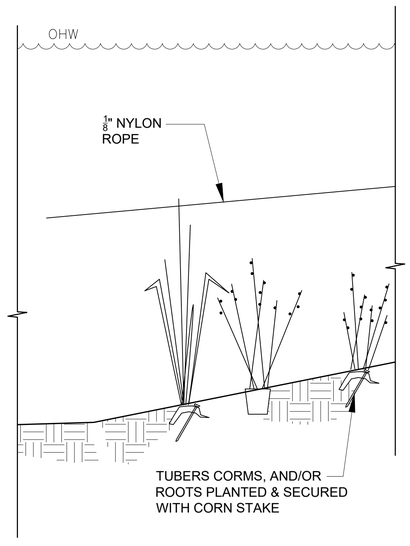


PLAN VIEW (DIAGRAM, NOT TO SCALE)

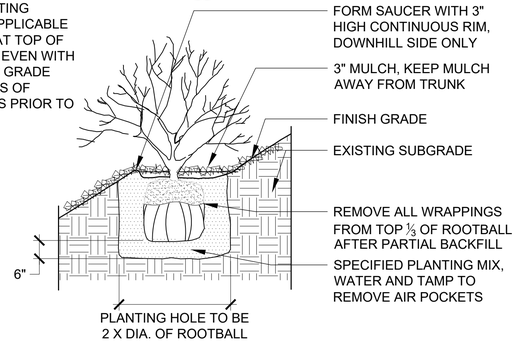
NOTE:
1. BUILD GOOSE EXCLUSION SYSTEM IN SECTIONS NO GREATER THAN 30' ALONG CONTOUR (6 POSTS SPACED AT 5')
2. ALL NEW PLANTINGS SHALL BE IMMEDIATELY PROTECTED WITH GOOSE EXCLUDER, GALVANIZED FENCING OR OTHER TEMPORARY MEANS IMMEDIATELY UPON PLANT/SEED INSTALLATION

D SALT MARSH PLANTING

1" = 1' - 0"

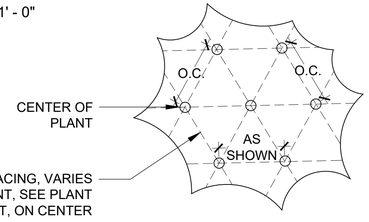


NOTES:
- STAKE TREES AS SHOWN IN TREE PLANTING DETAILS AS APPLICABLE
- PLANT SO THAT TOP OF ROOT BALL IS EVEN WITH THE FINISHED GRADE
- SCARIFY SIDES OF PLANTING PITS PRIOR TO BACKFILLING



E SHRUB PLANTING

3/4" = 1' - 0"



F GROUNDCOVER PLANTING

1/2" = 1' - 0"

PROJECT: WEST BAY YARDS

TITLE: PLANTING DETAILS

j.a. brennan associates PLLC
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2701 First Avenue, Suite 510
Seattle, WA 98121
t. 206.583.0620 f.206.583.0623
www.jabrennan.com

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DESIGNED BY: JB
APPROVED BY:
CAD FILE NO.

SHEET NO. L-1.4

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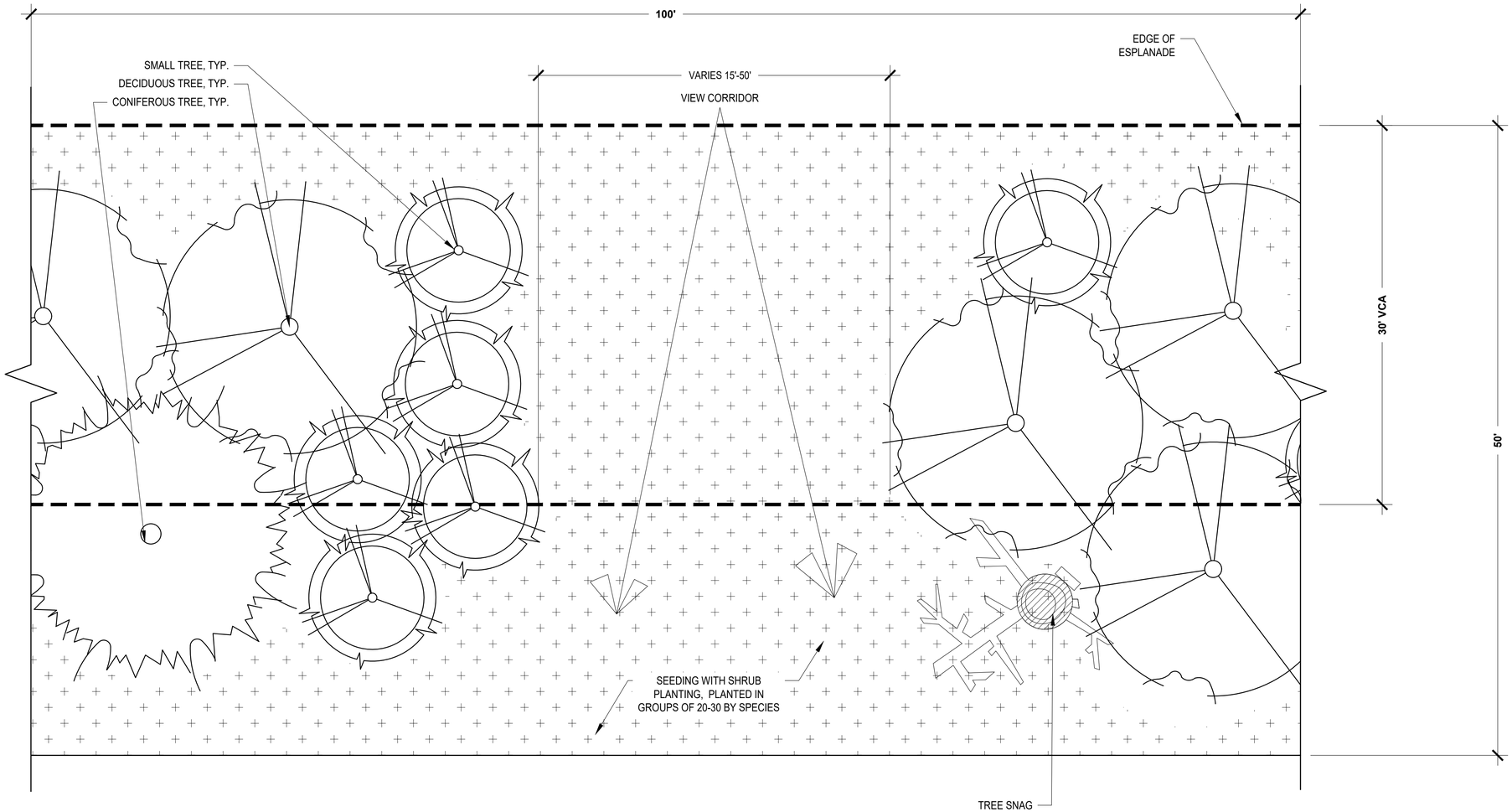

