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

US Army Corps of Engineers
Seattle District

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

AGENCY USE ONLY

Date received:

Agency reference #: ____________

Tax Parcel #(s): ____________

____

Part 1–Project Identification

1. Project Name (A name for your project that you create. Examples: Smith's Dock or Seabrook Lane Development) [help]
Luther Burbank Park Waterfront Improvements Project (Project)

Part 2–Applicant

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

2a. Name (Last, First, Middle)			
West, Paul			
2b. Organization (If applicable)			
City of Mercer Island Public Works			
2c. Mailing Address (Street or PO Box)			
9611 SE 36th Street			
2d. City, State, Zip			
Mercer Island, Washington 98040			
2e. Phone (1)	**2f.** Phone (2)	**2g.** Fax	**2h.** E-mail
(206) 275-7833			paul.west@mercergov.org

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

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

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

Part 3–Authorized Agent or Contact

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

3a. Name (Last, First, Middle)			
Jensen, Josh			
3b. Organization (If applicable)			
Anchor QEA, LLC			
3c. Mailing Address (Street or PO Box)			
1201 3rd Avenue, Suite 2600			
3d. City, State, Zip			
Seattle, Washington 98101			
3e. Phone (1)	**3f.** Phone (2)	**3g.** Fax	**3h.** E-mail
(206) 903-3374			jjensen@anchorqea.com

Part 4–Property Owner(s)

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

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

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

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

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

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

Part 5–Project Location(s)

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

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

5a. Indicate the type of ownership of the property. (Check all that apply.) [help]
☐ Private ☐ Federal ☒ Publicly owned (state, county, city, special districts like schools, ports, etc.) ☐ Tribal ☒ Department of Natural Resources (DNR) – managed aquatic lands (Complete JARPA Attachment E)
5b. Street Address (Cannot be a PO Box. If there is no address, provide other location information in 5p.) [help]
2040 84th Avenue SE
5c. City, State, Zip (If the project is not in a city or town, provide the name of the nearest city or town.) [help]
Mercer Island, Washington 98040
5d. County [help]
King
5e. Provide the section, township, and range for the project location. [help]

¼ Section	Section	Township	Range
SW	6	24 North	5 East

5f. Provide the latitude and longitude of the project location. [help] • Example: 47.03922 N lat. / -122.89142 W long. (Use decimal degrees - NAD 83)
47.591034 N lat. / -122.224481 W. long.
5g. List the tax parcel number(s) for the project location. [help] • The local county assessor's office can provide this information.
0624059014, 072405HYDR
5h. Contact information for all adjoining property owners. (If you need more space, use JARPA Attachment C.) [help]

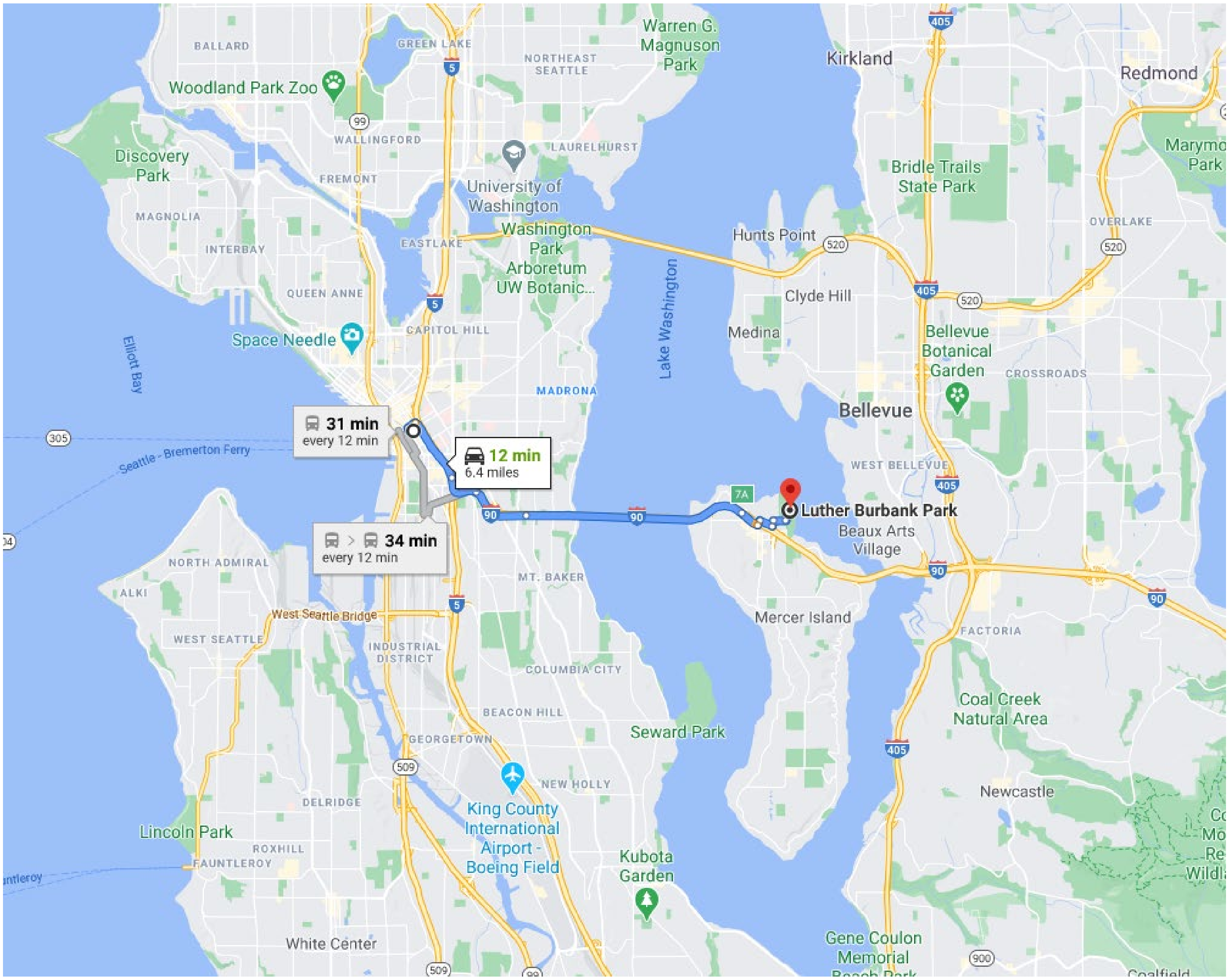
Name	Mailing Address	Tax Parcel # (if known)
City of Mercer Island	9611 SE 36th Street Mercer Island, Washington 98040	0724059054, 0124049018, 0124049002

5i. List all wetlands on or adjacent to the project location. [help]
No wetlands are present on or adjacent to the Project area (USFWS 2022). There are wetlands on the north and south end of the park that are outside of the Project area and will be unaffected by the Project.
5j. List all waterbodies (other than wetlands) on or adjacent to the project location. [help]
Lake Washington

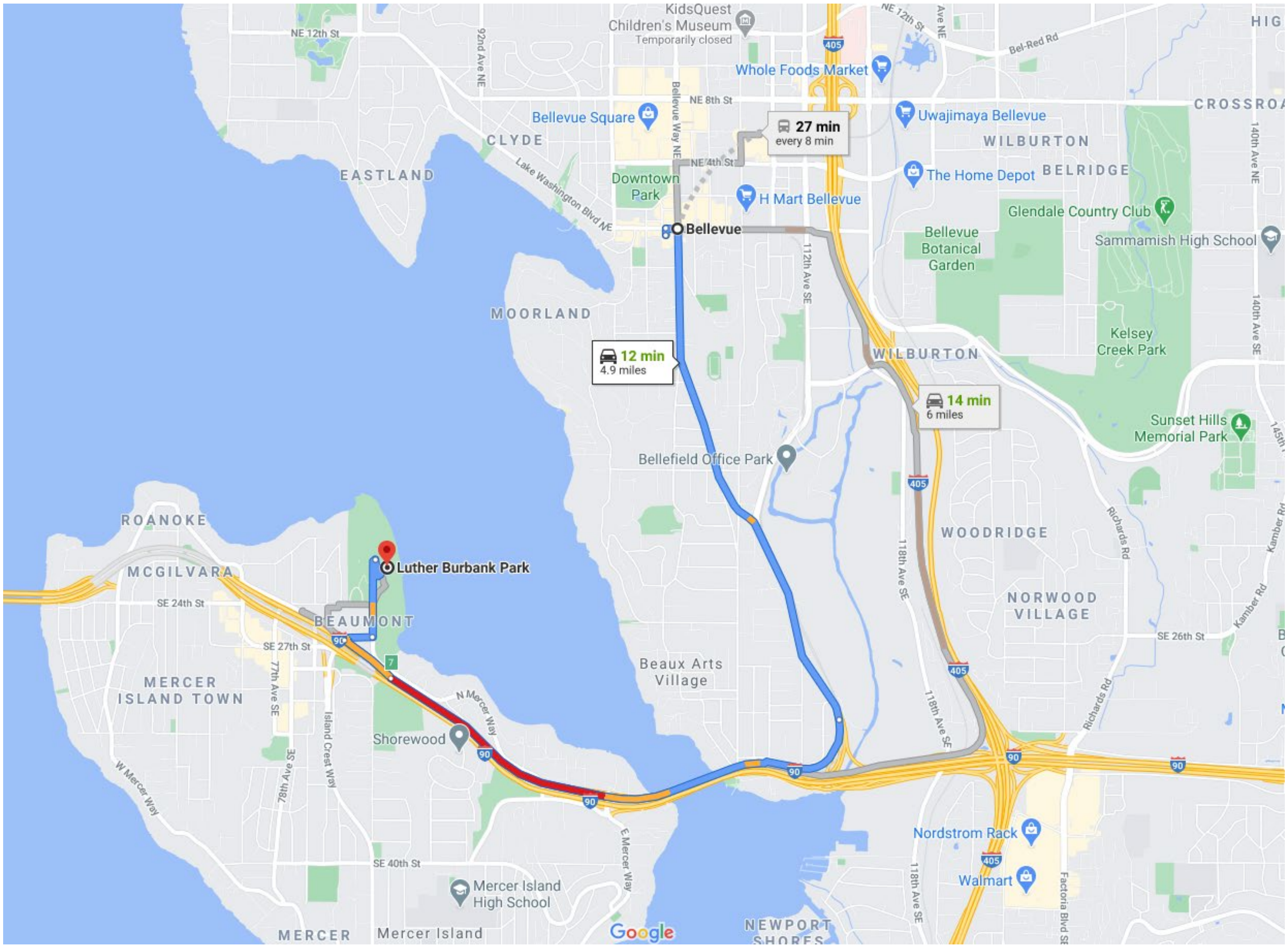
5k. Is any part of the project area within a 100-year floodplain? [help]	
☐ Yes ☒ No ☐ Don't know	
5l. Briefly describe the vegetation and habitat conditions on the property. [help]	
Luther Burbank Park is located on the shoreline of Lake Washington (Attachment 1, Figure 1). The park is a 55-acre recreation area managed by the City of Mercer Island. A portion of the park has been left undeveloped to foster a variety of wildlife, including 135 species of birds, 50 species of waterfowl, raccoons, beaver, muskrats, tree frogs, and rabbits (City of Mercer Island 2022). Habitat for many of the terrestrial species is provided by wetlands that occupy the north and south ends of the park, outside of the Project area. The park also contains manicured lawns surrounded by stands of trees. Lake Washington is a large, freshwater lake that occupies approximately 34 square miles between the metropolitan cities of Seattle and Bellevue. The water levels in Lake Washington are seasonally managed by the U.S. Army Corps of Engineers (USACE) to accommodate water usage, navigation, fish passage, and salinity control. The shoreline near the proposed dock replacement is developed with a shoreline promenade that is defined by a vertical bulkhead. There is a small pocket beach located immediately to the north of the promenade that contains some large woody debris and is primarily used for recreational use. The lake in the vicinity of the Project provides habitat for a variety of migratory bird species and fish including Chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), coho salmon (*O. kisutch*), steelhead trout (*O. mykiss*), resident cutthroat trout (*O. clarkii*) and bull trout (*Salvelinus confluentus*; WDFW 2022a).	
5m. Describe how the property is currently used. [help]	
Luther Burbank Park is used as a popular recreational resource and offers public access to Lake Washington. The park has a play area, an off-leash dog area, picnic areas, tennis courts, a boat dock, a public fishing pier, a swimming beach, and an amphitheater.	
5n. Describe how the adjacent properties are currently used. [help]	
The Project area is surrounded by the remainder of the park and park facilities. Adjacent properties include the Mercer Island Community and Event Center and a community pea-patch. Residential properties are located farther to the west, outside of the park. Lake Washington is located on the east side of the Project area and used primarily for recreation.	
5o. Describe the structures (above and below ground) on the property, including their purpose(s) and current condition. [help]	
Existing structures in the Project area include the dock and Boiler Building (Attachment 1, Figure 2). The Boiler Building is located within the waterfront plaza west of the dock and is currently used for park storage and restrooms. The shoreline is defined by a vertical concrete bulkhead spanning approximately 200 linear feet (lf). The bulkhead delineates the plaza area, which includes concrete paving and pavers. The existing dock (Attachment 1, Figure 2) is a fixed 5,500-square-foot (sf) dock structure with wood and concrete decking, supported by creosote-treated timber piles (14- to 16-inch-diameter). The deck is solid concrete with no grating and currently impedes light transmission to the aquatic environment. Some timber piles are damaged. The existing dock structure includes three main segments (north, central, and south), each measuring 8 feet wide.	

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

From Seattle: Take I-90 east across the Lacey V. Murrow floating bridge, then take Exit 7A for 77th Avenue SE. In 0.3 miles, turn left onto 77th Avenue SE, then turn right onto North Mercer Way. In 0.2 mile, turn left onto 81st Avenue SE, then turn right onto SE 24th Street. In 0.2 mile, turn left onto 84th Avenue SE and park in the North Lot of Luther Burbank Park. There are public trails that head west from the parking area to the promenade and dock.



From Bellevue: Take I-90 west to Exit 7 for Island Crest Way. Continue for 0.2 mile, then turn right onto SE 26th Street. In 0.1 mile, turn left onto 84th Avenue SE and park in the North Lot of Luther Burbank Park. There are public trails that head west from the parking area to the promenade and dock.



Part 6–Project Description

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

The City of Mercer Island (City) is proposing the Luther Burbank Park Waterfront Improvements Project (Project) to repair, maintain, and enhance the waterfront program at Luther Burbank Park in the City of Mercer Island, Washington. Attachment 1, Figures 3 and 4, provide an overview of the Project and a demolition plan, respectively. The Project includes repairing and replacing portions of the existing dock structures, including repairs to the north dock structure, and replacing and reconfiguring the central and south dock structures to accommodate waterfront programming and current and projected watercraft uses. Other waterside improvements include installing a grated overwater public platform in the nearshore to improve access to the water along the existing plaza area.

The Project also includes upgrades to the waterfront plaza and Boiler Building. These include Boiler Building repairs (i.e., new roof, seismic retrofits, and new lighting); Boiler Building restroom annex renovation to improve the restroom facilities and construct a new rooftop viewing deck; concession stand repairs; and waterfront plaza renovations and access upgrades. The Project will improve access to the waterfront by creating new Americans with Disabilities Act (ADA) accessible routes from the plaza to the viewing deck on the existing Boiler Building annex restroom rooftop, and to the expanded north beach area that will be improved with fish habitat gravel and riparian plantings. The ADA route will connect to the adjacent future south shoreline trail that will be constructed as part of a separate project. The ADA route will also connect to the existing trail that continues north of the Project area. All proposed waterfront improvements including the dock structures and gangways will also meet ADA requirements. The waterfront plaza renovations and access upgrades will incorporate low impact development (LID) features that will provide stormwater buffering and biofiltration functions similar to a vegetated shoreline. An irrigation intake system will also be added at the south end of the plaza to irrigate recreational shoreline landscapes.

The overwater platform feature is being permitted as a separate and independent project by the USACE. A separate Joint Aquatic Resources Permit Application form will be submitted for review by the USACE.

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

Luther Burbank Park is a popular park used by the residents of Mercer Island and the greater Seattle-Bellevue metro area for many waterfront recreational activities. The dock structures, in their current configuration, were constructed in 1974 to accommodate small boats in a different shoreline and recreational setting than exists today. The purpose of the Project is to modernize and optimize public access, recreational uses, and public safety, including reconfiguring the waterfront park to better accommodate small boats and non-motorized watercraft and improve ADA access to the docks, viewing deck, and beach while avoiding and minimizing potential impacts to sensitive environments and resulting in no net loss of ecological function.

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

☐ Commercial ☐ Residential ☐ Institutional ☐ Transportation ☒ Recreational

☒ Maintenance ☐ Environmental Enhancement

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

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

☒ Other: Install new upland trails, repair or renovate existing building/restrooms, install new irrigation intake, low impact development improvements, overwater access platform, nearshore habitat enhancements (gravel), riparian plantings

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

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

See Project Description, figures, and drawings in Attachment 1.

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

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

Start Date July 2023 End Date: November 2024 ☒ See JARPA Attachment D

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

$6,000,000

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

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

☒ Yes ☐ No ☐ Don't know U.S. Fish and Wildlife Service

Part 7–Wetlands: Impacts and Mitigation

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

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

☒ Not applicable

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

☐ Yes ☒ No ☐ Don't know

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

☐ Yes ☒ No ☐ Don't know

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

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

☐ Yes ☒ No

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

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

☐ Yes ☒ No ☐ Don't know

7f. Have you prepared a mitigation plan to compensate for any adverse impacts to wetlands? [help] • **If Yes**, submit the plan with the JARPA package and answer 7g. • **If No, or Not applicable**, explain below why a mitigation plan should not be required.
☐ Yes ☒ No ☐ Don't know
Not applicable
7g. Summarize what the mitigation plan is meant to accomplish, and describe how a watershed approach was used to design the plan. [help]
Not applicable
7h. Use the table below to list the type and rating of each wetland impacted, the extent and duration of the impact, and the type and amount of mitigation proposed. Or if you are submitting a mitigation plan with a similar table, you can state (below) where we can find this information in the plan. [help]

Activity (fill, drain, excavate, flood, etc.)	Wetland Name[1]	Wetland type and rating category[2]	Impact area (sq. ft. or Acres)	Duration of impact[3]	Proposed mitigation type[4]	Wetland mitigation area (sq. ft. or acres)
Not applicable						

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

Page number(s) for similar information in the mitigation plan, if available: ____________________
7i. For all filling activities identified in 7h, describe the source and nature of the fill material, the amount in cubic yards that will be used, and how and where it will be placed into the wetland. [help]
Not applicable
7j. For all excavating activities identified in 7h, describe the excavation method, type and amount of material in cubic yards you will remove, and where the material will be disposed. [help]
Not applicable

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

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

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

8a. Describe how the project is designed to avoid and minimize adverse impacts to the aquatic environment. [help]
☐ Not applicable
The Project will be constructed in, over, and along the shoreline of Lake Washington. Avoidance and minimization measures are incorporated into the design of the Project and include replacing overwater cover with grated decking to the extent practicable, replacing or encapsulating creosote-treated timber piles, shifting replacement dock components waterward to open up more of the nearshore habitat for migrating salmonids, and enhancing riparian vegetation and public beach area. The design balances upland stormwater management and shoreline access improvements to maintain shoreline and riparian habitat functions. To avoid or minimize potential adverse impacts to the aquatic environment, the following best management practices will be employed during construction:

- Applicable permits for the Project will be obtained prior to construction. Work will be performed according to the requirements and conditions of these permits.
- In-water work will occur during the approved regulatory work window for Lake Washington; expected to be July 16 to March 15.
- The contractor will be responsible for the preparation and implementation of a spill plan to be used for the duration of construction, which will include spill prevention, control, and response BMPs. In addition, the spill plan will outline roles and responsibilities, notifications, inspections, and response protocols to be implemented in the event of an inadvertent spill during construction.
- The contractor will supply to the Project Engineers a Temporary Erosion and Sediment Control (TESC) Plan and/or a Construction Stormwater Pollution Prevention Plan (SWPPP) that will use BMPs to prevent erosion and sediment-laden runoff from leaving the site (see Attachment 1, Figure 4). These plans will be implemented prior to the start of ground-disturbing activities. All areas disturbed by Project construction will be stabilized as soon as possible to prevent erosion and re-vegetated as soon as practicable post-construction and prior to the removal of TESC/SWPPP measures.
- Excess or waste materials will not be disposed of or abandoned waterward of the ordinary high water mark or allowed to enter waters of the state.
- No petroleum products, chemicals, or other toxic or deleterious materials will be allowed to enter surface waters.
- Barges will not be allowed to ground out during construction.
- A temporary floating debris boom will be installed around the work area. The contractor will be required to retrieve any floating debris generated during construction using a skiff and a net. Debris will be disposed of at an appropriate upland facility.
- Demolition and construction materials will not be stored where wave action or upland runoff can cause materials to enter surface waters.
- No uncured concrete or grout will be in contact with surface waters.
- Piles will be removed as practicable, using best efforts, equipment preferences, and BMPs identified in Washington Department of Natural Resources *Puget Sound Initiative Derelict Creosote Piling Removal: Best Management Practices for Pile Removal and Disposal* (WDNR 2017).
- All creosote-treated materials will be disposed of in a landfill or recycling facility approved to accept these types of materials.
- Vibratory pile driving will be used to the maximum extent practicable, with limited impact pile driving to reach required pile depths and for pile proofing. During all impact driving, sound-attenuation devices such as a wooden cushion blocks or similar devices will be employed to minimize sound-related impacts, as determined through federal Endangered Species Act consultation.
- New light fixtures for overwater structures will be directed away from the water to the extent practicable to minimize impacts on aquatic species.
- Geotechnical engineering recommendations will be incorporated into the Project.
- Any contaminated soils encountered in the vicinity of the two decommissioned underground storage tanks will be identified and handled according to a soil management plan developed by a qualified engineer.
- Any additional measures required by the agencies during Endangered Species Act review will be incorporated into the Project to avoid impacts on federally listed species.

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

☒ Yes ☐ No

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

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

☐ Yes ☒ No ☐ Don't know

The Project is designed to preserve and improve aquatic habitat compared to existing conditions. Therefore, a mitigation plan has not been prepared.

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

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

Not applicable. A mitigation plan has not been prepared for the Project.

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

Activity (clear, dredge, fill, pile drive, etc.)	Waterbody name[1]	Impact location[2]	Duration of impact[3]	Amount of material (cubic yards) to be placed in or removed from waterbody	Area (sq. ft. or linear ft.) of waterbody directly affected
North Dock (Attachment 1, Figures 7a, 8, and 9)					
Remove 1 creosote-treated timber pile	Lake Washington	In-water	Permanent	1 timber pile (12- to 14-inch)	1 sf lake bottom cover removed
Repair 5 damaged creosote-treated timber piles; leave in place	Lake Washington	In-water	Temporary	No change (existing piles remain in place)	None
Encapsulate 38 creosote-treated timber piles; leave in place	Lake Washington	In-water	Temporary	Approx. 2 ft depth of lake bottom excavated around each pile to allow installation of fiberglass jacket; native soil to be replaced around piles	80 sf lake bottom temporarily disturbed
Remove existing concrete dock segment; replace with FRP plastic grating	Lake Washington	Overwater	Permanent	n/a	235 sf overwater concrete replaced with grating
Remove wood finger dock	Lake Washington	Overwater	Permanent	n/a	120 sf overwater cover removed
Central Dock (Attachment 1, Figures 7a, 10, and 11)					
Remove fixed concrete dock	Lake Washington	Overwater	Permanent	n/a	1,500 sf overwater cover removed
Remove 26 creosote-treated timber piles	Lake Washington	In-water	Permanent	26 timber piles (12- to 14-inch) removed	26 sf lake bottom cover removed
Install wave attenuator float	Lake Washington	Overwater	Permanent	n/a	2,160 sf new overwater cover

Activity (clear, dredge, fill, pile drive, etc.)	Waterbody name[1]	Impact location[2]	Duration of impact[3]	Amount of material (cubic yards) to be placed in or removed from waterbody	Area (sq. ft. or linear ft.) of waterbody directly affected
Install 2 grated finger floats	Lake Washington	Overwater	Permanent	n/a	175 sf new overwater cover
Install grated gangway	Lake Washington	Overwater	Permanent	n/a	375 sf new overwater cover
Install 16 steel piles for wave attenuator/mooring float	Lake Washington	In-water	Permanent	16 steel piles (24-inch) installed	48 sf new lake bottom cover
Install 1 steel pile at gangway support	Lake Washington	In-water	Permanent	1 steel pile (16-inch) installed	0.5 sf new lake bottom cover
South Dock (Attachment 1, Figures 7a and 12)					
Remove fixed concrete dock	Lake Washington	Overwater	Permanent	n/a	1,930 sf overwater cover removed
Remove aluminum ramp	Lake Washington	Overwater	Permanent	n/a	40 sf overwater cover removed
Remove 7 wood finger docks	Lake Washington	Overwater	Permanent	n/a	840 sf overwater cover removed
Remove 40 creosote-treated timber piles	Lake Washington	In-water	Permanent	40 timber piles (12- to 14-inch) removed	40 sf lake bottom cover removed
Remove 2 concrete encapsulated piles	Lake Washington	In-water	Permanent	2 concrete piles (16-inch) removed	3 sf lake bottom cover removed
Install general purpose grated float	Lake Washington	Overwater	Permanent	n/a	380 sf new overwater cover
Install 2 grated finger floats	Lake Washington	Overwater	Permanent	n/a	90 sf new overwater cover
Install grated gangway	Lake Washington	Overwater	Permanent	n/a	225 sf new overwater cover
Install concrete gangway abutment	Lake Washington	Overwater	Permanent	n/a	18 sf new overwater cover
Install 6 steel piles	Lake Washington	In-water	Permanent	6 steel piles (16-inch) installed	8 sf new lake bottom cover
North Beach (Attachment 1, Figures 5 and 6)					
Install gravel for maintenance driveway	Lake Washington Shoreline	Above OHWM	Permanent	30 cy	600 sf
Install gravel pathway at north beach	Lake Washington Shoreline	Above OHWM	Permanent	13 cy	105 linear feet
Install gravel pathway at south on-grade pathway	Lake Washington Shoreline	Above OHWM	Permanent	15 cy	140 linear feet

Activity (clear, dredge, fill, pile drive, etc.)	Waterbody name[1]	Impact location[2]	Duration of impact[3]	Amount of material (cubic yards) to be placed in or removed from waterbody	Area (sq. ft. or linear ft.) of waterbody directly affected
Install rock revetment at north beach	Lake Washington Shoreline	Above OHWM	Permanent	1 cy	100 linear feet
Install rock terrace at on-grade pathway	Lake Washington Shoreline	Above OHWM	Permanent	42 cy	250 linear feet
Install sheet pile wall with concrete cap	Lake Washington Shoreline	Above OHWM	Permanent	1 cy	8 linear feet
Remove and reinstall stormwater outfall	Lake Washington shoreline	Above OHWM	Permanent	n/a	3 sf
Fill with habitat-grade gravel and cobble underlayment for north beach	Lake Washington Shoreline	Above OHWM	Permanent	55 cy above OHWM	720 sf above OHWM
Excavate to add cobble underlayment for north beach; backfill with cobble and habitat-grade gravel	Lake Washington Shoreline	Below OHWM	Temporary (area already contains habitat gravel)	10 cy below OHWM	115 sf below OHWM
Buoys (Attachment 1, Figure 7b)					
Install 3 buoys	Lake Washington	In-water	Permanent	n/a	Less than 6 sf
Irrigation Intake (Attachment 1, Figure 5)					
Trenching to install water piping between intake and pump station	Lake Washington Shoreline	Shoreline	Temporary	n/a	Approx. 50 lf trench in existing paved upland areas
Install screened intake	Lake Washington	In-water	Permanent	n/a	Less than 3 sf

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

8f. For all activities identified in 8e, describe the source and nature of the fill material, amount (in cubic yards) you will use, and how and where it will be placed into the waterbody. [help]

Habitat-grade gravel (2-inch minus meeting Washington Department of Fish and Wildlife [WDFW] grain size criteria) will be used to provide a suitable fish habitat in the nearshore along the north beach area. A total of 55 cubic yards (cy) will be placed over 720 square feet (sf). The material will be placed from the upland or by barge using a conveyor (e.g., telebelt or similar) to place the material precisely and evenly. All materials will be sourced from an approved off-site distributor.

8g. For all excavating or dredging activities identified in 8e, describe the method for excavating or dredging, type and amount of material you will remove, and where the material will be disposed. [help]
Approximately 10 cy (115 sf) of excavation below OHWM is proposed in order to install cobble and habitat gravel at the north beach. Approximately 80 sf of lake bottom will be excavated to allow installation of fiberglass jackets around timber piles; this material is expected to move back into place relatively quickly.

Part 9–Additional Information

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

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

Agency Name	Contact Name	Phone	Most Recent Date of Contact
USACE	Matthew Bennett	(206) 764-3428	July 2022
WDFW	Julian Douglas	(206) 584-9808	August 2022
WDNR	Trina Contreras	(206) 949-1720	August 2022
Ecology	Maria Sandercock	425-256-1372	November 2021

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

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

☐ Yes ☒ No

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

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

17110012

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

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

WRIA 8: Cedar – Sammamish Watershed

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

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

☒ Yes ☐ No ☐ Not applicable

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

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

☐ Urban ☐ Natural ☐ Aquatic ☐ Conservancy ☒ Other: Urban Park

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

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

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

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

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

☒ Yes ☐ No

Name of manual: ______________________

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

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

☐ Yes ☒ No

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

A cultural resources assessment for the Project is provided in Attachment 2. Previous cultural resources surveys in Luther Burbank Park and geotechnical information for the current Project indicate that the vicinity contains topsoil over glacial deposits. Most of the Project area would also have been inundated periodically. There are no historic structures in the Project area, and Project ground disturbance has minimal potential to encounter archaeological materials. An Inadvertent Discovery Plan is recommended during construction and is provided in Attachment 2.

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

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

☒ Yes ☐ No

See Attachment 2.

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

Table 1 presents a summary of threatened and endangered species potentially occurring in the action area based on species lists provided by the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). The NMFS species list encompasses the entire north Puget Sound region, while USFWS provides site-specific species lists. The table also identifies whether critical habitat has been designated by the NMFS or USFWS for those species within the Project vicinity. The Project will occur during the approved in-water work window for the site when the species listed in Table 1 are unlikely to be present.

Table 1
Federally Listed Species and Critical Habitat Likely to Occur in the Project Area

Common Name (Scientific Name)	Jurisdiction	Endangered Species Act Status	Critical Habitat
Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound evolutionarily significant unit	NMFS	Threatened	Designated
Steelhead (*O. mykiss*) Puget Sound distinct population segment	NMFS	Threatened	None designated within the action area.
Bull trout (*Salvelinus confluentus*) Coastal-Puget Sound distinct population segment	USFWS	Threatened	Designated
Marbled murrelet *(Brachyramphus marmoratus*)	USFWS	Threatened	None designated within the action area.

See the Critical Areas Report in Attachment 3 and the Biological Evaluation in Attachment 4 for more details.

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

Lake Washington provides habitat for a variety of aquatic species. Fish species occurrence and migration documented in Lake Washington according to the WDFW SalmonScape and Priority Habitat and Species websites (WDFW 2022a, 2022b) include bull trout (*Salvelinus confluentus*), Chinook salmon (*Oncorhynchus tshawytscha*), Puget Sound steelhead (*O. mykiss*), sockeye salmon (*O. nerka*), and coho salmon (*O. kisutch*). The WDFW Priority Habitat and Species data (WDFW 2022b) do not identify any documented occurrences of terrestrial species or priority habitats in the Project area of the Park.

Part 10–SEPA Compliance and Permits

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

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

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

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

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

☒ A SEPA determination is pending with The City of Mercer Island Community and Development Department (lead agency). The expected decision date is Winter 2023.

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

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

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

____

☐ Other: ______________________________

☐ SEPA is pre-empted by federal law.

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

LOCAL GOVERNMENT

Local Government Shoreline permits:

☒ Substantial Development ☒ Conditional Use ☒ Variance

☐ Shoreline Exemption Type (explain): ______________________________

Other City/County permits:

☐ Floodplain Development Permit ☒ Critical Areas Ordinance

STATE GOVERNMENT

Washington Department of Fish and Wildlife:

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

Washington Department of Natural Resources:

☒ Aquatic Use Authorization

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

Washington Department of Ecology:

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

*It is anticipated that Section 401 compliance, if required, can be covered under a Nationwide Permit (NWP) 3 for maintenance.

Federal and Tribal Government
United States Department of the Army (U.S. Army Corps of Engineers): ☒ Section 404 (discharges into waters of the U.S.) ☒ Section 10 (work in navigable waters) *It is anticipated that the work can be covered under a NWP 3 for maintenance.
United States Coast Guard: For projects or bridges over waters of the United States, contact the U.S. Coast Guard at: d13-pf-d13bridges@uscg.mil ☐ Bridge Permit ☐ Private Aids to Navigation (or other non-bridge permits)
United States Environmental Protection Agency: ☐ Section 401 Water Quality Certification (discharges into waters of the U.S.) on tribal lands where tribes do not have treatment as a state (TAS)
Tribal Permits: (Check with the tribe to see if there are other tribal permits, e.g., Tribal Environmental Protection Act, Shoreline Permits, Hydraulic Project Permits, or other in addition to CWA Section 401 WQC) ☐ Section 401 Water Quality Certification (discharges into waters of the U.S.) where the tribe has treatment as a state (TAS).

Part 11–Authorizing Signatures

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

11a. Applicant Signature (required) [help]

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

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

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

Paul D West	Paul D. West	10/25/2022
Applicant Printed Name	Applicant Signature	Date

11b. Authorized Agent Signature [help]

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

Josh Jensen, Anchor QEA	Joshua Jensen	October 20, 2022
Authorized Agent Printed Name	Authorized Agent Signature	Date

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

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

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

Property Owner Printed Name	Property Owner Signature	Date

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

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

References

City of Mercer Island, 2022. Luther Burbank Park. Accessed May 23, 2022. Available at: https://www.mercerisland.gov/parksrec/page/luther-burbank-park

USFWS (U.S. Fish and Wildlife Service), 2022. USFWS National Wetlands Inventory mapper. Accessed May 23, 2022. Available at: https://www.fws.gov/wetlands/data/mapper.html.

WDFW (Washington Department of Fish and Wildlife), 2022a. "SalmonScape." Accessed May 23, 2022. Available at: http://apps.wdfw.wa.gov/salmonscape

WDFW, 2022b. WDFW Priority Habitat and Species on the Web. Accessed May 23, 2022. Available at: http://apps.wdfw.wa.gov/phsontheweb.

JARPA ATTACHMENT D
PROJECT SCHEDULE AND PHASING

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

US Army Corps of Engineers Seattle District

AGENCY USE ONLY

Date received: ____________________

Agency reference #: ____________________

Tax Parcel #(s): ____________________

Attachment D:
Construction sequence [help]

TO BE COMPLETED BY APPLICANT [help]

Project Name: Luther Burbank Waterfront Improvements Project

Location Name (if applicable): Luther Burbank Park

Use this attachment only if your project will be constructed in phases or stages. Complete the outline showing the construction sequence and timing of activities, including the start and end dates of each phase or stage.

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

Phase or Stage	Start Date	End Date	Activity Description
1	July 2023	Jan. 2024	• Boiler Building Repairs: installing a new roof, seismic retrofits, and new lighting on the existing building • Restroom Annex Renovation: renovating the existing restrooms, constructing a new rooftop viewing deck, and installing new lighting on the existing building • Concession Stand Repairs: installing improvements and a new electrical panel within the concession area of the existing building
2	June 2024	Nov. 2024	• North Dock Repairs: constructing repairs and improvements • Central and South Dock Reconfiguration: removing existing dock structures, installing new gangways, wave attenuation/mooring float, grated docks • Overwater Access Platform: installing new platform to allow public access to lake high water level • Waterfront Plaza Renovation and Access Upgrades: installing plantings and irrigation, plaza paving improvements, benches and picnic table, ADA-accessible ramp and pathways, seawall, fencing, granite steps • North Beach Enhancements: placing fish habitat gravel landward of the upland edge of the existing beach, relocate boulders and LWD along the shoreline, and enhance riparian vegetation • Waterfront LID: installing new site drainage improvements including pervious pavers, installing a silva cell design, and complying with storm drainage reporting and compliance requirements • Irrigation Intake System: replacing and installing a new irrigation intake, pump system, and supply lines

JARPA ATTACHMENT E
DNR AQUATIC USE AUTHORIZATION FORM

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

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

US Army Corps of Engineers
Seattle District

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

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

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

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

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

1. Applicant Name (Last, First, Middle)

West, Paul

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

Luther Burbank Waterfront Improvements Project (Project)

3. Phone Number and Email

(206) 275-7833 paul.west@mercergov.org

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

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

5. Washington UBI (Unified Business Identifier) number, if applicable: [help]	
179019640	
6. Are you aware of any existing or previously expired Aquatic Use Authorizations at the project location?	
☒ Yes ☐ No ☐ Don't know If Yes, Authorization number(s): **Aquatic Lands Lease No. 20-A09917**	
7. Do you intend to sublease the property to someone else?	
☐ Yes ☒ No If Yes, contact your Land Manager to discuss subleasing.	
8. If fill material was used previously on DNR-managed aquatic lands, describe below the type of fill material and the purpose for using it. [help]	
Not applicable	

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

Signature for projects on DNR-managed aquatic lands:

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

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

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

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

JARPA ATTACHMENT 1
PROJECT DESCRIPTION AND FIGURES

[PROVIDED AS A SEPARATE FILE]

JARPA ATTACHMENT 2
CULTURAL RESOURCES ASSESSMENT

[PROVIDED AS A SEPARATE FILE]

JARPA ATTACHMENT 3
CRITICAL AREAS REPORT

[PROVIDED AS A SEPARATE FILE]

JARPA ATTACHMENT 4
BIOLOGICAL EVALUATION

[PROVIDED AS A SEPARATE FILE]

April 2023
Luther Burbank Park Waterfront Improvements

ANCHOR QEA

Project Description

Prepared for City of Mercer Island

April 2023
Luther Burbank Park Waterfront Improvements

Project Description

Prepared for
City of Mercer Island
Public Works Department
9611 SE 36th Street
Mercer Island, Washington 98040

Prepared by
Anchor QEA, LLC
1201 3rd Avenue, Suite 2600
Seattle, Washington 98101

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TABLES

DIAGRAMS

FIGURES

ABBREVIATIONS

ADA	Americans with Disabilities Act
BMP	best management practice
City	City of Mercer Island
FRP	fiberglass-reinforced plastic
lf	linear feet
LID	low-impact development
LWD	large woody debris
n/a	not applicable
Project	Luther Burbank Park Waterfront Improvements Project
sf	square feet
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
UST	underground storage tank
WDFW	Washington Department of Fish and Wildlife

1 Introduction

The City of Mercer Island (City) is proposing the Luther Burbank Park Waterfront Improvements Project (Project) to repair, maintain, and enhance the waterfront program at Luther Burbank Park in the City of Mercer Island, Washington (Figure 1). The Project includes repairing and replacing portions of the existing dock structures, including repairs to the north dock structure, and replacing and reconfiguring the central and south dock structures to accommodate waterfront programming and current and projected watercraft uses. Other waterside improvements include installing a grated overwater public access platform in the nearshore to improve access to the water along the existing plaza area.

The Project also includes upgrades to the waterfront plaza and Boiler Building. These include Boiler Building repairs (i.e., new roof, seismic retrofits, and new lighting); Boiler Building restroom annex renovation to improve the restroom facilities and construct a new rooftop viewing deck; concession stand repairs; and waterfront plaza renovations and access upgrades.

The Project will improve access to the waterfront by creating new Americans with Disabilities Act (ADA)-accessible routes and universally accessible routes from the plaza to the viewing deck on the existing Boiler Building annex restroom rooftop, and to the expanded north beach area that will be improved with fish habitat gravel and riparian plantings. The universally accessible route will connect to the adjacent future south shoreline trail that will be constructed as part of a separate project. The universally accessible route will also connect to the existing trail that continues north of the Project area. All proposed waterfront improvements including the dock structures and gangways will also meet universally accessible requirements.

The waterfront plaza renovations and access upgrades will incorporate low-impact development (LID) features that will provide stormwater buffering and biofiltration functions similar to a vegetated shoreline. An irrigation intake system will also be installed at the south end of the plaza.

Based on requirements provided by the Fire Department in an on-site meeting with KPFF Consulting Engineers in December 2022, the project will add a new ductile fire water line, fire hydrants, and a fire access apparatus access road (hammerhead). While installing that fire line, the project will excavate an existing gravel trail (1,235 square feet [sf]) and replace it with an in-kind gravel trail (1,235 sf). The project will also take advantage of some existing paved areas and expand it with permeable geogrid (2,384 sf) to create the hammerhead. Existing trees will be protected in place for the extent of the trenching, and the disturbed lawn and plant area will be renovated to match existing conditions.

The following sections provide more detail regarding the purpose and background of the Project, existing conditions, Project elements and construction methods, and best management practices (BMPs).

1.1 Purpose

Luther Burbank Park is a popular park used by the residents of Mercer Island and the greater Seattle-Bellevue metro area for many waterfront recreational activities. The dock structures in their current configuration (Figure 2) were constructed in 1974 to accommodate small boats in a different shoreline and recreational setting than exists today. The purpose of the Project is to modernize and optimize public access, recreational uses, and public safety, including reconfiguring the waterfront park to better accommodate small boats and nonmotorized watercraft and improve universal access to the docks, viewing deck, and beach, while avoiding and minimizing potential impacts to sensitive environments and resulting in no net loss of ecological function.

1.2 Location and Background

Luther Burbank Park is located on the shoreline of Lake Washington at 2040 84th Avenue SE, Mercer Island, Washington (Figure 1). The park is a 55-acre recreation area managed by the City. The park has a play area, trails, an off-leash dog area, picnic areas, tennis courts, a boat dock, a public fishing pier, a swimming beach, two smaller park buildings, a community pea-patch, and an outdoor amphitheater.

The Project area is located on the lake shoreline in the central area of the park. The Project area includes the Boiler Building, the Boiler Building restroom annex, the existing dock structure, the north beach area, and the waterfront plaza and bulkhead structure (Figure 2). The Project area is surrounded by the remainder of the park and park facilities. Adjacent properties outside the park include residential properties located to the west and southeast, and two roadways, North Mercer Way and Interstate 90, located southwest of the park. Lake Washington is located on the north and east sides of the park, and on the east side of the Project area.

King County constructed the dock facilities in 1974, with ownership subsequently transferred to the City. In 2006, the City issued a master plan showing the area as a small boating center with improved water access, including beach access and ADA-compliant access. In 2014, the City conducted an underwater structural assessment of the dock features and documented degraded conditions. The City initially considered renovating the existing structure, but at the advice of the Muckleshoot Tribe, developed a more holistic program to identify opportunities to redesign and improve the facilities and nearshore environment.

2 Existing Conditions

Existing structures in the Project area include the dock and Boiler Building (Figure 2). The Boiler Building is located within the waterfront plaza west of the dock and is currently used for park storage and restrooms. The shoreline is defined by a vertical concrete bulkhead spanning approximately 200 linear feet (lf). The bulkhead delineates the plaza area, which includes concrete paving and pavers. To the north of the dock along the plaza's shoreline bulkheads is an art installation called "Handsome Bollards" that includes a series of bollards approximately 6 feet apart with bronze hands that hold a metal chain. Current access to the plaza is limited to the gravel maintenance driveway at the south end of the Project area and an asphalt pathway at the north end.

Existing stormwater features include a stormwater conveyance swale that abuts the western edge of the gravel maintenance driveway and drains to an existing catch basin. The catch basin drains to the lake through a 6-inch PVC storm drain to an outfall south of the plaza. Two additional catch basins located north of the plaza, between the asphalt pathway and Boiler Building, drain to the lake through a 6-inch PVC storm drain and outfall in the north end of the plaza. The northern outfall runs underneath the plaza and through the existing bulkhead to the lake.

The existing dock (Figure 2) is a fixed 5,500-sf dock structure with wood and concrete decking, supported by 107 creosote-treated timber piles (14- to 16-inch-diameter). The deck is solid concrete with no grating and currently impedes light transmission to the aquatic environment. The existing dock structure includes three main segments, each measuring 8 feet wide. Eight narrow (22- by 4-foot) timber fixed dock fingers provide moorage opportunities for small powerboats along the existing dock. A 500-sf float and gangway (ramp) flank the existing dock structure. The float is intended to be reused in the new design.

In 2014, the City conducted an assessment of shoreline and overwater structures, including an underwater structural assessment of the dock, and noted degraded conditions (OAC 2014). Shoreline structures observed within the Project area include the concrete bulkhead, brick and concrete pavers at the plaza, and the gravel maintenance road. The concrete bulkhead was found to be in good condition; however, the brick pavers and the maintenance road appeared to present hazards. The brick pavers were found to be a potential tripping hazard with uneven surfaces, and the maintenance road showed signs of erosion from runoff on the road and adjacent areas. Overwater structures observed within the Project area include the concrete dock, finger docks, and the timber piles. The concrete dock and creosote-treated timber piles were found to be in good condition. Structural issues were noted in relation to the timber cap beams and mooring piles on the south end of the dock. The cap beams and mooring piles showed signs of decay and were recommended for repair.

Two decommissioned underground storage tanks (USTs) associated with previous boiler plant operations are located in the Project area. These are registered with the Washington State

Department of Ecology. Petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and metals (barium, chromium and lead) associated with the tanks have been detected in site soils (GeoEngineers 2022a) at concentrations below Model Toxics Control Act Method A cleanup levels. The City has developed an environmental construction contingency plan for soil management for Luther Burbank Park, with GeoEngineers as a geotechnical consultant. This identifies and provides direction on how to handle any contaminated soils encountered during construction. Any contaminated materials removed from the site will be properly disposed of at an approved upland landfill.

As discussed previously, the Project area is developed with public recreation facilities. Outside of the Project area, approximately 20 acres of the park is undeveloped open space that supports a variety of wildlife, including 135 species of birds, 50 species of waterfowl, raccoons, beavers, muskrats, tree frogs, and rabbits (City of Mercer Island 2022). Habitat for many of the terrestrial species is provided by wetlands that occupy the north and south ends of the park, outside of the Project area. The park also contains areas with maintained lawns surrounded by stands of trees.

Lake Washington is a large, freshwater lake that occupies approximately 34 square miles between the metropolitan cities of Seattle and Bellevue. The water levels in Lake Washington are seasonally managed by the U.S. Army Corps of Engineers to accommodate water usage, navigation, fish passage, and salinity control. The park's shoreline is characterized by various conditions including a developed concrete shoreline and undeveloped vegetated areas. Within the Project area, the shoreline condition, categorized by the south, central, and north areas, includes the following (Figure 2):

- The south Project area shoreline is located south of the waterfront plaza. This area consists of small areas of lawn, shrubby riparian vegetation along the lake shore, a gravel driveway, and trees/shrubs and invasive vegetation farther upslope. Improvements to the south shoreline trail (outside the Project area) are being permitted as part of a separate project.
- The central Project area shoreline, adjacent to the waterfront plaza, has a vertical bulkhead slope. The lake bottom substrate contains sand and silt with small rocks and remnant concrete and timber debris from past uses. The central shoreline is mostly developed, and vegetation is limited to dense non-native aquatic vegetation, Eurasian milfoil (*Myriophyllum spicatum*), found near the park's shoreline.
- The north Project area shoreline consists of a small gravel beach bordered by lombardy poplar trees and shrubs, with a trail, grass lawn areas, and trees located farther upslope.

Lake Washington provides habitat for a variety of aquatic species. Fish species occurrence and migration documented in Lake Washington, according to the Washington Department of Fish and Wildlife (WDFW) SalmonScape and Priority Habitats and Species websites (WDFW 2022a, 2022b), includes bull trout (*Salvelinus confluentus*), Chinook salmon (*Oncorhynchus tshawytscha*), Puget

Sound steelhead (*O. mykiss*), sockeye salmon (*O. nerka*), and coho salmon (*O. kisutch*). The WDFW Priority Habitats and Species data (WDFW 2022b) do not identify any documented occurrences of terrestrial priority species or priority habitats in the Project area of the park. The potential occurrence of bald eagle, federally listed salmonids, and marbled murrelet is discussed in the Project Critical Areas Report and Biological Evaluation.

3 Project Elements and Construction Methods

The Project includes upland, shoreline, in-water, and overwater work along Lake Washington. Figure 3 provides an overview of the project components, and Figure 4 provides a demolition plan. Project details and construction methods are described in the following subsections.

3.1 Upland and Shoreline Improvements

The proposed upland and shoreline improvements include the following (Figures 3 through 6):

- **Boiler Building Repairs:** installing a new roof, seismic retrofits, and new lighting on the existing building
- **Boiler Building Restroom Annex Renovation (Rooftop Viewing deck):** renovating the existing restrooms, constructing a new rooftop viewing deck, and installing new lighting on the existing building
- **Concession Stand Repairs:** installing improvements and a new electrical panel within the concession area of the existing building
- **Waterfront Plaza Renovations and Access Upgrades:**
  - Installing 1,770 sf of planting and irrigation
  - Installing 2,000 sf of plaza paving improvements
  - Installing three benches and one picnic table
  - Installing 65 lf of a new structural ADA-accessible ramp to the viewing deck
  - Expanding the north beach access with a new 120-lf universally accessible pathway connection and mobi mats at the beach expansion to provide access to the ordinary high water mark
  - Installing a 6-foot concrete seatwall at north beach pathway
  - Installing 61 lf of split rail fencing
  - Installing a new 140-lf on-grade pathway connection between the structural ramp, south shoreline trail, and upland plaza
  - Replacing an existing 252-lf gravel trail (1,235 sf) with an in-kind gravel trail (1,235 sf) at the new fire line installation
  - Installing a ductile iron fire water line and fire hydrants
  - Installing geogrid to expand an existing hardscape area to create an approved fire apparatus access turnaround for fire trucks
  - Installing granite steps at the new on-grade pathway
- **Shoreline and Beach Enhancements:** expanding the north beach by placing fish habitat gravel landward of the upland edge of the existing beach, relocating boulders and large woody debris (LWD) along the shoreline, enhancing riparian vegetation
- **Waterfront Drainage LID:** installing new site drainage improvements including 2,500 sf of pervious paver drainage design at the plaza, installing a silva cell biofiltration array with a new

stormwater outfall to the lake, and complying with all associated storm drainage reporting and compliance requirements

- **Irrigation Intake System Installation:** replacing and installing a new irrigation intake, pump system, and supply lines
- **Fire Department Required Updates:** adding a fire water line, fire hydrants, and a fire access apparatus access road and renovating an existing gravel trail

3.1.1 Boiler Building Repairs

Exterior repairs to the Boiler Building will include installing seismic retrofits and a new roof, and replacing and installing wall-mounted light fixtures to enhance public safety.

3.1.2 Boiler Building Restroom Annex Renovation (Viewing Deck)

The Boiler Building restroom annex rooftop will be renovated to facilitate a new outdoor viewing deck. The viewing deck will be constructed with Bison wood-paneled deck-surfacing material on pedestals with a 1/2-inch maximum gap for ADA accessibility on top of the existing concrete roof. The existing rooftop elevation is 29 feet, and the rooftop itself is 40 feet by 21 feet in length and width. The new rooftop will be elevated to approximately 30 feet in height to match the future second level of the Boiler Building and will match the existing extent of the rooftop area. Amenities, such as a new guardrail, light fixtures, new signage displays, and site furnishings, will be installed. Diagrams 1 and 2 provide conceptual sketches of the rooftop viewing deck overlaid on photographs of the existing structure.

Diagram 1
Conceptual Sketch of Viewing Deck (South End) and ADA-Accessible Ramp Location

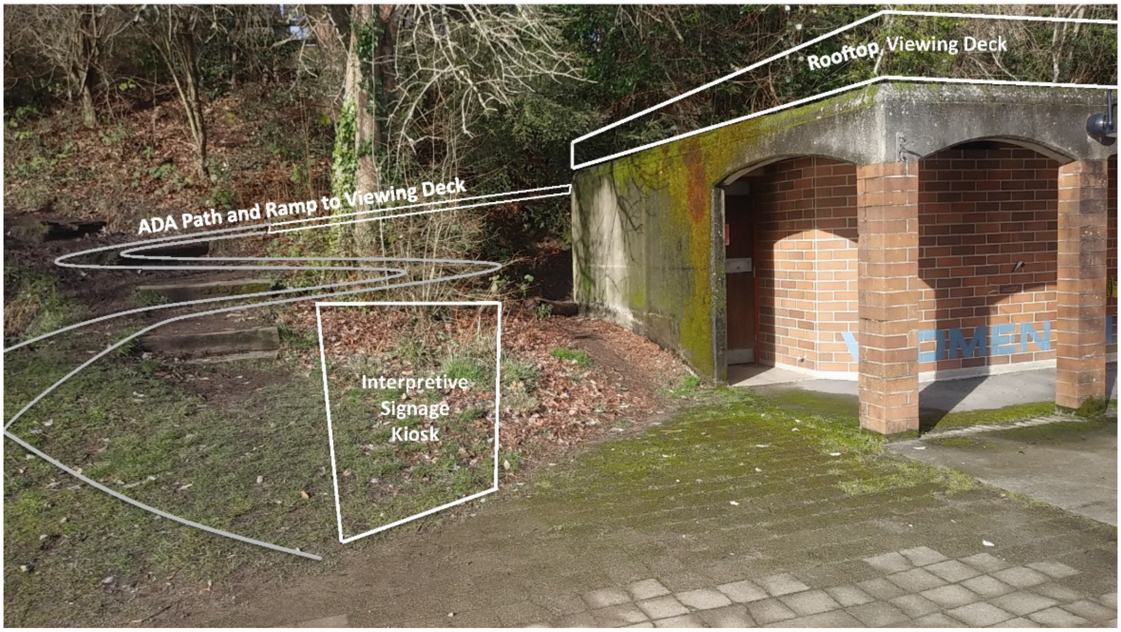


Diagram 2
Conceptual Sketch of Viewing Deck

3.1.3 Concession Stand Repairs

The concession stand is located between the Boiler Building and restrooms and is approximately 160 sf in area. An existing casework area on the east side of the wall will be removed and replaced with a new 6-inch concrete wall with concrete counter above. A new sink will be installed in the southwest corner of the concession area and a new electrical panel will be installed in the northwest corner.

3.1.4 Waterfront Plaza Renovations and Access Upgrades

Table 1 describes each Project element and the impervious surface removed, replaced, or installed for each feature. Approximately 25% of the Project area is currently impervious surfaces (buildings, pavement, driveway, and docks). The Project will reduce overall impervious surface area by approximately 5%.

Plaza renovations for the Project include removing 5,205 sf of concrete pavers, brick pavers, concrete paving, and a small area of asphalt paving in front of the Boiler Building restroom annex under the breezeway (Figure 4). Approximately 2,595 sf of existing impervious surface will be replaced, including 2,015 sf of new concrete paving in the western portion of the plaza by the Boiler Building and 580 sf of gravel driveway paving (Figure 5). Approximately 2,410 sf of pervious pavers will be installed in the eastern part of the plaza (not included in impervious surface calculations). Two benches are proposed along the outside of Boiler Building in the plaza, and one picnic table is proposed at southern end of the plaza. Diagrams 3 to 5 provide conceptual sketches of these improvements overlaid on photographs of existing conditions.

Table 1
Impervious Surfaces Summary

Project Element	Impervious Surface Removed (sf)	Impervious Surface Replaced (sf)	New Impervious Surface Installed (sf)
Waterfront Plaza			
Concrete pavers, brick pavers, and concrete paving at waterfront plaza	4,425	2,015	n/a
Asphalt paving at Boiler Building restroom annex breezeway	320	n/a	n/a
Driveway and ADA Trail/Ramp			
Gravel driveway paving	580	580	n/a
Gravel on-grade pathway south of plaza	170	n/a	700
Structural concrete ADA-accessible ramp to the new viewing deck	n/a	n/a	260
Rock terrace at on-grade pathway	n/a	n/a	375
Granite steps at on-grade pathway	n/a	n/a	60

Project Element	Impervious Surface Removed (sf)	Impervious Surface Replaced (sf)	New Impervious Surface Installed (sf)
Fire Department Updates			
Gravel trail renovation at fire line	1,235	1,235	n/a
Fire apparatus access hammerhead	n/a	n/a	86
North Beach Access			
Gravel pathway at north beach	30	n/a	400
Concrete pathway segment	n/a	n/a	150
Rock revetment at north beach	n/a	n/a	300
Concrete cap for sheet pile wall	n/a	n/a	11
Rock terrace at north beach	n/a	n/a	60
Concrete seatwall	n/a	n/a	11
Total	**6,440**	**3,830**	**2,413**

Diagram 3
Existing Plaza and East Side of Boiler Building with Approximate Locations of New Benches and Lighting (Looking North)

Diagram 4
Approximate Locations of New Paving at South End of Plaza (Looking North)

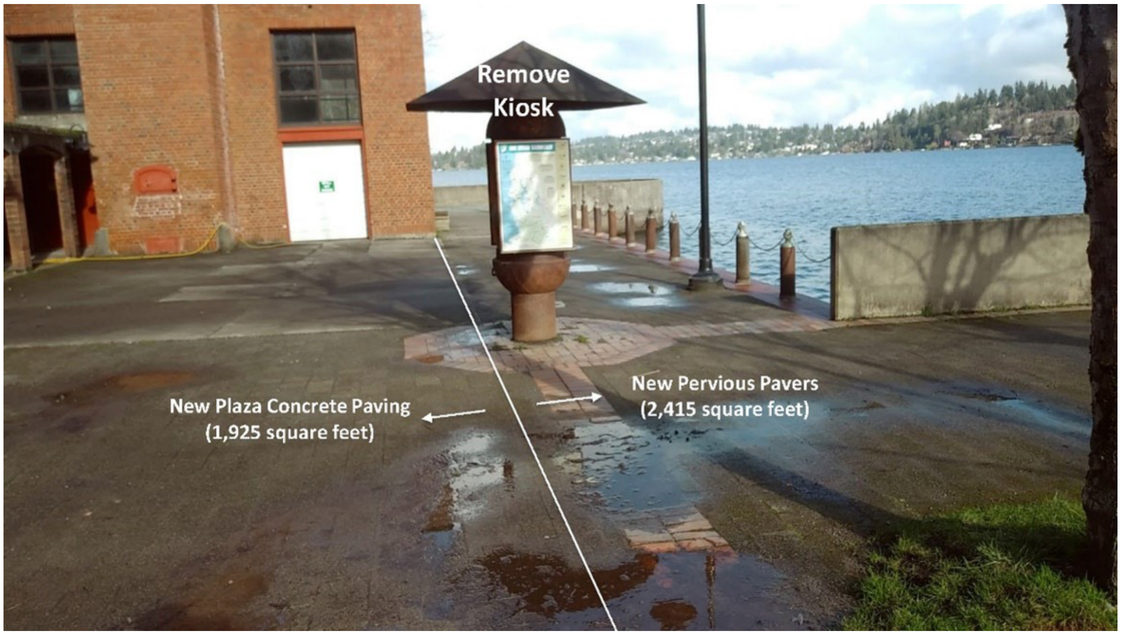


Diagram 5
Locations of New Pervious Pavers and Silva Cell at South End of Plaza (Looking South)

The Project includes several shoreline trail access improvements (on-grade pathway and ramp, north beach pathway). The new on-grade pathway south of the plaza will be an accessible, crushed rock surfaced pedestrian trail (Figure 5, Diagram 1). Approximately 42 cubic yards of terraced rock wall (375 sf) will be placed to accommodate ADA-accessible slopes along this public access trail. An existing stormwater outfall will be temporarily removed and reinstalled during this construction.

A new structural accessible walkway is designed to provide access to the new viewing deck and will be located behind the Boiler Building restroom annex on the northwest side of the rooftop (see Diagram 1). Piles will be driven to support the viewing deck access walkway. To eliminate the need to excavate for footings; 4" diameter steel piles, will be driven into the ground. A footing drain will also be installed below grade along the length of the back of the boiler building, this will be an 18" x 20" gravel filled trench, including a perforated or slotted pipe to collect and divert surface and shallow groundwater away from the building. The access walkway will connect to the new on-grade crushed gravel pathway that will lead down to the plaza, dock, and future south shoreline trail. The on-grade pathway will also lead uphill to a new granite step feature that connects to an existing uphill trail network. Construction of the upland trail will be completed with standard heavy equipment including small excavators, small bulldozer, dump truck, and similar equipment.

The north beach access will be expanded with a new universally accessible and ADA-compliant pathway connection (Figure 5). A gravel pathway will connect to a concrete trail segment leading to a seatwall. An up-to-6-foot-long sheet pile wall with concrete cap will be installed at the east end of the trail. The trail will be supported by a rock terrace on the landward side and a rock revetment adjacent to the beach (see sections in Figure 6). The sheet pile wall and rock terrace and revetment features are proposed to provide shoreline stabilization support to the landward public access trail and to protect the habitat restoration area and beach from erosion.

3.1.5 Shoreline and Beach Enhancements

In addition to improving public access and safety, the design includes shoreline and beach enhancements (Figure 5). The Project will expand the north beach by placing fish habitat gravel landward of the upland edge of the existing beach, relocate boulders and LWD along the shoreline, and enhance riparian vegetation. The beach expansion includes placing 45 cubic yards of habitat gravel and cobble underlayment (605 sf) and relocating intermittent boulders and LWD along the existing beach and riparian buffer area. The expanded beach and riparian area will maintain nearshore habitat functions. The planting plan to replace removed riparian vegetation and trees is described in Section 3.3.

Habitat gravel will consist of naturally rounded material that complies with WDFW grain size criteria for Lake Washington. Gravel depth is a maximum of 2- to 3-foot thickness on the landward side, tapering on the waterward toe of placement (see sections in Figure 6). The material will be placed from the upland or by barge using a conveyor (e.g., telebelt or similar) to place the material precisely and evenly. All materials will be sourced from an approved off-site distributor.

Diagram 6 provides a photograph of the existing north beach with the approximate location of nearshore habitat enhancements labeled.

Diagram 6
Approximate Location of North Beach Improvements (Looking North)

3.1.6 Waterfront Low-Impact Development

Approximately 2,410 sf of concrete and brick pavers at the plaza will be replaced with pervious pavers along the eastern edge of the plaza. The pervious pavers will abut the new concrete paving on the western portion of the plaza and will end at the waterfront edge (Diagram 4). A silva cell system will be installed under the south end of the plaza to provide biofiltration of stormwater (Diagram 5). A new outfall from this system will be installed in the bulkhead south of the pedestrian plaza. A vegetated conveyance swale will be installed along the resurfaced gravel maintenance driveway.

3.1.7 Irrigation Intake System Installation

The irrigation intake system includes installing a new water pump station south of the Boiler Building and a new freshwater intake screen in Lake Washington east of the pump station (Figure 5). These features will connect to upland irrigation systems within the park. Upland work will include installing the pump station, trenching approximately 50 feet east from the pump station under the plaza to the intake screen, and installing pipe bedding material and the piping in the trench. Additional trenching will occur to install piping north of the plaza area to a Fire Department connection just northwest of the administrative building.

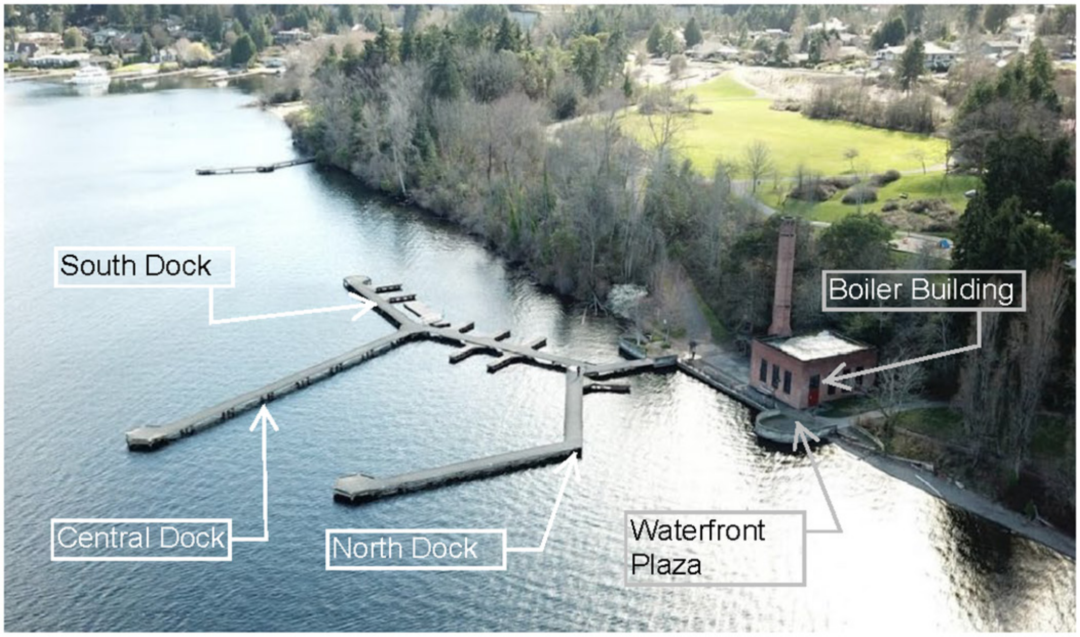
A coring saw, or similar, will be used to core a hole through the existing retaining wall to insert the intake and filter backwash pipes through the wall and into the lake. A small portion of the lake, in and around the area where the pipe penetration will be constructed through the bulkhead wall, will be temporarily dewatered to allow for drilling through the bulkhead and installation of the screen in the dry. Once the penetration is sealed and grout has cured, the screen will be installed on the end of the pipe and the temporary cofferdam used to dewater that portion of the lake will be removed and the lake will be allowed to submerge the fish screen.

The intake screen will be a self-cleaning suction screen designed to screen fish from entering the intake facilities in compliance with current fish screening guidelines from WDFW and the National Marine Fisheries Service. The irrigation intake system will draw water from Lake Washington at a maximum rate of 0.089 cubic foot per second (40 gallons per minute), as allowed by the approved water right change (Water Right Claim 158498AH).

3.2 In-Water and Overwater Activities

The in-water and overwater Project elements are described in this section and shown in Figures 3, 4, and 7 through 12. Diagram 7 shows an aerial overview of the existing dock structures.

Diagram 7
Aerial View of Existing Dock Structures (Looking Southwest)



3.2.1 North Dock Repairs

The Project proposes to retain and repair the northernmost segment of the dock (approximately 188 feet long and 8 feet wide; Figures 7 and 8). Approximately 235 sf of the existing concrete dock connecting to the waterfront plaza will be removed and replaced with fiberglass-reinforced plastic (FRP) grating. Approximately 120 sf of an existing wood finger dock will be removed (Figure 4).

Some timber piles supporting the north dock have decayed and need repair. The project includes removing and replacing the top portion of up to five decayed timber piles with ACZA-treated timber. The damaged portions of the pile will be cut away, and a new timber section will be attached to the remaining pile with steel straps (Figure 9).

As part of the north dock repairs, 38 creosote-treated timber piles will be wrapped with fiberglass jackets (Figure 8). The area around the bottom of each pile will be excavated a minimum of 2 feet deep to allow the jacket to be extended below the mudline. A marine epoxy grout will be injected between the pile and the jacket. The jackets will isolate the creosote-treated piles from the water to prevent further leaching of creosote into the water column, reducing a source of water pollution into the lake.

3.2.2 Central Dock Reconfiguration

The central dock is a fixed concrete structure (Figure 3). The existing dock will be entirely removed (Figure 4) and replaced in a new configuration.

The reconfigured central dock will include a wave attenuator/mooring float attached to the existing fixed concrete dock by an ADA-compliant grated gangway (Figure 7). The wave attenuator/mooring float will be 10 feet wide with 2 feet of freeboard. To provide adequate wave attenuation and protect shoreline ecological functions from erosion, the float material will be concrete, with light penetration options where possible. The bulk of the structure is located as far offshore as practical in approximately 36 to 38 feet of water to reduce the effect of shading on the lake bottom. The float will attach to 16 new steel piles (24-inch diameter; Figures 10 and 11). Attached to the inside of the wave attenuator/mooring float will be two new grated finger floats, each 25 feet long with 1.5 feet of freeboard (Figure 7). Elevation and section views of the central dock are provided in Figures 10 and 11.

The intended use of the wave attenuator/mooring float is for small (up to 26-foot) powerboat moorage. The width is designed to attenuate passing vessel wakes and protect moored boats. The wave attenuation function is critical because the area is frequented by wake surfing boats, a recent boating trend that uses back-weighted boats designed to produce large wakes for surfing without the use of the tow rope that is typically required for waterskiing and wake boarding. In the last decade, wake surfing has become popular in Lake Washington. The large waves this generates cause floating docks to pitch excessively. The waves affect the docks intermittently, unpredictably, and without warning. These conditions create unstable surfaces on floating docks, posing a risk to dock users and prohibiting ADA-compliant access. The wave attenuation provided by this mooring float addresses this problem. This project will also install regulatory buoys offshore of the float to inform boaters of wake regulations in proximity to the shoreline (Section 3.2.5).

According to the Mercer Island Shoreline Master Program, breakwaters are prohibited, except for those structures installed to protect or restore ecological functions. These structures shall provide for mitigation according to the sequence defined in Washington Administrative Code 173-26-201(2)(e). The proposed wave attenuation float has been designed to reduce wave energy along both the south and north shorelines of the park. The float reduces wave energy from both storm waves present during winter months and large boat wakes present primarily during summer months. Wave modeling completed as part of the design process for the dock predicts that wave heights will be reduced between 0.5 and 1.0 foot along portions of the shoreline compared to adjacent shorelines (Blue Coast 2022). This reduction in wave height will subsequently reduce wave energy along the nearshore and along the shoreline areas of the park, thus reducing the erosion due to waves and boat wake in these areas. This will provide protection to the recently restored area that was supplemented by placement of habitat-grade gravel and LWD and the planting of native riparian plant species (permitted under City Permit Nos. SHL20-016 and SHL SHL21-009).

3.2.3 South Dock Reconfiguration

The south dock is a fixed concrete structure that will be removed (Figure 4) and replaced in a new configuration. As with the central dock, the south dock will have a grated surface that allows for at least 40% light transmittance over 100% of the dock.

The new south dock is intended for nonmotorized watercraft—kayaks, canoes, rowboats, and small sailboats—to accommodate public use and boating programs such as rentals, classes, and camps. The design includes the reuse of an existing 10-foot by 50-foot grated float and construction of a new 8-foot-wide by 50-foot-long, 9-inch-freeboard general-purpose float (Figures 7 and 12). The proposed floating structures will connect to the existing fixed dock by an ADA-compliant grated gangway. The floats will attach to five new steel piles (16-inch diameter).

The new general-purpose float will be constructed with a low freeboard to accommodate kayaks and stand-up paddleboards, and with grated surfacing to meet light transmittance requirements. Two grated finger floats (each 15 feet long by 3 feet wide) will extend from the general-purpose float to provide areas for kayak launching, including one ADA-accessible kayak launch point.

3.2.4 Overwater Access Platform

The Project includes a new grated overwater platform as part of the goal to improve access to the waterfront (Figure 3). Portions of the “Handsome Bollards” chain will be removed to allow the public past the art feature and onto the platform where they can access the lake at water level. The platform will only provide access to the ordinary high water level and will not descend to the beach substrate. The platform will attach to the existing concrete bulkhead at the plaza as an overwater feature and will be of FRP grating material. The platform is being permitted separately with the U.S. Army Corps of Engineers but will be incorporated with the Project for other permit agencies.

3.2.5 Buoys

To reduce the risks created by passing vessels, the City will replace one buoy and add two new buoys in the lake. Two will be “no wake” buoys located east and southeast of the docks, and one will be a “nonmotorized vessel” buoy located near the south dock (Figure 7).

3.2.6 Summary of Pile and Overwater Cover Quantities

Table 2 summarizes the in-water piles and overwater cover to be removed, repaired, and installed.

Up to sixty-seven 12- to 14-inch creosote-treated timber piles and two 16-inch concrete encapsulated piles in total will be removed during dock demolition and repair. A total of 23 new steel piles (16- and 24-inch diameter) will be installed for the reconfigured docks, and six new pin piles (6-inch diameter) will be installed for the overwater platform. The Project will result in a net reduction of 40 piles in Lake Washington, and removal or fiberglass encapsulation of creosote-treated timber piles.

Piles will be installed using a water-based pile driver and a vibratory and/or impact hammer. It is anticipated that impact pile driving will be limited to proofing or if obstructions are encountered during vibratory pile driving. During all impact driving, sound-attenuation devices such as wooden cushion blocks or similar devices will be employed to minimize sound-related impacts.

The Project will result in a net reduction of approximately 5 sf of overwater cover (4,665 sf removed and 4,660 sf added). Much of the new overwater cover to be installed for the Project will consist of grated material that will allow light penetration.

Table 2
In-Water and Overwater Work Summary

Project Portion	Element	Features Removed	Features Replaced	Net Change
North Dock Repairs[1]	In-water piles	One 12- to 14-inch creosote-treated timber pile[1]	Not applicable	Net decrease of 1 in-water pile
	Overwater cover	Approximately 355 sf of overwater cover (235 sf of existing concrete dock; 120 sf of one wood finger dock)	235 sf FRP grating	Net decrease of 120 sf overwater cover
Central Dock Reconfiguration	In-water piles	Approximately twenty-six 12- to 14-inch creosote-treated timber piles	Approximately 17 piles (sixteen 24-inch steel piles; one 16-inch steel pile)	Net decrease of 9 in-water piles
	Overwater cover	Approximately 1,500 sf fixed concrete dock	Approximately 3,160 sf of new overwater cover (2,610 sf of wave attenuator float, 175 sf of two grated finger floats, 375 sf of grated gangway)	Net increase of 1,660 sf overwater cover
South Dock Reconfiguration	In-water piles	Approximately 42 piles (forty 12- to 14-inch creosote-treated timber piles; two 16-inch concrete encapsulated piles)	Approximately six 16-inch steel piles	Net decrease of 36 in-water piles
	Overwater cover	Approximately 2,810 sf existing cover (1,930 sf of fixed concrete dock; 40 sf of aluminum ramp; seven 120-sf wood finger docks)	Approximately 713 sf of new overwater cover (380 sf of general-purpose float, 90 sf of 2 grated finger floats, 225 sf of grated gangway, 18 sf of concrete gangway abutment)[3]	Net decrease of 2,097 sf overwater cover
Overwater Access Platform	In-water piles	Not applicable	Approximately 6 pin piles (6-inch steel piles)	Net increase of 6 in-water piles
	Overwater cover	Not applicable	Approximately 552 sf of grated overwater cover	Net increase of 552 sf overwater cover
Total	**In-water piles**	**Approximately 69 piles removed**	**Approximately 29 piles installed**	**Net decrease of 40 in-water piles**
	Overwater cover	**Approximately 4,665 sf of existing cover removed**	**Approximately 4,660 sf of new/relocated overwater cover installed[2]**	**Net decrease of approximately 5 sf of overwater cover**

Notes:

1. Table does not include repair and fiberglass encapsulation of existing north dock piles. Up to five 14-inch decayed creosote-treated timber pile tops will be removed and replaced with ACZA-treated timber piles and wrapped with fiberglass jacket.
2. Approximately 2,000 sf of new overwater cover will consist of FRP grating.
3. An existing floating wood dock will be removed from the south dock during demolition, temporarily stored on site, and replaced for reuse as part of the reconfigured south dock. This floating wood dock is not included in the overwater cover calculations shown here.

3.3 Planting Plan

To construct the new access pathways, plaza paving, and expanded north beach, up to 12 trees located along the shoreline and in the uplands will be removed and replaced with 20 new trees (Table 3; Figures 13 and 14). Approximately 3,860 sf of riparian and upland vegetation will be removed during construction, and 1,940 sf of native shrub and groundcover vegetation will be installed, including shoreline riparian, upland, and stormwater swale vegetation. Loss of vegetation is due to areas expanded for public access opportunities. The proposed project will install diverse native planting palette, including variety of groundcover, shrubs, and both deciduous and coniferous trees, which will increase the function of the riparian buffer compared to existing conditions.

All planting areas will be irrigated and maintained per the park maintenance plan to establish and support species growth. Table 3 summarizes the proposed tree and vegetation removal and replacement activities. All plant installations will occur above the ordinary high water mark.