A TYPICAL VCA AND RIPARIAN PLANTING

1" = 5' - 0"

PROJECT: WEST BAY YARDS

TITLE: PLANTING DETAILS

j.a. brennan associates PLLC
Landscape Architects & Planners
2701 First Avenue, Suite 510
Seattle, WA 98121
t. 206.583.0620 f.206.583.0623
www.jabrennan.com

REVISION:

DATE:	DESCRIPTION:

SCALE: AS SHOWN
DATE: 7/9/2025
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DESIGNED BY: JB
APPROVED BY:
CAD FILE NO.

SHEET NO. L-1.5

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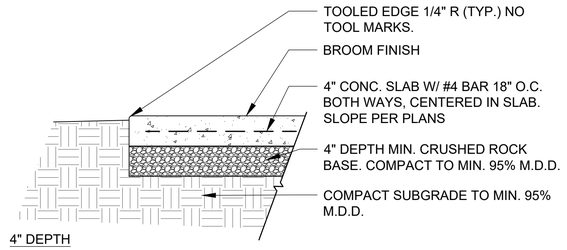
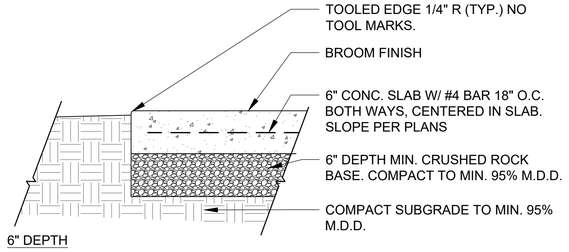
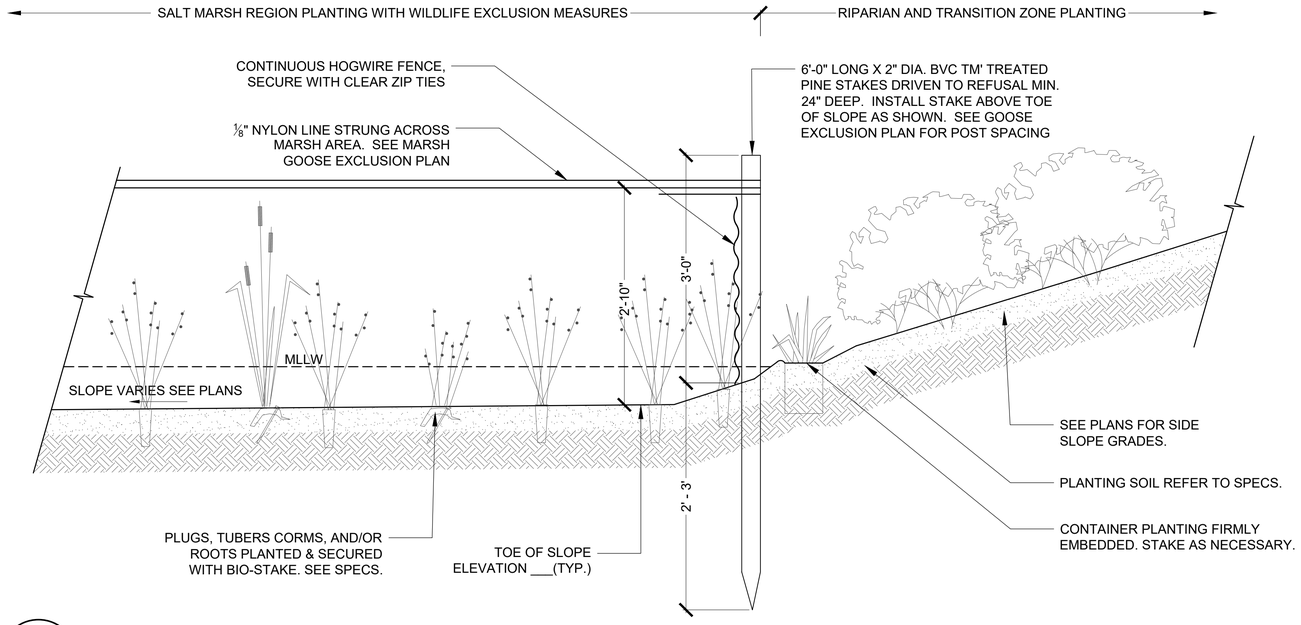