Table 3
Areas of Vegetation Disturbance and Restoration

Project Component	Location	Quantity or Area
Vegetation removal	North beach	1,430 sf (riparian)
	South on-grade pathway	2,430 sf (upland)
	Total	**3,860 sf removed**
Shrub and groundcover planting	North beach	710 sf (riparian)
	South on-grade pathway	1,230 sf (upland)
	Total	**1,940 sf installed**
Tree removal	North beach	6 trees (deciduous)
	South on-grade pathway and ramp	3 trees (deciduous)
	Plaza	3 trees (deciduous)
	Total	**12 trees removed**
Tree installation	North beach	11 trees
	South on-grade pathway	8 trees
	Plaza	1 tree
	Total	**20 trees installed**

3.4 Project Schedule

The Project is anticipated to be constructed in two phases and will occur over 14 months beginning in or around July 2023, or once all permits and approvals are issued. In-water work will occur during the approved regulatory work window for Lake Washington, which is typically between July 16 and

March 15. Overwater or upland activities may occur outside of the in-water work window. The following construction phase and sequences are proposed:

1. **Phase 1: July 2023 to January 2024**
    a. Boiler Building Repairs
    b. Boiler Building Restroom Annex Renovation
    c. Concession Stand Repairs
2. **Phase 2: June 2024 to November 2024**
    a. North Dock Repairs
    b. Central Dock Reconfiguration
    c. South Dock Reconfiguration
    d. Overwater Access Platform
    e. Waterfront Plaza Renovation and Access Upgrades
    f. North Beach Enhancements
    g. Waterfront LID
    h. Irrigation Intake System

4 Best Management Practices

Avoidance and minimization measures are incorporated into the design of the Project. They include replacing overwater cover with grated decking to the extent practicable, replacing or encapsulating creosote-treated timber piles, shifting replacement dock components waterward to open more nearshore habitat for migrating salmonids, and enhancing riparian vegetation and public beach area. The design balances upland stormwater management and shoreline access improvements to maintain shoreline and riparian habitat functions. To avoid or minimize potential adverse impacts to the aquatic environment, the following BMPs will be employed during construction:

- Applicable permits for the Project will be obtained prior to construction. Work will be performed according to the requirements and conditions of these permits.
- In-water work will occur during the approved regulatory work window for Lake Washington; expected to be July 16 to March 15.
- The contractor will be responsible for the preparation and implementation of a spill plan to be used for the duration of construction, which will include spill prevention, control, and response BMPs. In addition, the spill plan will outline roles and responsibilities, notifications, inspections, and response protocols to be implemented in the event of an inadvertent spill during construction.
- The contractor will supply to the Project Engineers a Temporary Erosion and Sediment Control (TESC) Plan and/or a Construction Stormwater Pollution Prevention Plan (SWPPP) that will use BMPs to prevent erosion and sediment-laden runoff from leaving the site (see Figure 4). These plans will be implemented prior to the start of ground-disturbing activities. All areas disturbed by Project construction will be stabilized as soon as possible to prevent erosion and re-vegetated as soon as practicable post-construction and prior to the removal of TESC/SWPPP measures.
- Excess or waste materials will not be disposed of or abandoned waterward of the ordinary high water mark or allowed to enter waters of the state.
- No petroleum products, chemicals, or other toxic or deleterious materials will be allowed to enter surface waters.
- Barges will not be allowed to ground out during construction.
- A temporary floating debris boom will be installed around the work area (Figure 4). The contractor will be required to retrieve any floating debris generated during construction using a skiff and a net. Debris will be disposed of at an appropriate upland facility.
- Demolition and construction materials will not be stored where wave action or upland runoff can cause materials to enter surface waters.
- No uncured concrete or grout will be in contact with surface waters.
- Piles will be removed as practicable, using best efforts, equipment preferences, and BMPs identified in Washington Department of Natural Resources *Puget Sound Initiative Derelict*

Creosote Piling Removal: Best Management Practices for Pile Removal and Disposal (WDNR 2017).

- All creosote-treated materials will be disposed of in a landfill or recycling facility approved to accept these types of materials.
- Vibratory pile driving will be used to the maximum extent practicable, with limited impact pile driving to reach required pile depths and for pile proofing. During all impact driving, sound-attenuation devices such as a wooden cushion blocks or similar devices will be employed to minimize sound-related impacts, as determined through federal Endangered Species Act consultation.
- New light fixtures for overwater structures will be directed away from the water to the extent practicable to minimize impacts on aquatic species.
- Geotechnical engineering recommendations will be incorporated into the Project.
- Any contaminated soils encountered in the vicinity of the two decommissioned USTs will be identified and handled according to a soil management plan developed by a qualified engineer.
- Any additional measures required by the agencies during Endangered Species Act review will be incorporated into the Project to avoid impacts on federally listed species.

5 References

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Figures

Refer to previously provided figures and revised plan set

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ANCHOR QEA

Memorandum

July 28, 2022

To: Paul West, City of Mercer Island

From: Barbara Bundy

cc: Anna Spooner

Re: Cultural Resources Assessment, Luther Burbank Park Waterfront Improvements Project

Introduction

The City of Mercer Island Public Works Department (Public Works) is proposing the Luther Burbank Park Waterfront Improvements Project (Project) to repair, maintain, and enhance the waterfront program at Luther Burbank Park on the north end of Mercer Island, Washington (the Project). The Project requires a permit from the U.S. Army Corps of Engineers (USACE) and must comply with Section 106 of the National Historic Preservation Act, implementing regulations at 36 Code of Federal Regulations (CFR) 800, and USACE regulations at 33 CFR 325.

Section 106 requires federal agencies to consider the effects of their undertakings on historic properties, which are prehistoric or historic sites, districts, structures, or objects that are listed in (or eligible for listing in) the National Register of Historic Places (NRHP). This memorandum describes recorded and potential historic properties and recommends that USACE determine that no historic properties will be affected by the Project.

Project Description

The Project is located in Luther Burbank Park on Mercer Island (Section 6 of Township 24 North, Range 5 East; Figures 1 and 2). The Project includes repairing and replacing portions of the existing dock structures, including repairs to the north dock structure, and replacing and reconfiguring the central and south dock structures to accommodate waterfront programming and current and projected watercraft uses. Other waterside improvements include installing grated overwater public access stairs in the nearshore to improve access to the water along the existing plaza area. The major Project elements are as follows:

1. **North Dock Repairs:** repairing existing overwater north dock infrastructure (in-water ground disturbance up to 2 feet below the mudline)
2. **Central Dock and South Dock Reconfiguration and Public Access Stair:** installing new overwater infrastructure (in-water ground disturbance of up to 20 feet below the mudline)
3. **Building Improvements and Renovations:** installing a new roof and seismic retrofits, renovating the existing restrooms, constructing a new rooftop viewing deck/outdoor

classroom, and new lighting on the existing building, installing improvements and a new electrical panel within the concession area (no ground disturbance)

4. **Shoreline and Beach Enhancements:** expanding the north beach by excavating into the adjacent uplands and constructing a shoreline rockery (up to 6 feet of excavation), placing fish habitat gravel landward from the new shoreline rockery edge to the existing beach, relocating boulders and large woody debris along the shoreline, and enhancing riparian vegetation (minimal surface ground disturbance)
5. **Waterfront Drainage:** installing pervious paver drainage design at the plaza, installing a silva cell design, and associated storm drainage work (ground disturbance up to 3 feet below the existing ground surface)
6. **Irrigation Intake System Installation:** replacing and installing a new irrigation intake, pump system, and supply lines (ground disturbance up to 3 feet below the existing ground surface)
7. **Waterfront Plaza Renovations and Access Upgrades:** installing planting and irrigation (ground disturbance up to 2 feet below the existing ground surface), improving plaza paving and installing benches and a picnic table, constructing new access routes north and south of the plaza with pathways, ramps, steps, rockeries, and split-rail fencing (ground disturbance up to 6 feet below the existing ground surface)

Regulatory Context

Under Section 106 and its implementing regulations at 36 CFR 800, USACE is required to consider the effects of the permitted activity on historic properties. An historic property is "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places" (36 CFR 800.16(l)(1)). Traditional Cultural Properties may also be historic properties. Under the Section 106 process, USACE must consult with interested and affected Indian Tribes and the State Historic Preservation Officer (SHPO) on potential impacts to cultural and historic resources.

To be eligible for inclusion in the NRHP, an historic property must have significance and retain integrity. Significant properties meet one or more of the following criteria:

A. They have an association with events that have made a significant contribution to the broad patterns of our history
B. They have an association with the lives of significant persons in our past
C. They embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
D. They have yielded or may be likely to yield information important in history or prehistory

"Integrity" is defined as an historic property's ability to convey its historic significance, in other words, its historic appearance and setting.

This report assists USACE with fulfilling the requirements of Section 106 by recommending the following:

- The Area of Potential Effects (APE)
- Whether there are NRHP-eligible historic properties in the APE
- Whether the undertaking will adversely affect any NRHP-eligible historic properties

Area of Potential Effects

The APE for a project is "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties" (36 CFR 800.16(d)). The APE typically includes areas where ground disturbance could affect archaeological sites or modifications could affect historic structures. USACE will determine the APE for the project. Because there are no proposed modifications to historic structures (the boiler building was determined not NRHP eligible in 2018 and the restroom addition is less than 50 years old) and no effects to the viewshed of any historic structure, the recommended APE is limited to areas of upland and in-water ground disturbance (Figure 3).

Environmental and Cultural Context

Environmental Context

Mercer Island is a large island in the southern part of Lake Washington, a freshwater lake that occupies approximately 34 square miles between the metropolitan cities of Seattle and Bellevue. The lake is in the Puget Trough physiographic province, a valley system that extends from Puget Sound south through the Willamette Valley and that separates the Olympic Mountains from the Western Cascades (Franklin and Dryness 1973). During the last glacial advance, the Vashon Stade of the Late Wisconsin glaciation, glaciers extended as far as 85 miles south of Seattle. Glaciers began to recede about 16,000 years ago, leaving behind a rapidly changing landscape of proglacial lakes, meltwater streams, and other alluvial features. As the glaciers retreated, land formerly depressed by the weight of the ice began to rebound, a process of uplift that lasted until approximately 9,000 years ago (Dragovich et al. 1994; Troost 2011).

As glaciers retreated, meltwater lakes—blocked from draining to the ocean by ice—formed over the Puget Sound area, submerging much of the area between the Olympic and Cascade mountains (Troost 2011). The Project area at this time would have been under fresh water. About 14,900 years ago, the last glacial lake broke through its ice dam and drained; marine waters intruded, and Lake Washington was briefly part of Puget Sound because land was depressed below sea level by ice cover and had not yet rebounded. Water levels were much lower than modern lake levels because sea levels were relatively low (Troost 2011; Hodges 2010). The Project area would have been upland at this time. Shortly thereafter, what is now Lake Washington began to fill with fresh water as uplift continued and the connection with Puget Sound was cut off. Lake levels began to rise and continued to do so through the Late Holocene, when they reached historic levels recorded in the mid-1800s, fluctuating with seasonal weather patterns (Hodges 2010). The Project area would have been under an average of 2 to 9 feet of water in the Late Holocene, with a fairly steep paleoshoreline approximately 300 feet west of the modern shoreline (Troost 2011). An 1884 General Land Office map shows the APE under water (Figure 5).

The Lake Washington watershed has been altered since the time of Euroamerican contact. In 1883, Euroamerican settlers trenched a log chute between Union Bay and nearby Portage Bay of Lake Union to the west (Dorpat 1982); the chute was eventually widened into the Montlake Cut in 1916. When the cut was opened, Lake Washington abandoned its southern outlet and began draining into Lake Union. The lake level lowered about 8.9 feet (Hodges 2010). Lake levels since the Montlake Cut have been controlled by the U.S. Army Corps of Engineers at the Ballard Locks in Seattle, dampening seasonal fluctuations.

Native vegetation in the Puget Sound area consists of forests of the *Tsuga heterophylla* zone, which is characterized by western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), and Douglas fir (*Pseudotsuga menziesii*), with a dense shrub and herbaceous understory including sword fern (*Polystichum munitum*), salal (*Gaultheria shallon*), Oregon grape (*Mahonia aquifolium*), ocean spray (*Holodiscus discolor*), Pacific blackberry (*Rubus ursinus*), red huckleberry (*Vaccinium parvifolium*), and red elderberry (*Sambucus racemose*) (Franklin and Dyrness 1973). A variety of fauna would have been present in the vicinity prior to modern land modifications, including fish, invertebrates, waterfowl, and large and small mammals. The Project location is currently landscaped with a variety of native and non-native plants, primarily maintained lawn.

Cultural Context

The earliest evidence of prehistoric human occupation in Western Washington may be the Manis mastodon site on the Olympic Peninsula near Sequim, which has been radiocarbon dated to about 12,000 before present (BP) (Gustafson and Manis 1984). There are few other sites that date before about 5,000 BP. Numerous sites have been identified across the region dating to the period after 5,000 BP, when larger populations began to organize in more complex ways to exploit a wide range of resources, including salmon and shellfish, land mammals, and plant resources such as berries, roots, and bulbs (Matson and Coupland 1995). Over time, populations accumulated in large, semi-sedentary cedar plank house villages located at river mouths and confluences and on protected shorelines. The artifact tool kits became increasingly complex and specialized, allowing for large takes of resources, which were processed and stored for year-long consumption (Ames and Maschner 1999).

The Project area is in the traditional territory of the Duwamish, a Southern Coast Salish group speaking the Southern Lushootseed language, who lived in villages from Lake Washington to the Black River (Suttles and Lane 1990). In fact, early Euroamerican maps record the name "Duwamish

Lake" for Lake Washington. More than 12,000 Lushootseed speakers occupied the Puget Sound region prior to European contact; however, epidemics introduced by the newcomers reduced this population to only 5,000 by the 1850s (Suttles and Lane 1990).

Southern Coast Salish villages were occupied part of the year, largely in winter, and residents made seasonal journeys to camps near resource gathering areas. Coastal villages relied on fish, which they caught with various weirs and traps, as well as shellfish and sea mammals (Suttles and Lane 1990; Ruby and Brown 1986). These food sources were supplemented by various berries, roots, and bulbs (Suttles and Lane 1990; Ruby and Brown 1986).

Waterman (1922) recorded the following three ethnographic place names on Mercer Island:

1. #118: "*TsEktsEk!a'bats*, 'where gooseberry bushes grow'" for a location on the northwest side of the island near what is now Proctor Landing
2. #119: *La'gwitsatEb*, for the southernmost point of the island, a location with spiritual significance
3. #120: *Q!oq!o'btsi*, for a location on the central western shore of the island

Waterman does not report any village or campsites around Calkins Point. Padgett (2013) wrote that Duwamish people "did not build permanent settlements [on Mercer Island] because they were not comfortable staying overnight on the island," which was said to sink into the lake each night. However, there is not a reference or informant noted for this assertion.

Captain George Vancouver's 1792 exploration of Puget Sound marked the first Euroamerican intrusion in the region (Kirk and Alexander 1990). However, Euroamerican settlement in the region was not established until 1832; the earliest instance was at Fort Nisqually at the southern end of Puget Sound. The Wilkes Expedition of 1841 used the fort as a base for explorations in southern Puget Sound (Kirk and Alexander 1990).

Lumber was Puget Sound's major export for much of its early history. Washington was the number one lumber-producing state in 1910, with 63 percent of the state's wageworkers dependent upon the forest products industry for jobs (Schwantes 1996). The timber industry declined in the early twentieth century, but the region's fortunes were revived by military industry during World War II.

Euroamerican settlement on Mercer Island began in the 1870s; 20 years later the island was home to just a few families (Padgett 2013). One settler, a lawyer from Wisconsin named Charles C. Calkins, platted the town of East Seattle and built the Calkins Hotel in 1891. Calkins owned land across northern Mercer Island, and he lent his name to Calkins Point (in Luther Burbank Park north of the Project area) as well as the hotel and a steamship (Stein 2002a). However, his stay on Mercer Island was short and tragic: by the late 1890s he had left in financial and personal ruin (Stein 2002a; Padgett 2013).

The Park was part of Calkins' homestead; it was sold at the time of his departure. The owner leased the property to Major Cicero Newell, who had a history of operating schools for indigent children. Newell developed a school for troubled children at the abandoned Calkins Hotel, later moving the school operation to tents on the Project area property. Working with Newell, the Seattle school district purchased the property in 1903 and developed a "Parental School" for troubled youth on the property (Stein 2002b; Bullis 1978). The property expanded to the north and west when the Montlake Cut lowered lake levels in 1916.

At its maximum extent, the campus contained two schoolhouses, a hospital, barn, laundry, dormitory, steam plant, and farm. The school became an all-boys school in 1928, and in 1931 it was renamed after noted botanist Luther Burbank. The boiler building was constructed in 1928, and presumably the retaining wall that created the raised area on which it sits. A 1933 aerial photograph shows the school campus (Photograph 1). The school closed in 1967, and the property became a county park a year later. In 1976, decrepit wooden structures were burned and the 1928 dormitory refurbished (Stein 2002b; Bullis 1978). The public dock was built in 1974, and an annex to the boiler building constructed as a public restroom serving the dock. In 1998, an arson fire occurred in the boiler room building, damaging the interior (Boyle Wagoner Architects 1998). In 2002, ownership of the Park was transferred to the City of Mercer Island.

Previous Research

There are no recorded archaeological sites within a mile of the Project area. The nearest recorded sites are a historic debris scatter in Bellevue (45KI1008), approximately 1.4 miles east of the Project area, and submerged World War II aircraft in Lake Washington approximately 2 miles northwest of the Project area. No cultural resources surveys have been conducted in the Project area, though it appears that SHPO evaluated the potentially historic structures in the Park in 2018 and determined them to be not NRHP-eligible. The nearest cultural resources survey occurred at Calkins Point in the Park, approximately 1,500 feet north of the Project area (Bundy 2015). Two other surveys were conducted along the shoreline west of Calkins Point, approximately 1,800 to 2,100 feet northwest of the Project area (Kassa-Kleinschmidt 2017; Kleinschmidt and Gardner 2018). All three surveys included subsurface testing and identified topsoil and fill over glaciolacustrine deposits. These results are consistent with the landform history.

Photograph 1
Luther Burbank School in 1933

Source: Museum of History and Industry

Geotechnical testing conducted for the Project offers an indication of subsurface conditions within the APE (Geoengineers 2022a, 2022b). Three upland borings revealed the following (Figure 4):

- B-1 and B-2: 6 inches of sod above glacial till
- B-3: 10 inches of concrete and base course over 7 feet of fill, over glacial till

Three in-water borings revealed "lake sediments underlain by weathered glacially consolidated soil" (Geoengineers 2022b: 2). These results indicate that intact Holocene soils are unlikely to be present in the APE.

Potential to Affect Historic Properties

There are no historic structures in the APE, and therefore there will be no effects to built-environment historic properties. Possible disturbance of unrecorded archaeological resources during construction is the only potential effect.

Most of the Project elements entail little to no ground disturbance (dock repair and reconfiguration, building improvements and renovations, and shoreline and beach enhancements).

Utilities work (drainage and irrigation infrastructure) includes ground disturbance up to 3 feet below the existing ground surface. This will occur along the shoreline within 9 feet of the ordinary high water mark (OHWM). Borings B-1 and B-2 were located in this area, and both revealed sod over glacial till. This is consistent with the results of other subsurface testing in Luther Burbank Park. These improvements are also below the expected water level of Lake Washington prior to the Montlake Cut, and are unlikely to contain intact archaeological materials.

Plaza renovations mostly entail minimal ground disturbance, but also include new pathways, ramps, steps and rockeries, each of which could require up to 6 feet of ground disturbance. The pathway south of the plaza and adjacent steps are cut into a steep slope behind the boiler building, and are therefore unlikely to encounter archaeological materials. The expanded north beach, access pathway, and associated shoreline rockeries are about 3 feet above OHWM, and would have been inundated at least seasonally prior to the Montlake Cut. Construction is unlikely to encounter intact archaeological materials.

In summary, previous cultural resources surveys in Luther Burbank Park and geotechnical information for the current Project indicate that the vicinity contains topsoil over glacial deposits. Most of the Project area would also have been inundated periodically.

Recommendations

Because there are no historic structures in the Project area, and ground disturbance has minimal potential to encounter archaeological materials, it is recommended that USACE determine that **no historic properties will be affected** by the Project. An Inadvertent Discovery Plan is recommended during construction, and is provided as Attachment A.

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Figures

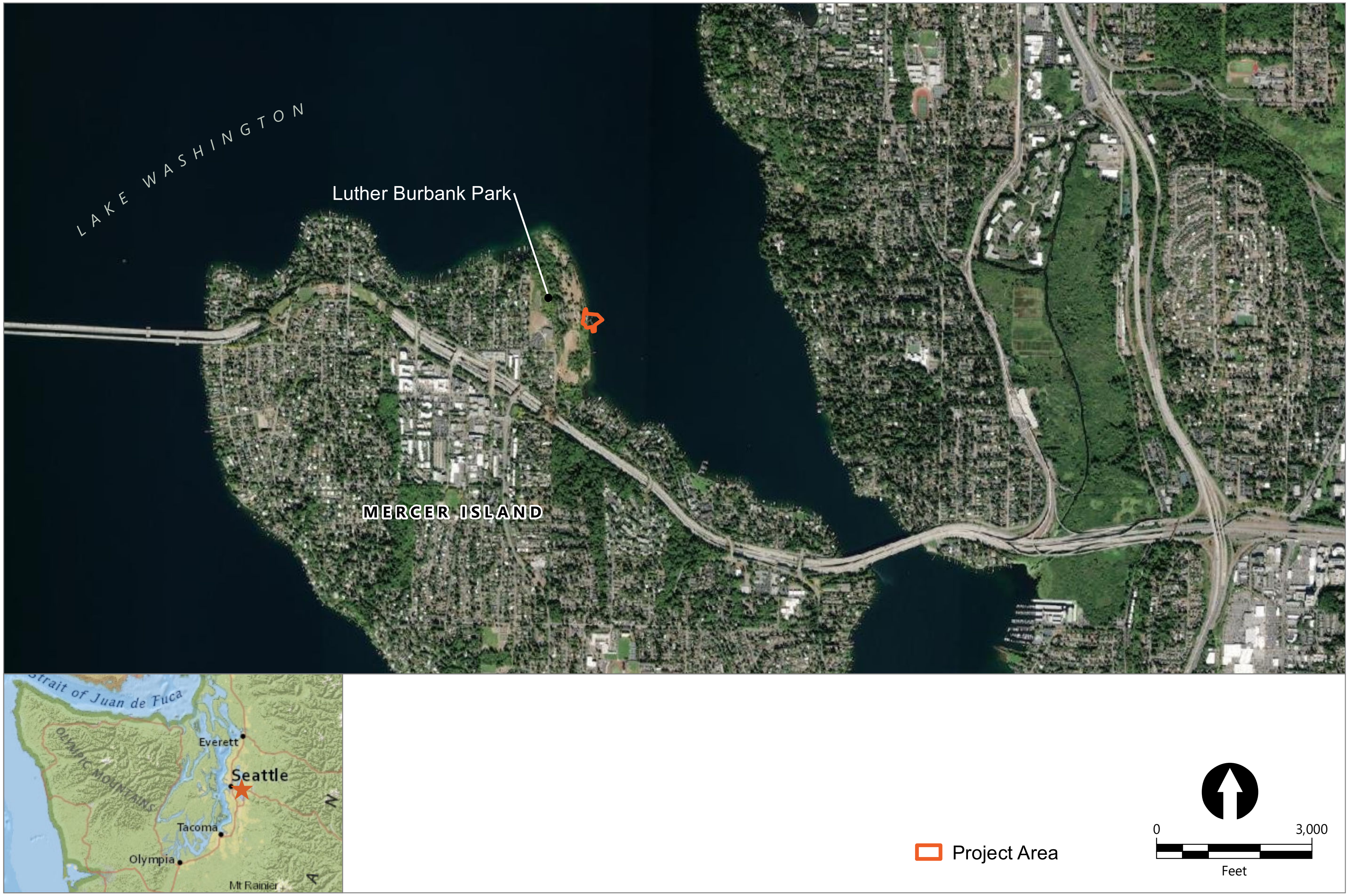

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Figure 1
Project Vicinity
Cultural Resources Assessment
Luther Burbank Park Waterfront Improvements

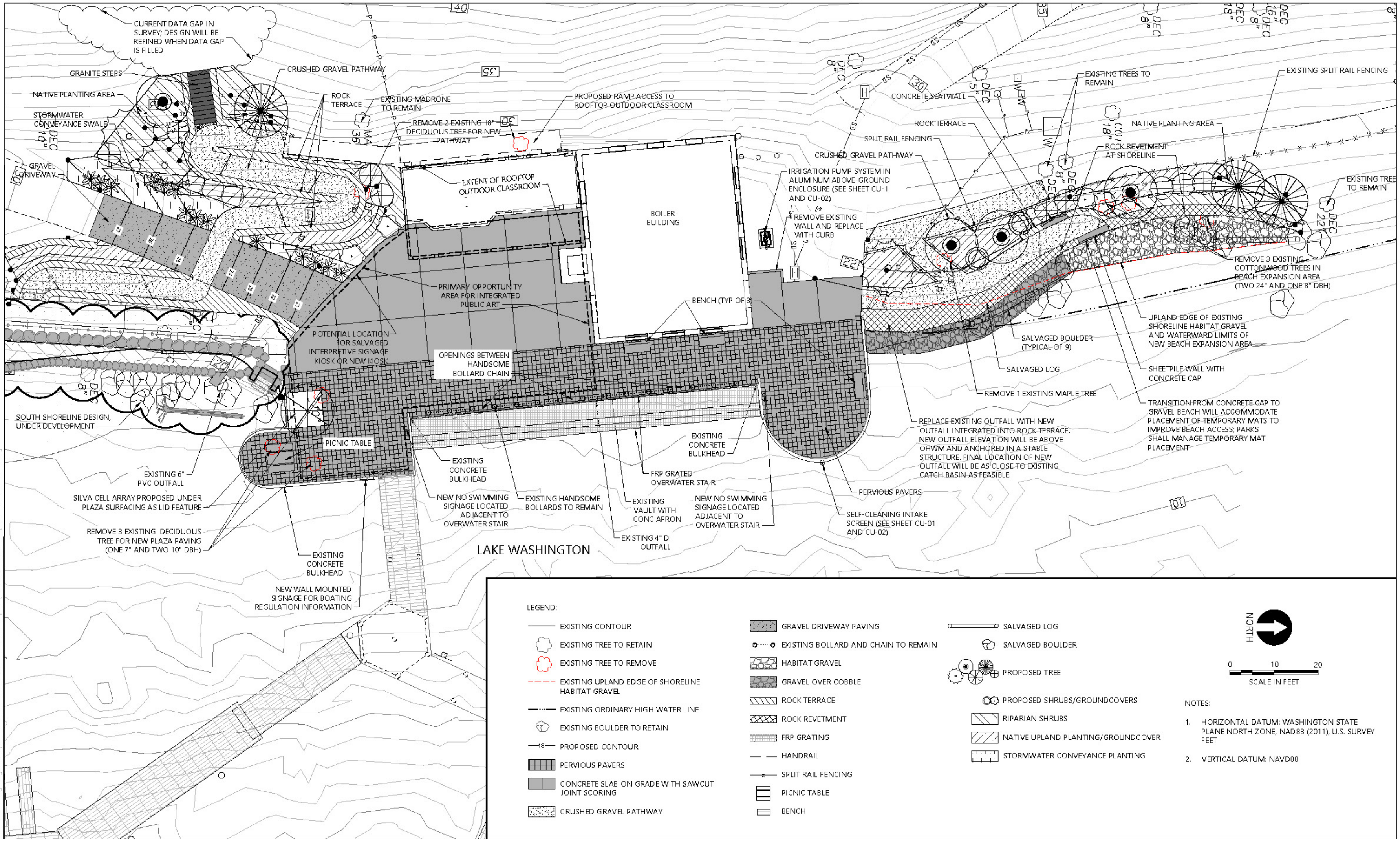

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Figure 2
Project Plan View
Cultural Resources Assessment
Luther Burbank Park Waterfront Improvements

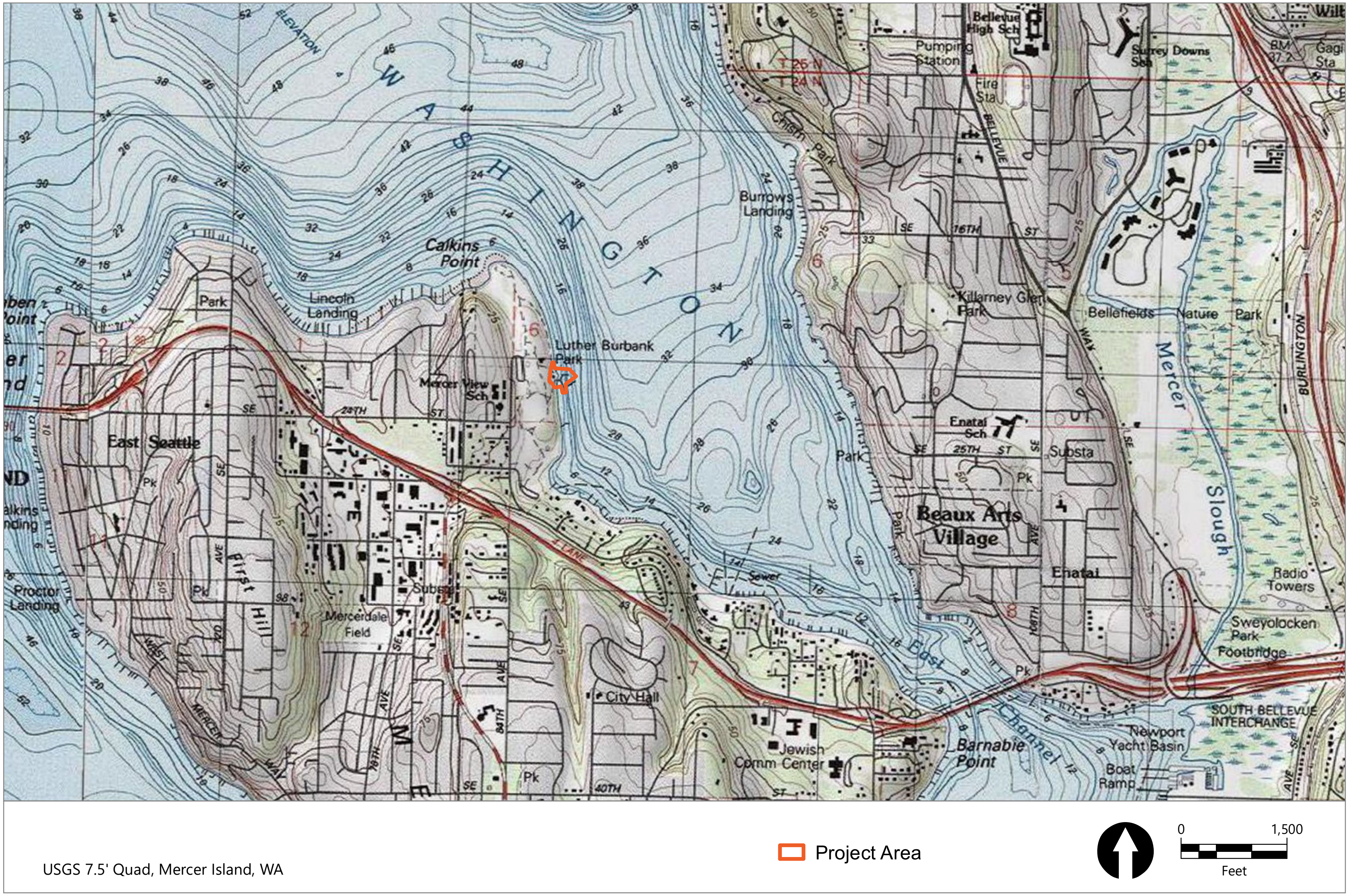

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Figure 3
Area of Potential Effects
Cultural Resources Assessment
Luther Burbank Park Waterfront Improvements

USGS 7.5' Quad, Mercer Island, WA

Project Area

0 60
Feet

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ANCHOR QEA

Figure 4
Geotechnical Test Locations

Cultural Resources Assessment
Luther Burbank Park Waterfront Improvements

Attachment A
Inadvertent Discovery Plan

Inadvertent Discovery Plan

Luther Burbank Park Waterfront Improvements Project

July 15, 2022

The City of Mercer Island Public Works Department (Public Works) is proposing the Luther Burbank Park Waterfront Improvements Project (Project) to repair, maintain, and enhance the waterfront program at Luther Burbank Park on the north end of Mercer Island, Washington.. The Project requires a permit from the U.S. Army Corps of Engineers (USACE) and must comply with Section 106 of the National Historic Preservation Act, its implementing regulations at 36 Code of Federal Regulations (CFR) 800, and USACE's Section 106 regulations at 33 CFR 325. USACE has determined that no historic properties will be affected by the Project. However, ground disturbance will occur, and there is some remaining potential that archaeological materials may be encountered. This plan describes procedures that must be followed if archaeological resources or human remains are encountered during construction, in compliance with applicable local, state, and federal laws.

Archaeological Resources

On-site staff must implement the following steps in the event of a discovery of archaeological resources.

1. Recognize Archaeological Resources. An archaeological resource could be prehistoric or historic. Examples include:
    1. An accumulation of shell, burned rocks, or other food-related materials
    2. Bones or small pieces of bone
    3. An area of charcoal or very dark stained soil with artifacts
    4. Stone tools or waste flakes (i.e., an arrowhead, or stone chips)
    5. Basketry, cordage, or rope
    6. Clusters of tin cans or bottles, buried railroad tracks, decking, or logging or agricultural equipment or tools

    When in doubt, assume the material is an archaeological resource.

2. Stop Work. If any Public Works employee, contractor or subcontractor believes that he or she has uncovered an archaeological resource at any point in the project, all work adjacent to the find must stop in an area adequate to protect the find (expected to be a 30-foot radius unless conditions indicate otherwise). The location of the find shall not be left unsecured at any time.

3. Notify Project Management. Contact the Public Works Project Manager. If the Project Manager is not available, the monitor shall contact the alternate Public Works contact. The

Project Manager, alternate, or designee will make all other contacts. Do not call 911 or speak with the media.

The Project Manager, alternate, or designee will implement the following steps when notified of a discovery.

1. Contact the Project Archaeologist. The Project Manager will retain a qualified archaeologist to evaluate whether the find is an archaeological site or resource as defined by state or federal law. If the Project Archaeologist recommends that the find is not an archaeological site or resource, the recommendation will be provided to USACE and Public Works. Construction may continue when authorized by USACE.

2. Notify Consulting Parties. If the Project Archaeologist determines that the find is an archaeological site or resource, the Project Archaeologist will notify USACE and Public Works. USACE shall notify consulting parties (State Historic Preservation Officer [SHPO], tribes, and any other identified interested parties) of the find within 48 hours, per 36 CFR 800.13.

3. Evaluate Significance. The Project Archaeologist will conduct any additional research necessary to evaluate significance under state or federal law. Based on this research, the Project Archaeologist will recommend to USACE and Public Works whether the find is significant.

4. Determine Significance and Continue Consultation. USACE will determine whether the find is significant and will provide the determination to consulting parties. Consulting parties shall respond within 48 hours, per 36 CFR 800.13.

   If USACE determines that the find is not significant and consulting parties do not object within 48 hours, construction may continue when authorized by USACE. If any consulting party objects, USACE shall continue consultation in good faith to resolve the lack of agreement. If agreement cannot be reached, USACE shall seek comment from the Advisory Council on Historic Preservation, as described in 36 CFR 800.4(c)(2).

5. Avoid or Mitigate Adverse Effects. If USACE determines that the find is significant, USACE will work with Public Works to determine whether adverse effects can be avoided. If adverse effects can be avoided, USACE will provide documentation of avoidance and a determination of No Adverse Effect. If consulting parties do not object within 48 hours, construction may continue when authorized by USACE. If any consulting party objects, USACE will continue consultation until a reasonable and good faith effort has been made to resolve the lack of agreement.

If a determination is made that adverse effects cannot be avoided, USACE will work with Public Works and consulting parties to develop mitigation measures. These could include an Archaeological Treatment Plan describing data recovery efforts or other mitigation measures.

Human Remains

Human remains require special treatment under Revised Code of Washington (RCW) 68.50.645. Any potential remains that are encountered during project work should be assumed to be human until determined otherwise by the Project Archaeologist or law enforcement personnel. Procedures for the discovery of possible human remains are described below.

On-site staff must implement the following steps in the event of a discovery of potential human remains.

1. Stop Work. If any Public Works employee, contractor, or subcontractor believes that he or she has uncovered possible human remains at any point in the project, all work adjacent to the discovery must stop. Work stoppage must be adequate to protect the discovery, which is expected to be a minimum of 30 feet in all directions, unless the Project Archaeologist or law enforcement personnel indicate otherwise.

2. Do Not Handle Human Remains. Possible human remains shall not be handled, removed, reburied, or covered.

3. Flag and Secure the Area. The area of discovery will be flagged and secured. The location of the discovery will not be left unsecured at any time. Construction equipment and personnel will not enter the area. Spoils piles or vehicles from the area that have the potential to contain human remains, such as dump trucks, will remain on site. No persons other than the proper law enforcement personnel, the King County Medical Examiner, and professional archaeologists will be authorized to access the discovery location after the area is secured.

4. Notify Project Management. Contact the Public Works Project Manager. If they are not available, contact alternate Public Works contact. The Project Manager, alternate, or designee will make all other contacts.

5. Avoid Any Other Communication. Do not call 911, the media, or members of the public about the find.

The Public Works Project Manager, alternate, or designee will implement the following steps when notified of a discovery of potential human remains.

1. Preliminary Observation. The Project Manager will notify USACE (via phone and email) of the discovery and will coordinate with the Project Archaeologist to assess whether the discovery may be human remains (without disturbing the discovery further). If the discovery can be definitively identified as nonhuman, procedures for archaeological resources will be followed.

2. Notify Law Enforcement. If the discovery could possibly be human remains, the Project Manager or the Project Archaeologist shall call the City of Mercer Island Police nonemergency number and report that potential human remains have been discovered. The City of Mercer Island Police will control the discovery site until it is either determined to be non-forensic (not a crime scene) or the investigation is complete.

3. Participate in Consultation. Under RCW 27.53.030, RCW 68.50, and RCW 68.60, SHPO will have jurisdiction over non-forensic human remains. USACE and Public Works will participate in consultation. If there are also archaeological materials at the human remains discovery location, there may be a parallel archaeological resources process led by USACE. Construction can resume when authorized by USACE and SHPO.

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Non-Emergency Number: (425) 577-5656

April 2023
Luther Burbank Park Waterfront Improvements

Critical Areas Study

Prepared for City of Mercer Island

April 2023
Luther Burbank Park Waterfront Improvements

Critical Areas Study

Prepared for
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Mercer Island, Washington 98040

Prepared by
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Geotechnical review completed by Geoengineers (see Appendices C and D)

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ABBREVIATIONS

ADA	Americans with Disabilities Act
BMP	best management practice
CAS	Critical Areas Study
City	City of Mercer Island
DNR	Department of Natural Resources
DPS	distinct population segment
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FRP	fiberglass-reinforced plastic
FWHCA	fish and wildlife habitat conservation area
lf	linear feet
LID	low impact development
LWD	large woody debris
MICC	Mercer Island City Code
NAVD88	North American Vertical Datum of 1988
NMFS	National Marine Fisheries Service
OHWM	ordinary high water mark
Project	Luther Burbank Park Waterfront Improvements Project
sf	square feet
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
UST	underground storage tank
WDFW	Washington Department of Fish and Wildlife

1 Introduction

The City of Mercer Island (City) is proposing the Luther Burbank Park Waterfront Improvements Project (Project) to repair, maintain, and enhance the waterfront program at Luther Burbank Park in the City of Mercer Island, Washington (Figures 1 and 2).

This Critical Areas Study (CAS) has been prepared by Anchor QEA to support the local permitting and land use review for the Project consistent with the critical areas reporting requirements in the Mercer Island City Code (MICC) Chapter 19.07.110. The Project is located within the City's regulated shoreline area. According to MICC 19.13.010D, critical areas within shoreline jurisdiction are regulated by the critical areas code requirements in MICC 19.07.010 through and including MICC 19.07.190, Ordinance 19C-05.

This CAS evaluates the presence of existing critical areas within the Project area and potential impacts to the critical areas and regulated buffers as defined in MICC Chapter 19.07. Critical areas regulated by the City include wetlands, watercourses, fish and wildlife conservation areas (FWHCAs), and geologically hazardous areas. Per MICC 19.07.170, the site review also included a survey for bald eagle (*Haliaeetus leucocephalus*) nests within the Park to identify areas used by bald eagles for foraging, nesting, and roosting, or within 660 feet of a bald eagle nest.

Project staff gathered and reviewed existing information consistent with MICC Chapter 19.07 to assess existing critical areas. Anchor QEA performed a critical areas site visit on February 19, 2020. Subsequent site visits have occurred in 2021 and 2022 as part of this Project, confirming existing conditions within the Project area.

A Project plan set is provided as Appendix A. Site photographs are provided in Appendix B.

1.1 Project Purpose

Luther Burbank Park is a popular park used by the residents of Mercer Island and the greater Seattle-Bellevue metro area for many waterfront recreational activities. The dock structures in their current configuration were constructed in 1974 to accommodate small boats in a different shoreline and recreational setting than exists today. The purpose of the Project is to modernize and optimize public access, recreational uses, and public safety, including reconfiguring the waterfront park to better accommodate small boats and nonmotorized watercraft and improve Americans with Disabilities Act (ADA) and universal access to the docks, viewing deck, and beach, while avoiding and minimizing potential impacts to sensitive environments and resulting in no net loss of ecological function.

1.2 Project Background and Description

The Project includes repairing and replacing portions of the existing dock structures, including repairs to the north dock structure, and replacing and reconfiguring the central and south dock structures to accommodate waterfront programming and current and projected watercraft uses. Other waterside improvements include installing a grated overwater public access platform in the nearshore to improve access to the water along the existing plaza area.

The Project also includes upgrades to the waterfront plaza and Boiler Building. These include Boiler Building repairs (i.e., new roof, seismic retrofits, and new lighting); Boiler Building restroom annex renovation to improve the restroom facilities and construct a new rooftop viewing deck; concession stand repairs; and waterfront plaza renovations and access upgrades.

The Project will improve access to the waterfront by creating new ADA and universally accessible routes from the plaza to the viewing deck on the existing Boiler Building annex restroom rooftop, and to the expanded north beach area that will be improved with fish habitat gravel and riparian plantings. The accessible route will connect to the adjacent future south shoreline trail that will be constructed as part of a separate project. The accessible route will also connect to the existing trail that continues north of the Project area. All proposed waterfront improvements including the dock structures and gangways will also meet accessibility requirements.

Based on requirements provided by the Fire Department in an on-site meeting with KPFF Consulting Engineers in December 2022, the project will add a new ductile fire water line, fire hydrants, and a fire access apparatus access road (hammerhead). While installing that fire line, the project will excavate an existing gravel trail (1,235 square feet [sf]) and replace it with an in-kind gravel trail (1,235 sf). The project will also take advantage of some existing paved areas and expand it with permeable geogrid (2,384 sf) to create the hammerhead. Existing trees will be protected in place for the extent of the trenching, and the disturbed lawn and plant area will be renovated to match existing conditions.

The waterfront plaza renovations and access upgrades will incorporate low impact development (LID) features that will provide stormwater buffering and biofiltration functions similar to a vegetated shoreline. An irrigation intake system will also be installed at the south end of the plaza.

The Project includes upland, shoreline, in-water, and overwater work along Lake Washington. Figures 3 and 4 provide an overview of the project components. Appendix A provides a detailed plan set. Project details and construction methods are described in the following subsections.

1.3 Upland and Shoreline Improvements

The proposed upland and shoreline improvements include the following (Figure 3):

- **Boiler Building Repairs:** installing a new roof, seismic retrofits, and new lighting on the existing building
- **Boiler Building Restroom Annex Renovation (Rooftop Viewing Deck):** renovating the existing restrooms, constructing a new rooftop viewing deck, and installing new lighting on the existing building
- **Concession Stand Repairs:** installing improvements and a new electrical panel within the concession area of the existing building
- **Waterfront Plaza Renovations and Access Upgrades:**
  - Installing 1,970 sf of planting and irrigation
  - Installing 1,800 sf of plaza paving improvements
  - Installing three benches and one picnic table
  - Installing 65 linear feet (lf) of a new structural ADA-accessible ramp to the viewing deck
  - Expanding the north beach access with a new 120-lf ADA-accessible pathway connection and beach expansion
  - Installing a 6-foot concrete seatwall at north beach pathway
  - Installing 61 lf of split rail fencing
  - Installing a new 140-lf on-grade pathway connection between the structural ramp, south shoreline trail, and upland plaza
  - Replacing an existing 252-lf gravel trail (1,235 sf) with an in-kind gravel trail (1,235 sf) at the new fire line installation
  - Installing a ductile iron fire water line and fire hydrants
  - Installing geogrid to expand an existing hardscape area to create an approved fire apparatus access turnaround for fire trucks
  - Installing granite steps at the new on-grade pathway
- **Shoreline and Beach Enhancements:** expanding the north beach by placing fish habitat gravel landward of the upland edge of the existing beach, relocating boulders and large woody debris (LWD) along the shoreline, enhancing riparian vegetation.
- **Waterfront Drainage LID:** installing new site drainage improvements including 2,500 sf of pervious paver drainage design at the plaza, installing a silva cell biofiltration array with a new stormwater outfall to the lake, and complying with all associated storm drainage reporting and compliance requirements
- **Irrigation Intake System Installation:** replacing and installing a new irrigation intake, pump system, and supply lines
- **Fire Department Required Updates:** adding a fire water line, fire hydrants, and a fire access apparatus access road and renovating an existing gravel trail

1.3.1 Boiler Building Repairs

Exterior repairs to the Boiler Building will include installing seismic retrofits, a new roof, and replacing and installing wall-mounted light fixtures to enhance public safety.

1.3.2 Boiler Building Restroom Annex Renovation (Viewing Deck)

The Boiler Building restroom annex rooftop will be renovated to facilitate a new rooftop viewing deck. The viewing deck will be constructed with Bison wood-paneled deck-surfacing material on pedestals with a 1/2-inch maximum gap for ADA accessibility on top of the existing concrete roof. The existing rooftop elevation is 29 feet, and the rooftop itself is 40 feet by 21 feet in length and width. The new rooftop will be elevated to approximately 30 feet in height to match the future second level of the Boiler Building and will match the existing extent of the rooftop area. Amenities, such as a new guardrail, light fixtures, new signage displays, and site furnishings, will be installed.

1.3.3 Concession Stand Repairs

The concession stand is located between the Boiler Building and restrooms and is approximately 160 sf in area. An existing casework area on the east side of the wall will be removed and replaced with a new 6-inch concrete wall with concrete counter above. A new sink will be installed in the southwest corner of the concession area and a new electrical panel will be installed in the northwest corner.

1.3.4 Waterfront Plaza Renovations and Access Upgrades

Table 1 describes each Project element and the impervious surface removed, replaced, or installed for each feature. Approximately 25% of the Project area is currently impervious surfaces (buildings, pavement, driveway, and docks). The Project will reduce overall impervious surface area by approximately 5%.

Plaza renovations for the Project include removing 5,205 sf of concrete pavers, brick pavers, concrete paving, and a small area of asphalt paving in front of the Boiler Building restroom annex under the breezeway. Approximately 2,595 sf of existing impervious surface will be replaced, including 2,015 sf of new concrete paving in the western portion of the plaza by the Boiler Building and 580 sf of gravel driveway paving. Approximately 2,410 sf of pervious pavers will be installed in the eastern part of the plaza (not included in impervious surface calculations). Two benches are proposed along the outside of Boiler Building in the plaza, and one picnic table is proposed at southern end of the plaza.

The Project includes several shoreline trail access improvements (on-grade pathway and ramp, north beach pathway). The new on-grade pathway south of the plaza will be an accessible, crushed rock surfaced pedestrian trail. Approximately 42 cubic yards of terraced rock wall (375 sf) will be placed to accommodate ADA-accessible slopes along this pathway. An existing stormwater outfall will be temporarily removed and reinstalled during this construction.

A new structural ADA-accessible ramp is designed to provide access to the new viewing deck and will be located behind the Boiler Building restroom annex on the northwest side of the rooftop. Several footings will be installed to support the viewing deck access ramp, ranging from 3.5 to 5.5 feet deep and requiring excavation of approximately 20 cubic yards of soil total. The ramp will connect to the new on-grade crushed gravel pathway that will lead down to the plaza, dock, and future south shoreline trail. The on-grade pathway will also lead uphill to a new granite step feature that connects to an existing uphill trail network. Construction of the upland trail will be completed with standard heavy equipment including small excavators, small bulldozer, dump truck, and similar equipment.

The north beach access will be expanded with a new universally accessible pathway connection. A gravel pathway will connect to a concrete trail segment leading to a seatwall. A sheet pile wall with concrete cap will be installed at the east end of the trail. The trail will be supported by a rock terrace on the landward side and a rock revetment adjacent to the beach.

Table 1
Impervious Surfaces Summary

Project Element	Impervious Surface Removed (sf)	Impervious Surface Replaced (sf)	New Impervious Surface Installed (sf)
Waterfront Plaza			
Concrete pavers, brick pavers, and concrete paving at waterfront plaza	4,425	2,015	n/a
Asphalt paving at Boiler Building restroom annex breezeway	320	n/a	n/a
Driveway and ADA Trail/Ramp			
Gravel driveway paving	580	580	n/a
Gravel on-grade pathway south of plaza	170	n/a	700
Structural concrete ADA-accessible ramp to the new viewing deck	n/a	n/a	260
Rock terrace at on-grade pathway	n/a	n/a	375
Granite steps at on-grade pathway	n/a	n/a	60
Fire Department Updates			
Gravel trail renovation at fire line	1,235	1,235	n/a
Fire apparatus access hammerhead	n/a	n/a	86
North Beach Access			
Gravel pathway at north beach	30	n/a	400
Concrete pathway segment	n/a	n/a	150
Rock revetment at north beach	n/a	n/a	300

Project Element	Impervious Surface Removed (sf)	Impervious Surface Replaced (sf)	New Impervious Surface Installed (sf)
Concrete cap for sheet pile wall	n/a	n/a	11
Rock terrace at north beach	n/a	n/a	60
Concrete seatwall	n/a	n/a	11
Total	**6,440**	**3,830**	**2,413**

1.3.5 Shoreline and Beach Enhancements

In addition to improving public access and safety, the design includes shoreline and beach enhancements. The Project will expand the north beach by placing fish habitat gravel landward of the upland edge of the existing beach, relocate boulders and LWD along the shoreline, and enhance riparian vegetation. The beach expansion includes placing 45 cubic yards of habitat gravel and cobble underlayment (605 sf) and relocating intermittent boulders and LWD along the existing beach and riparian buffer area. The expanded beach and riparian area will maintain nearshore habitat functions. The planting plan to replace removed riparian vegetation and trees is described in Section 1.5.

Habitat gravel will consist of naturally rounded material that complies with WDFW grain size criteria for Lake Washington. Gravel depth is a maximum of 2- to 3-foot thickness on the landward side, tapering on the waterward toe of placement. The material will be placed from the upland or by barge using a conveyor (e.g., telebelt or similar) to place the material precisely and evenly. All materials will be sourced from an approved off-site distributor.

1.3.6 Waterfront LID

Approximately 2,410 sf of concrete and brick pavers at the plaza will be replaced with pervious pavers along the eastern edge of the plaza. The pervious pavers will abut the new concrete paving on the western portion of the plaza and will end at the waterfront edge. A silva cell system will be installed under the south end of the plaza to provide biofiltration of stormwater. A new outfall from this system will be installed in the bulkhead south of the pedestrian plaza. A vegetated conveyance swale will be installed along the resurfaced gravel maintenance driveway.

1.3.7 Irrigation Intake System Installation

The irrigation intake system includes installing a new water pump station south of the Boiler Building and a new freshwater intake screen in Lake Washington east of the pump station. The City will connect the proposed system to upland irrigation systems within the park. Upland work will include installing the pump station, trenching approximately 50 feet east from the pump station under the plaza to the intake screen, and installing pipe bedding material and the piping in the trench.

A coring saw, or similar, will be used to core a hole through the existing retaining wall to insert the intake and filter backwash pipes through the wall and into the lake. A small portion of the lake, in and around the area where the pipe penetration will be constructed through the bulkhead wall, will be temporarily dewatered to allow for drilling through the bulkhead and installation of the screen in the dry. Once the penetration is sealed and grout has cured, the screen will be installed on the end of the pipe and the temporary cofferdam used to dewater that portion of the lake will be removed and the lake will be allowed to submerge the fish screen.

The intake screen will be a self-cleaning suction screen designed to screen fish from entering the intake facilities in compliance with current fish screening guidelines from WDFW and the National Marine Fisheries Service. The irrigation intake system will draw water from Lake Washington at a maximum rate of 0.089 cubic foot per second (40 gallons per minute), as allowed by the approved water right change (Water Right Claim 158498AH).

1.4 In-Water and Overwater Activities

The in-water and overwater Project elements are described in this section and shown in Figures 3 and 4. A detailed plan set is provided in Appendix A.

1.4.1 North Dock Repairs

The Project proposes to retain and repair the northernmost segment of the dock (approximately 188 feet long and 8 feet wide). Approximately 235 sf of the existing concrete dock connecting to the waterfront plaza will be removed and replaced with fiberglass-reinforced plastic (FRP) grating. Approximately 120 sf of an existing wood finger dock will be removed.

Some timber piles supporting the north dock have decayed and need repair. The project includes removing and replacing the top portion of up to five decayed timber piles with ACZA-treated timber. The damaged portions of the pile will be cut away, and a new timber section will be attached to the remaining pile with steel straps.

As part of the north dock repairs, 38 creosote-treated timber piles will be wrapped with fiberglass jackets. The area around the bottom of each pile will be excavated a minimum of 2 feet deep to allow the jacket to be extended below the mudline. A marine epoxy grout will be injected between the pile and the jacket. The jackets will isolate the creosote-treated piles from the water to prevent further leaching of creosote into the water column, reducing a source of water pollution into the lake.

1.4.2 Central Dock Reconfiguration

The central dock, a fixed concrete structure, will be entirely removed and replaced in a new configuration. The reconfigured central dock will include a wave attenuator/mooring float attached to the existing fixed concrete dock by an ADA-compliant grated gangway. The wave attenuator/mooring float will be 10 feet wide with 2 feet of freeboard. To provide adequate wave attenuation, the float material will be concrete, with light penetration options where possible. The bulk of the structure is located as far offshore as practical in approximately 36 to 38 feet of water to reduce the effect of shading on the lake bottom. The float will attach to 16 new steel piles (24-inch diameter). Attached to the inside of the wave attenuator/mooring float will be two new grated finger floats, each 25 feet long with 1.5 feet of freeboard.

The intended use of the wave attenuator/mooring float is for small (up to 26-foot) powerboat moorage. The width is designed to attenuate passing vessel wakes and protect moored boats. The wave attenuation function is critical because the area is frequented by wake surfing boats, a recent boating trend that uses back-weighted boats designed to produce large wakes for surfing without the use of the tow rope that is typically required for waterskiing and wake boarding. In the last decade, wake surfing has become popular in Lake Washington. The large waves this generates cause floating docks to pitch excessively. The waves affect the docks intermittently, unpredictably, and without warning. These conditions create unstable surfaces on floating docks, posing a risk to dock users and prohibiting ADA-compliant access. The wave attenuation provided by this mooring float addresses this problem. This project will also install regulatory buoys offshore of the float to inform boaters of wake regulations in proximity to the shoreline (Section 1.4.5).

According to the Mercer Island Shoreline Master Program, breakwaters are prohibited, except for those structures installed to protect or restore ecological functions. These structures shall provide for mitigation according to the sequence defined in Washington Administrative Code 173-26-201(2)(e). The proposed wave attenuation float has been designed to reduce wave energy along both the south and north shorelines of the park. The float reduces wave energy from both storm waves present during winter months and large boat wakes present primarily during summer months. Wave modeling completed as part of the design process for the dock predicts that wave heights will be reduced between 0.5 and 1.0 foot along portions of the shoreline compared to adjacent shorelines (Appendix E). This reduction in wave height will subsequently reduce wave energy along the nearshore and shoreline areas of the park, thus reducing the erosion due to waves and boat wake in these areas. This will provide protection to the recently restored area that was supplemented by placement of habitat-grade gravel and LWD and the planting of native riparian plant species (permitted under City Permit Nos. SHL20-016 and SHL SHL21-009).

1.4.3 South Dock Reconfiguration

The south dock is a fixed concrete structure that will be removed and replaced in a new configuration. As with the central dock, per MICC 19.13.050(H)(5), the south dock is required to have a grated surface that allows for 40% light transmittance over 100% of the dock. The new south dock is intended for nonmotorized watercraft—kayaks, canoes, rowboats, and small sailboats—to accommodate public use and boating programs such as rentals, classes, and camps. The design includes the reuse of an existing 10-foot by 50-foot grated float and construction of a new 8-foot-wide-by-50-foot-long, 9-inch-freeboard general-purpose float. The proposed floating structures will connect to the existing fixed dock by an ADA-compliant grated gangway. The floats will attach to five new steel piles (16-inch diameter).

The new general-purpose float will be constructed with a low freeboard to make the use of kayaks and stand-up paddleboards easier and with grated surfacing to meet light transmittance requirements. Two grated finger floats (each 15 feet long by 3 feet wide) will extend from the general-purpose float to provide areas for kayak launching, including one ADA-accessible kayak launch point.

1.4.4 Overwater Access Platform

The Project includes a new grated overwater platform as part of the goal to improve access to the waterfront. Portions of the "Handsome Bollards" chain will be removed to allow the public past the art feature and onto the platform where they can access the lake at water level. The platform will only provide access to the water level and will not descend to the beach substrate. The platform will attach to the existing concrete bulkhead at the plaza as an overwater feature and will be of FRP grating material. The platform is being permitted separately with the U.S. Army Corps of Engineers (USACE) but will be incorporated with the Project for other permit agencies.

1.4.5 Buoys

To meet reduce the risks created by passing vessels, the City will replace one buoy and add two new buoys in the lake. Two will be "no wake" buoys located east and southeast of the docks, and one will be a "nonmotorized vessel" buoy located near the south dock.

1.4.6 Summary of Pile and Overwater Cover Quantities

Table 2 summarizes the in-water piles and overwater cover to be removed, repaired, and installed.

Up to sixty-seven 12- to 14-inch creosote-treated timber piles and two 16-inch concrete encapsulated piles in total will be removed during dock demolition and repair. A total of 23 new steel piles (16- and 24-inch diameter) will be installed for the reconfigured docks, and six new pin piles (6-inch diameter) will be installed for the overwater platform. The Project will result in a net reduction of 40 piles in Lake Washington, and removal or fiberglass encapsulation of creosote-treated timber piles.

Piles will be installed using a water-based pile driver and a vibratory and/or impact hammer. It is anticipated that impact pile driving will be limited to proofing or if obstructions are encountered during vibratory pile driving. During all impact driving, sound-attenuation devices such as wooden cushion blocks or similar devices will be employed to minimize sound-related impacts.

The Project will result in a net reduction of approximately 5 sf of overwater cover (4,665 sf removed and 4,660 sf added). Much of the new overwater cover will consist of grated material that will allow light penetration.

Table 2
In-Water and Overwater Work Summary

Project Portion	Element	Features Removed	Features Replaced	Net Change
North Dock Repairs[1]	In-water piles	One 12- to 14-inch creosote-treated timber pile[1]	Not applicable	Net decrease of 1 in-water pile
	Overwater cover	Approximately 355 sf of overwater cover (235 sf of existing concrete dock; 120 sf of one wood finger dock)	235 sf FRP grating	Net decrease of 120 sf overwater cover
Central Dock Reconfiguration	In-water piles	Approximately twenty-six 12-to 14-inch creosote-treated timber piles)	Approximately 17 piles (sixteen 24-inch steel piles; one 16-inch steel pile)	Net decrease of 9 in-water piles
	Overwater cover	Approximately 1,500 sf fixed concrete dock	Approximately 3,160 sf of new overwater cover (2,610 sf of wave attenuator float, 175 sf of two grated finger floats, 375 sf of grated gangway)	Net increase of 1,660 sf overwater cover
South Dock Reconfiguration	In-water piles	Approximately 42 piles (forty 12- to 14-inch creosote-treated timber piles; two 16-inch concrete encapsulated piles)	Approximately six 16-inch steel piles	Net decrease of 36 in-water piles
	Overwater cover	Approximately 2,810 sf existing cover (1,930 sf of fixed concrete dock; 40 sf of aluminum ramp; seven 120-sf wood finger docks)	Approximately 713 sf of new overwater cover (380 sf of general-purpose float, 90 sf of 2 grated finger floats, 225 sf of grated gangway, 18 sf of concrete gangway abutment)	Net decrease of 2,097 sf overwater cover

Project Portion	Element	Features Removed	Features Replaced	Net Change
Overwater Access Platform	In-water piles	Not applicable	Approximately 6 pin piles (6-inch steel piles)	Net increase of 6 in-water piles
	Overwater cover	Not applicable	Approximately 552 sf of grated overwater cover	Net increase of 552 sf overwater cover
Total	**In-water piles**	**Approximately 69 piles removed**	**Approximately 29 piles installed**	**Net decrease of 40 in-water piles**
	Overwater cover	**Approximately 4,665 sf of existing cover removed**	**Approximately 4,660 sf of new overwater cover installed**	**Net decrease of approximately 5 sf of overwater cover**

Notes:

1. Table does not include repair and fiberglass encapsulation of existing north dock piles. Up to five 14-inch decayed creosote-treated timber pile tops will be removed and replaced with ACZA treated timber piles and wrapped with fiberglass jacket.
2. Approximately 2,000 sf of new overwater cover will consist of FRP grating.
3. An existing floating wood dock will be removed from the south dock during demolition, temporarily stored on site, and replaced for reuse as part of the reconfigured south dock. This floating wood dock is not included in the overwater cover calculations shown here.

1.5 Vegetation Disturbance and Restoration

To construct the new access pathways, plaza paving, and expanded north beach, up to 12 trees located along the shoreline and in the uplands will be removed and replaced with 20 new trees (Table 3; Figures 5 and 6). Approximately 4,300 sf of invasive native and non-native riparian and upland vegetation will be removed during construction, and 2,020 sf of native shrub and groundcover vegetation will be installed, including shoreline riparian, upland, and stormwater swale vegetation.

All planting areas will be irrigated and maintained per the park maintenance plan to establish and support species growth. Table 3 summarizes the proposed tree and vegetation removal and replacement activities. All plant installations will occur above the ordinary high water mark (OHWM).

Table 3
Areas of Vegetation Disturbance and Restoration

Project Component	Location	Quantity or Area
Vegetation removal	North beach	1,800 sf (riparian)
	South on-grade pathway	2,500 sf (upland)
	Total	**4,300 sf removed**
Shrub and groundcover planting	North beach	730 sf (riparian)
	South on-grade pathway	1,290 sf (upland)
	Total	**2,020 sf installed**

Project Component	Location	Quantity or Area
Tree removal	North beach	6 trees (deciduous)
	South on-grade pathway and ramp	3 trees (deciduous)
	Plaza	3 trees (deciduous)
	Total	**12 trees removed**
Tree installation	North beach	11 trees
	South on-grade pathway	8 trees
	Plaza	1 trees
	Total	**20 trees installed**

1.6 Project Schedule

The Project is anticipated to be constructed in two phases and will occur over 14 months beginning in or around July 2023, or once all permits and approvals are issued. In-water work will occur during the approved regulatory work window for Lake Washington, which is typically between July 16 and March 15. Overwater or upland activities may occur outside of the in-water work window. The following construction phase and sequences are proposed:

1. **Phase 1: July 2023 to January 2024**
   a. Boiler Building Repairs
   b. Boiler Building Restroom Annex Renovation
   c. Concession Stand Repairs
2. **Phase 2: June 2024 to November 2024**
   a. North Dock Repairs
   b. Central Dock Reconfiguration
   c. South Dock Reconfiguration
   d. Overwater Access Platform
   e. Waterfront Plaza Renovation and Access Upgrades
   f. North Beach Enhancements
   g. Waterfront LID
   h. Irrigation Intake System

1.7 Statement of Accuracy and Assumptions

The information provided in this CAS has been prepared by professional biologists, planners, and engineers using the best available science to provide an evaluation of critical areas and potential impacts. This CAS documents that there are no wetlands or watercourses present in or near the Project area. In addition, no bald eagle nests were identified within 660 feet of the Project area, as identified per U.S. Fish and Wildlife Service (USFWS) bald eagle nest disturbance management guidelines (USFWS 2007). The Project area contains geologic hazard areas and FWHCAs as defined by MICC 19.07.160 and 17.07.170, respectively. Discussion of risk mitigation through design and construction, and no net loss of ecological functions, is provided.

1.8 Review of Existing Information

Anchor QEA reviewed the following sources of information to support field observations:

- City of Mercer Island GIS mapping (City of Mercer Island 2022)
- King County interactive mapping (King County 2022)
- National Marine Fisheries Service and U.S. Fish and Wildlife Service information about federally listed species (NMFS 2022, USFWS 2022a)
- Natural Resources Conservation Service soils mapping (NRCS 2020)
- National Wetland Inventory mapping (USFWS 2022b)
- Washington Department of Fish and Wildlife Priority Habitats and Species and salmonid mapping (WDFW 2022a, 2022b)
- Geotechnical reports prepared by GeoEngineers for the Project (Appendices C and D)
- Wave and Wake Modeling Report prepared by Blue Coast Engineering for the Project (Appendix E)
- Tree Report prepared by the City for the Project (Appendix F)

2 Project Area Description

Existing structures in the Project area include the dock and Boiler Building. The Boiler Building is located within the waterfront plaza west of the dock and is currently used for park storage and restrooms. The shoreline is defined by a vertical concrete bulkhead spanning approximately 200 lf. The bulkhead delineates the plaza area, which includes concrete paving and pavers. To the north of the dock along the plaza's shoreline bulkheads is an art installation called "Handsome Bollards" that includes a series of bollards approximately 6 feet apart with bronze hands that hold a metal chain. Current access to the plaza is limited to the gravel maintenance driveway at the south end of the Project area and an asphalt pathway at the north end.

Existing stormwater features include a stormwater conveyance swale that abuts the western edge of the gravel maintenance driveway and drains to an existing catch basin. The catch basin drains to the lake through a 6-inch PVC storm drain to an outfall south of the plaza. Two additional catch basins located north of the plaza, between the asphalt pathway and Boiler Building, drain to the lake through a 6-inch PVC storm drain and outfall in the north end of the plaza. The northern outfall runs underneath the plaza and through the existing bulkhead to the lake.

Two decommissioned underground storage tanks (USTs) associated with previous boiler plant operations are located in the Project area. These are registered with the Washington State Department of Ecology. Petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and metals (barium, chromium and lead) associated with the tanks have been detected in site soils (GeoEngineers 2022) at concentrations below Model Toxics Control Act Method A cleanup levels. The City has engaged a geotechnical consultant to develop a soil management plan should any contaminated soils be encountered during construction. Any contaminated materials removed from the site will be properly disposed of at an approved upland landfill.

The existing dock is a fixed 5,500-sf dock structure with wood and concrete decking, supported by 107 creosote-treated timber piles (14- to 16-inch-diameter). The deck is solid concrete with no grating and currently impedes light transmission to the aquatic environment. The existing dock structure includes three main segments, each measuring 8 feet wide. Eight narrow (22-by-4-foot) timber fixed dock fingers provide moorage opportunities for small powerboats along the existing dock. A 500-sf float and gangway (ramp) flank the existing dock structure. The float is intended to be reused in the new design.

Shoreline structures within the Project area include the concrete bulkhead, brick and concrete pavers at the plaza, and the gravel maintenance road. The concrete bulkhead is in good condition; however, the brick pavers and the maintenance road present hazards. The brick pavers are a potential tripping hazard with uneven surfaces, and the maintenance road shows signs of erosion from runoff on the road and adjacent areas. Overwater structures within the Project area include the concrete dock, finger docks, and the timber piles. The concrete dock and creosote-treated timber piles are in good condition. However, the timber cap beams and mooring piles on the south end of the dock show signs of decay and need repair.

Outside of the Project area, portions of the Park have been left undeveloped as wildlife habitat. Wetlands are located at the north and south ends of the Park, outside of the Project area. The Park also contains areas with maintained lawns surrounded by stands of trees.

As described in Section 3 of this CAS, the critical areas analysis for wetlands, watercourses, FWHCAs, and geologically hazardous areas was completed within the Project area, and the bald eagle nest survey area was expanded to include the entire Park.

2.1 Topography

The topography of the Park and Project area slopes down from the inland side of the Park to the Lake Washington shoreline. Topographic maps identify the highest elevation in the Project area as approximately 44 feet North American Datum of 1988 (NAVD88), sloping down toward the shoreline (Figure 7).

GeoEngineers completed a geotechnical assessment and report for the upland portions of the Project area (Appendix C). The report describes that the Boiler Building and restroom annex are constructed into the toe of an upland slope that grades downward from the higher elevation portions of the Park to the west to shoreline of Lake Washington. The slope behind the buildings is on the order of 50 to 60 feet tall and is inclined between 2 Horizontal to 1 Vertical (2H:1V) and 1.25H:1V (50% to 80% slopes). There is about a 1-foot gap between the back (western) sides of the building and the slope except for the lower 4 to 5 feet of the slope toe where the western walls of the building retains the lower portion of the slope.

2.2 Soils

The Natural Resources Conservation Service (NRCS) Web Soil Survey identifies one soil series, Kitsap silt loam, 2% to 8% slopes, within the Project area (NRCS 2020; Figure 8)).

The Washington State Department of Natural Resources (DNR) Geologic Information Portal (DNR 2020) identified nearby hand augers conducted for the former steam plant. These investigations indicate the subsurface consists of alluvial sand overlying glacial drift deposits of silty clay.

Geotechnical testing conducted for the upland portion of the Project (Appendix C) included three upland borings that revealed the following:

- B-1 and B-2: 6 inches of sod above glacial till
- B-3: 10 inches of concrete and base course over 7 feet of fill, over glacial till

Three in-water borings revealed "lake sediments underlain by weathered glacially consolidated soil" (Appendix D).

2.3 Hydrology

The Project is located in the Cedar-Sammamish Basin Water Resource Inventory Area 8 (Ecology 2020). Hydrologic characteristics in the Park are influenced by regional groundwater, direct precipitation, surface water runoff, wetlands, and Lake Washington. Wetlands and watercourses are located in the Park but are not present within the Project area, as described in Sections 3.2 and 3.3.

No stream channels, areas of inundation, or seeps were identified in the Project area during the February 19, 2020, site visit. However, based on conversations with the project team we understand that groundwater seepage is routinely observed on the face of the hillside in some areas. This is not unusual on slopes composed of glacially consolidated soils. Perched groundwater tends to accumulate within portions of the deposits that contain higher percentages of sand and gravel and lower percentages of silt and clay, or within areas that have higher degree of weathering. Perched groundwater volumes tend to fluctuate throughout the year, typically being highest during winter and spring months and during periods of prolonged precipitation (Appendix C).

Lake Washington is hydraulically controlled by USACE, as described in Section 3.4.3. Washington Department of Fish and Wildlife (WDFW) mapping does not identify any freshwater surface stream channels to Lake Washington within the Project area (WDFW 2022a, 2022b).

2.4 Plant Communities

The Project area includes trees, mowed lawn, developed recreational facilities, a small gravel beach with adjacent shrubs, and the docks. No wetlands are located within the Project area, as described in Section 3.2. In Lake Washington, areas of dense non-native aquatic vegetation, Eurasian milfoil (*Myriophyllum spicatum*), can be found intermittently along the shoreline of the Park.

Freshwater emergent wetland habitat is mapped several hundred feet north of the Project area (Figure 9). These wetland features were reviewed during the bald eagle survey. No freshwater wetland habitat is mapped within the Project area (USFWS 2022a; WDFW 2022a; King County 2022; City of Mercer Island 2022). Anchor QEA ecologists did not identify any freshwater wetlands in the Project area during the site visits, substantiating the online data.

3 Critical Areas Description

This section describes the presence of critical areas within the Project area as defined under MICC Chapter 19.07. Critical areas evaluated include wetlands, watercourses, FWHCAs, and geologically hazardous areas.

3.1 Methods

To document and describe wetlands, watercourses, FWHCAs, and geologically hazardous areas within the Project area, Anchor QEA reviewed existing information (Section 1.8) and performed an aerial photograph assessment. Additionally, Anchor QEA conducted a critical areas site visit at the Project area on February 19, 2020. Subsequent site visits have occurred in 2021 and 2022 as part of this Project, confirming existing conditions within the Project area. The entire Project area was accessible during the site visits. During the site visits, Anchor QEA documented general information regarding habitats and dominant plant species and communities. Potential wetland features were evaluated based on MICC wetland delineation criteria; however, no wetland conditions were observed within the Project area.

Visible wildlife species, tracks, and other signs observed during the site visits were documented. The bald eagle nest survey was performed by walking and scanning trees within the Park using binoculars.

The OHWM of Lake Washington was not delineated during the site visit because Lake Washington is hydraulically controlled, and the low- and high-water elevations are established. Photographs taken to document vegetation and habitat conditions are included in Appendix B.

3.2 Wetlands

No wetland conditions were observed within the Project area during the February 2020 site visit, subsequent site visits, or as identified by online mapping. Within the Park, USFWS (2022b) and WDFW (2022a) identify wetlands located in the northern and southern parts of the park, more than 800 feet away from the Project area. These wetlands were observed during the site visit but not delineated because they are well outside of the Project area. Because there are no wetlands within the Project area, and no impacts to wetlands or wetland buffers will result from the Project, no further evaluation of wetlands is provided in this CAS.

3.3 Watercourses

No streams, drainage channels, areas of inundation, seeps, or associated riparian habitat were observed within the Project area during the February 2020 site visit, subsequent site visits, or as identified by online mapping. Two riverine channels are mapped south of the Park boundary (and more than 1,000 feet from the Project area; Figure 9; USFWS 2022a; WDFW 2022a). Because there are no streams or other watercourses within the Project area, and no impacts to streams or stream buffers will result from the Project, no further evaluation of watercourses is provided in this CAS.

3.4 Fish and Wildlife Habitat Conservation Areas

Per MICC Chapter 19.07.170, FWHCAs include the following:

- Areas where state or federally listed endangered, threatened, sensitive, or candidate species, or species of local importance, have primary association
- Priority habitats and areas associated with priority species identified by the WDFW
- Areas used by bald eagles for foraging, nesting, and roosting, or within 660 feet of a bald eagle nest
- Watercourses and wetlands and their buffers
- Biodiversity areas

The only FWHCA within the Project area is Lake Washington, which contains federally listed and state priority fish species, and potential bald eagle habitat.

3.4.1 Vegetation and Shoreline Conditions

The Project area contain a mixture of native and non-native trees and shrubs, mowed lawn areas, developed recreation facilities, concrete bulkheads, and a small beach. Photographs of the Project area are included in Appendix B.

North of the Boiler Building, riparian vegetation near the lake shoreline includes deciduous trees (e.g., big-leaf maple and Lombardy poplar), native shrubs, and invasive Himalayan blackberry. Upslope from the shoreline, vegetation includes coniferous and deciduous trees, native shrubs, abundant Himalayan blackberry, and areas of mowed lawn. The area in front of the Boiler Building consists of the waterfront plaza and shoreline supported by concrete bulkheads, with no riparian vegetation. Also north of the Boiler Building is a narrow nearshore (beach) area with a gravel substrate, chained logs, and boulders. Dense non-native aquatic vegetation, Eurasian milfoil, is present in the lake around the docks.

South of the waterfront plaza is an existing gravel access driveway running through a mixed coniferous-deciduous forest. Native shrubs and Himalayan blackberry are also present in this area. The South Shoreline Trail Restoration Project, which is being permitted separately, begins south of the waterfront plaza and is located between the gravel access driveway and the lake shoreline.

3.4.2 Wildlife and Habitat

Vegetation communities within the Project area provide a range of habitat for terrestrial wildlife. Wildlife relies on vegetation for food, shelter, and cover from predators. Wildlife diversity is generally related to the structure and composition of plant species within vegetative communities. In general, vegetation communities that contain few species or vegetative layers (herbaceous vegetation, shrubs, or trees) support a low diversity of wildlife, whereas vegetation communities that are more complex and contain a wide variety of plant species and vegetative layers can support a greater diversity of wildlife. The dominant presence of non-native vegetation and high level of human activity reduce the overall quality of potential habitat for wildlife species. The Park is surrounded by residential development, so vegetated corridors connecting habitat within the Project area to undisturbed habitats are limited.

Although a comprehensive wildlife survey has not been conducted within the Project area, with the exception of the bald eagle survey, vegetation communities within the Project area likely provide habitat for a variety of terrestrial wildlife species common to King County and western Washington that are adapted to park settings within urban residential areas. The Project area provides habitat for native and non-native bird, amphibian, reptile, insect, and small mammal species to breed, forage, and rest.

Portions of Lake Washington provide quality habitat for aquatic species, as described in Section 3.4.3. Within the Project area, the shoreline condition, categorized by the south, central, and north areas, includes the following:

- The south Project area shoreline is located south of the waterfront plaza. This area consists of small areas of lawn, shrubby riparian vegetation along the lake shore, a gravel driveway, and trees/shrubs and invasive vegetation farther upslope. Improvements to the south shoreline trail (outside the Project area) are being permitted as part of a separate project.
- The central Project area shoreline, adjacent to the waterfront plaza, has a vertical bulkhead slope. The lake bottom substrate contains sand and silt with small rocks and remnant concrete and timber debris from past uses. The central shoreline is mostly developed, and vegetation is limited to dense non-native aquatic vegetation, Eurasian milfoil (*Myriophyllum spicatum*), found near the park's shoreline.
- The north Project area shoreline consists of a small gravel beach with fringing trees and shrubs, with a trail, grass lawn areas, and trees located farther upslope.

3.4.2.1 Bald Eagle Survey

One bald eagle nest was observed in the north portion of the Park in a Douglas fir tree, about 1,400 feet from the Project area boundary. During the 2020 site visit, a pair of bald eagles were observed perched on the nest tree and on adjacent Douglas fir trees.

Trees within the Project area are generally less than 40 feet tall, and not of a size typically associated with bald eagle perching and roosting. Overall, no potential bald eagle nest trees were observed within the Project area and no bald eagle nests were identified within 660 feet of the Project area, the minimum distance identified under USFWS bald eagle nest disturbance management guidelines to avoid disturbances to nesting bald eagles (USFWS 2007) and as regulated per MICC 19.07.170.

3.4.3 Lake Washington

Lake Washington is a FWHCA per the criteria in MICC 19.07 (Critical Areas). The OHWM of Lake Washington was not delineated during the February 2020 site visit, or more recently, because the lake is hydraulically controlled by USACE at the Hiram M. Chittenden Ballard Locks. USACE lowers the lake in the winter months (typically in December) to a low-water elevation of 16.67 feet NAVD88 to allow for flood storage. In the summer (typically in June), the lake level is raised to a high-water elevation of 18.67 feet NAVD88. Therefore, the Project defines the OHWM as 18.67 feet NAVD88 and the ordinary low water mark as 16.67 feet NAVD88.