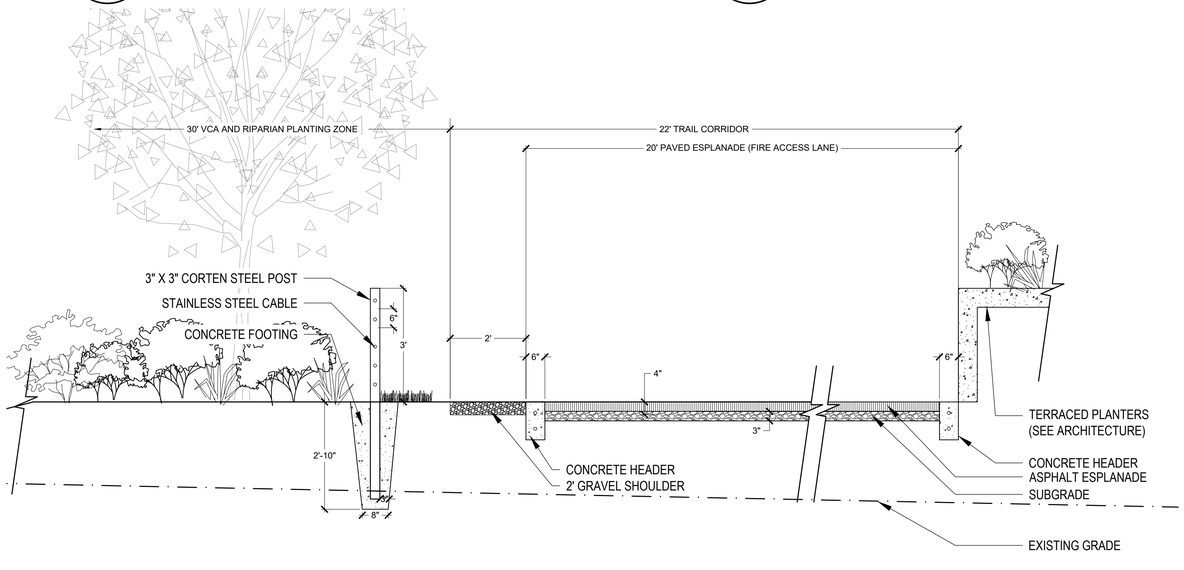
NOTES:

1. UNLESS OTHERWISE NOTED ON GRADING PLANS, CONCRETE FINISH GRADE TO BE FLUSH WITH FINISH GRADE OF ALL ADJACENT PAVEMENT, PLAYGROUND SAFETY SURFACING, LAWN AND LANDSCAPE AREAS.
2. LOCATE CONTROL & EXPANSION JOINTS PER LAYOUT PLANS. IN ADDITION, PROVIDE ⅜" EXPANSION JOINT AT ALL DRAINAGE STRUCTURES AND AT THE INTERFACE WITH ALL VERTICAL SURFACES EXCEPT ROCKS AND BOULDERS.
3. LIGHT BROOM FINISH TYP. DIRECTION PERPENDICULAR TO PEDESTRIAN TRAFFIC ON WALKS. VERIFY WITH OWNER'S REPRESENTATIVE IF DIRECTION IS NOT CLEAR.
4. OWNER'S REPRESENTATIVE SHALL APPROVE LAYOUT OF ALL FORMS PRIOR TO POURING CONCRETE. USE FLEXIBLE FORMS FOR ALL CURVED PAVEMENT.



A CONCRETE PAVING

1" = 1' - 0"



B GOOSE EXCLUSION

1" = 1' - 0"

C ASPHALT ESPLANADE SECTION WITH CABLE PLANT PROTECTION

1/2" = 1' - 0"

PROJECT: WEST BAY YARDS

TITLE: HARDSCAPE DETAILS

j.a. brennan associates PLLC
Landscape Architects & Planners
2701 First Avenue, Suite 510
Seattle, WA 98121
t. 206.583.0620 f.206.583.0623
www.jabrennan.com

REVISION:

DATE:	DESCRIPTION:

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DATE: 7/9/2025
DRAWN BY: SS
DESIGNED BY: JB
APPROVED BY:
CAD FILE NO.