Lake Washington provides habitat for a variety of aquatic species. Salmonids documented in Lake Washington include bull trout (*Salvelinus confluentus*), Chinook salmon (*Oncorhynchus tshawytscha*), Puget Sound steelhead (*O. mykiss*), sockeye salmon (*O. nerka*), coho salmon (*O. kisutch*), and kokanee (*O. nerka*) (WDFW 2022a, 2022b). Other fish species that are present in Lake Washington include coastal cutthroat trout (*O. clarkii clarkii*), largemouth and smallmouth bass (*Micropterus salmoides* and *M. dolomieu*), yellow perch (*Perca flavescens*), and black crappie (*Pomoxis nigromaculatus*).

3.4.4 Priority Species and Habitats

The WDFW Priority Habitats and Species data (WDFW 2022a) do not document occurrences of any terrestrial species or priority habitats in the Project area or the Park. South of I-90, several areas are mapped as priority habitat biodiversity corridors. Priority fish species documented in Lake Washington are described in Section 3.4.3. Analysis of federally listed species and critical habitats is described in Section 3.4.5.

3.4.5 ESA-Listed Species and Critical Habitat

Species and critical habitats listed under the federal Endangered Species Act (ESA) and under National Marine Fisheries Service (NMFS) and USFWS jurisdiction in western Washington are referenced on the agencies' websites. The NMFS identifies ESA-listed species that occur or may occur within a broad geographic area, such as an evolutionarily significant unit (ESU) or a distinct population segment (DPS), rather than a project-specific location (NMFS 2022). The USFWS identifies ESA-listed species that may occur within a specific location where a project is proposed (USFWS 2022a). Table 4 lists species and critical habitat that are likely to occur in the vicinity of the Project. A separate Biological Evaluation has been prepared for the Project that describes these species in detail (Anchor QEA 2022).

Table 4
Federally Listed Species and Critical Habitat Likely to Occur in the Project Vicinity

Species	Jurisdiction	ESA Status	Critical Habitat
Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound ESU	NMFS	Threatened	Designated
Steelhead (*O. mykiss*) Puget Sound DPS	NMFS	Threatened	None designated within the action area
Bull trout (*Salvelinus confluentus*) Coastal-Puget Sound DPS	USFWS	Threatened	Designated
Marbled murrelet *(Brachyramphus marmoratus*)	USFWS	Threatened	None designated within the action area

3.5 Geologically Hazardous Areas

MICC 19.07.160 describes three categories of geologically hazardous areas subject to critical areas review: 1) erosion hazard areas, 2) landslide hazard areas, and 3) seismic hazard areas. Information about these features in the Project area is described in the following sections, based on City and resource agency mapping and code definitions. Geotechnical engineering review of the area is summarized from the Project geotechnical reports in Appendices C and D (see also Section 4).

3.5.1 Erosion Hazard Areas

As defined in MICC 19.16.010 , erosion hazard areas are those areas greater than 15% slope and subject to a severe risk of erosion due to wind, rain, water, slope, and other natural agents, including those soil types or areas identified by the NRCS as having a "severe" or "very severe" rill and inter-rill erosion hazard.

The upland portion of the Project area is located within a mapped erosion hazard area (Figure 10). Mapped soils in the Project area consist of Kitsap silt loam, 2% to 8% slopes (Figure 8). This soil type has a slight to moderate erosion hazard (SCS 1973).

3.5.2 Landslide Hazard Areas

Per MICC 19.16.010, a landslide hazard is defined as an area with one or a combination of the geologic, topographic, and hydrologic factors as follows:

1. Areas of historic failures
2. Areas with all three of the following characteristics:
    a. Slopes steeper than 15%
    b. Hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock
    c. Springs or groundwater seepage

3. Areas that have shown evidence of past movement or that are underlain or covered by mass wastage debris from past movements
4. Areas potentially unstable because of rapid stream incision and streambank erosion
5. Steep slopes consisting of any slope of 40% or greater calculated by measuring the vertical rise over any 30-foot horizontal run.

The upland portion of the Project area is located within a mapped landslide hazard area (Figure 11). The Project area contains slopes greater than 15% and 40%, meeting the above code definitions.

The City's development standards for landslide hazard areas require the following buffers (when more than one condition applies to a site, the largest buffer shall be applied):

- Steep slope buffer widths shall be equal to the height of a steep slope, but not more than 75 feet, and applied to the top and toe of slopes.
- Shallow landslide hazard areas shall have minimum 25-foot buffers applied in all directions.
- Deep-seated landslide hazard areas shall have 75-foot buffers applied in all directions.

Portions of the Project would be located within landslide hazard areas (based on slope and potential seepage near the boiler building and restroom annex) and toe-of-slope buffer areas.

3.5.3 Seismic Hazard Areas

Seismic hazard areas are defined by the City as areas subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement, soil liquefaction, or surface faulting (MICC 19.16.010).

The upland shoreline in the Project area is mapped within a seismic hazard area and is in the vicinity of the Seattle Fault zone (Figure 12).

4 Critical Areas Impacts Assessment and Mitigation

This section provides a summary of potential impacts to FWHCAs and geologically hazardous areas, and mitigation to avoid and minimize impacts. As discussed in Section 3, these are the only types of critical areas that occur within the Project area and that could potentially be affected by the Project.

The applicant must avoid, minimize, and mitigate impacts to environmentally critical areas and associated buffers consistent with mitigation sequencing described in MICC 19.07.100. Mitigation sequencing and best management practices (BMPs) are described further in Section 5.

4.1 Fish and Wildlife Habitat Conservation Areas

4.1.1 City Code Requirements

The City's regulations for FWHCAs (MICC 19.07.170.C) state that development proposals shall implement wildlife and habitat protection measures identified in the wildlife habitat assessment and follow the USFWS (2007) National Bald Eagle Management Guidelines.

4.1.2 Project Impacts

The primary potential construction impact on fish and wildlife species and associated habitat is temporary disturbance and removal of vegetation (Section 1.5). Temporary disturbance during construction will include in-air noise generated by heavy construction equipment such as small excavators and bulldozers, dump trucks, and other standard construction equipment, and both in-air and underwater noise created by pile driving. Small areas of the shoreline below the OHWM will need to be dewatered during installation of the irrigation intake and stormwater outfall. Construction also has the potential to impact water quality through potential spills of fuels or other petroleum products used in construction equipment, and through increased turbidity during removal and installation of piles.

These potential impacts are discussed in this section. A separate Biological Evaluation has been prepared for the Project to address impacts on federally listed fish species and marbled murrelet that may use the Project area (Anchor QEA 2022). Measures to address these impacts are described in Section 5.

4.1.2.1 Construction Noise and Disturbance

In-air noise will occur periodically throughout the construction period described in Section 1.6. Underwater noise generated by pile driving will be limited to the approved in-water work period (July 16 to March 15) to minimize impacts on salmonid species.

Noise associated with construction could result in avoidance behavior by some fish and wildlife species. Areas near the pile driving location could experience underwater noise levels injurious to fish, as described in the Biological Evaluation prepared for the project. Fish would be able to move out of affected areas, and in-water work would be limited to the agency-approved work windows to minimize impacts on listed fish species.

The Project area is within a popular park that experiences ongoing human disturbance, and it is expected that wildlife would resume use of the Project area once construction is complete. No bald eagle nests are located within the 660-foot minimum distance identified under USFWS bald eagle management guidelines to avoid disturbances to nesting bald eagles (USFWS 2007) and as regulated per MICC 19.07.170 (2020). The noise levels associated with operation of the Park after construction are expected to be consistent with current noise levels.

The small areas of the shoreline below the OHWM that will be dewatered during installation of the irrigation intake and stormwater outfall are located along the existing waterfront plaza where habitat has been degraded by past land use. Given the short period of dewatering required, small area affected, and low habitat quality, impacts to aquatic habitat would be minor.

4.1.2.2 Water Quality Impacts

The use of construction equipment over, in, and near the waters of Lake Washington has the potential to release petroleum products into the water if a leak or accidental spill occurs. The risk of such impacts is low provided that contractors adhere to the BMPs listed in Section 5.

Removal, repair, and installation of piles could result in temporary minor increased turbidity in Lake Washington. This would be localized to the areas near the piles. Fish would be able to move away from the construction area to avoid turbidity. In-water work will be restricted to the approved in-water work period (July 16 to March 15) to minimize impacts on salmonid species.

The potential for soil erosion from upland areas is discussed in Section 4.2.1 and BMPs are discussed in Section 5. With implementation of these measures, it is unlikely that eroded soil would enter nearby surface waters during construction or operation of the Project.

4.1.2.3 Vegetation Removal

Construction will require the removal of native and non-native vegetation as described in Section 1.5. While this represents a relatively small amount of vegetation removal relative to vegetation throughout the Park, it is a loss of potential habitat for terrestrial wildlife species. Removal of riparian vegetation would reduce the amount of shade and sources of invertebrate prey for fish species in the area north of the waterfront plaza. This impact is considered temporary because additional native plantings will be installed in the Project area, as described in Section 5. The replacement of non-native vegetation with native riparian plants will improve ecological function from existing conditions.

4.1.3 Mitigation Measures

With implementation of the mitigation sequencing and construction BMPs described in Section 5, and the planting plan, nearshore habitat restoration, and aquatic habitat improvements discussed below, the Project would result in no net loss of fish and wildlife habitat functions in the Project area.

4.1.3.1 Planting Plan

As described in Section 1.5, construction will include the removal of up to 10 trees and replacement with 20 new trees (Table 3; Figures 5 and 6). Approximately 4,300 sf of native and non-native riparian and upland vegetation will be removed during construction, and 2,020 sf of native shrub and groundcover vegetation will be installed, including shoreline riparian, upland, and stormwater swale vegetation. Installation of the stormwater swale along the driveway will help to filter stormwater. A portion of the vegetation to be removed consists of non-native invasive species, which will be replaced with native plants that provide more diversity and habitat value for wildlife.

The Tree Report in Appendix F describes compliance with MICC 19.10 – Trees.

4.1.3.2 Nearshore and Aquatic Habitat Restoration

The Project will expand the area of nearshore habitat along the lake to approximately 605 sf. The beach enhancement, installed above the OHWM, will increase the beach area by 204 sf. Western red cedars will be installed near the north beach, providing additional shading for the lake.

The completed Project will provide a minor benefit to aquatic habitat in Lake Washington. A net reduction of 45 piles and 5 sf of overwater cover would occur. Creosote-treated piles will be replaced with steel piles, or encapsulated in fiberglass, improving water quality. Existing concrete decking will be replaced with grating, allowing better light penetration. The center and south docks will be shifted into deeper water to open up the nearshore habitat for use by salmonids.

4.2 Geologically Hazardous Areas

The Project will alter existing geologically hazardous areas and their associated buffers. These impacts can be effectively mitigated through Project design and application of BMPs, as discussed in this section.

4.2.1 Erosion Hazard Areas

4.2.1.1 City Code Requirements

The City's development standards for erosion hazard areas (MICC 19.07.160.E) require all development proposals to demonstrate compliance with MICC 15.09, stormwater management program, and to show that the proposed work will not create a net increase in geological instability on or off site.

4.2.1.2 Project Impacts

Construction of the Project will include removal of existing concrete and pavers, clearing of vegetation, trenching to install irrigation piping, and excavation of soils to install ADA-accessible features and stormwater improvements. There is the potential for disturbed soils to erode and potentially be washed into Lake Washington unless proper measures are taken.

4.2.1.3 Mitigation Measures

The Project geotechnical report indicates that the Project area should not be susceptible to erosion hazards with implementation of geotechnical engineering recommendations (Appendix C). Additional BMPs are described in Section 5. With these measures in place, no impacts to erosion hazard areas are anticipated during construction. All disturbed areas will be revegetated or resurfaced, as applicable, and stormwater management measures meeting applicable requirements will be installed, as discussed in Section 1.3. Therefore, the Project will not create a net increase in geological instability on or off site that would result in additional erosion.

4.2.2 Landslide and Seismic Hazard Areas

4.2.2.1 City Code Requirements

The Project will be constructed consistent with City code requirements for landslide and seismic hazard areas. City code (MICC 19.07.160.B) contains the following requirements for alteration of landslide and seismic hazard areas:

2. Alteration of landslide hazard areas and seismic hazard areas and associated buffers may occur if the critical area study documents find that the proposed alteration:
    a. Will not adversely impact other critical areas;
    b. Will not adversely impact the subject property or adjacent properties;
    c. Will mitigate impacts to the geologically hazardous area consistent with best available science to the maximum extent reasonably possible such that the site is determined to be safe; and
    d. Includes the landscaping of all disturbed areas outside of building footprints and installation of hardscape prior to final inspection.
3. Alteration of landslide hazard areas, seismic hazard areas and associated buffers may occur if the conditions listed in subsection (B)(2) of this section are satisfied and the geotechnical professional provides a statement of risk matching one of the following:
    a. An evaluation of site-specific subsurface conditions demonstrates that the proposed development is not located in a landslide hazard area or seismic hazard area;
    b. The landslide hazard area or seismic hazard area will be modified or the development has been designed so that the risk to the site and adjacent property is eliminated or mitigated such that the site is determined to be safe;

c. Construction practices are proposed for the alteration that would render the development as safe as if it were not located in a geologically hazardous area and do not adversely impact adjacent properties; or
d. The development is so minor as not to pose a threat to the public health, safety and welfare.

4.2.2.2 Project Impacts

Construction will include grading on steep slopes and within toe-of-slope buffer areas (MICC 19.07.160.C) for construction of trails, ADA ramp, and the stormwater conveyance. Grading in these areas has the potential to increase the likelihood of a landslide during construction.

While the Project area is located within a seismic hazard area, the geotechnical reports (Appendices C and D) found that the Project area is underlain by dense to very dense, glacially consolidated soils with a low risk of liquefaction. Liquefaction occurs during vibration or shaking of the ground, usually during an earthquake, when soils lose strength and become more like a liquid than a solid, posing risks to structures. Another potential risk during earthquakes is lateral spreading, which occurs when large blocks of soil on the surface move when an underlying soil layer loses strength. Due to the low liquefaction risk at the Project area, the geotechnical reports conclude there is also a low risk of lateral spreading occurring at this site (Appendices C and D).

The Project area is in the vicinity of the Seattle Fault zone. However, because bedrock in this area is covered by hundreds of feet of glacial soils, it is unlikely that movement of the fault would result in significant surface rupture at the ground surface (Appendices C and D).

4.2.2.3 Mitigation Measures

The Project will incorporate the geotechnical engineering design and construction recommendations described in Appendix C to avoid and minimize potential impacts to landslide hazard areas.

The Project will be designed to meet current seismic design standards and geotechnical engineering recommendations (Appendices C and D). The Boiler Building will be retrofitted to withstand a seismic event, and the dock piles will be driven to depth to meet a competent soil criterion based on design structural loads. Additional construction BMPs are described in Section 5.

5 Mitigation Sequencing and Best Management Practices

The City requires Projects to implement mitigation sequencing as described in MICC 19.07.100. The following summarizes how the Project fulfills each step in the mitigation sequencing process:

A. **Avoiding the impact altogether by not taking a certain action or parts of an action.** The Project is designed to include the minimum necessary impacts to critical areas to support the purpose and need. Therefore, other potential impacts from material expansion of structures, use of less environmentally friendly materials, or further encroachment into critical areas have been avoided through Project design.

B. **Minimizing impacts by limiting the degree or magnitude of the action and its implementation.** The Project design limits vegetation removal and soil disturbance to the minimum needed. New overwater structures will allow for light penetration to the water to the maximum extent feasible, minimizing shading impacts to aquatic habitat, and there will be no net increase in overwater cover.

C. **Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.** Areas that are disturbed during construction and that are located outside of pathways, plaza surfacing, and other developed facilities will be revegetated.

D. **Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.** Creosote-treated pilings will be either removed or encapsulated in fiberglass to reduce leaching to the water. New pilings will be steel, reducing future maintenance needs. The Project includes LID measures to improve stormwater management. The new irrigation intake will be screened to prevent entrainment of fish, per agency requirements.

   There are 3,851 sf of removed vegetation and 1,936 sf of proposed vegetation. This is a net loss of 1,915 sf of vegetated area. There are 2,437 sf of new permeable paving added in the plaza area as well. The beach enhancement, installed above the OHWM, will increase the beach area by 204 square feet. The increased beach and nearshore area provide increased and improved habitat opportunities for migrating juvenile salmon and other aquatic habitats. Public access to the water is also significantly increased with the installation of ramps and universal walkways to the OHWM; although these contribute to the impermeable surface areas, it is a significant improvement because it will create universal access to the water for all members of the public.

E. **Compensating for the impact by replacing, enhancing, or providing substitute resources or environments.** The Project will reduce overall impervious surface area by approximately 5% and will reduce peak runoff by providing infiltration potential and reducing impervious surfaces. Riparian and upland vegetation will be planted and the north beach nearshore will be expanded to enhance lakeshore habitats. The 12 trees proposed to be removed by the Project will be replaced by 20 new trees. Approximately 3,680 sf of riparian and upland vegetation will be removed during construction to accommodate expanded public access opportunities, including increasing the size of the north beach area. Approximately 1,940 sf of new native shrub and groundcover vegetation will be installed around these areas and will include riparian, upland, and stormwater swale vegetation.

Though there is no prescriptive mitigation ratio given in MICC 19.07 for vegetation removal within a FWHCA, vegetation will be replaced at a ratio of less than 1:1 due to the placement of habitat gravels within the north beach expansion area. This action meets the overall standards of no net loss of shoreline or habitat function by reducing overall vegetation and increasing nearshore aquatic habitat and public access opportunities with the placement of these gravels and replacement of non-native vegetation with native plant species. The Tree Report in Appendix F describes compliance with MICC 19.10 – Trees.

F. **Monitoring the impact and taking appropriate corrective measures to maintain the integrity of compensating measures.** The City will develop a maintenance and monitoring plan for all installed plantings to ensure success.

To avoid or minimize potential adverse impacts to the aquatic environment, the following BMPs will be employed during construction:

- Applicable permits for the Project will be obtained prior to construction. Work will be performed according to the requirements and conditions of these permits.
- In-water work will occur during the approved regulatory work window for Lake Washington; expected to be July 16 to March 15.
- The contractor will be responsible for the preparation and implementation of a spill plan to be used for the duration of construction, which will include spill prevention, control, and response BMPs. In addition, the spill plan will outline roles and responsibilities, notifications, inspections, and response protocols to be implemented in the event of an inadvertent spill during construction.
- The contractor will supply to the Project Engineers a Temporary Erosion and Sediment Control (TESC) Plan and/or a Construction Stormwater Pollution Prevention Plan (SWPPP) that will use BMPs to prevent erosion and sediment-laden runoff from leaving the site. These plans will be implemented prior to the start of ground-disturbing activities. All areas disturbed by Project construction will be stabilized as soon as possible to prevent erosion and re-vegetated as soon as practicable post-construction and prior to the removal of TESC/SWPPP measures.
- Excess or waste materials will not be disposed of or abandoned waterward of the OHWM or allowed to enter waters of the state.
- No petroleum products, chemicals, or other toxic or deleterious materials will be allowed to enter surface waters.

- Barges will not be allowed to ground out during construction.
- A temporary floating debris boom will be installed around the work area. The contractor will be required to retrieve any floating debris generated during construction using a skiff and a net. Debris will be disposed of at an appropriate upland facility.
- Demolition and construction materials will not be stored where wave action or upland runoff can cause materials to enter surface waters.
- No uncured concrete or grout will be in contact with surface waters.
- Piles will be removed as practicable, using best efforts, equipment preferences, and BMPs identified in Washington Department of Natural Resources *Puget Sound Initiative Derelict Creosote Piling Removal: Best Management Practices for Pile Removal and Disposal* (WDNR 2017).
- All creosote-treated materials will be disposed of in a landfill or recycling facility approved to accept these types of materials.
- Vibratory pile driving will be used to the maximum extent practicable, with limited impact pile driving to reach required pile depths and for pile proofing. During all impact driving, sound-attenuation devices such as a wooden cushion blocks or similar devices will be employed to minimize sound-related impacts, as determined through federal Endangered Species Act consultation.
- New light fixtures for overwater structures will be directed away from the water to the extent practicable to minimize impacts on aquatic species.
- Geotechnical engineering recommendations will be incorporated into the Project (Appendices C and D).
- The City has developed an environmental construction contingency plan for soil management for Luther Burbank Park, with GeoEngineers as a geotechnical consultant. This identifies and provides direction on how to handle any contaminated soils encountered in the vicinity of the two decommissioned underground storage tanks.
- Any additional measures required by the agencies during ESA review will be incorporated into the Project to avoid impacts on federally listed species.

6 References

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Figures

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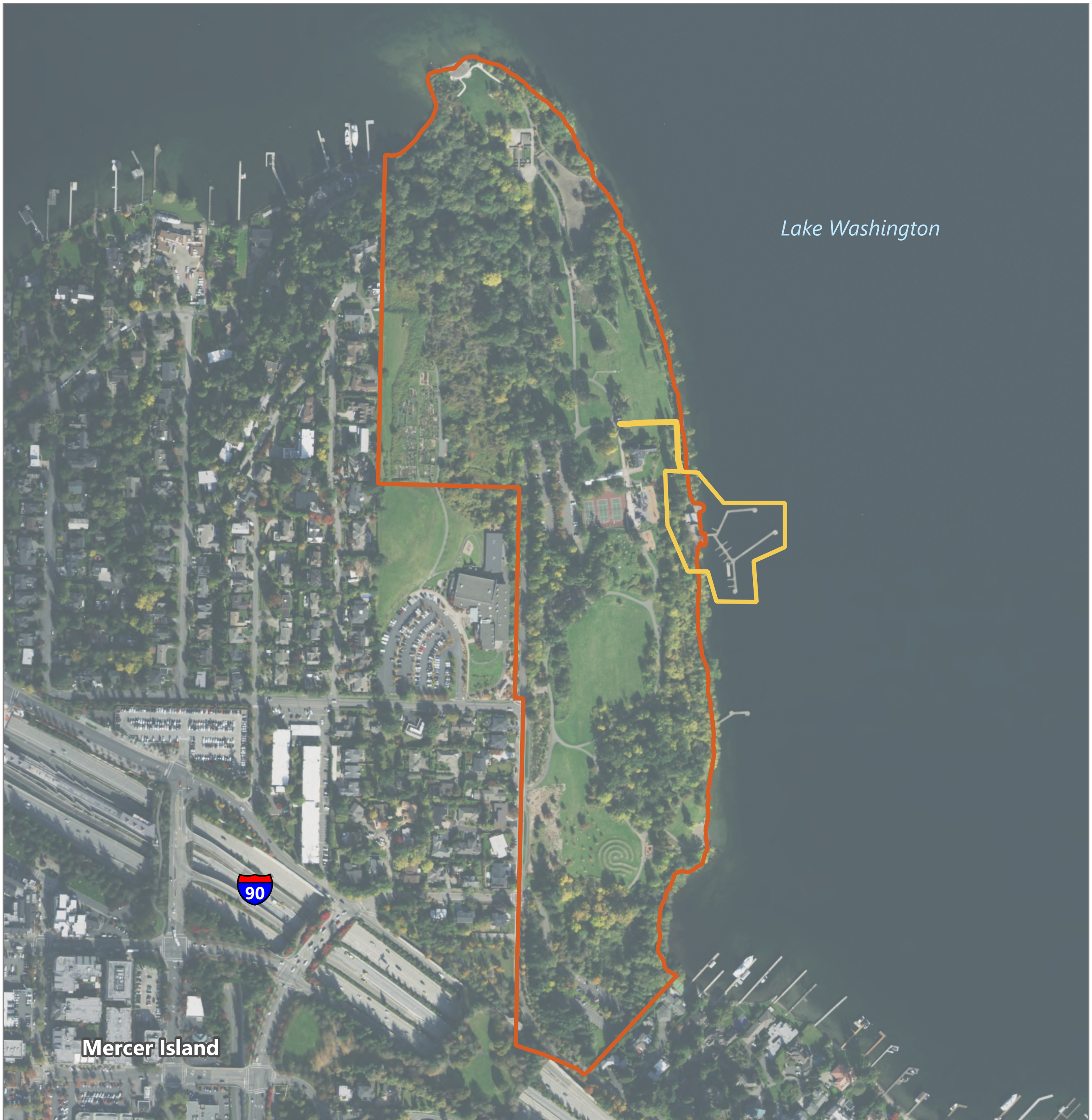
Miles

Figure 1
Vicinity Map
Critical Areas Study
Luther Burbank Park Waterfront Improvements



LEGEND:

Project Area

Luther Burbank Park

NOTE:
1. Aerial imagery: USA NAIP Streaming Imagery

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Feet

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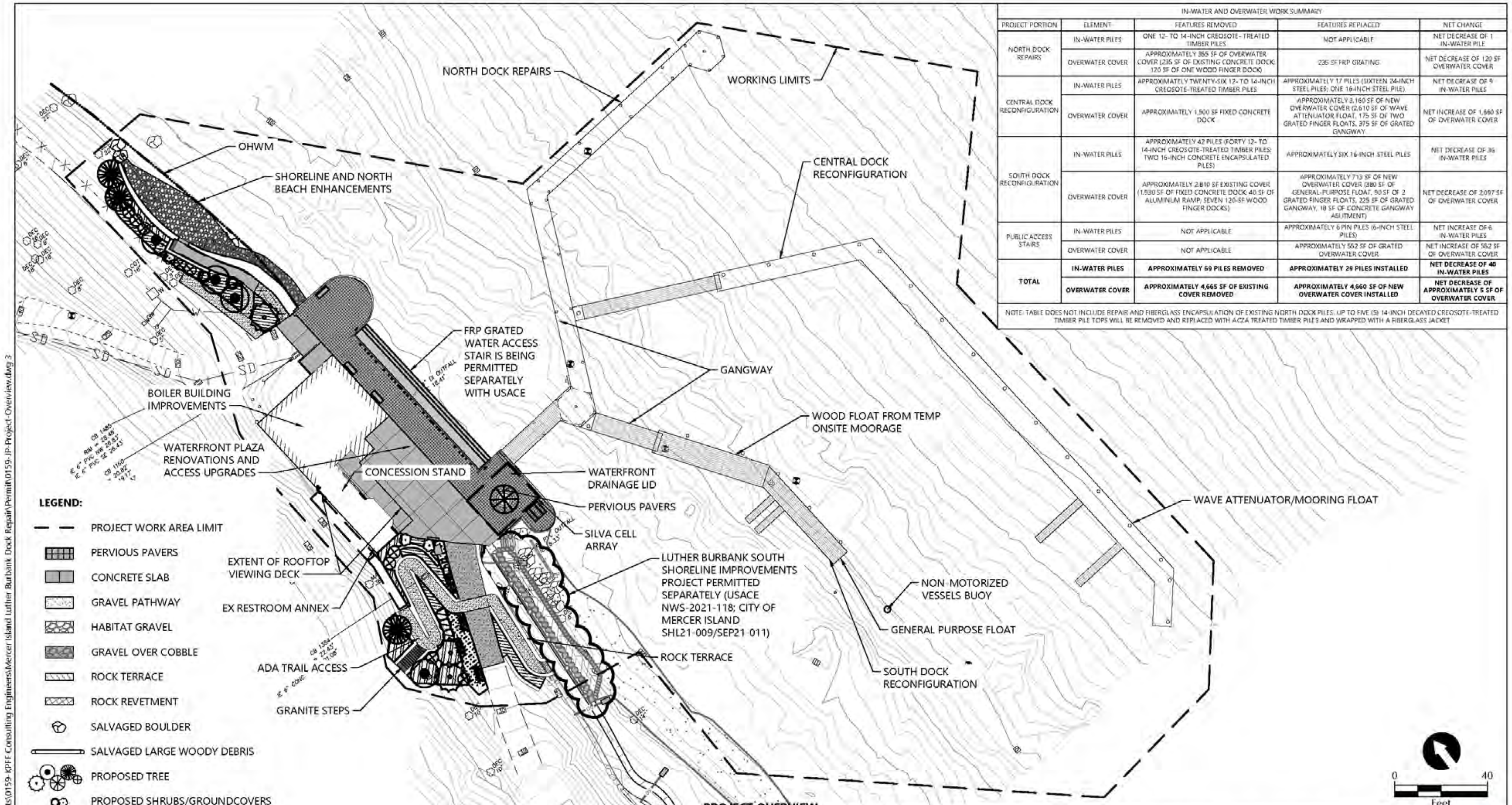
ANCHOR QEA

Figure 2
Aerial Photograph of Park and Project Area
Critical Areas Study
Luther Burbank Park Waterfront Improvements



IN-WATER AND OVERWATER WORK SUMMARY

PROJECT PORTION	ELEMENT	FEATURES REMOVED	FEATURES REPLACED	NET CHANGE
NORTH DOCK REPAIRS	IN-WATER PILES	ONE 12- TO 14-INCH CREOSOTE-TREATED TIMBER PILES	NOT APPLICABLE	NET DECREASE OF 1 IN-WATER PILE
	OVERWATER COVER	APPROXIMATELY 355 SF OF OVERWATER COVER (235 SF OF EXISTING CONCRETE DOCK; 120 SF OF ONE WOOD FINGER DOCK)	235 SF FRP GRATING	NET DECREASE OF 120 SF OVERWATER COVER
CENTRAL DOCK RECONFIGURATION	IN-WATER PILES	APPROXIMATELY TWENTY-SIX 12- TO 14-INCH CREOSOTE-TREATED TIMBER PILES	APPROXIMATELY 17 PILES (SIXTEEN 24-INCH STEEL PILES; ONE 16-INCH STEEL PILE)	NET DECREASE OF 9 IN-WATER PILES
	OVERWATER COVER	APPROXIMATELY 1,500 SF FIXED CONCRETE DOCK	APPROXIMATELY 3,160 SF OF NEW OVERWATER COVER (2,610 SF OF WAVE ATTENUATOR FLOAT, 175 SF OF TWO GRATED FINGER FLOATS, 375 SF OF GRATED GANGWAY	NET INCREASE OF 1,660 SF OF OVERWATER COVER
SOUTH DOCK RECONFIGURATION	IN-WATER PILES	APPROXIMATELY 42 PILES (FORTY 12- TO 14-INCH CREOSOTE-TREATED TIMBER PILES; TWO 16-INCH CONCRETE ENCAPSULATED PILES)	APPROXIMATELY SIX 16-INCH STEEL PILES	NET DECREASE OF 36 IN-WATER PILES
	OVERWATER COVER	APPROXIMATELY 2,810 SF EXISTING COVER (1,930 SF OF FIXED CONCRETE DOCK; 40 SF OF ALUMINUM RAMP; SEVEN 120-SF WOOD FINGER DOCKS)	APPROXIMATELY 713 SF OF NEW OVERWATER COVER (380 SF OF GENERAL-PURPOSE FLOAT, 90 SF OF 2 GRATED FINGER FLOATS, 225 SF OF GRATED GANGWAY, 18 SF OF CONCRETE GANGWAY ABUTMENT)	NET DECREASE OF 2,097 SF OF OVERWATER COVER
PUBLIC ACCESS STAIRS	IN-WATER PILES	NOT APPLICABLE	APPROXIMATELY 6 PIN PILES (6-INCH STEEL PILES)	NET INCREASE OF 6 IN-WATER PILES
	OVERWATER COVER	NOT APPLICABLE	APPROXIMATELY 552 SF OF GRATED OVERWATER COVER	NET INCREASE OF 552 SF OF OVERWATER COVER
TOTAL	**IN-WATER PILES**	**APPROXIMATELY 69 PILES REMOVED**	**APPROXIMATELY 29 PILES INSTALLED**	**NET DECREASE OF 40 IN-WATER PILES**
	OVERWATER COVER	**APPROXIMATELY 4,665 SF OF EXISTING COVER REMOVED**	**APPROXIMATELY 4,660 SF OF NEW OVERWATER COVER INSTALLED**	**NET DECREASE OF APPROXIMATELY 5 SF OF OVERWATER COVER**

NOTE: TABLE DOES NOT INCLUDE REPAIR AND FIBERGLASS ENCAPSULATION OF EXISTING NORTH DOCK PILES. UP TO FIVE (5) 14-INCH DECAYED CREOSOTE-TREATED TIMBER PILE TOPS WILL BE REMOVED AND REPLACED WITH ACZA TREATED TIMBER PILES AND WRAPPED WITH A FIBERGLASS JACKET

LEGEND:

- PROJECT WORK AREA LIMIT
- PERVIOUS PAVERS
- CONCRETE SLAB
- GRAVEL PATHWAY
- HABITAT GRAVEL
- GRAVEL OVER COBBLE
- ROCK TERRACE
- ROCK REVETMENT
- SALVAGED BOULDER
- SALVAGED LARGE WOODY DEBRIS
- PROPOSED TREE
- PROPOSED SHRUBS/GROUNDCOVERS
- RIPARIAN SHRUBS
- NATIVE UPLAND PLANTING/GROUNDCOVER
- STORMWATER CONVEYANCE PLANTING
- PICNIC TABLE
- BENCH

SOURCE: SURVEY AND PIER PLAN CAD FILE PROVIDED BY KPFF.

Oct 19, 2022 1:49pm chewett K:\Projects\0159-KPFF Consulting Engineers\Mercer Island Luther Burbank Dock Repair\Permit\0159-JP-Project-Overview.dwg 3

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

PROPOSED: REPAIR AND REPLACE DOCK STRUCTURES

PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

HORIZONTAL DATUM: WASHINGTON STATE PLANE, NORTH ZONE, NAD83
VERTICAL DATUM: NAVD88

LATITUDE: 47.591034 N
LONGITUDE: -122.224481 W
S-T-R: 6-25N-5E

IN: LAKE WASHINGTON
NEAR/AT: MERCER ISLAND
COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

ANCHOR QEA
1201 3rd Ave. Suite 2600
Seattle, WA 98101
206-287-9130

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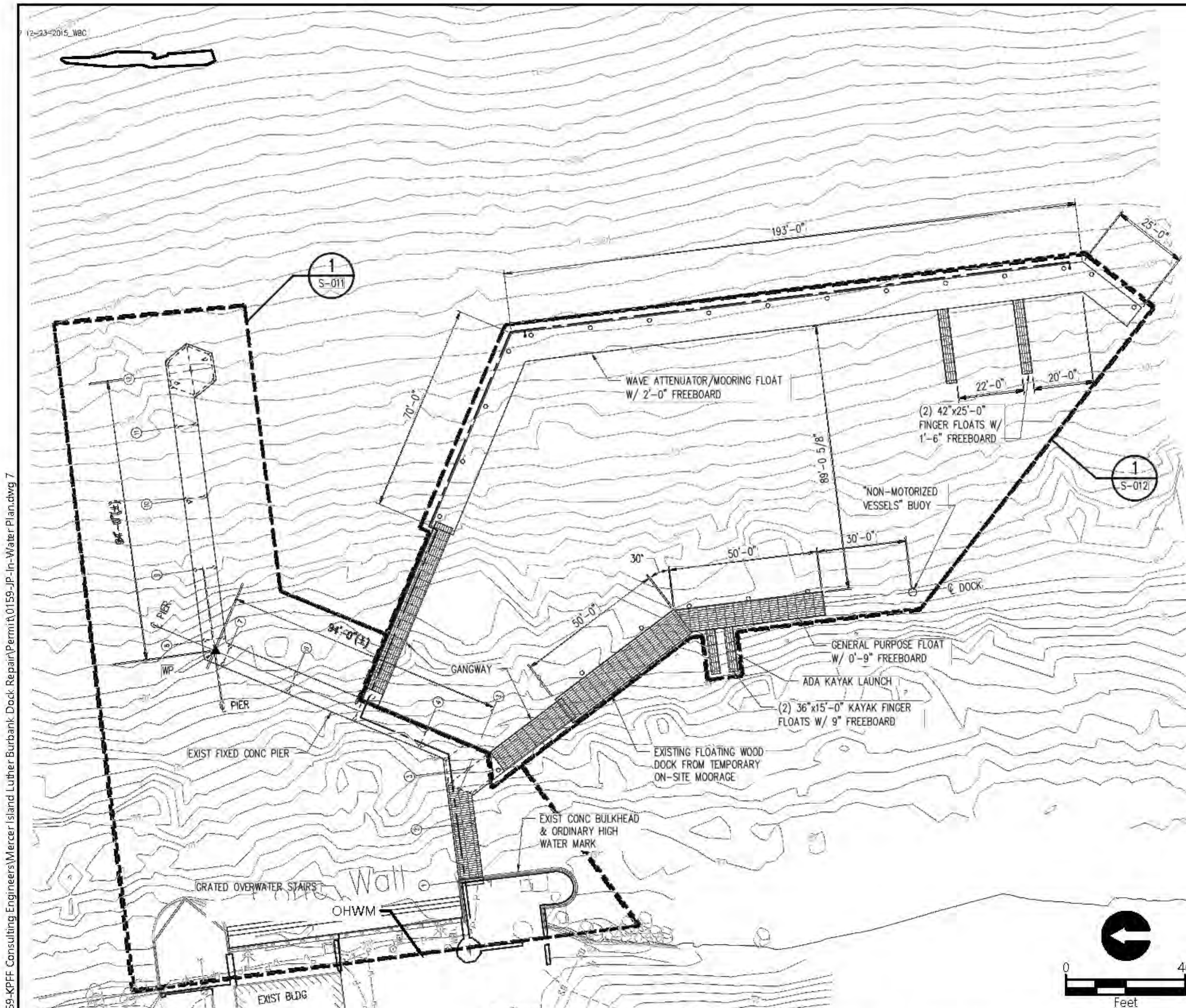
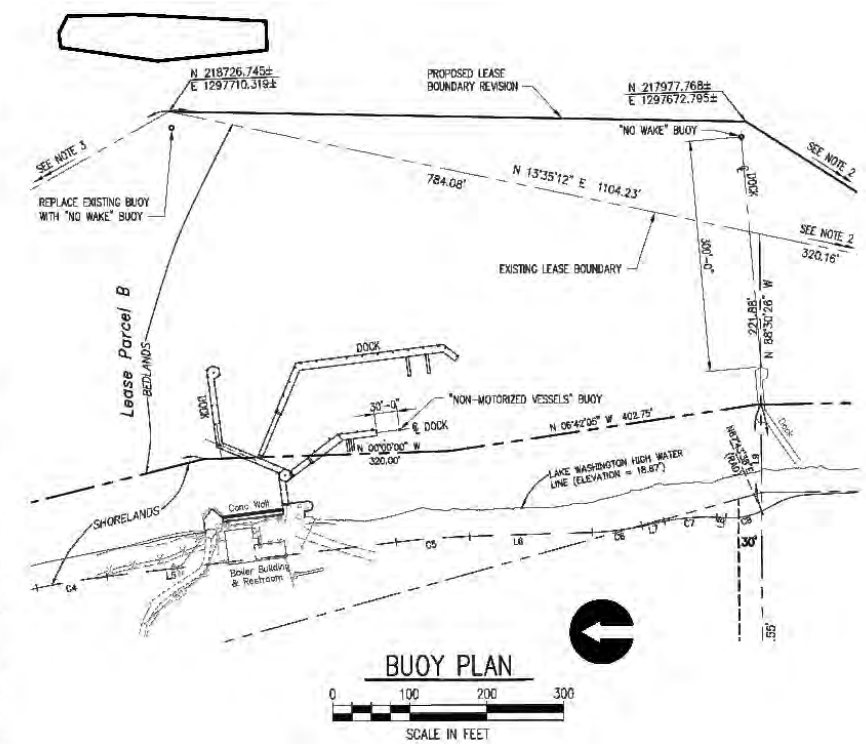
NOTES:

1. PROPOSED IMPROVEMENTS OVERWATER COVERAGE: ±4425 SF.
2. EXTENDS TO EXISTING BOUNDARY CORNER AT N 217653.411, E 1297450.919.
3. EXTENDS TO EXISTING BOUNDARY CORNER AT N 220320.192, E 1296873.931.