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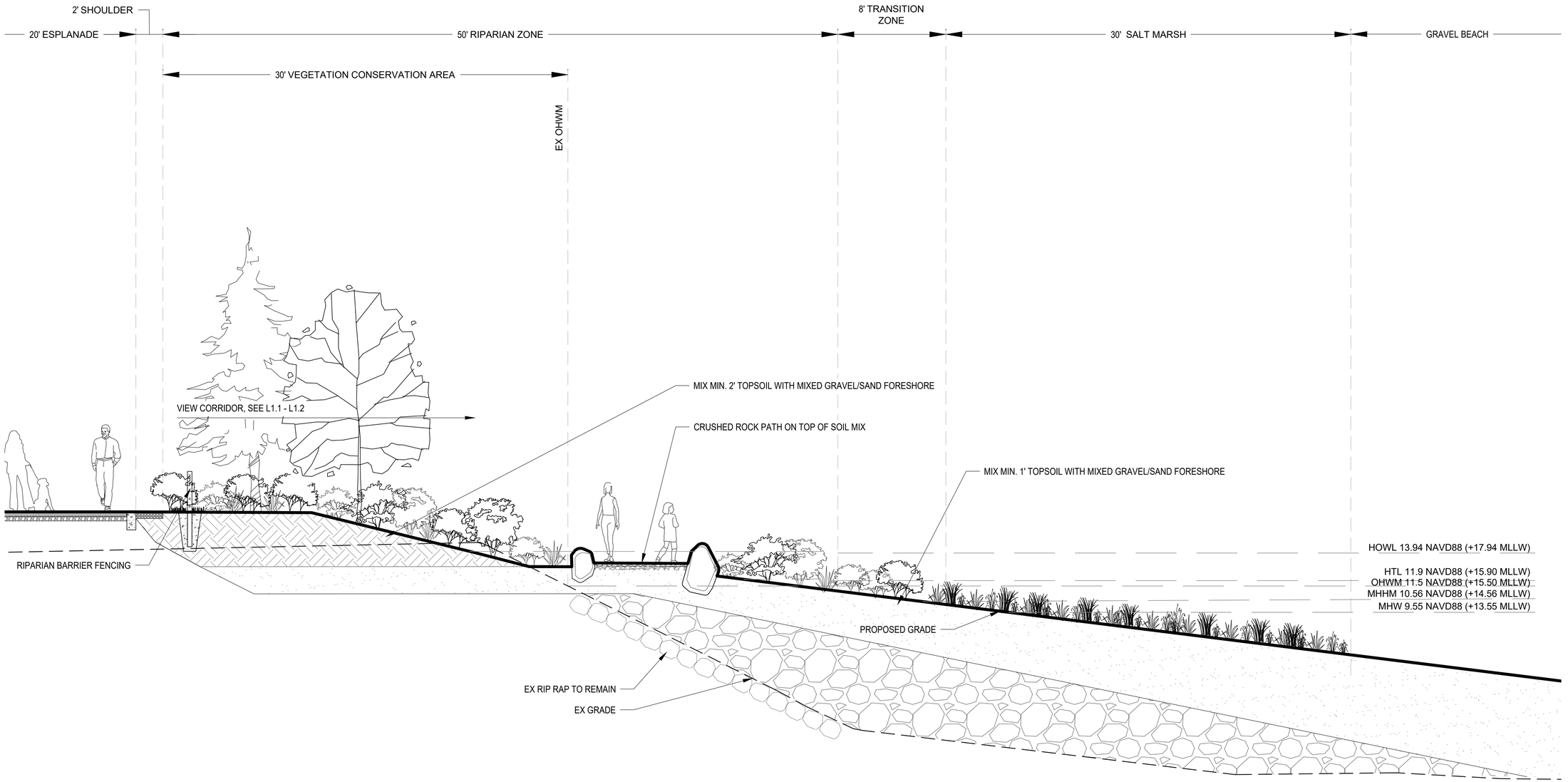

A SECTION

1/4" = 1' - 0"

PROJECT: WEST BAY YARDS

TITLE: SECTION

j.a. brennan associates PLLC
Landscape Architects & Planners
2701 First Avenue, Suite 510
Seattle, WA 98121
t. 206.583.0620 f.206.583.0623
www.jabrennan.com

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Attachment 14.B

WEST BAY DEVELOPMENT GROUP, LLC
WEST BAY YARDS PROJECT

RESTORATION AND MITIGATION PLAN

APPENDIX B: MONITORING METHODS

WSDOT Wetland Mitigation Site Monitoring Methods

WSDOT Updated 6/12/08

Purpose

As science warrants and as customer needs evolve, WSDOT seeks to keep pace with the best available science with regard to wetland monitoring methods. Current methods at WSDOT rely on standard ecological and biostatistical methods.[1] This document is divided into three sections: Principles that Guide WSDOT Wetland Monitoring Methods, a Description of WSDOT Wetland Monitoring Methods, and a section of Questions and Answers.

To the degree possible, we have informed jurisdictional authorities at all levels, and sought regulatory support and approval as our protocol has evolved for monitoring wetland mitigation sites. A substantive change was made in recent years with approval of the Army Corps of Engineers, Environmental Protection Agency, Ecology, King County, and other entities. Presentations detailing these changes were made to internal staff at WSDOT, to regulatory agencies, and at conferences such as the Society of Wetland Scientists (SWS) and Society for Ecological Restoration (SER). Support was overwhelming for our efforts to better quantify and measure compliance with mitigation success criteria.

We will continue to keep an open dialogue regarding methods we use for monitoring wetland mitigation sites.

[1] These methods are based on techniques described in Bonham (1989), Elzinga et al. (2001), Krebs (1999), Zar (1999), and other sources.

Principles that Guide WSDOT Wetland Monitoring Methods

Objective-based Monitoring
We collect data using a monitoring plan and sampling design developed specifically for each site. The monitoring plan and sampling design address success standards, performance measures, permit requirements, contingencies, and other considerations as appropriate.

Adaptive Management
Adaptive management is a critical component of WSDOT's monitoring and site management. The adaptive management process includes four iterative steps:

1. Success Standard (or performance measures) are developed to describe the desired condition,
2. management action is implemented to achieve the desired condition,
3. the resource is monitored to determine if the desired condition has been achieved, and
4. an alternate management plan is initiated if the desired condition is not achieved.

Monitoring is integral to the success of an effective adaptive management strategy. Without valid monitoring data, management actions may or may not result in improved conditions or compliance with regulatory permits. Timely decisions, based on valid monitoring data, result in increased efficiency and higher probabilities of success (Shabman 1995; Thom and Wellman 1996). The adaptive management process is illustrated in Figure 1.

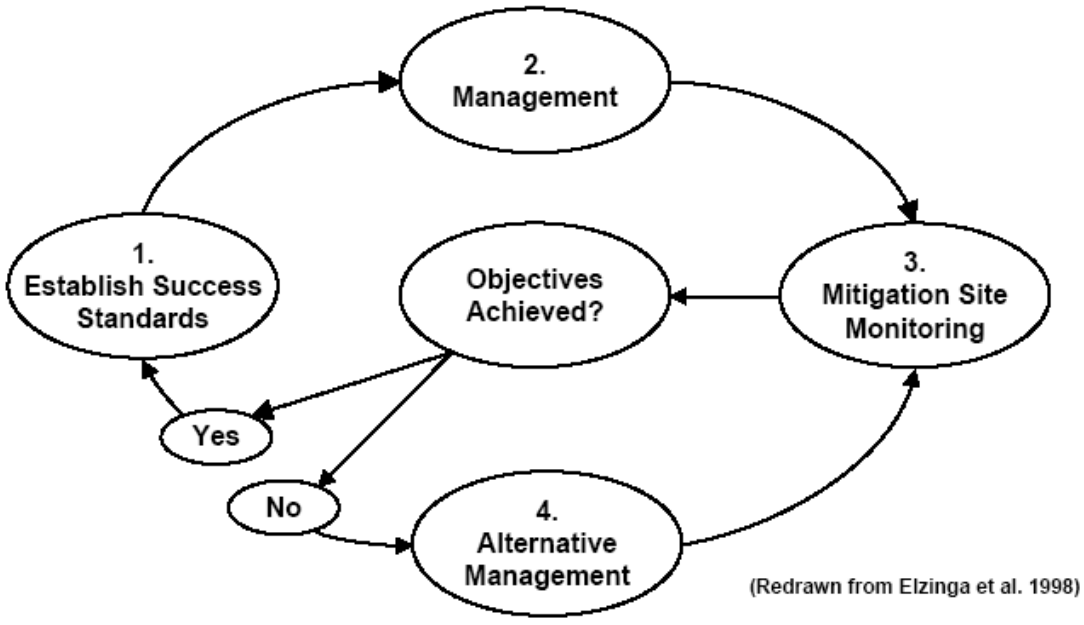


Figure 1 The Adaptive Management Process

Statistical Rigor
WSDOT's monitoring approach strives to minimize subjectivity and increase the reliability of data collection and analysis. Important considerations include appropriate sampling design, sampling resolution, random sampling procedures, and sample size analysis. Our goal is to provide customers with an objective evaluation of site conditions based on valid and reliable monitoring data.

Sampling Objectives
Sampling objectives are developed to establish a measure of reliability for collected data. In a typical WSDOT monitoring situation, biologists set a target confidence level and confidence interval half width in a sampling objective to guide the data collection process. Sample size analysis confirms when sampling objectives have been achieved. When success standards and performance measures are ultimately addressed in a report, the confidence level and confidence interval are noted following the estimated value as (CI x = Y_1-Y_2), where:

- *CI = confidence interval*
- *X = confidence level*
- *Y_1 low estimate*
- *Y_2 high estimate*

For example, an estimated cover provided by woody species reported as 65% ($CI_{80\%}$ = 52-78% cover) means that we are 80% confident that the true cover value is between 52% and 78% (Figure 2).