IN-WATER AND OVERWATER CONSTRUCTION PLAN

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SOURCE: IN-WATER AND OVERWATER CONSTRUCTION PLAN PROVIDED BY KPFF.

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

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LONGITUDE: -122.224481 W
S-T-R: 6-25N-5E

IN: LAKE WASHINGTON
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COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

ANCHOR QEA
1201 3rd Ave, Suite 2600
Seattle, WA 98101
206-287-9130

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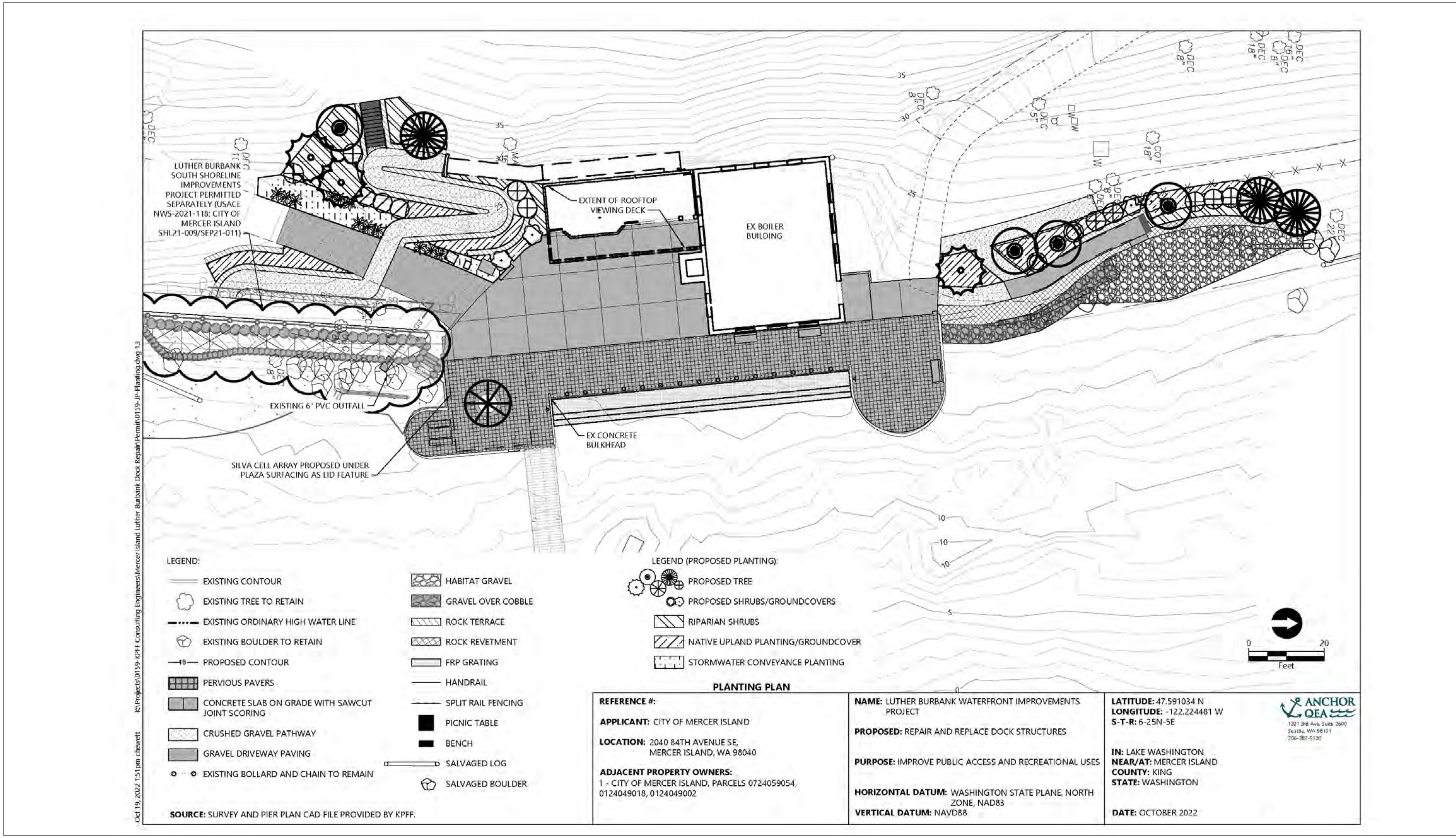

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ANCHOR QEA

Figure 5
Planting Plan
Critical Areas Study
Luther Burbank Park Waterfront Improvements

PLANT SCHEDULE			
COMMON NAME	SCIENTIFIC NAME	SIZE	SPACING
TREES			
GRAND FIR	ABIES GRANDIS	5-6' HT	AS SHOWN
WESTERN RED CEDAR	THUJA PLICATA	5-6' HT	AS SHOWN
BIG LEAF MAPLE	ACER MACROPHYLLUM	1.5" CAL	AS SHOWN
SWAMP OAK	QUERCUS PALUSTRIS	2" CAL	AS SHOWN
VINE MAPLE	ACER CIRCINATUM	5 GAL	AS SHOWN
HIGH SHRUBS			
INDIAN PLUM	OEMLERIA CERASIFORMIS	2 GAL	AS SHOWN
MOCK ORANGE	PHILADELPHUS LEWISII	2 GAL	AS SHOWN
SHRUBS - RIPARIAN			
SWORD FERN	POLYSTICHUM MUNITUM	1 GAL	3' O.C.
RED FLOWERING CURRANT	RIBES SANGUINEUM	1 GAL	3' O.C.
NOOTKA ROSE	ROSA NUTKANA	1 GAL	3' O.C.
THIMBLEBERRY	RUBUS PARVIFLORUS	1 GAL	3' O.C.
SNOWBERRY	SYMPHORICARPOS ALBUS	1 GAL	3' O.C.
GROUNDCOVERS			
SWORD FERN	POLYSTICHUM MUNITUM	1 GAL	3' O.C.
OREGON GRAPE	MAHONIA NERVOSA	1 GAL	3' O.C.
SHRUBS/GROUNDCOVERS - STORMWATER CONVEYANCE AREA			
RED OSIER DOGWOOD	CORNUS SERICEA	1 GAL	AS SHOWN
LADY FERN	ATHYRIUM FILIX-FEMINA	1 GAL	AS SHOWN
SEED MIX - STORMWATER CONVEYANCE AREA			

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PLANT SCHEDULE

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

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LATITUDE: 47.591034 N
LONGITUDE: -122.224481 W
S-T-R: 6-25N-5E

IN: LAKE WASHINGTON
NEAR/AT: MERCER ISLAND
COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

LEGEND:

Project Area

Major 10-foot Contour

Minor 2-foot Contour

NOTES:
1. Aerial imagery: USA NAIP Streaming Imagery
2. Topographic contours from City of Mercer Island.

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Figure 7
Project Area Boundary and Topography
Critical Areas Study
Luther Burbank Park Waterfront Improvements

LEGEND:

Project Area
Park Boundary

USDA NRCS Soil Type

Seattle Muck
Puget Silty Clay Loam
Kitsap silt loam, 2 to 8 percent slopes
Kitsap silt loam, 15 to 30 percent slopes

NOTE:
1. Aerial imagery: USA NAIP Streaming Imagery

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Feet

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Figure 8
USDA NRCS Soils
Critical Areas Study
Luther Burbank Park Waterfront Improvements

LEGEND:

Project Area

Park Boundary

NWI Wetland Type

Lake

Riverine

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

NOTE:
1. Aerial imagery: USA NAIP Streaming Imagery

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Figure 9
USFWS National Wetlands Inventory
Critical Areas Study
Luther Burbank Park Waterfront Improvements

LEGEND:

- Project Area
- Park Boundary
- Erosion Hazard

NOTES:

1. Aerial imagery: USA NAIP Streaming Imagery
2. Erosion hazards from City of Mercer Island.

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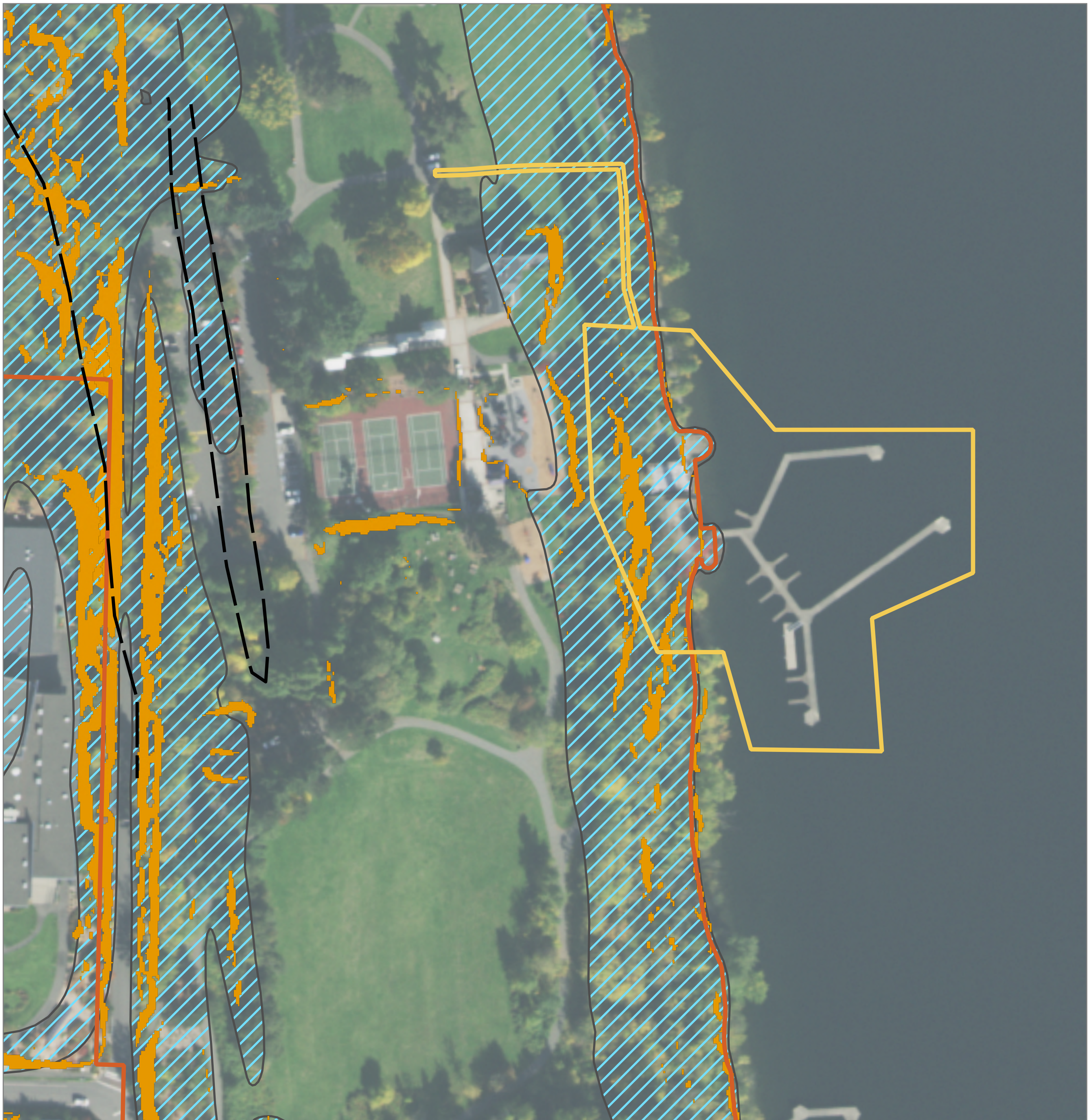
ANCHOR QEA

Figure 10
Erosion Hazard Areas
Critical Areas Study
Luther Burbank Park Waterfront Improvements



LEGEND:

- Project Area
- Park Boundary
- Geologic Contacts
- Potential Slide
- Steep Slope Area (Slope > 40%)

NOTES:
1. Aerial imagery: USA NAIP Streaming Imagery
2. Geologic contacts and potential slide areas from City of Mercer Island.
3. Steep slope areas calculated using Lidar data provided by City of Mercer Island.

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Figure 11
Landslide Hazard Areas
Critical Areas Study
Luther Burbank Park Waterfront Improvements

LEGEND:

- Project Area
- Park Boundary
- Seismic Hazard Area
- Fault Line (Seattle Fault Zone)

NOTES:
1. Aerial imagery: USA NAIP Streaming Imagery
2. Seismic hazard areas and fault line from City of Mercer Island.

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ANCHOR QEA

Figure 12
Seismic Hazard Areas

Appendix A
Project Plan Set

Appendix B
Photographs

Photograph 1. Looking southeast from existing pathway toward Boiler Building and existing docks (April 2021).

Photograph 2. Looking northwest over existing north beach (April 2021).

Photograph 3. Looking east from plaza over existing docks (April 2021).

Photograph 4. Handsome Bollards chain and existing bulkhead in front of Boiler Building (April 2021).

Photograph 5. Existing Boiler Building (April 2021).

Photograph 6. Existing restroom annex building (April 2021).

Photograph 7. Existing gravel access driveway and footpath with wooden stairs at south end of plaza (April 2021).

Photograph 8. Looking southeast from north beach over existing docks (May 2022).

Photograph 9. Looking south from north beach toward existing bulkhead and Boiler Building (May 2022).

Appendix C
Geotechnical Report for Upland Improvements

Geotechnical Engineering Services

Luther Burbank Park Upland Improvements Mercer Island, Washington

for

City of Mercer Island

August 5, 2022

GeoEngineers
Earth Science + Technology

Geotechnical Engineering Services

Luther Burbank Park Upland Improvements
Mercer Island, Washington

for
City of Mercer Island

August 5, 2022

GeoEngineers

1101 Fawcett Avenue, Suite 200
Tacoma, Washington 98402
253.383.4940

Geotechnical Engineering Services

Luther Burbank Park Upland Improvements
Mercer Island, Washington

File No. 0817-024-01

August 5, 2022

Prepared for:

City of Mercer Island Public Works
9601 SE 36th Street
Mercer Island, Washington 98040

Attention: Paul West, CIP Project Manager

Prepared by:

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

Brett E. Larabee, PE
Senior Geotechnical Engineer

LYLE JOSEPH STONE
STATE OF WASHINGTON
45765
REGISTERED
PROFESSIONAL ENGINEER
8/5/22

Lyle J. Stone, PE
Associate Geotechnical Engineer

BEL:LJS:kjb

Table of Contents

LIST OF FIGURES

APPENDICES

1.0 INTRODUCTION AND PROJECT UNDERSTANDING

This report presents the results of our geotechnical engineering services for the Luther Burbank Park Upland Improvements project. The project site is located at 2040 84th Avenue SE in Mercer Island, Washington. A vicinity map is provided as Figure 1. Our understanding of the project is based on our communications with you and project partners, KPFF and Swenson Say Faget, review of the 30 percent upland improvement plans (dated September 8, 2022), review of construction plans for the existing dock and portions of the shoreline bulkhead dated April 1973 (1973 Dock Plans), and our prior experience at the site. We are currently providing geotechnical engineering services to support improvements to the existing docks at the park. This work is ongoing, and our services related to the dock will be provided in a separate geotechnical report.

Proposed upland improvements are expected to consist of four main components:

- A seismic retrofit of the existing boiler plant building, and installation of a perimeter drain around the structure boiler plant and concessions/restroom building.
- Construction of a new Americans with Disability Act (ADA) accessible pedestrian ramp leading from existing trails to a second-story rooftop classroom area on top of the restroom building.
- Replacement of existing pavement with low impact surfacing such as permeable pavers, Silva Cells or other similar products intended to limit stormwater runoff and construction.
- Decommissioning of underground storage tanks (USTs) in accordance with applicable regulations.

We understand that seismic design for the restroom building retrofit will be competed in accordance with ASCE 41-17. Seismic design for the pedestrian ramp will be completed in accordance with the 2018 International Building Code (IBC). We expect that stormwater management facilities at the site will be designed in accordance with 2014 Washington State Department of Ecology Stormwater Management Manual for Western Washington (SWMMWW) which has been adopted by the City of Mercer Island.

Based on the available information, we understand that there are two abandoned USTs in the project vicinity that were associated with previous boiler plant operations and that petroleum hydrocarbons associated with the tanks have been detected in site soil. We understand that the City of Mercer Island (City) is assessing the status of the tanks and current plans include leaving the tank in place, however removal of the tank is also being evaluated. GeoEngineers is providing environmental service to support decommissioning of the USTs. Our environmental services are being provided in separate deliverables.

2.0 SCOPE OF SERVICES

The purpose of our services was to explore subsurface conditions at the site as a basis for providing geotechnical recommendations for design and construction. Our services were completed in accordance with our signed agreement dated January 4, 2022. Our specific scope of services is summarized in our proposal dated January 4, 2022.

3.0 SITE CONDITIONS

3.1. Surface Conditions

The project site is located on the shoreline of Lake Washington approximately in the geographical center of the parks' shoreline frontage. Development at the site includes the historic brick boiler plant building, a brick restroom building that connects to the southwest corner of the boiler plant, a concrete shoreline bulkhead, concrete and brick paved sidewalks and landscaped areas.

The boiler plant and restroom buildings are constructed into the toe of an upland slope that grades downward from the higher elevation portions of the park to the west to shoreline of Lake Washington. The slope behind the buildings is on the order of 50 to 60 feet tall and is inclined between 2 Horizontal to 1 Vertical (2H:1V) and 1.25H:1V. There is about a 1-foot gap between the back (western) sides of the buildings and the slope except for the lower 4 to 5 feet of the slope toe where the western walls of the buildings retain the lower portion of the slope. The upland slope behind the buildings is vegetated with trees and developed with foot-trails that provide access to the shoreline. Access to the shoreline area is also provided by two more primary routes: (1) a gravel surfaced maintenance road to the south of the buildings that is inclined around 4H:1V and (2) an asphalt paved walkway to the north of the building that is inclined on the order of 2H:1V. An apparent stormwater conveyance swale (ditch) is located along the western edge of the gravel maintenance road.

The existing shoreline bulkhead is approximately 200 feet long. The southern terminus of the bulkhead is just south of the access point to docks and the northern terminus of the bulkhead is about 15 feet north of the boiler plant building. The bulkhead has two circular "push-outs" that provide viewing areas. The southern push-out is planted with three trees. Based on our review of historic areal imagery, we understand the straight section of bulkhead in front of the boiler plant building was construed at the same time as the boiler plant (approximately 1928). The push-outs appear to have been constructed at the same time as the restroom building (1970's). According to the 1973 Dock Plans, the push out sections of the bulkhead are supported on shallow foundations. We expect that the original section of bulkhead and the existing boiler plant and restroom buildings are also supported on shallow foundations.

3.2. Subsurface Conditions

3.2.1. Literature Review

We reviewed the Geologic Map of King County (2007). According to the map the project site is underlain by glacial till (Qvt). Glacial till is typically comprised of a mixture of sand, gravel and cobbles in a silt matrix. Glacial till soils were consolidated by the weight of the overriding glacier and are typically dense to very dense.

We reviewed geologic and geotechnical information provided to us for other projects completed within Luther Burbank Park. This included photos from installation of a stormwater utility on the north side of the boiler plant building in 2018. The soils exposed in the reviewed photos are consistent with glacial till or other glacially consolidated soils.

We also searched for readily available geotechnical information in the project vicinity using the Washington State Department of Natural Resources Geologic Information Portal. We reviewed summary exploration logs associated with design of the Mercer Island Community and Event Center which is located to the west and upland of Luther Burbank Park. Reviewed exploration logs indicated that dense glacially consolidated soils were present near existing ground surface at that site.

3.2.2. Subsurface Explorations and Laboratory Testing

As part of our study, we advanced three hollow stem auger borings in the vicinity of the proposed improvements. The locations of our explorations are shown on the Site Plan, Figure 2. The borings were drilled on April 1, 2020 to depths between 11 and 13.5 feet below ground surface (bgs). A description of the field exploration program and the boring logs are presented in Appendix A.

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

3.2.3. Soil Conditions

Borings B-1 and B-2 were advanced in areas currently surfaced with sod. Sod thicknesses were typically on the order of 6 inches or less. Below the sod in B-1 and B-2 we observed what we interpret to be glacial till. Glacial till soils typically consisted of hard silt with sand and sandy silt with. We observed occasional gravel within the till and while not directly observed, we expect that cobbles and boulders could also be present within the glacial till. Practical drilling refusal was encountered in B-1 around 13.5 feet bgs and around 11 feet bgs in B-2.

B-3 was advanced within a concrete paved sidewalk area near the location of the relic USTs. Concrete thickness was on the order of 6 inches at the boring location and the concrete was underlain by about 4 inches of base course material. Below the base course in B-3 we observed what we interpret to be fill extending to around 7 feet bgs. Underlaying the fill was glacial till. Observed fill generally consisted of stiff sandy silt which we expect is reworked native soil. Underlying glacial till was hard and consisted of material similar to the glacial till observed in B-1 and B-2.

3.2.4. Groundwater Conditions

Our understanding of groundwater conditions is based on conditions observed during drilling of our borings and groundwater measurements taken in two previously installed monitoring wells at the site. The monitoring wells are located about 5 feet from the eastern edge of the shoreline bulkhead within the brick paved sidewalk area in front of the restroom building. Groundwater was measured in these wells around 2 feet below ground surface which was consistent with the distance to the water level in Lake Washington as measured from the ground surface elevation of the bulkhead. We expect that the groundwater observed in the wells is hydraulically connected with the water levels in Lake Washington and will fluctuate seasonally with lake levels.

Groundwater was observed in B-3 around 3 feet bgs during drilling. B-3 was located about 5 feet west of the previously mentioned monitoring wells. The groundwater observed in B-3 was located within the fill and was perched on top of the underlying glacial till soils which were observed to be moist.

We did not observe groundwater during drilling of B-1 and B-2. Soil samples collected in B-1 and B-2 appeared moist and we did not observe indications of soil oxidation or staining that would suggest that groundwater periodically flows through the glacial till. Based on these observations it does not appear that the water in Lake Washington penetrates into or flows through the intact glacial till at the site.

During our surface reconnaissance we did not observe active groundwater seepage on the face of the hillside behind the boiler plant and restroom building. However, based on our conversations with the project team we understand that groundwater seepage is routinely observed on the face of the hillside in some areas. This is not unusual on slopes comprised of glacially consolidated soils and perched groundwater tends to accumulate within portions of the deposits that contain higher percentages of sand and gravel and lower percentages of silt and clay or within areas that have higher degree of weathering. Perched groundwater volumes tend to fluctuate throughout the year typically being highest during winter and spring months and during periods of prolonged precipitation.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1. Geologic Hazards

We evaluated the site for geologic hazards as described in Mercer Island City Code 19.07.160 – Geologically Hazardous Areas. This includes landslide hazard areas, seismic hazard areas, and erosion hazard areas. We did not observe indicators of a landslide hazard area during our study. Potential seismic hazards are addressed in the Seismic Design section. In our opinion, the site does not pose an erosion hazard provided best management practices are implemented and our erosion and sedimentation control recommendations are followed as outlined in the Site Development and Earthwork section. Based on our review of available information, to our knowledge, no other geologic hazards are mapped in the project area.

4.2. Seismic Design

4.2.1. Seismic Design Parameters

The tables below provide seismic design parameters developed in accordance with ASCE 41-17 for the BSE-1 (5 percent chance of exceedance in 50 years) and BSE-2 (20 percent chance of exceedance in 50 years) seismic events and in accordance with the 2018 IBC which references ASCE 7-16. The project site is underlain by dense to very dense glacially consolidated soils and we recommend using a response spectrum for Site Class C for this site.

TABLE 1. SEISMIC DESIGN PARAMETERS ASCE 41-17

Seismic Design Parameter	BSE-1 (5% exceedance in 50 years)	BSE-2 (20% exceedance in 50 years)
Spectral Response Acceleration at Short Periods (S_S)	1.034g	0.489
Spectral Response Acceleration at 1-Second Periods (S_1)	0.351g	0.152
Site Class	C	C
Site Modified Spectral Response Acceleration at Short Periods (S_{XS})	1.241g	0.635
Site Modified Spectral Response Acceleration at 1-Second Periods (S_{X1})	0.527g	0.228

TABLE 2. SEISMIC DESIGN PARAMETERS 2018 IBC

2018 IBC Seismic Design Parameters	
Spectral Response Acceleration at Short Periods (S_S)	1.388g
Spectral Response Acceleration at 1-Second Periods (S_1)	0.482g
Site Class	C
Site Modified Peak Ground Acceleration (PGA_M)	0.712g
Design Spectral Response Acceleration at Short Periods (SD_S)	1.11g
Design Spectral Response Acceleration at 1-Second Periods (SD_1)	0.483g

4.2.2. Liquefaction, Lateral Spreading and Surface Rupture

Liquefaction refers to a condition where vibration or shaking of the ground, usually from earthquake forces, results in development of excess pore pressures and subsequent loss of strength in the affected soil deposit. In general, soils that are susceptible to liquefaction include loose to medium dense "clean" to silty sands that are below the water table.

Based on the soil conditions observed in our explorations and our understanding of the site geology, in our opinion it is unlikely that there are potentially liquefiable soils present at the project site and there is a low risk of liquefaction occurring during the seismic design events.

Lateral spreading related to seismic activity typically involves lateral displacement of large, surficial blocks of non-liquefied soil when an underlying soil layer loses strength during seismic shaking. Lateral spreading usually develops in areas where sloping ground or large grade changes (including retaining walls) are present. Due to the low liquefaction risk at the site, in our opinion there is also a low risk of lateral spreading occurring at this site.

According to the Department of Natural Resources Seismic Hazards Map, the project site is in the vicinity of the Seattle Fault zone. However, because bedrock in this area is covered by hundreds of feet of glacial soils, it is unlikely that movement of the fault would result in significant surface rupture at the ground surface.

4.3. Foundation Support

4.3.1. General

The sections below provide design and construction recommendations for conventional shallow foundations (spread footings), drilled pier type foundations (pier foundations) and micropiles. We have also included recommendations for evaluating the foundations of existing structures at the site.

We understand that a perimeter footing drain will be installed on the west side of the existing restroom and boiler plant buildings. Recommendations for design of footing drains are included in Section 4.3.2.6.

4.3.2. Spread Footings

4.3.2.1. General

In our opinion, the proposed structures can be adequately supported on shallow foundations bearing on glacial till soils. Glacial till soils are expected to be present within about a foot of the ground surface across the site. The depth to glacial till could vary in areas where grading or fill activities have occurred. Because glacial till soils are expected to be present at shallow depths, we recommend that existing fill, if present, be removed from below footings.

For spread foundation design, we recommend that footings be established at least 18 inches below the lowest adjacent grade and have minimum widths of 24 inches.

4.3.2.2. Foundation Bearing Surface Preparation and Protection

Shallow footing excavations should be performed using a smooth-edged bucket to limit bearing disturbance. We recommend that the base of all footing excavations be proof compacted to a uniformly firm and unyielding condition prior to placement of structural fill, formwork or rebar. Loose or disturbed materials present at the base of footing excavations should be removed or compacted. Fill, if present, should be removed from below spread footings. If soft or otherwise unsuitable areas are observed at the foundation bearing surface that cannot be compacted to a stable and uniformly firm condition the following options may be considered: (1) the exposed soils may be moisture conditioned and recompacted; or (2) the unsuitable soils may be overexcavated and replaced with compacted structural fill, as needed.

Foundation bearing surfaces should not be exposed to standing water. If water is present in the excavation, it must be removed before placing structural fill, formwork and reinforcing steel. Protection of exposed soil should be considered during the wetter times of the year. Typically, a 3- to 4-inch lean concrete mat or a 6- to 8-inch crushed rock section is suitable for foundation bearing surface protection.

Prepared foundation bearing surfaces should be observed and evaluated by a member of our firm prior to placement of structural fill, formwork or steel reinforcement. Our representative will confirm that the bearing surfaces have been prepared in accordance with our recommendations and is suitable for supporting the design footing load and provide recommendations for remediation, if necessary.

4.3.2.3. Allowable Soil Bearing Resistance

Spread footings bearing on subgrades prepared as recommended may be designed using an allowable soil bearing pressure of 4,000 pounds per square foot (psf). This bearing pressure applies to the total of dead and long-term live loads and may be increased by one-third when considering total loads, including earthquake or wind loads. This bearing pressure assumes that footings are located on level ground. If footings are located in areas of sloping ground, the allowable bearing pressure should be decreased by a factor of 0.5 for slope inclinations up to 2H:1V. We do not recommend that spread footings be located on slopes that are steeper than 2H:1V.

These are net bearing pressures. The weight of the footing and overlying backfill can be ignored in calculating footing sizes. Higher bearing pressures may be applicable on a case-by-case basis provided footing elevations, loading conditions are known, and subgrades are protected during construction. We can work with the design team to evaluate increased bearing pressures, if this would provide value to the project.

4.3.2.4. Foundation Settlement

Disturbed soil must be removed from the base of footing excavations and the bearing surface should be prepared as recommended. Provided these measures are taken, we estimate the total static settlement of shallow foundations will be on the order of 1 inch or less for the bearing pressures presented above. Differential settlements could be on the order of ¼ to ½ inch between comparably loaded isolated column footings or along 50 feet of continuous footing. Settlement is expected to occur rapidly as loads are applied. Settlements could be greater than estimated if loose or disturbed soil is present beneath footings.

4.3.2.5. Lateral Resistance

The ability of the soil to resist lateral loads is a function of frictional resistance, which can develop on the base of footings and slabs and the passive resistance, which can develop on the face of below-grade elements of the structure as these elements tend to move into the soil. The allowable frictional resistance on the base of the footing may be computed using a coefficient of friction of 0.4 applied to the vertical dead-load forces. The allowable passive resistance on the face of the footing or other embedded foundation elements may be computed using an equivalent fluid density of 350 pounds per cubic foot (pcf) for undisturbed site soils or structural fill extending out from the face of the foundation element a distance at least equal to two and one-half times the depth of the element. These values include a factor of safety of about 1.5.

The passive earth pressure and friction components may be combined provided that the passive component does not exceed two-thirds of the total. For level ground conditions, the top foot of soil should be neglected when calculating passive lateral earth pressure unless the area adjacent to the foundation is covered with pavement or a slab-on-grade. If footings are located on sloping ground, the top 2 feet of soil should be neglected when calculating passive lateral earth pressures.

4.3.2.6. Perimeter Footing Drains

We understand that a perimeter drain will be installed on the west side of the existing building. Perimeter footing drains should be provided with cleanouts and should consist of at least 4-inch-diameter perforated pipe surrounded on all sides by 6 inches of drain material enclosed in a non-woven geotextile fabric for underground drainage to prevent fine soil from migrating into the drain material. We recommend that the drainpipe consist of either heavy-wall solid pipe or rigid corrugated smooth interior polyethylene pipe. We do not recommend using flexible tubing for footing drainpipes. The drain material should consist of pea gravel or material similar to “Gravel Backfill for Drains” per Washington State Department of Transportation (WSDOT) Standard Specifications Section 9-03.12(4). The perimeter drains should be sloped to drain by gravity, if practical, to a suitable discharge point. Water collected in roof downspout lines must not be routed to the perimeter footing drains. Provided the envisioned perimeter footing drain is installed as recommended, in our opinion individual footing drains or below slab drains are not necessary.

4.3.3. Bearing Resistance of Existing Footings

We understand that the existing footings for the boiler plant, restroom building, and bulkhead walls will be evaluated considering current building codes and may be relied upon to resist loads from new improvements. Based on review of provided as-built drawings the existing structures are supported on shallow spread footings. It is unclear what bearing pressures were assumed for design of the footings and what methods were used for preparing foundation bearing surfaces. At this time, we recommend that the existing footings be evaluated using an allowable bearing resistance of 3,500 psf. Existing footings can be evaluated using the lateral resistance values provided above.

If more information on design and construction of the existing footings is obtained, or if can be confirmed that the existing foundations are bearing directly on intact glacial till, we expect that a higher bearing resistance bearing could be considered. Depending on structural demands it could be necessary to retrofit existing footings using deep foundations. For this site we expect that drilled micropiles are the most feasible solution for reinforcing existing footings. Recommendations for design and construction of micropiles are included in Section 4.2.5 of this report.

4.3.4. Pier Foundations

4.3.4.1. General

We expect that pier foundations will consist of a precast or cast in place concrete foundation installed into a predrilled/or excavated hole. The sections below provide recommendations for design and construction of pier foundations.

4.3.4.2. Axial Resistance

Pier foundations will achieve axial downward resistance through end bearing resistance at the toe of the pier and through skin friction along the length of the foundation. Uplift resistance will be achieved through skin friction only.

We recommend that end bearing resistance of pier foundations be estimated assuming an allowable soil bearing pressure of 5,000 psf. Downward skin friction resistance can be estimated using an allowable unit skin resistance of 350 psf per linear foot of embedded foundation. Uplift skin friction resistance can be estimated using an allowable unit skin resistance of 300 psf per linear foot of embedded foundation. These values are appropriate for foundation embedment depths up to about 15 feet. If foundation embedment depths are expected to exceed, we should be contacted to consider a revised estimate of pier axial resistance based on the proposed structure.

For example, a 2 foot diameter pier footing embedded 10 feet below grade would achieve the following **allowable** resistances:

$$End\ Bearing\ Resistance = \text{Bearing}\ pressure\ (psf) \times Toe\ Area\ (sf)$$

$$= 5{,}000psf\ \times\ \pi(\frac{2\ ft.}{2})^2 \cong 15{,}700\ lbs.$$

$$Downward\ Skin\ Resistance = Unit\ Skin\ Resistance \times Pier\ Perimeter\ (ft) \times Pier\ Embedment(ft)$$

$$= 350\ psf\ \ \times \pi\ (2\ ft) \times 10\ ft. \cong 22{,}000\ lbs.$$

$$Upward\ Skin\ Resistance = Unit\ Uplift\ Resistance \times Pier\ Perimeter\ (ft) \times Pier\ Embedment(ft)$$

$$= 300\ psf\ \ \times \pi(2\ ft) \times 10\ ft. \cong 18{,}850\ lbs.$$

4.3.4.3. Lateral Resistance

The tables below provide recommendations for evaluating lateral resistance of pier foundations. Table 3 provides allowable lateral bearing resistance values for the soils encountered in our borings. Lateral bearing resistances are based on correlations presented in Table 17-2 of the WSDOT *Geotechnical Design Manual*.

TABLE 3. LATERAL SOIL BEARING RESISTANCE

Depth Range (feet)	Allowable Lateral Bearing Resistance (psf)
0 to 5	2,000
5 and below	4,500

Table 4 provides recommended soil parameters for lateral pier foundation analyses using the software program LPILE (Ensoft Inc. 2016).

TABLE 4. RECOMMENDED LPILE PARAMETERS

Depth Range (feet)	p-y Curve Type	Eff. Unit Wt. (pcf)	Friction Angle (deg)	K (pci)
0 to 5	Sand (Reese)	125	34	200
5 and below	Sand (Reese)	125	38	225

If lateral pier foundation analyses are completed using LPILE, we recommend that we be allowed to review the results of the analyses to confirm that the results are consistent with our experience designing foundations and our understanding of soil conditions at the site.

4.3.4.4. Construction Considerations

We present two conditions to consider when constructing pier foundations.

- Condition 1, an excavation the same dimension of the designed foundation is created, and the precast foundation is placed in the excavation or the foundation is cast directly against undisturbed earth; or
- Condition 2, an excavation larger than the designed dimension of the foundation is created, a casing is placed into the excavation and the foundation concrete is cast inside the casing. The casing could be left in place permanently or removed from the excavation as the foundation is constructed. If the casing is left in place any overexcavated area outside of the casing would need to be backfilled with controlled density fill (CDF).

Construction of Condition 1 requires the sidewalls of the excavation to stay stable during construction of the foundation. Construction of Condition 2 does not require the sidewalls of the excavation to remain stable. Based on the soil and groundwater conditions at the site, in our opinion it is feasible to complete excavations for drilled pier foundations without the use of temporary casing (Condition 1). The use of temporary casing could still be desirable in areas of sloping ground, if groundwater seepage is encountered in excavations, or if the excavations will be left open for an extended period of time. If a sacrificial or permanent casing is used, this practice should be coordinated with the structural engineer.

Excavations for drilled pier foundations discussed above are typically completed with augers attached to tracked excavator type equipment. The size of excavator needed to complete the excavation will depend on the foundation diameter and depth. Selection of this foundation alternative should consider equipment access restrictions to the foundation locations.

We recommend that the base of the pier footing excavations be free of loose or disturbed soils prior to construction of the foundation. If loose or disturbed soils are present at the base of the excavation and cannot be adequately compacted or removed, we recommend that quarry spalls be pushed into the excavation subgrade until a stable base is established. If water accumulates in the excavation, the water should be removed from the excavation prior to pouring concrete.

4.3.5. Micropiles

4.3.5.1. General

Micropiles are small-diameter drilled piles (typically less than 12 inches in diameter) that are constructed by drilling a hole, placing reinforcement and then grouting the hole. Various methods can be used to drill the holes for micropiles. In our opinion, any drilling method can be considered provided it can form a stable hole at the required dimensions and within specified tolerances. Temporary casings are often used to help maintain stability of the excavation sidewalls during micropile drilling. In some cases, the steel casing is left in place, especially within the upper portions of the pile to increase the structural capacity of the micropiles.

Reinforcement generally consists of a large steel reinforcing bar installed down the center of the hole. The grouting method used to construct the micropiles has a significant impact on capacity. Micropiles installed by gravity grouting have lower capacities, and micropiles installed by pressure grouting or post-grouting (two-stage grouting process) can achieve much higher capacities. We typically recommend that micropiles be installed using pressure grouting or post-grouting methods.

Micropiles develop their resistance to axial loads primarily within the "bonded length" of the micropile (portion of the pile where grout is in direct contact with the soil and no outer casing is present). Axial resistance of micropiles is primarily derived from side friction within the bonded length. Because of their small diameters, end bearing resistance of micropiles is typically low compared to the side resistance. In our opinion, it is conservate to ignore the contribution of end bearing resistance when evaluating the axial capacity of micropiles.

4.3.5.2. Design Recommendations

We recommend that micropiles be designed using the procedures and recommendations outlined in the 2005 Federal Highway Administration (FHWA) *NHI-05-039, Micropile Design and Construction Manual*. We recommend that micropiles have a minimum embedment depth of 10 feet and have a minimum dimeter of 6 inches.

In lieu of micropile resistance charts we have provided estimates of the soil-grout bond stress values for the various strata of the design soil profile. These values are summarized in Table 5. These unit values can be used to estimate resistances of micropiles of various diameters and lengths. In our opinion, the provided values are conservative with respect to micropile design. A sacrificial test micropile could be installed at the site and a load test completed to measure the achieved soil -grout bond strength and serve as a basis for designing the production micropiles.

TABLE 5. MICROPILE DESIGN VALUES

Depth Range[1]	Layer Ultimate[2] Soil Grout Bond Stress (psi)	Layer Ultimate[2] End Bearing Stress (psi)	Layer Ultimate[2] Uplift Soil Grout Bond Stress (psi)
0 to 5	120	N/A[4]	120
5 and below	200	N/A[4]	200

Notes: [1]Depths are referenced to existing ground surface

[2]These values assume the micropiles are installed using pressure grout or post grouting installation methods. The following factors of safety should be considered when evaluating allowable resistance. Static Conditions: Skin Friction = 2.0, Uplift = 2.0. Seismic Conditions: Skin Friction = 1.5, Uplift = 1.75

4.3.5.3. Micropile Lateral Design

Because micropiles are relatively slender, single micropiles often have a relatively low lateral capacity. It is often necessary to install micropiles in groups or use battered micropiles to resist lateral loads. Permanent steel casings are also used to help increase the lateral stiffness of micropiles.

In our opinion the geotechnical properties previously provided for lateral analysis of drilled pier foundations are also suitable for evaluating micropiles. Group effects can be considered negligible for groups of micropiles spaced greater than 3 diameters apart. If micropiles will be spaced closer than what is recommended above, we should be notified and can provide additional recommendations for evaluation group effects. If micropiles are included in this project we recommend that GeoEngineers review the results of the lateral analyses to confirm that the analysis was completed in accordance with the intent of our recommendations.

4.3.5.4. Micropile Settlement

Provided micropiles are designed as recommended, we estimate that the settlement of micropiles under static loads will generally be on the order of ½-inch or less, exclusive of the elastic micropile compression. Most of this settlement should occur rapidly as loads are applied. Differential settlement between adjacent micropiles is expected to be negligible.

4.3.5.5. Micropile Testing

Micropiles should be tested to verify the installed capacity. We recommend that a minimum of one sacrificial micropile be tested to at least 2 times the design load. The sacrificial micropile should be in the same general location as production micropiles and be installed using the same means and methods as the production piles. We recommend that a minimum of 10 percent of the production piles, but at least 2, be proof-tested to 1.67 times the design load. The structural engineer may require additional or alternative testing requirements.

Micropile load testing should be completed using a load frame capable of distributing large test loads into the near surface soils without damaging existing structural elements or below ground utilities. The location of the micropile pile load tests should be reviewed during the design phase to minimize impacts to existing improvements.

4.3.5.6. Construction Considerations

The contractor should be prepared to install micropiles below the groundwater table and through soils that contain gravel, cobbles and boulders. The contractor should be prepared to use casing and/or drilling fluid to maintain drill hole stability.

Micropile layout should consider the location of existing below grade improvements. If an obstacle is encountered during micropile installation, it may be necessary to adjust the micropile location. Typically adjusting micropile locations by up to 1 to 2 pile diameters can be accommodated without significant change to the foundation design. Adjustments to the locations of micropiles during construction should be reviewed by the structural engineer.

No direct information regarding capacity (e.g., driving resistance data) of the micropiles is obtained during installation. Therefore, we recommend the installation and testing of micropiles be carefully monitored by a member from our firm who can observe and document conditions encountered.

4.4. Earth Pressures for Conventional Below-Grade Structures

4.4.1. Design Parameters

We recommend the following lateral earth pressures be used for design of conventional retaining walls and below-grade structures. These values are also appropriate for evaluating the existing shoreline bulkhead and existing building walls which we understand are retaining soils at the toe of the slope. We recommend that the undrained parameters be used for evaluating earth pressures of the existing bulkhead. Undrained pressures should also be used for evaluating the existing building walls unless a perimeter drain is installed behind the structure. For other walls, if drained design parameters are used, drainage systems must be included in the design in accordance with the recommendations presented in Section 4.3.2 below.

- Active soil pressure may be estimated using an equivalent fluid density of 35 pcf for the drained condition.
- Active soil pressure may be estimated using an equivalent fluid density of 85 pcf for the undrained condition; this value includes hydrostatic pressures.
- At-rest soil pressure may be estimated using an equivalent fluid density of 55 pcf for the drained condition.
- At-rest soil pressure may be estimated using an equivalent fluid density of 95 pcf for the undrained condition; this value includes hydrostatic pressures.
- For backfill sloping conditions up to 2H:1V, the soil pressures presented above should be increased by 15 percent.
- For seismic considerations, a uniform lateral pressure of 10H psf (where H is the height of the retaining structure or the depth of a structure below ground surface) should be added to the lateral earth pressure.
- A traffic surcharge should be included if vehicles are allowed to operate within ½ the height of the retaining walls. A typical traffic surcharge of 250 psf can be estimated by assuming an additional 2 feet of fill as part of the wall height. Other surcharge loads should be considered on a case-by-case basis. We can provide additional surcharge loads for specific loading conditions once known.

The active soil pressure condition assumes the wall is free to move laterally 0.001 H, where H is the wall height). The at-rest condition is applicable where walls are restrained from movement. The above-recommended lateral soil pressures do not include surcharge loads than those described.

Over-compaction of fill placed directly behind retaining walls or below-grade structures must be avoided. We recommend use of hand-operated compaction equipment and maximum 6-inch loose lift thickness when compacting fill within about 5 feet of retaining walls and below-grade structures.

Retaining wall foundation bearing surfaces should be prepared following Section 4.2 of this report. Provided bearing surfaces are prepared as recommended retaining wall foundations may be designed using the allowable soil bearing values and lateral resistance values presented previously.

4.4.2. Drainage

If retaining walls or below-grade structures are designed using drained parameters, a drainage system behind the structure must be constructed to collect water and prevent the buildup of hydrostatic pressure against the structure. We recommend the drainage system include a zone of free-draining backfill a minimum of 18 inches in width against the back of the wall. The drainage material should consist of coarse sand and gravel containing less that 5 percent fines based on the fraction of material passing the ¾-inch sieve. Material similar to "Gravel Backfill for Drains" per WSDOT Standard Specifications Section 9-03.12(4) is also suitable. Waffle board-type drainage mats may be considered instead of gravel provided they are protected from accumulating silt and discharge appropriately.

A perforated, rigid, smooth-walled drainpipe with a minimum diameter of 4 inches should be placed along the base of the structure within the free-draining backfill and extend for the entire wall length. The drain pipe should be metal or rigid PVC pipe and be sloped to drain by gravity. Discharge should be routed to appropriate discharge areas and designed to reduce erosion potential. Cleanouts should be provided to allow routine maintenance. We recommend roof downspouts or other types of drainage systems not be connected to retaining wall drain systems.

4.5. Stormwater Management

Stormwater infiltration facilities are not currently envisioned for this project, however use of porous surfacing or pavement systems that designed to store and transport collected water (e.g. Silva Cells) are being considered.

The site has a very low potential for stormwater infiltration. Existing soils at the site are comprised of very compact, hard, fine grained glacially consolidated soils that have very slow infiltration rates and based on the proximity to the lake, anticipated groundwater levels in level portions of the site are expected within a few feet of the ground surface. Based on these conditions we do not recommend that traditional stormwater infiltration facilities such as bioswales, infiltration trenches or permeable pavements be considered for use at this site. Infiltration in specific areas of the site where historical grading has taken place or where fill is present could be feasible, however additional studies would need to be completed to further evaluate infiltration potential.

Silva Cells are described as a modular suspended pavement system. The cells consist of square or rectangular units that include a roof and bottom supported by four "posts" at the corners. The units have opens sides and hollow interior. The cell interiors are typically filled with porous soil that allow for the storage and transportation of stormwater. While some infiltration through the base of the cells can occur, the cells can be designed assuming no infiltration and an underdrain system is typically included to discharge stormwater. Once installed the cell system can support different surfacing materials including pavers, gravel surfacing and in certain cases traditional pavements.

Silva Cells or other systems are often designed by the product manufacturer, and we recommend that they be consulted during design if these systems are being used.

To support design of stormwater collection and storage systems, the table below includes typical soil properties for common backfill materials and existing soils at the site.

TABLE 6. TYPICAL SOIL HYDRAULIC PROPERTIES

Soil Type	Referenced Gradation	Estimated Hydraulic Conductivity (inches per hour)	Porosity (n)	Void Ratio (e)
Glacial till	See Figure A-5 in Appendix A	<0.01	0.15	0.17
WSDOT Gravel Borrow	WSDOT Standard Specification 9-03.14(1)	29	0.29	0.41
WSDOT Select Borrow	WSDOT Standard Specification 9-03.14(2)	42	0.26	0.35
WSDOT Common Borrow	WSDOT Standard Specification 9-03.14(3)	20	0.24	0.32
Silty Sand with Occasional Gravel	Gravel = 4% Sand = 66% Silt = 30%	0.3	0.26	0.35
Silty Sand with Gravel	Gravel = 19% Sand = 51% Silt = 30%	0.75	0.22	0.28
Fine Sand	Sand = 99% Silt =1%	0.5	0.3	0.43

Notes:

Provided values are approximate and are based on WSDOT research report WA-RD 872.1 and our experience.

Estimates hydraulic conductivity, porosity and void ration values are based for compacted soils.

4.6. Site Development and Earthwork

We anticipate that site development and earthwork will include demolition of existing features, excavating for shallow foundations, utilities and other improvements, establishing subgrades for structures and hardscaping, and placing and compacting fill and backfill materials. We expect that site grading and earthwork can be accomplished with conventional earthmoving equipment. The following sections provide specific recommendations for site development and earthwork.

4.6.1. Clearing, Stripping and Demolition

Clearing and stripping depths will likely be on the order of 2 inches in areas currently surfaced with sod or other surface vegetation. Greater stripping depths could be required within structural areas or areas of unsuitable soils, if observed during construction. Stripped grass and sod material must not be re-used as fill.

Coarse gravel, cobbles and boulders should be expected within the glacial till soils present at the site. Accordingly, the contractor should be prepared to remove boulders and cobbles, if encountered during grading or excavation. Boulders may be removed from the site or used in landscape areas. Voids caused by boulder removal should be backfilled with structural fill.

We recommend that existing pavements and hardscaping be completely removed from areas that will be developed. During removal of these features, disturbance of surficial soils may occur, especially if left exposed to wet conditions. Disturbed soils may require additional remediation during construction and grading. If utilities exist beneath planned structures, they should be removed and backfilled or abandoned in place.

4.6.2. Erosion and Sedimentation Control

Erosion and sedimentation rates and quantities can be influenced by construction methods, slope length and gradient, amount of soil exposed and/or disturbed, soil type, construction sequencing and weather. Implementing an Erosion and Sedimentation Control Plan will reduce the project impact on erosion-prone areas. The plan should be designed in accordance with applicable city, county and/or state standards. The plan should incorporate basic planning principles, including:

- Scheduling grading and construction to reduce soil exposure;
- Re-vegetating or mulching denuded areas;
- Directing runoff away from exposed soils;
- Reducing the length and steepness of slopes with exposed soils;
- Decreasing runoff velocities;
- Preparing drainage ways and outlets to handle concentrated or increased runoff;
- Confining sediment to the project site; and
- Inspecting and maintaining control measures frequently.

Some sloughing and raveling of exposed or disturbed soil on slopes should be expected. We recommend that disturbed soil be restored promptly so that surface runoff does not become channeled.

Temporary erosion protection should be used and maintained in areas with exposed or disturbed soils to help reduce erosion and reduce transport of sediment to adjacent areas and receiving waters. Permanent erosion protection should be provided by paving, structure construction or landscape planting.

Until the permanent erosion protection is established, and the site is stabilized, site monitoring may be required by qualified personnel to evaluate the effectiveness of the erosion control measures and to repair and/or modify them as appropriate. Provisions for modifications to the erosion control system based on monitoring observations should be included in the Erosion and Sedimentation Control Plan.

4.6.3. Temporary Excavation

Excavations deeper than 4 feet must be shored or laid back at a stable slope if workers are required to enter. Shoring and temporary slope inclinations must conform to the provisions of Title 296 Washington Administrative Code (WAC), Part N, “Excavation, Trenching and Shoring.” Regardless of the soil type encountered in the excavation, shoring, trench boxes or sloped sidewalls will be required under Washington Industrial Safety and Health Act (WISHA). The contract documents should specify that the contractor is responsible for selecting excavation and dewatering methods, monitoring the excavations for safety and providing shoring, as required, to protect personnel and structures.

The glacial till soils are hard and have some amount of cohesion that can allow them to stand vertical or near vertical for a limited amount of time. These soils can also slough unexpectedly. In general, temporary cut slopes at this site should be planned to be inclined no steeper than about 1½H to 1V (horizontal to vertical). Steeper slopes, up to about 1H to 1V can be considered within the intact glacial till deposits provided the contractor's competent person concurs with this assessment and monitors excavations in accordance with applicable regulations. This guideline assumes that all surface loads are kept at a minimum distance of at least one-half the depth of the cut away from the top of the slope and that seepage is not present on the slope face. Flatter cut slopes will be necessary where seepage occurs or if surcharge loads are anticipated. Temporary covering with heavy plastic sheeting should be used to protect slopes during periods of wet weather.

4.6.4. Permanent Slopes

If permanent slopes are necessary, we recommend they be constructed at a maximum inclination of 2H:1V. Where 2H:1V permanent slopes are not feasible, protective facings and/or retaining structures should be considered.

To achieve uniform compaction, we recommend that fill slopes be overbuilt slightly and subsequently cut back to expose well-compacted fill. Fill placement on slopes steeper than about 5H:1V should be benched into the slope face. The configuration of benches depends on the equipment being used. Bench excavations should be level and extend into the slope face.

Exposed areas should be re-vegetated as soon as practical to reduce the surface erosion and sloughing. Temporary protection should be used until permanent protection is established.

4.6.5. Groundwater Handling Considerations

In shoreline areas, groundwater should be expected in excavations that extend more than a few feet below the ground surface. Groundwater levels near the lake are expected to match water levels in Lake Washington. The glacial till soils have a very low permeability, therefore the quantity of water seeping into the excavation is expected to be low through these native soils and is expected to be manageable with isolated sumps and pumps. In areas where fill is present, groundwater handling could be more extensive. Groundwater could be especially challenging in areas where old utility trenches or pipe bedding are located and connect or otherwise provide a conduit to the shoreline of Lake Washington. If these conditions exist, the contractor might need to construct trench dams or other measures to slow groundwater flow.

Within the hillside area west of the existing buildings, we expect that perched groundwater could be encountered in shallow excavations. Perched groundwater can likley be handled adequately with sumps, pumps, and/or diversion ditches, as necessary. Groundwater seepage handling needs will typically be lower during the late summer and early fall months. Ultimately, we recommend that the contractor performing the work be made responsible for controlling and collecting groundwater encountered.

4.6.6. Surface Drainage

Surface water from roofs, pavements and landscape areas should be collected and controlled. Curbs or other appropriate measures such as sloping pavements, sidewalks and landscape areas should be used to direct surface flow away from buildings, erosion sensitive areas and from behind retaining structures. Roof and catchment drains should not be connected to wall or foundation drains.

4.6.7. Subgrade Preparation

Subgrades that will support slab-on-grade floors, pavements, and other site features bearing on final grade should be thoroughly compacted to a uniformly firm and unyielding condition on completion of stripping/excavation and before placing structural fill. We recommend that subgrades for structures, pavements and other bearing surfaces be evaluated, as appropriate, to identify areas of yielding or soft soil. Probing with a steel probe rod or proof-rolling with a heavy piece of wheeled construction equipment are appropriate methods of evaluation.

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

4.6.8. Subgrade Protection and Wet Weather Considerations

The wet weather season generally begins in October and continues through May in Western Washington; however, periods of wet weather can occur during any month of the year. The soils encountered in our explorations contain a significant amount of fines. Soil with high fines content is very sensitive to small changes in moisture and is susceptible to disturbance from construction traffic when wet or if earthwork is performed during wet weather. If wet weather earthwork is unavoidable, we recommend that the following steps be taken.

- The ground surface in and around the work area should be sloped so that surface water is directed away from the work area. The ground surface should be graded so that areas of ponded water do not develop. Measures should be taken by the contractor to prevent surface water from collecting in excavations and trenches. Measures should be implemented to remove surface water from the work area.
- Earthwork activities should not take place during periods of heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting.
- The contractor should take necessary measures to prevent on-site soils and other soils to be used as fill from becoming wet or unstable. These measures may include the use of plastic sheeting and controlling surface water with ditches, sumps with pumps and by grading. The site soils should not be left uncompacted and exposed to moisture. Sealing the exposed soils by rolling with a smooth-drum roller prior to periods of precipitation will help reduce the extent to which these soils become wet or unstable.
- Construction traffic should be restricted to specific areas of the site, preferably areas that are surfaced with working pad materials not susceptible to wet weather disturbance.
- Construction activities should be scheduled so that the length of time that soils are left exposed to moisture is reduced to the extent practical.
- During periods of wet weather, concrete should be placed as soon as practical after preparation of the footing excavations. Foundation bearing surfaces should not be exposed to standing water. If

water pools in the base of the excavation, it should be removed before placing structural fill or reinforcing steel.

- If footing excavations are exposed to extended wet weather conditions, a lean concrete mat or a layer of clean crushed rock can be considered for foundation bearing surface protection.

4.7. Fill Materials

4.7.1. Structural Fill

The workability of material for use as structural fill will depend on the gradation and moisture content of the soil. We recommend that washed crushed rock or select granular fill, as described below, be used for structural fill during the rainy season. If prolonged dry weather prevails during the earthwork phase of construction, materials with a somewhat higher fines content may be acceptable. Weather, material use, schedule, duration exposed, and site conditions should be considered when determining the type of import fill materials purchased and brought to the site for use as structural fill.

Material used for structural fill should be free of debris, organic material, and rock fragments larger than 6 inches. For most applications, we recommend that structural fill material consist of material similar to "Select Borrow" or "Gravel Borrow" as described in Section 9-03.14 of the Washington State Department of Transportation (WSDOT) Standard Specifications.

4.7.2. Select Granular Fill/Wet Weather Fill

Select granular fill should consist of well-graded sand and gravel or crushed rock with a maximum particle size of 6 inches and less than 5 percent fines by weight based on the minus ¾-inch fraction. Organic matter, debris or other deleterious material should not be present. In our opinion, material with gradation characteristics similar to WSDOT Specification 9-03.9 (Aggregates for Ballast and Crushed Surfacing), "Gravel Backfill for Walls" as described in Section 9-03.12(2) of the WSDOT Standard Specifications, or 9-03.14 (Borrow) is suitable for use as select granular fill, provided that the fines content is less than 5 percent (based on the minus ¾-inch fraction) and the maximum particle size is 6 inches.

4.7.3. Pipe Bedding

Trench backfill for the bedding and pipe zone should consist of well-graded granular material similar to "gravel backfill for pipe zone bedding" described in Section 9-03.12(3) of the WSDOT Standard Specifications. The material must be free of roots, debris, organic matter and other deleterious material. Other materials may be appropriate depending on manufacturer specifications and/or local jurisdiction requirements.

4.7.4. Trench Backfill

Trench backfill must be free of debris, organic material and rock fragments larger than 6 inches. We recommend that import trench backfill material consist of material similar to "Select Borrow" or "Gravel Borrow" as described in Section 9-03.14 of the WSDOT Standard Specifications. Where water is present, alternative materials may need to be considered.

4.7.5. Gravel Backfill for Walls

Backfill material used within 5 feet behind retaining walls should consist of free-draining material similar to "Gravel Backfill for Walls" as described in Section 9-03.12(2) of the WSDOT Standard Specifications.

4.7.6. Capillary Break Material

Structural fill placed as capillary break material below on-grade floor slabs should consist of ¾-inch coarse aggregate with negligible sand or silt as described in Section 9-03.1(4)C Grading No. 67 of the WSDOT Standard Specifications. WSDOT Specification 9-03.9 (Aggregates for Ballast and Crushed Surfacing, Crushed Surfacing Base Course [CSBC]) may also be considered.

4.7.7. Crushed Surfacing for Pavements and Sidewalks

Structural fill placed as CSBC below pavements and sidewalks should meet the requirements for Crushed Surfacing Base Course, Section 9-03.9(3) of the WSDOT Standard Specifications.

4.7.8. On-Site Soil

Based on our subsurface explorations and experience, it is our opinion that existing site soils will likely only be suitable for fill in non-structural areas and during periods of extended dry weather. The on-site soils may be considered for use as structural fill and trench backfill, provided they can be adequately moisture conditioned, placed and compacted as recommended and do not contain organic or other deleterious material.

The native glacial till soils at the site are primarily comprised of sandy silt and are extremely moisture sensitive. These soils will be very difficult or impossible to properly compact when wet and we do not recommend they be reused as structural fill during periods of wet weather. In addition, it is possible that existing soils will be generated at moisture contents above what is optimum for compaction. In this case, the soils would need to be moisture conditioned prior to re-use. Space for drying out material during dryer weather or covering on-site materials generated during wet weather should be considered. During wetter or even slightly colder times of year, such as when temperatures get below about 60 degrees, accommodations to cover stockpiled material generated on site that will be used as structural fill should be planned.

If earthwork occurs during a typical wet season, or if the soils are persistently wet and cannot be dried back due to prevailing wet weather conditions, we recommend the use of imported select granular fill, as described above.

4.7.9. Fill Placement and Compaction

To obtain proper compaction, fill soil should be compacted near optimum moisture content and in uniform horizontal lifts. Lift thickness and compaction procedures will depend on the moisture content and gradation characteristics of the soil and the type of equipment used. The maximum allowable moisture content varies with the soil gradation and should be evaluated during construction. Generally, 12-inch loose lifts are appropriate for steel-drum vibratory roller compaction equipment. Compaction should be achieved by mechanical means. During fill and backfill placement, sufficient testing of in-place density should be conducted by a representative of GeoEngineers to check that adequate compaction is being achieved.

4.7.9.1. Area Fills and Pavement Bases

Fill placed to raise site grades and materials under pavements and structural areas should be placed on subgrades prepared as previously recommended. Fill material placed below structures and footings should be compacted to at least 95 percent of the theoretical maximum dry density (MDD) per ASTM International (ASTM) D 1557. Fill material placed shallower than 2 feet below pavement sections should be compacted to at least 95 percent of the MDD. Fill placed deeper than 2 feet below pavement sections should be compacted to at least 90 percent of the MDD. Fill material placed in landscaping areas should be compacted to a firm condition that will support construction equipment, as necessary, typically around 85 to 90 percent of the MDD.

4.7.9.2. Backfill Behind Below-Grade Structures

Backfill behind retaining walls or below-grade structures should be compacted to between 90 and 92 percent of the MDD. Overcompaction of fill placed directly behind below-grade structures should be avoided. We recommend use of hand-operated compaction equipment and maximum 6-inch loose lift thickness when compacting fill within about 5 feet behind below-grade structures.

4.7.9.3. Trench Backfill

For utility excavations, we recommend that the initial lift of fill over the pipe be thick enough to reduce the potential for damage during compaction, but generally should not be greater than about 18 inches above the pipe. In addition, rock fragments greater than about 1 inch in maximum dimension should be excluded from this lift.

Trench backfill material placed below structures and footings should be compacted to at least 95 percent of the MDD. In paved areas, trench backfill should be uniformly compacted in horizontal lifts to at least 95 percent of the MDD in the upper 2 feet below subgrade. Fill placed below a depth of 2 feet from subgrade in paved areas must be compacted to at least 90 percent of the MDD. In non-structural areas, trench backfill should be compacted to a firm condition that will support construction equipment, as necessary.

5.0 LIMITATIONS

We have prepared this report for City of Mercer Island Public Works, for the Luther Burbank Park Upland Improvement Project. City of Mercer Island Public Works may distribute copies of this report to owner and owner's authorized agents and regulatory agencies as may be required for the Project.

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

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

FIGURES

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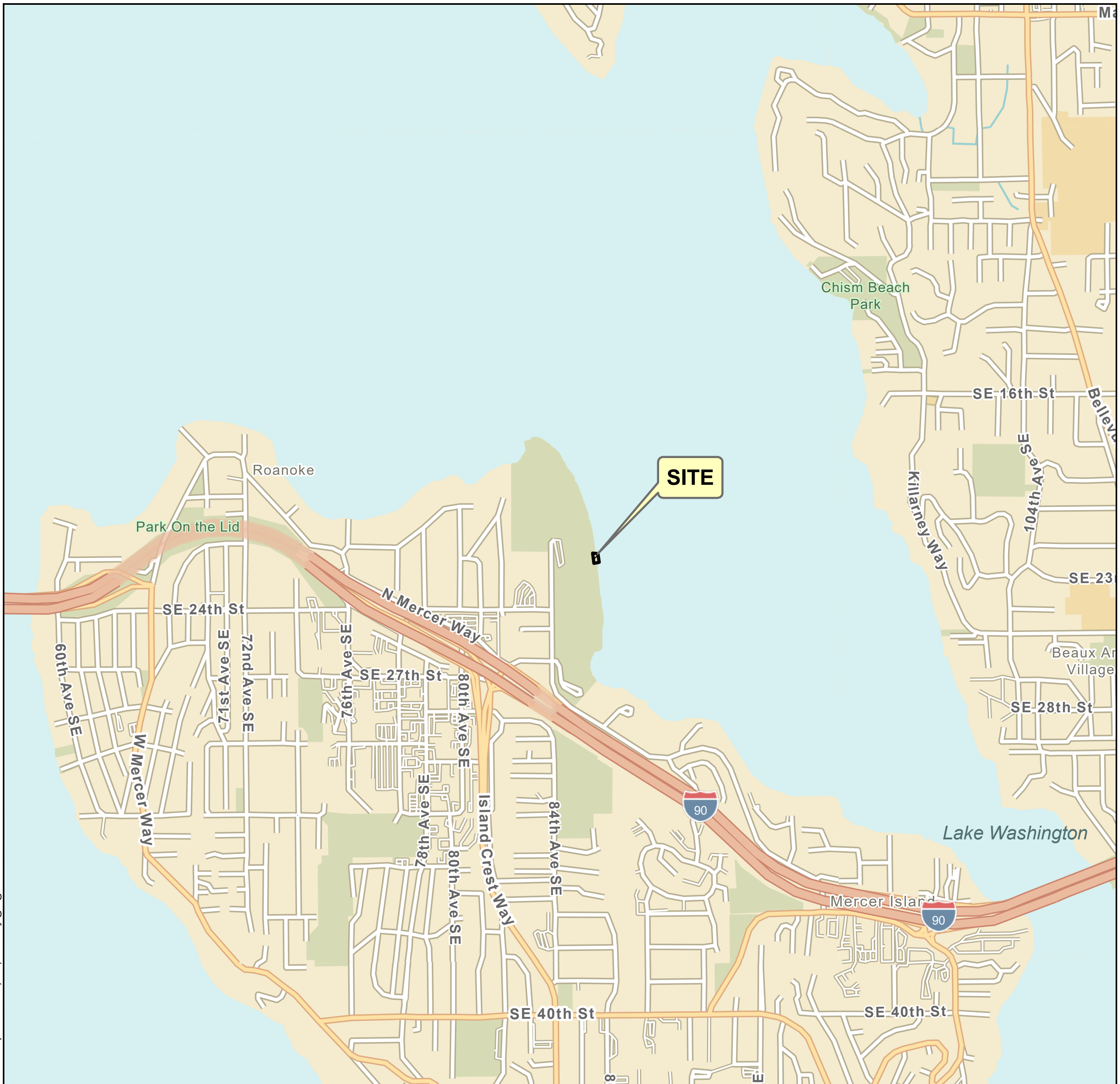

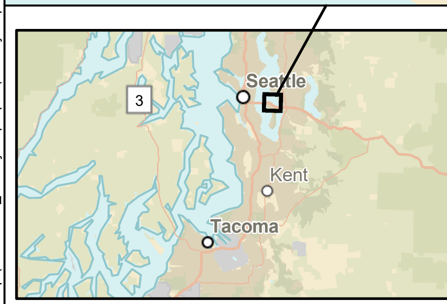

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Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content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

Data Source: ESRI

Projection: NAD 1983 UTM Zone 10N

Vicinity Map

Luther Burbank Park Upland Improvements
Mercer Island Washington

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Figure 1

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Legend

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

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

Data Source: Aerial from Google Earth Pro dated 08/14/2020.

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

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Site Plan

Luther Burbank Park Upland Improvements
Mercer Island Washington

GeoEngineers

Figure 2

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APPENDICES

GeoEngineers

APPENDIX A
Subsurface Explorations and Laboratory Testing

APPENDIX A
SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

Subsurface Explorations

General

Soil conditions at the project site were explored by advancing three borings on April 1, 2022. The approximate locations of our explorations and shown on Figure 2. The explorations were located in the field using a GPS device. The locations of the explorations shown on the Site Plan (Figure 2) should be considered approximate.

Soil Borings

Soil borings were advanced to between 11 feet and 13.5 feet below ground surface (bgs) using a track-mounted hollow-stem auger drill rig equipment and operators under subcontract to GeoEngineers. The explorations were continuously monitored by a representative from our firm who examined and classified the soil encountered, obtained representative soil samples, and maintained a detailed log of the explorations. Soil encountered in the borings was classified in general accordance with ASTM International (ASTM) D 2488 and the classification chart listed in Key to Exploration Logs, Figure A-1. Logs of the borings are presented in Figures A-2 through A-4. The logs are based on interpretation of the field and laboratory data and indicate the depth at which we interpret subsurface materials or their characteristics to change, although these changes might actually be gradual.

Soil samples were obtained from the borings at approximate 2.5- to 5-foot-depth intervals using either a 2-inch, outside-diameter, standard split-spoon sampler (Standard Penetration Test [SPT]) in general accordance with ASTM D 1586 or using a larger 2.4-inch-diameter sampler. The samplers were driven into the soil using a 140-pound rope and cathead hammer, free-falling 30 inches. The number of blows required to drive the samplers each of three, 6-inch increments of penetration were recorded in the field. The sum of the blow counts for the final 12 inches of penetration, unless otherwise noted, is reported on the boring logs.

Laboratory Testing

Soil samples obtained from the borings and test pits were returned to our laboratory for further examination and testing. The testing completed on each sample is presented in the corresponding boring log or test pit log.

Grain-size analyses were performed on selected soil samples in general accordance with ASTM Test Method D 6913. This test provides a quantitative determination of the distribution of particle sizes in soils. Figure A-5 presents the results of the grain-size analyses.

SOIL CLASSIFICATION CHART

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

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

ADDITIONAL MATERIAL SYMBOLS

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

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

Sampler Symbol Descriptions

- 2.4-inch I.D. split barrel / Dames & Moore (D&M)
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab
- Continuous Coring

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

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

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

Laboratory / Field Tests

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

Sheen Classification

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

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

Key to Exploration Logs

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Figure A-1

Drilled	Start 4/1/2022	End 4/1/2022	Total Depth (ft) 13.5	Logged By LSP / Checked By BEL	Driller Geologic Drill Technologies	Drilling Method Hollow-stem Auger

Surface Elevation (ft) / Vertical Datum	23 / NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Mini Track Rig
Easting (X) / Northing (Y)	1297163 / 218603	System Datum	WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0				ML	Dark brown sandy silt with organics (stiff, moist) (sod)			
					ML	Gray sandy silt with occasional oxidation staining (hard, moist) (glacial till)			
20		18	34	1 / SA			13	67	
	5	18	55	2					
15		11	50/5"	3					
					SM	Gray silty fine sand (very dense, moist)			
	10	6	50/6"	4					
		18	71	5 / SA	ML	Gray silt with sand (hard, moist)	16	74	
		18	86	6					
10									

Practical drilling refusal at 13½ feet

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Esri Survey. Vertical approximated based on Project Survey.

Log of Boring B-1

GeoEngineers

Project: Luther Burbank Park Upland Improvements
Project Location: Mercer Island, Washington
Project Number: 0817-024-01

Figure A-2
Sheet 1 of 1

Drilled	Start 4/1/2022	End 4/1/2022	Total Depth (ft)	11	Logged By LSP, Checked By BEL	Driller	Geologic Drill Technologies	Drilling Method	Hollow-stem Auger

Surface Elevation (ft) / Vertical Datum	20 / NAVD88	Hammer Data	Rope & Cathead / 140 (lbs) / 30 (in) Drop	Drilling Equipment	Mini Track Rig
Easting (X) / Northing (Y)	1297149 / 218583	System Datum	WA State Plane South / NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							ML	Dark brown sandy silt with organics (stiff, moist) (sod)			
								ML	Gray silt with sand and occasional gravel (hard, moist) (glacial till)			
			18	65		1 / SA				14	71	
15	5		18	58		2						
			17	75/11"		3						
10	10			50/6"		4						

Practical drilling refusal at 11 feet

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Esri Survey. Vertical approximated based on Project Survey.

Log of Boring B-2

GEOENGINEERS

Project: Luther Burbank Park Upland Improvements
Project Location: Mercer Island, Washington
Project Number: 0817-024-01

Figure A-3
Sheet 1 of 1

Drilled	Start 4/1/2022	End 4/1/2022	Total Depth (ft)	11.5	Logged By LSP Checked By BEL	Driller Geologic Drill Technologies	Drilling Method Hollow-stem Auger

Surface Elevation (ft) Vertical Datum	20 NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Mini Track Rig
Easting (X) Northing (Y)	1297142 218689	System Datum	WA State Plane South NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							CC	Approximately 6 inches concrete			
			12	14		1		SP-SM	Approximately 4 inches gray fine to coarse sand with silt (medium dense, moist) (base course)			
								ML	Gray sandy silt with gravel (stiff, moist) (fill)			
			15	WOH		2						No sheen, slight odor
									Becomes wet			Perched groundwater observed at approxiamtely 3 feet during drilling
15	5		16	46		3						Slight sheen, slight odor
								ML	Light brown sandy silt (hard, moist) (glacial till)			
			18	60		4						No sheen, no odor
10	10		16	60		5						No sheen, no odor

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Esri Survey. Vertical approximated based on Project Survey.

Log of Boring B-3

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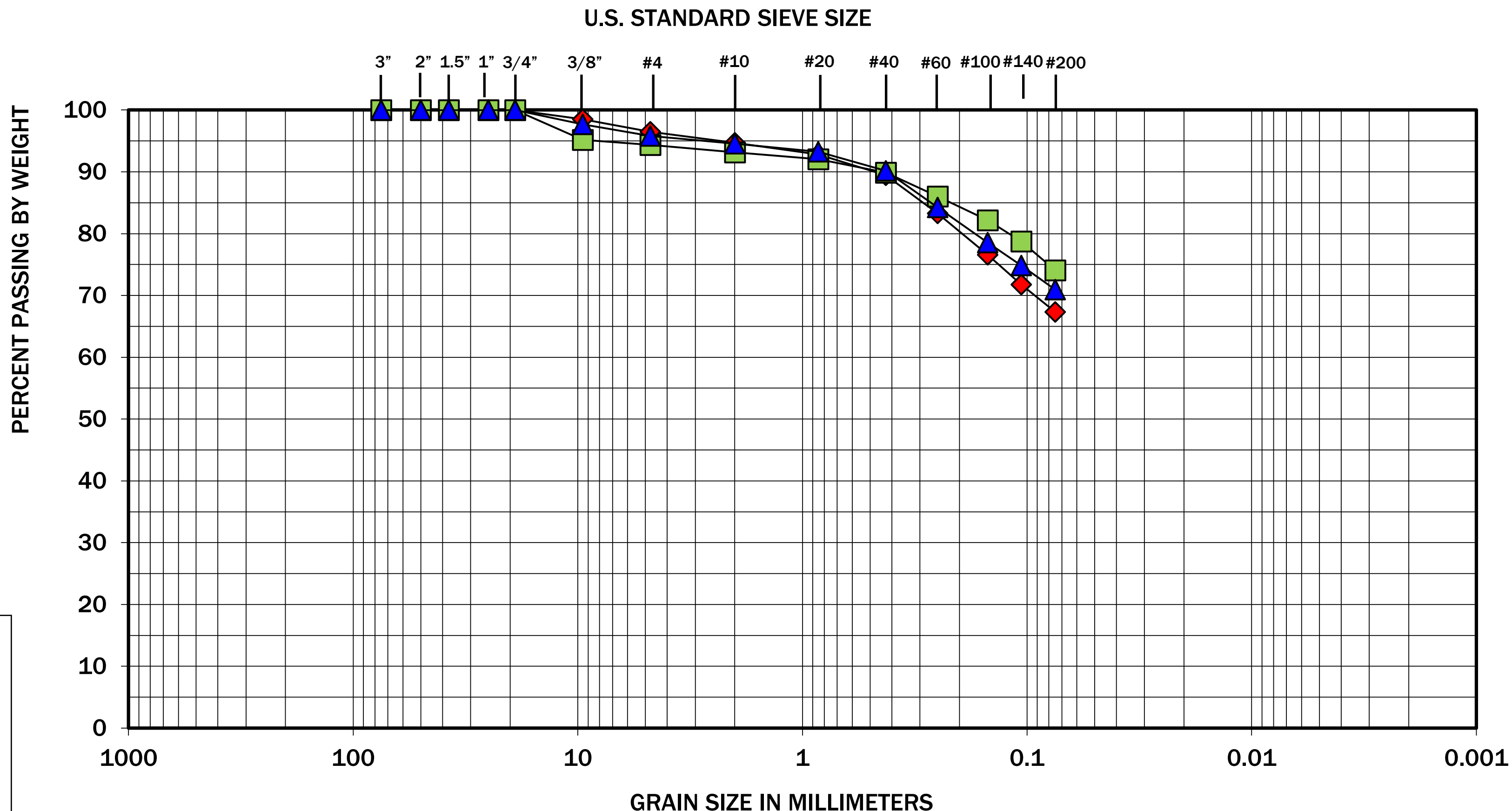
Project: Luther Burbank Park Upland Improvements
Project Location: Mercer Island, Washington
Project Number: 0817-024-01

Figure A-4
Sheet 1 of 1

0817-024-01 Date Exported: 4/11/2022



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-1	2.5	13	Sandy silt (ML)
■	B-1	10.5	16	Silt with sand (ML)
▲	B-2	2.5	14	Silt with sand (ML)

AASHTO ACCREDITED

The grain size analysis results were obtained in general accordance with ASTM C 136. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

GEOENGINEERS

Luther Burbank Park Upland Improvements
Mercer Island, Washington

Sieve Analysis Results

Figure-A-5

APPENDIX B
Report Limitations and Guidelines for Use

APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

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

Read These Provisions Closely

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

Geotechnical Services are Performed for Specific Purposes, Persons and Projects

This report has been prepared for City of Mercer Island Public Works and for the Project(s) specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with City of Mercer Island Public Works dated January 4, 2022 and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

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

This report has been prepared for the Luther Burbank Upland Improvements Project in Mercer Island, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

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

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

- the function of the proposed structure;

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

- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

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

Environmental Concerns are Not Covered

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

Information Provided by Others

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

Subsurface Conditions Can Change

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

Geotechnical and Geologic Findings are Professional Opinions

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

Geotechnical Engineering Report Recommendations are Not Final

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

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

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

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

Do Not Redraw the Exploration Logs

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

Give Contractors a Complete Report and Guidance

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

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

Contractors are Responsible for Site Safety on Their Own Construction Projects

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

Biological Pollutants

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

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

Appendix D
Geotechnical Report for Dock Improvements

Geotechnical Engineering Services

Luther Burbank Park Dock Repair
Mercer Island, Washington

for
KPFF Consulting Engineers

June 30, 2022

GeoEngineers
Earth Science + Technology

Geotechnical Engineering Services

Luther Burbank Park Dock Repair
Mercer Island, Washington

for
KPFF Consulting Engineers

June 30, 2022

GeoEngineers

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Geotechnical Engineering Services

Luther Burbank Park Dock Repair
Mercer Island, Washington

File No. 0817-024-02

June 30, 2022

Prepared for:

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APPENDICES

1.0 INTRODUCTION AND PROJECT UNDERSTANDING

This report presents the results of our geotechnical engineering services for the Luther Burbank Park Dock Repair project. The project site is located at 2040 84th Avenue SE in Mercer Island, Washington. Our understanding of the project is based on our communications with Andrew Bennett (KPFF Consulting Engineers [KPFF]) and information provided including the 60 percent dock improvement plans dated June 13, 2022 and the plans for the original dock dated April 26, 1973 (1973 Plans).