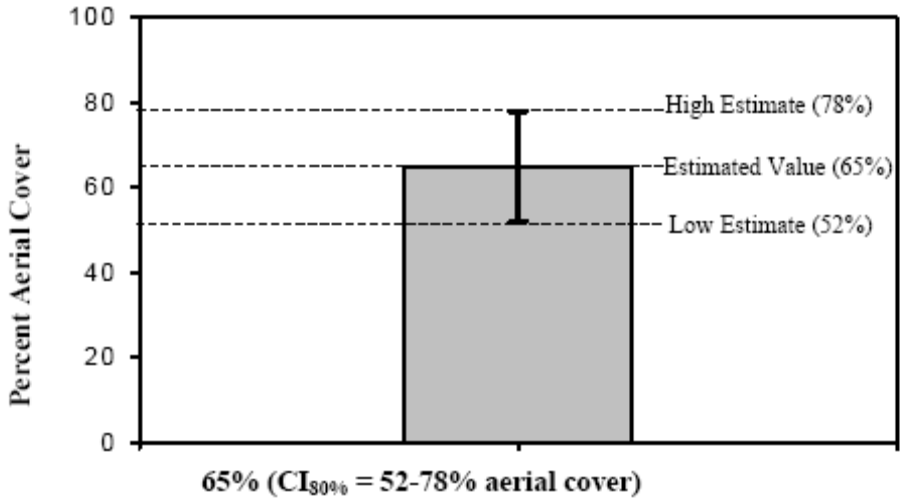


Figure 2 Estimated Cover Value Expressed with Confidence Interval Range

Description of WSDOT Wetland Monitoring Methods

Process

Monitoring typically begins the first spring after a site is planted and continues for the time period designated by the permit or mitigation plan. Sites may be monitored beyond the designated period to track the development of appropriate characteristics.

Monitoring activities are driven by site-specific performance criteria detailed in the mitigation plan or permits. Data may be collected on a variety of environmental parameters including vegetation, soils, hydrology, or wildlife. When data analysis is complete, information on site development is communicated to region staff to facilitate management activities as part of an adaptive management process. Monitoring reports are issued to regulatory agencies and published on the web.

Sampling Design

When sampling is required, a sampling design is developed for the site or zone of interest. Sampling designs can vary from simple to complex depending on the number and type of attributes to be measured. Specific elements such as the size and shape of the site, the presence of environmental gradients, and plant distribution patterns are factors that influence the sampling design. Elements of the sampling design may include the location of the baseline, orientation of transects (Figure 3), the method of data collection, and the number and type of sample units to be used. Independence and interspersion of sample units are also important requirements. Depending on the sampling objective and site characteristics, transects may vary in number, length, and separation distance. Sampling transect locations are determined by using either a simple, systematic, stratified, or restricted random sampling method. A detailed explanation of the above sampling procedures can be found in *Monitoring Plant and Animal Populations* (Elzinga et al. 2001).

Figure 3 Baseline and Sampling Transects

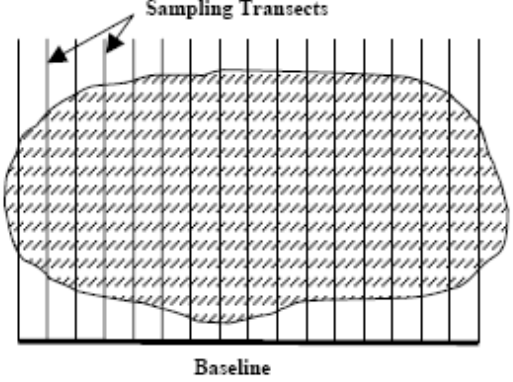
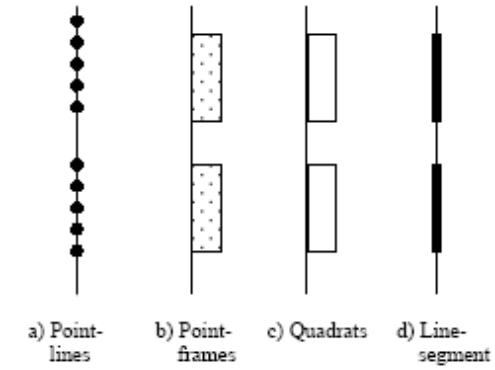


Figure 4 (a-d) Examples of Sampling Transects and Sample Units



A diagram showing the sampling design is typically included in mitigation site reports. Sample units appropriate to one or more of the methods described below are randomly located on or adjacent to the sampling transects (Figure 4 a-d). These drawings are general representations of the actual sampling designs and do not include specific details.

Vegetation Monitoring

Point-Line Method

The point-line method (Bonham 1989; Coulloudon et al. 1999) is used to estimate vegetative cover. With this technique, sample units consisting of fixed sets of points are randomly placed along sampling transects (Figure 4a). Point-line data is collected using point-intercept devices, pin flags, or densitometers to determine plant species intercepted at that point location. For each sample unit, cover is determined based on the number of times target vegetation is encountered divided by the total number of points. For example, if invasive species were encountered on 20 points from a sample unit composed of 100 points, the aerial cover of invasive species for that sample unit is 20 percent.

Point-Frame Method

Point-frames are used to measure vegetative cover (Bonham 1989; Coulloudon et al. 1999). A point-frame is a rectangular frame that encloses a set of points collectively serving as a sample unit (Figure 4b).[2] The sample unit is lowered over herbaceous vegetation and data is recorded where target vegetation intercepts point locations. As with the point-line method, a cover value for each sample unit is determined. For example, if native species were encountered on 20 points in a point-frame composed of 40 points, the aerial cover of native species for that point-frame sample unit is 50 percent.

Quadrat Method

To measure survival or density of planted trees and shrubs in an area, quadrat sample units are randomly located along sampling transects (Bonham 1989; Coul!oudon et al. 1999). Quadrat width and length are based on characteristics of the vegetative community and patterns of plant distribution. Quadrats are typically located lengthwise along sampling transects (Figure 4c). Plants within a quadrat are recorded as alive, stressed or dead. The success standard or contingency threshold can be addressed with a percent survival estimate of plantings, or a density per unit area of living plantings as appropriate. For example, if eight planted woody species were recorded as alive and two were recorded as dead in a sample unit measuring 1 x 20 meters, the survival of planted woody species for that sample unit would be 80%, and the density would be 0.4 live plants per square meter.

[2] The WSDOT Wetland Assessment and Monitoring Program typically uses a frame formed with polyvinyl chloride (PVC). Strings span the frame lengthwise and points are marked on the strings using a standard randomization method.

Line-Intercept Method

Cover data for the woody species community is collected using the line-intercept method (Bonham 1989; Coulloudon et al. 1999).[3] Line-segments, serving as sample units, are randomly located along sampling transects (Figure 4d). All woody vegetation intercepting the length of each sample unit is identified and the length of each canopy intercept recorded. For each sample unit, the sum of the canopy intercept lengths is divided by the total length to calculate an aerial cover value. For example, if woody vegetation was encountered on 80 meters from a 100-meter sample unit, the aerial cover for that sample unit is 80 percent.

Unequal-Area Belt Transect Method

For surveys of irregularly shaped regions, the unequal-area belt transect method provides an easy-to-implement sampling protocol that may be particularly useful for assessments of woody species density or survival (Stehman and Salzer 2000). With this technique, fixed-width belt transects (quadrats) are positioned perpendicular to a baseline using a simple, systematic, or restricted random sampling method. Once a belt transect has been located, field crews traverse the entire length of the transect counting all plants within the perimeter of the belt transect.

The following equations are used to analyze plant density data collected from unequal-area belt transects.

First, density is estimated using a ratio estimator of the mean number of plants per transect divided by the mean area per transect.

$$\hat{D} = \frac{\bar{y}}{\bar{a}}$$

$\hat{D}$ = sample-based estimator of density
$\bar{y}$ = sample mean plants per transect
$\bar{a}$ = sample mean transect area

Second, variance of the sample-based density estimator is derived from the following equation.

$$\hat{V}(\hat{D}) = \frac{1}{\bar{a}^2}\left(\frac{N-n}{N}\right)\frac{s_e^2}{n}$$

N = population size
n = sample size
s_e^2 = pooled variance[4]
$\hat{V}(\hat{D})$ = variance of the density

Finally, a confidence interval for the sample-based estimator is calculated as follows.

$$\hat{D} \pm (t)[SE(\hat{D})]$$

$\hat{D}$ = sample-based estimator of density
SE = sample standard error

[3] Depending on site conditions and other considerations, woody cover data may be collected using the point-line method and a densitometer.

[4] $s_e^2 = \sum_s \left(y_u - \hat{D}a_u\right)^2 \Big/ (n-1)$

For more information on the unequal-area belt transect method and data analysis techniques see Stehman and Salzer (2000).

Sample Size Analysis

With each of the above methods, sample size analysis is performed in the field to ensure that an adequate number of sample units are obtained to report the data at the specified confidence level and interval. The mean percent aerial cover value and standard deviation are calculated from the data, and sample size analysis is conducted. The following sample size equation for estimating a single population mean or a population total within a specified level of precision is used to perform this analysis (Elzinga et al. 2001).

$$n = \frac{(z)^2(s)^2}{(B)^2}$$

z = standard normal deviate
s = sample standard deviation
B = precision level [5]
n = unadjusted sample size

A sample size correction to n is necessary for adjusting "point-in-time" parameter estimates.[6] It is the adjusted n value that reveals the number of sample units required to report the estimated mean value at a specified level of confidence.

Hydrology Monitoring

Primary and secondary field indicators of wetland hydrology (Ecology 1997) are recorded to address hydrology standards and to aid in future delineation efforts. These indicators are recorded during each site visit over the monitoring period of the site. Mitigation sites are delineated during their third year of monitoring to determine if sufficient wetland area has been provided. Mid-course corrections or adaptive management are initiated if necessary. Each site is also delineated in the spring following the last year of vegetation monitoring so the actual wetland area can be compared to the planned wetland area.

[5] In this equation, the precision level equals half the maximum acceptable confidence interval width multiplied by the sample mean.
[6] Adjusted n values found in this report were obtained using the algorithm for a one-sample tolerance probability of 0.90 (Kupper and Hafner 1989; Elzinga et al 2001).

Questions and Answers

Why does WSDOT use temporary instead of permanent transects?

In most monitoring situations, the intent of WSDOT biologists is to numerically estimate vegetation attributes at a point-in-time. Factors such as the shape and size of the area to be addressed, environmental gradients, and plant distributions influence how monitoring is best conducted. Success standards and performance measures may require measurement of different attributes, over different spatial areas, in different years of the monitoring period. Consequently, sampling designs using temporary transects appropriate for each sampling event are either necessary or desirable. Additionally, invasive plant species may colonize an area of a site that cannot be satisfactorily sampled by already established permanent transects. Monitoring reports issued annually by WSDOT include diagrams of sampling designs, details of methods used, and a confidence interval for quantitative results. Additional information is found in *Monitoring Plant and Animal Populations* (Elzinga et al. 2001; Chapt. 8).

How does WSDOT incorporate randomization into its methods?

Randomization is a fundamental requirement of all statistical sampling procedures (Sokal and Rohlf 1995; Zar 1999). Therefore, randomization is incorporated on at least two levels when sampling is conducted on a WSDOT mitigation site. Techniques are used that assure each sample unit in a statistical population has an equal chance of being included in a sample. Sampling transect locations are determined by using either a simple, systematic, stratified, or restricted random sampling method. Sample units are also randomly located using similar techniques along sampling transects. Under certain circumstances, further randomization is appropriate, such as when macroplots are used to sample an especially large area (Elzinga et al. 2001).

Are objective methods better than methods based on visual estimates?

The primary problem with visual estimates is the unknown level of observer bias involved (Greig-Smith 1983; Hatton et al. 1986). For this reason, WSDOT favors objective methods based on biostatistics for use in measuring success standards and performance measures. In addition to providing better and more credible information for measuring compliance criteria, proper site management depends on having valid information with a known level of reliability.

How many sample units are needed to address a success standard?

The number of sample units needed to address a particular success standard or performance measure is influenced by several factors and cannot be known prior to sampling. WSDOT uses pilot sampling techniques, and data are run through sample-size equations. Results provide an estimate of how many sample units will be required to obtain an estimated value (to address performance criteria) at a certain level of statistical confidence. Variation of the measured attribute between individual sample units (standard deviation) heavily influences the number of sample units required. The greater the variation between sample units, the greater the number of sample units required. A thoughtful sampling design that considers environmental gradients and plant distributions often greatly reduces the number of sample units needed to address success standards or performance measures.

Literature Cited

Bonham, C. D. 1989. Measurements for Terrestrial Vegetation. John Wiley & Sons, New York, NY.

Coulloudon, B., K. Eshelman, J. Gianola, N. Habich, L. Hughes, C. Johnson, M. Pellant, P. Podborny. A. Rasmussen, B. Robles, P. Shaver, J. Spehar, J. Willoughby. 1999. Sampling Vegetation Attributes. BLM Technical Reference 1734-4, Denver, CO.

Elzinga, C. L, D. W. Salzer, J. W. Willoughby, and J. P. Gibbs. 2001. Monitoring Plant and Animal Populations. Blackwell Science, Inc., MaIden, MA.

Elzinga, C. L., D. W. Salzer, and J. W. Willoughby. 1998. Measuring and Monitoring Plant Populations. Bureau of Land Management Technical Reference 1730-1, BLM/RS/ST-98/005+ 1730. National Business Center, Denver, CO.

Greig-Smith, P. 1983. Quantitative Plant Ecology, 3rd edition. University of California Press, Berkeley, CA.

Hatton, T. J., N. E. West, P. S. Johnson. 1986. Relationship of the Error Associated with Ocular Estimation and Actual Total Cover. Journal of Range Management 39: 91-92.

Krebs, C. J. 1999. Ecological Methodology, 2nd edition. Benjamin/Cummings, New York, NY.

Kupper, L. L. and K. B. Hafner. 1989. How Appropriate are Popular Sample Size Formulas? The American Statistician (43): 101-105.

Shabman, L.A. 1995. Making Watershed Restoration Happen: What Does Economics Offer? In Rehabilitating Damaged Ecosystems, ed. J. Cairns, pp. 35-47. Lewis Publishers, Boca Raton, FL.

Sokal, R.R. and F.J. Rohlf. 1995. Biometry, 3rd edition. W.H. Freeman and Company, NY.

Stehman, S. and D. Salzer. 2000. Estimating Density from Surveys Employing Unequal-Area Belt Transects. Wetlands. Vol. 20, No. 3, pp. 512-519. The Society of Wetland Scientists, McLean, VA

Thom, R. M. and K. F. Wellman. 1996. Planning Ecosystem Restoration Monitoring Programs. Evaluation of Environmental Investments Research Program, United States Army Corps of Engineers, IWR Report 96-R-23.

Washington State Department of Ecology. 1997. Washington State Wetlands Identification and Delineation Manual. Ecology Publication No. 96-94. Olympia, WA.

Zar, J. H. 1999. Biostatistical Analysis, 4th edition. Prentice-Hall, Inc., Upper Saddle River, NJ.