We understand that portions of the existing moorage pier and floating docks at the park will be removed, and new floating dock segments secured in place using driven piles will be installed. We understand that 24-inch and 16-inch diameter steel pipe piles will be used to secure the docks. In additional to the dock improvements, a new overwater staircase is proposed along the existing shoreline bulkhead. We understand that the existing bulkhead will not be substantially modified as part of installing the overwater stairs and new docks. We understand that the staircase will be supported on either 6- to 8-inch diameter steel pipe piles.

Onshore improvements around the existing boiler plant building are also proposed at the site. GeoEngineers prepared a draft geotechnical report (dated April 26, 2022) to support the onshore improvements. These services are being provided under a separate contract with the City of Mercer Island.

2.0 SCOPE OF SERVICES

The purpose of our services was to review available existing subsurface information and complete hand-tool explorations at the site as a basis for providing geotechnical recommendations for design and construction. Our services were completed in accordance with our signed agreement dated May 26, 2020 and amended on June 1, 2022. Our specific scope of services is summarized in our proposal dated March 23, 2020.

3.0 SITE CONDITIONS

3.1. Surface Conditions

The project site is located on the shoreline of Lake Washington approximately in the geographical center of the parks' shoreline frontage. In the area of the dock the upland shoreline is developed with a concrete and brick sidewalk and a historic brick boiler plant building that has been converted into a restroom and park equipment storage area. An approximately 200-foot-long concrete bulkhead is located along the shoreline in front of the boiler plant.

The existing floating docks and moorage pier are accessed via the bulkhead area and extend approximately 250 feet out from the shoreline. The pier is supported on timber piles with top diameters on the order of 12 inches and butt diameters on the order of 8 inches as indicated in the 1973 plans.

3.2. Subsurface Conditions

3.2.1. Literature Review

We reviewed the Geologic Map of King County (2007). According to the map the project site is underlain by glacial till (Qvt). Glacial till is typically comprised of a mixture of sand, gravel, and cobbles in a silt matrix. Glacial till soils were consolidated by the weight of the overriding glacier and are typically dense to very dense.

The 1973 plans included data from four test piles driven as part of the pier construction. The test piles were embedded between 15 and 17 feet below mudline using a 3,450 pound drop hammer. End of drive blow counts for the test piles ranged between 10 and 16 blows per foot. The 1973 plans indicate that the soils encountered during the test pile program were interpreted to be "blue clay and cemented glacial till…"

We also reviewed the subsurface exploration logs completed to support the onshore improvements project. The locations of these explorations are shown on the Site Plan, Figure 1 and the exploration logs are included in Appendix A for reference. In these explorations very dense glacial till was encountered starting within about 1 foot of the ground surface with the exception of B-3, which was advanced in the vicinity of a relic underground storage tank. In B-3 about 7 feet of fill associated with the tank was observed on top of very dense glacially consolidated soils.

3.2.2. Subsurface Explorations

As part of our study, we advanced three dynamic cone penetrometer (DCP) test explorations from the existing pier. The locations of the DCP explorations are shown on the Site Plan, Figure 2. The DCP explorations extended between 2 and 2½ feet below mudline. No soil samples are obtained during DCP testing, therefore, our understanding of subsurface conditions in the offshore area of the site is based on the measured DCP penetration rates, reviewed information, and our experience.

3.2.3. Subsurface Conditions

Measured water depths ranged from about 14 feet to 24 feet at the locations of our DCP explorations.

The DCP explorations extended 2 to 2½ feet below mudline. Plots of the estimated Standard Penetration Test (SPT) "N" value versus depths for each DCP exploration is shown on Figure 3. The SPT values presented are based on published correlations between DCP pentation rate and SPT N values.

Based on the measured driving resistance, our observations, and our understanding of the site geology we encountered what we interpret to be lake sediments underlain by weathered glacially consolidated soil in our DCPs. The thickness of the lake sediments at the DCP locations appears to be on the order of 1 to 2 feet. The lake sediments were penetrated with the tip of the DCP under the weight of the rods (zero blow counts) or with a few blows of the DCP drop hammer. We expect the lake soils likely consist of a mixture of soft organic material, loose sand, and soft silt. The thickness of the lake sediments are expected to vary across the site. Due to the relative steepness of the lakebed in the project area, it appears unlikely that thick layers of lake sediments would collect with the project boundaries, however small depressions in the lakebed could locally collect more loose sediments than other steeper areas. To account for the uncertainty in the thickness of this layer, we recommend assuming that there is at least a 5-foot layer of lake sediments when designing the piles. In our opinion this is conservative with regards to piles design and prudent, given then limited explorations completed for this study.

DCP penetration resistance generally increased with depth when the weathered glacially consolidated soils were encountered. We expect that these soils are comprised of medium dense to dense soil similar to the glacially consolidated soils observe in the upland areas. We expect that the weathered zone of the glacially consolidated soils is on the order of 5 to 10 feet thick and is underlain by intact glacially consolidated soil.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1. Seismic Design

4.1.1. Seismic Design Parameters

The table below provides seismic design parameters developed in accordance the 2018 International Building Code (IBC) which references American Society of Civil Engineers (ASCE) 7-16. The project site is underlain by dense to very dense glacially consolidated soils and we recommend using a response spectrum for Site Class C for this site.

TABLE 1. SEISMIC DESIGN PARAMETERS 2018 IBC

2018 IBC Seismic Design Parameters	
Spectral Response Acceleration at Short Periods (S_S)	1.388g
Spectral Response Acceleration at 1-Second Periods (S_1)	0.482g
Site Class	C
Site Modified Peak Ground Acceleration (PGA_M)	0.712g
Design Spectral Response Acceleration at Short Periods (SD_S)	1.11g
Design Spectral Response Acceleration at 1-Second Periods (SD_1)	0.483g

4.1.2. Liquefaction, Lateral Spreading and Surface Rupture

Liquefaction refers to a condition where vibration or shaking of the ground, usually from earthquake forces, results in development of excess pore pressures and subsequent loss of strength in the affected soil deposit. In general, soils that are susceptible to liquefaction include loose to medium dense “clean” to silty sands that are below the water table.

Based on the soil conditions observed in our explorations and our understanding of the site geology, in our opinion it is unlikely that there are potentially liquefiable soils present at the project site and there is a low risk of significant liquefaction occurring during the seismic design event.

Lateral spreading related to seismic activity typically involves lateral displacement of large, surficial blocks of non-liquefied soil when an underlying soil layer loses strength during seismic shaking. Lateral spreading usually develops in areas where sloping ground or large grade changes (including retaining walls) are present. Due to the low liquefaction risk at the site, in our opinion there is also a low risk of lateral spreading occurring at this site.

According to the Department of Natural Resources Seismic Hazards Map, the project site is in the vicinity of the Seattle Fault zone. However, because bedrock in this area is covered by hundreds of feet of glacial soils, it is unlikely that movement of the fault would result in significant surface rupture at the ground surface.

4.2. Dock Piles

4.2.1. General

Based on information provided by KPFF, 24-inch diameter by 0.625 inch wall (24 x 0.625 -inch) and 16 x 0.625-inch wall open ended steel pipe piles will be installed to secure the new docks. We understand that the 24-inch diameter piles will be embedded around 28 feet below mudline and the 16-inch diameter piles will be installed around 20 feet below mudline. Design and construction recommendations for the dock piles are provided in the sections below.

4.2.2. Soil Properties for Lateral Pile Analysis

We understand that KPFF will be evaluating lateral pile performance using the software program LPILE (Ensoft 2016). We recommend that the soil profile and properties in Table 2 be used for static evaluation of the piles. We expect that some strain softening of the site soils could occur during seismic shaking, however strain softening is expected to be negligible within the glacially consolidated soil units. In our opinion the static parameters presented below can also be used for evaluating pseudo-static conditions. If piles are spaced at least six pile diameters on center, no reduction of lateral capacity for group action is needed.

Due to the uncertainty of the subsurface profile at the site we recommend evaluating a range of contacts between the units to establish a critical or controlling case.

TABLE 2. SOIL PROPERTIES FOR LATERAL PILE ANALYSES

Soil Unit	Anticipated Top of Unit (feet below mudline)	Anticipated Bottom of Unit (feet below mudline)	LPile Soil Type	Effective Unit Weight (pcf)	Friction Angle (Ø) or Cohesion (c)	Stiffness (K) or Strain Factor (E50)
Lake Sediments	Mudline	5	Soft Clay (Matlock)	58	c = 200 psf	E50 =20
Weathered Glacially Consolidated Soils	5	10	Sand (Reese)	63	Ø = 32°	K= 100 pci
Glacially Consolidated Soil	10	Extent of analysis	Sand (Reese)	68	Ø = 38°	K= 125 pci

4.2.3. Axial Pile Resistance

Figure 4 and Figure 5 present our estimate of ultimate and allowable pile axial pile resistance for the 16-inch and 24-inch diameter open ended pipe piles, respectively. The provided axial resistances are based on unplugged soil conditions, which in our opinion, is conservative with regards to pile design. The allowable resistances include a minimum factor of safety of about 1.5 for side friction and end bearing, and 2.0 for uplift. The allowable resistances apply to single piles. If piles are spaced at least three pile diameters on center, no reduction of axial capacity for group action is needed.

We expect that axial loads on the dock piles will be relatively modest and that the piles will achieve the needed allowable resistances at shallow embedment depths into the glacially consolidated soils. Additional embedment into the glacially consolidated soils beyond what is needed for axial resistance will likley be required for lateral fixity. This will necessitate overdriving the piles to achieve the minimum pile tip elevations. The additional driving could produce a soil plug in the tip of the pile, further increasing the driving resistance. Table 3 provides an estimate of pile overdrive resistance at the anticipated pile embedment depths provided by KPFF. The reported overdrive resistances in Table 3 are ultimate resistances that could occur and are provided for reference and evaluating pile installation. The overdrive resistances should not be used for design of the piles.

TABLE 3: ESTIMATED PILE OVERDRIVE RESISTANCE

Pile Size	Pile Embedment Depth (feet below mudline)	Anticipated Total Overdrive Resistance
24'' x 0.625''	28	Unplugged: 160 kips Plugged: 850 kips
16'' x 0.625''	20	Unplugged: 70 kips Plugged: 330 kips

4.2.4. Pile Installation Considerations

4.2.4.1. Anticipated Driving Conditions and Hammer Selection

We expect that soft or loose lake deposit soils will be present near the mudline at the start of driving and that driving resistance will rapidly increase as the piles encounter and are driven into the glacially consolidated soils. Zones of coarse gravels and cobbles should be expected. Boulders, if encountered, may obstruct the installation of piles in the planned location. If a boulder is encountered at depth, it may be necessary to use a sacrificial reinforced H-pile or other pile as a "spud" in an attempt to move or break up the boulder before advancing the production pile. Alternatively, relocating the proposed pile may need to be considered. The contractor performing the work should be made aware of the anticipated driving conditions and should be prepared to deal with these conditions during construction.

We anticipate that a vibratory hammer will be the preferred installation method for the piles. However, based on the soil conditions at the site and our experience we anticipate that a combination of vibratory and impact driving could be required to achieve required embedment depths. Alternatively, the pile could be driven using an impact hammer only.

Advancing piles into glacially consolidated soils with a vibratory hammer can be difficult. Based on our experience we expect that a vibratory hammer could be capable of installing the open-ended steel pipe piles about 10 to 20 feet into glacially consolidated soils. The actual embedment depth that can be achieved with a vibratory hammer will depend on the size of the hammer used, the length of the pile and the subsurface conditions encountered at the installation location.

The size of vibratory hammer required to install the pile will depend on the length of the pile and the conditions encountered. To advance the pile, vibratory hammers must mobilize or "excite" the mass of the hammer-pile combination. The heavier the hammer-pile combination, the more energy required to excite the system. A rough estimate of the minimum vibratory hammer size required to vibrate the pile-hammer combination can be made using the American Pile Driving Equipment (APE) Amplitude Equation. The amplitude equation is a relatively simple calculation and does not consider embedment depth, soil conditions or pile type (i.e., open ended or closed ended). Based on our calculations using the amplitude equation we expect that at least an APE 50 (eccentric moment = 1,300 in-lbs.) would be necessary to vibrate a 50-foot-long, 24- x 0.625-inch pipe pile. However, given anticipated soil conditions, a larger vibratory hammer would likley be necessary to advance the piles a significant distance into the glacially consolidated soils. The APE 200 hammer (eccentric moment = 4,400 in-lbs) is commonly used in the region to install steel pipe piles into glacially consolidated soils. We expect that a hammer of this size is more appropriately sized for driving the 24-inch diameter piles, but may be oversized, and could damage, the 16-inch diameter piles during driving. Pile damage during vibratory installation typically occurs at the top of the pile and can be remedied by removing or “fresh heading” the damaged section after installation.

If a vibratory hammer is not capable of installing the pile to the design embedment depth, use of an impact hammer will likely be necessary. Similarly, if a soil plug were to form during installation, we expect that a vibratory hammer may not be capable of installing the pile. In our experience the 16- and 24- inch-diameter are at a relatively high risk of plugging, especially during impact driving.

We completed a preliminary pile drivability analysis using the software program GRLWEAP to evaluate minimum impact hammer sizes that will likley be necessary to install the envisioned piles. Considering the range of overdrive resistances presented in Table 3, we anticipate that an impact hammer with a minimum rated energy between 60 and 80 kip-feet will likely be suitable for installing the 24-inch diameter piles and an impact hammer with a minimum rated energy between 30 and 50 kip-feet will likely be suitable for installing the 16-inch diameter piles. Note that these are minimum hammer energy ranges. Larger hammers than what are estimated for each piles’ size could also be acceptable, however pile driving stresses will need to be evaluated to determine if larger hammers will damage the piles during installation. Two different sized hammers, or a single hammer with variable energy settings, could be required for pile installation on the project.

Ultimately, the hammers used to install the piles should be evaluated and selected by the contractor performing the work. We recommend that the contractor performing the work submit a pile installation plan, which at a minimum should include:

- A proposed vibratory hammer size.
- A proposed impact hammer size and a pile drivability analysis considering the hammer-pile driving configuration. The pile drivability analysis should evaluate the driving stresses that could occur during installation and the calculated driving stresses from the drivability analysis should be compared to the allowable driving stresses for the pile. Typically, driving stresses in steel piles should be limited to 90 percent of the steel yield strength. Ultimately, anticipated pile driving stresses should be reviewed by a structural engineer.
- A contingency plan for advancing the pile to the design embedment depth if refusal with a vibratory hammer is encountered.
- A plan for advancing piles through zones of coarse gravels and cobbles, and a proposed plan for dealing with boulders, should they be encountered.

4.2.4.2. Additional Considerations

An approximation of axial pile capacity can be made during impact driving by monitoring hammer blows versus penetration distance and observing hammer stroke height. It is not possible to accurately correlate pile capacity to penetration rate when piles are installed using vibratory hammers. Often, piles installed using a vibratory hammer will be “proofed” using an impact hammer once the pile is near or at the design tip elevation in order to approximate pile capacity. In our opinion this pile proofing is not necessary if the minimum pile embedment depth is controlled by lateral loading. We recommend that we be allowed to review the design pile embedment depth and loads once they are finalized so we can provide a final recommendation on the need for pile axial capacity verification.

4.3. Overwater Staircase Piles

4.3.1. Axial Resistance

We understand that 6-inch to 8-inch diameter steel pipe piles will be used to support the proposed overwater staircase. Smaller diameter piles are often installed using pneumatic impact hammers that can mounted to excavators.

Table 4 below provides recommended allowable pile resistances for 6- and 8-inch-diameter piles. The allowable resistances include a factor of safety of around 2. Typically, small diameter piles driven to a specified penetration rate that corresponds to an estimated allowable pile resistance. The estimated penetration rates that correspond to the provided pile resistances are also provided in Table 3.

TABLE 4. PILE AXIAL RESISTANCE

Pile Diameter (D) and Wall Thickness (T)	Allowable Pile Resistance (kips)	Pile Penetration Rate at Allowable Pile Resistance 2,000 lb. hammer	Pile Penetration Rate at Allowable Pile Resistance 3,000 lb. hammer	Pile Penetration Rate at Allowable Pile Resistance 5,000 lb. hammer
D = 6 inches T = 0.28 inches	15	10	6 sec/in	4 sec/in
D = 8 inches T = 0.322 inches	25	Larger hammer recommended	10 sec/in	8 sec/in

4.3.2. Lateral Pile Analysis

In our opinion the LPILE parameters provided previously for the dock piles are also appropriate for evaluating the overwater staircase piles. For 6-inch and 8-inch diameter piles, lateral group effects do not need to be considered for piles spaced more than six diameters apart (center-to-center) in the direction of loading. We should be notified if piles will be spaced closer than six diameters apart and can provide recommendations for appropriate P-Multipliers, if requested.

4.3.3. Pile Installation Considerations

We recommend that the piles be embedded at least 5 feet into intact glacially consolidated soils. Ultimately, the target pile embedment depth should be determined based on the results of the lateral pile analysis and the penetration rates observed during pile installation.

We expect that soft or loose lake deposit soils will be present near the mudline at the start of driving and that driving resistance will rapidly increase as the piles encounter and are driven into the glacially consolidated soils. Zones of coarse gravels and cobbles should be expected within the glacially consolidated soils. Boulders, if encountered, may obstruct the installation of piles in the planned location. If a boulder is encountered at depth, it may be necessary to use a sacrificial pile to move or break up the boulder before advancing the production pile. Alternatively, relocating the proposed pile may need to be considered. The contractor performing the work should be made aware of the anticipated driving conditions and should be prepared to deal with these conditions during construction.

The contractor performing the work should be made responsible for selecting the hammer and equipment necessary to install the piles. We recommend that the contractor submit a pile installation plan, which at a minimum should include:

- Proposed hammer type and size;
- Pile driving refusal criteria; and
- A plan for advancing piles through zones of coarse gravels and cobbles, and a proposed plan for dealing with boulders, should they be encountered.

In our experience, to make material transportation and handling easier, smaller diameter piles are typically installed in 20-foot sections that are connected using a compression coupler. If a compression coupler system is used, the connection points should also be welded.

Because the piles will be installed into soils that contain gravels and cobbles, we recommend that the piles be constructed using high strength steel. Even if the piles are constructed of high strength steel, the small diameter piles will have relatively thin walls that can be damaged when driven into coarse-grained soils. In our opinion piles with a wall thickness less than about ¼ inch have a relatively high risk of damage during installation and piles with a wall thickness greater than ⅜ inch have a lower risk of damage during installation.

5.0 LIMITATIONS

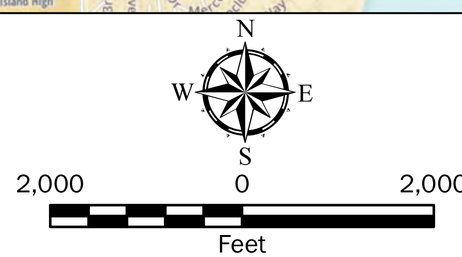
We have prepared this report for KPFF Consulting Engineers, for the Luther Burbank Park Dock Repair Project. KPFF may distribute copies of this report to owner and owner's authorized agents and regulatory agencies as may be required for the Project.

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

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

FIGURES

GeoEngineers



Vicinity Map

Luther Burbank Park Dock Repair
Mercer Island, Washington

GEOENGINEERS

Figure 1

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

Data Source: Mapbox Open Street Map, 2016

Projection: NAD 1983 UTM Zone 10N

Legend

B-1 Boring by GeoEngineers, Inc., 2022

DCP-1 DCP Location by GeoEngineers, Inc., 2020

Notes:

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

Data Source: Aerial from Google Earth Pro dated 08/14/2020.

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

N
W E
S

60 0 60
Feet

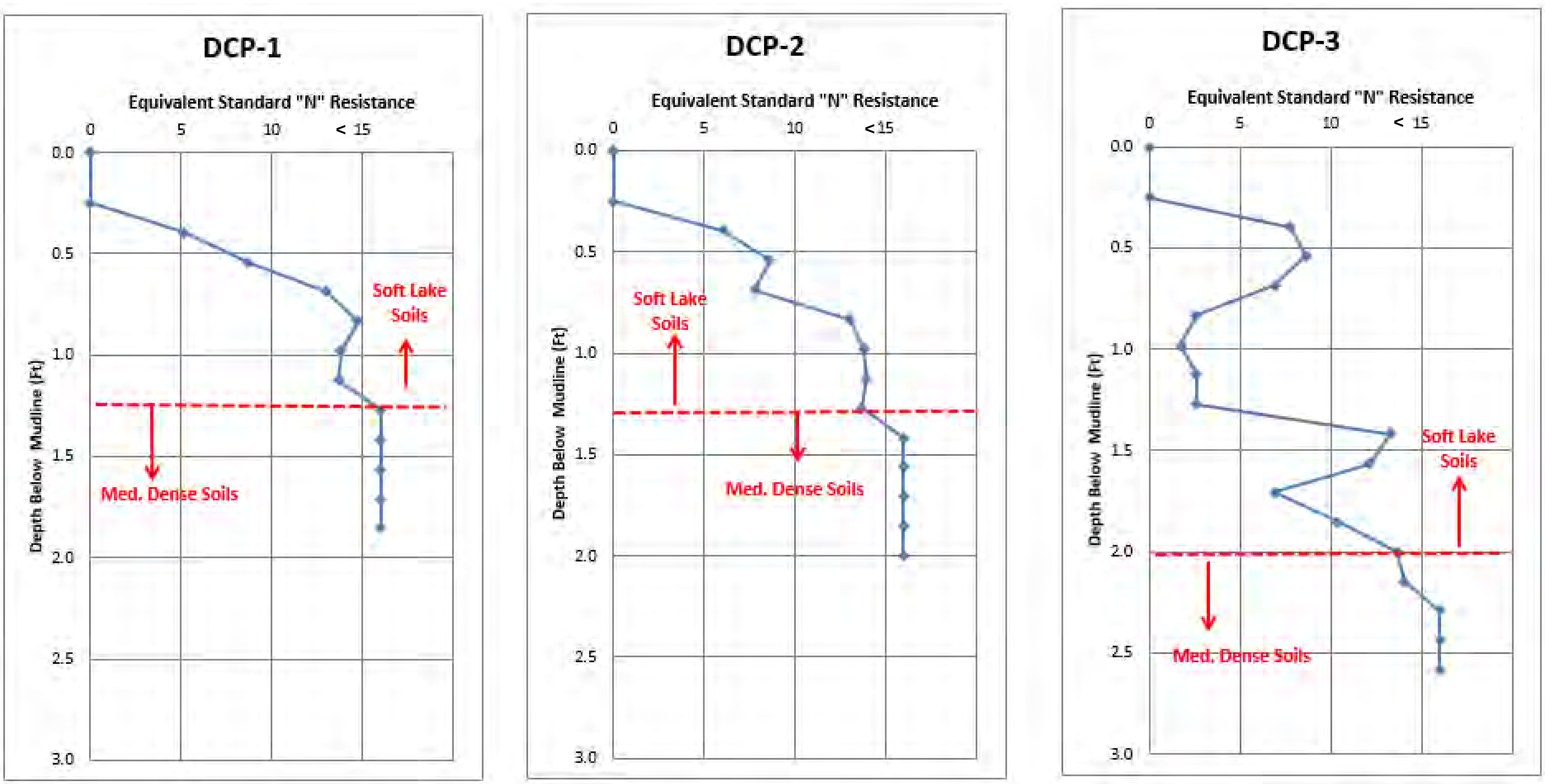
Site Plan

Luther Burbank Park Upland Improvements
Mercer Island Washington

GEOENGINEERS

Figure 2

\\geoengineers.com\WAN\Projects\0\0817024\CAD\00\Geotech Report\081702400_F02_Site Plan.dwg TAB:F02 Date Exported: 06/09/22 - 13:58 by tbyrd



DCP Logs

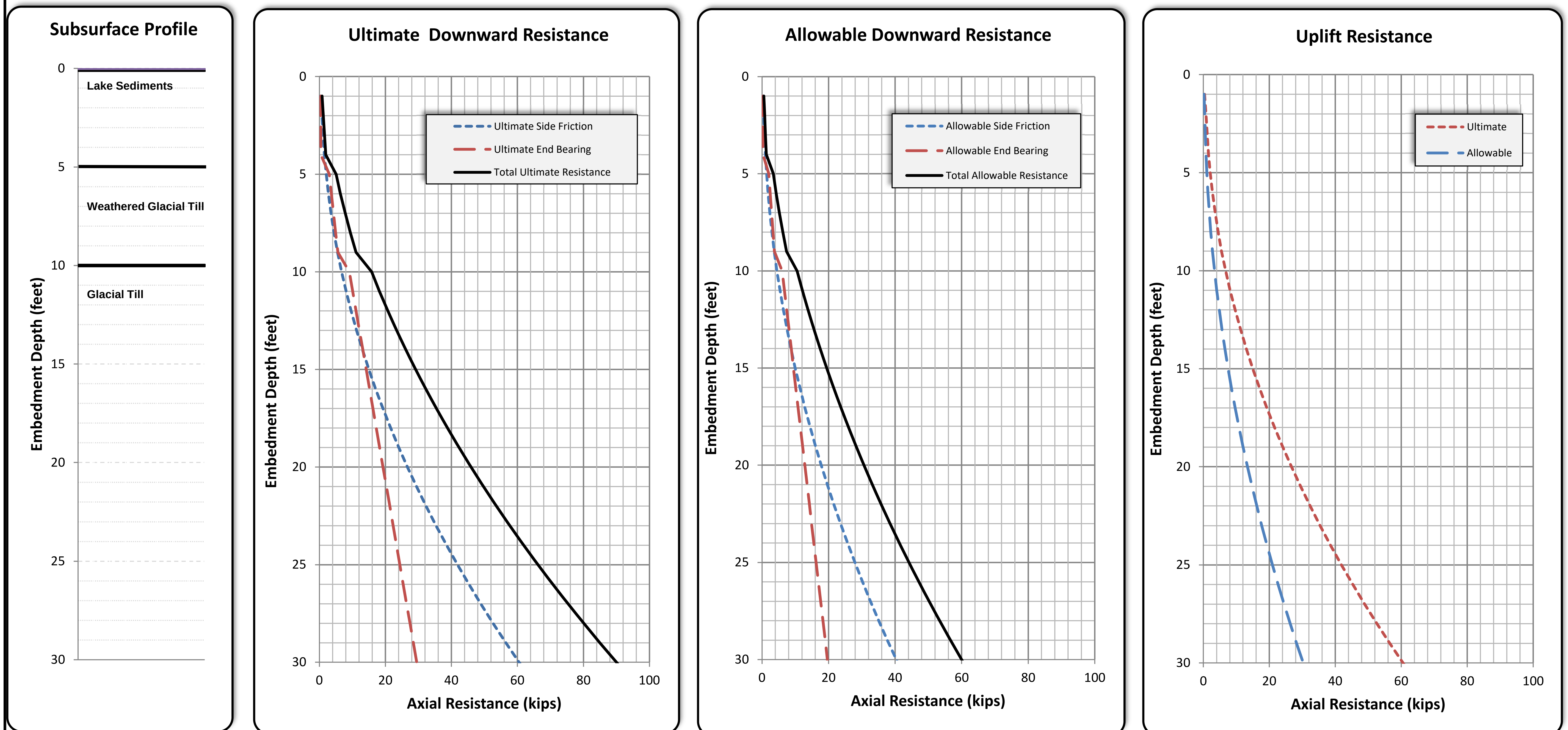
Luther Burbank Park Dock Repair
Mercer Island, Washington

GeoEngineers

Figure 3

AXIAL PILE RESISTANCE

16 x 0.625-inch Open-End Steel Pipe Pile



Axial Pile Resistance

Luther Burbank Park Dock Repair
Mercer Island, Washington

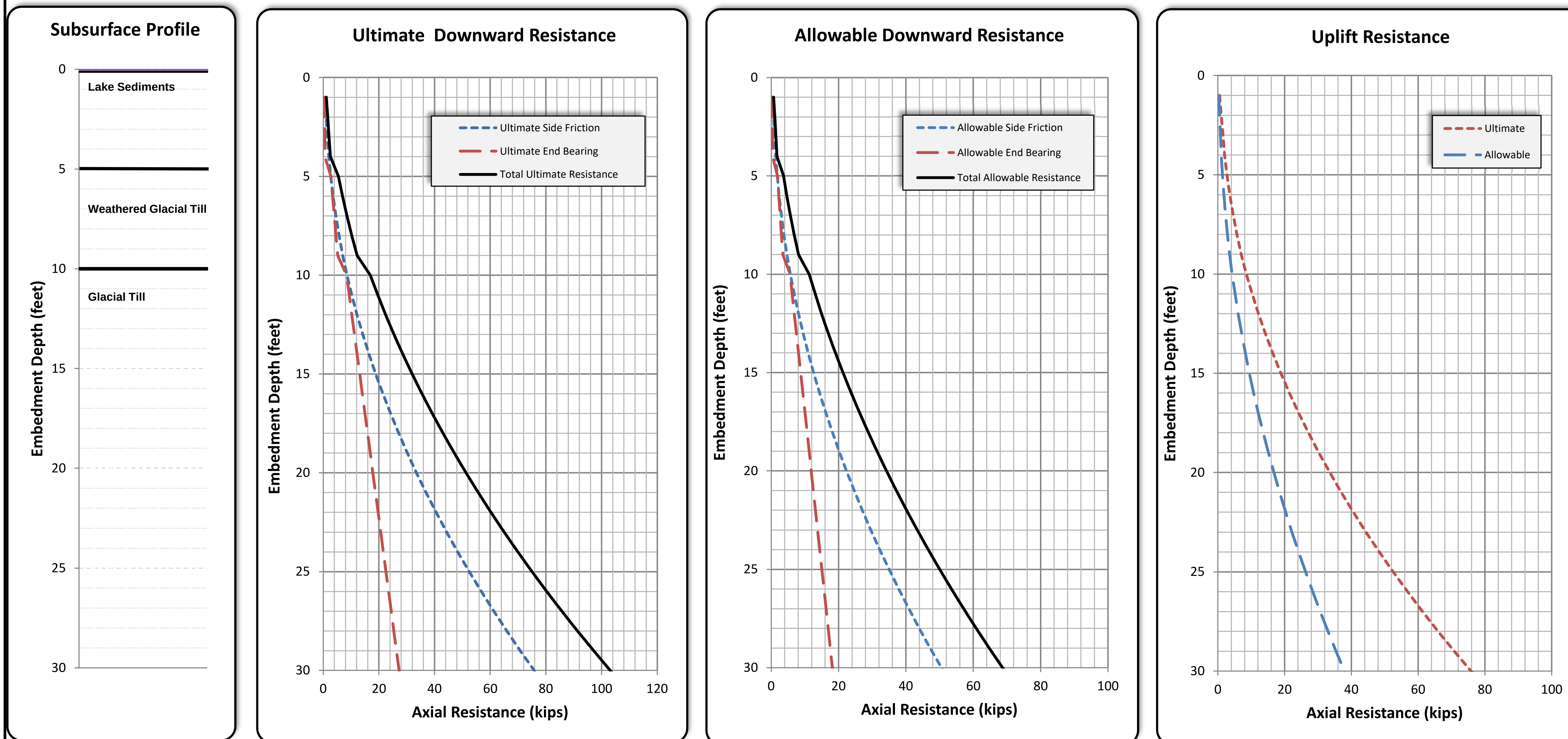
GEOENGINEERS

Figure 4

0817-024-02

AXIAL PILE RESISTANCE

24 x 0.625-inch Open-End Steel Pipe Pile



Axial Pile Resistance
Luther Burbank Park Dock Repair Mercer Island, Washington
GEOENGINEERS · **Figure 5**

0817-024-02

APPENDICES

GeoEngineers

APPENDIX A
References Exploration Logs

SOIL CLASSIFICATION CHART

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

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

ADDITIONAL MATERIAL SYMBOLS

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

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

Laboratory / Field Tests

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

Sheen Classification

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

Sampler Symbol Descriptions

- 2.4-inch I.D. split barrel / Dames & Moore (D&M)
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab
- Continuous Coring

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

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

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

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

Key to Exploration Logs

GeoEngineers

Figure A-1

Drilled	Start 4/1/2022	End 4/1/2022	Total Depth (ft) 13.5	Logged By LSP / Checked By BEL	Driller Geologic Drill Technologies	Drilling Method Hollow-stem Auger

Surface Elevation (ft) 23 / Vertical Datum NAVD88	Hammer Data Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment Mini Track Rig
Easting (X) 1297163 / Northing (Y) 218603	System Datum WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							ML	Dark brown sandy silt with organics (stiff, moist) (sod)			
								ML	Gray sandy silt with occasional oxidation staining (hard, moist) (glacial till)			
20			18	34		1 / SA				13	67	
	5		18	55		2						
15			11	50/5"		3						
								SM	Gray silty fine sand (very dense, moist)			
	10		6	50/6"		4						
			18	71		5 / SA		ML	Gray silt with sand (hard, moist)	16	74	
			18	86		6						
10												

Practical drilling refusal at 13½ feet

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Esri Survey. Vertical approximated based on Project Survey.

Log of Boring B-1

GEOENGINEERS

Project: Luther Burbank Park Upland Improvements
Project Location: Mercer Island, Washington
Project Number: 0817-024-01

Figure A-2
Sheet 1 of 1

Drilled	Start 4/1/2022	End 4/1/2022	Total Depth (ft)	11	Logged By LSP / Checked By BEL	Driller Geologic Drill Technologies	Drilling Method	Hollow-stem Auger
Surface Elevation (ft) / Vertical Datum	20 / NAVD88		Hammer Data	Rope & Cathead / 140 (lbs) / 30 (in) Drop			Drilling Equipment	Mini Track Rig
Easting (X) / Northing (Y)	1297149 / 218583		System Datum	WA State Plane South / NAD83 (feet)		Groundwater not observed at time of exploration		

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							ML	Dark brown sandy silt with organics (stiff, moist) (sod)			
								ML	Gray silt with sand and occasional gravel (hard, moist) (glacial till)			
			18	65		1 / SA				14	71	
15	5		18	58		2						
			17	75/11"		3						
10	10			50/6"		4						
												Practical drilling refusal at 11 feet

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Esri Survey. Vertical approximated based on Project Survey.

Log of Boring B-2

GEOENGINEERS

Project: Luther Burbank Park Upland Improvements
Project Location: Mercer Island, Washington
Project Number: 0817-024-01

Figure A-3
Sheet 1 of 1

Drilled	Start 4/1/2022	End 4/1/2022	Total Depth (ft)	11.5	Logged By LSP Checked By BEL	Driller Geologic Drill Technologies	Drilling Method Hollow-stem Auger

Surface Elevation (ft) Vertical Datum	20 NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Mini Track Rig
Easting (X) Northing (Y)	1297142 218689	System Datum	WA State Plane South NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							CC	Approximately 6 inches concrete			
			12	14		1		SP-SM	Approximately 4 inches gray fine to coarse sand with silt (medium dense, moist) (base course)			
								ML	Gray sandy silt with gravel (stiff, moist) (fill)			
			15	WOH		2						No sheen, slight odor
									Becomes wet			Perched groundwater observed at approxiamtely 3 feet during drilling
15	5		16	46		3						Slight sheen, slight odor
								ML	Light brown sandy silt (hard, moist) (glacial till)			
			18	60		4						No sheen, no odor
10	10		16	60		5						No sheen, no odor

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Esri Survey. Vertical approximated based on Project Survey.

Log of Boring B-3

GeoEngineers

Project: Luther Burbank Park Upland Improvements
Project Location: Mercer Island, Washington
Project Number: 0817-024-01

Figure A-4
Sheet 1 of 1

APPENDIX B
Report Limitations and Guidelines for Use

APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

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

Read These Provisions Closely

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

Geotechnical Services are Performed for Specific Purposes, Persons and Projects

This report has been prepared for KPFF Consulting Engineers and for the Project(s) specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with KPFF Consulting Engineers dated May 26, 2020 and amended on June 1, 2022 and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

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

This report has been prepared for the Luther Burbank Park Dock Repair project located at 2040 84th Avenue SE in Mercer Island, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

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

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1 Developed based on material provided by GBA, GeoProfessional Business Association; www.geoprofessional.org.

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

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

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

Environmental Concerns are Not Covered

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

Subsurface Conditions Can Change

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

Geotechnical and Geologic Findings are Professional Opinions

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

Geotechnical Engineering Report Recommendations are Not Final

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

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

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

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

Do Not Redraw the Exploration Logs

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

Give Contractors a Complete Report and Guidance

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

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

Contractors are Responsible for Site Safety on Their Own Construction Projects

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

Biological Pollutants

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

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

Information Provided by Others

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

GeoEngineers

Appendix E
Wave and Wake Modeling Report

DRAFT

BLUE COAST ENGINEERING

MEMORANDUM

To: Andy Bennett, P.E. (KPFF) and Will Cyrier, P.E.

From: Eduardo Sierra and Kathy Ketteridge, P.E., PhD

Date: January 9, 2022

Re: Luther Burnbank Marina Design: Wave and Wake Modeling

This technical memorandum summarizes the coastal engineering analysis completed by Blue Coast Engineering, LLC (Blue Coast) in support of the Luther Burnbank Marina design project. This evaluation developed empirical estimates of wind waves and wakes offshore of the Luther Burbank Marina and model predictions of wave/wake characteristics inside the marina based on proposed float layouts provided to Blue Coast by KPFF.

1. Extreme Winds

Wind data at Lake Washington were obtained from two sources: WDOT 520 Bridge (Latitude: 47.64 N, -Longitude: 122.26 W), and Renton Municipal Airport (Latitude: 47.49 N, Longitude: -122.21 W). Figure 1 shows a vicinity map as well as the wind station locations considered in this study. The data from these two sources were reviewed, statistically processed, and analyzed to develop an extremal analysis following the method of Goda (1984). Wind roses generated from the results of this analysis for both wind stations considered are also shown in Figure 1.

The shoreline in this area runs north to south along the northeastern corner of Mercer Island. The site is exposed to wind waves from the north-northeast (northerly) or south-southeast (southerly). Waves from the west and southwest are not expected to be significant at the site due to the small fetch distance across Lake Washington at the site from those directions. Due to the topography and project location with respect to the two wind stations, WDOT 520 Bridge station analysis was used for modeling wind waves from the northerly direction and wind from Renton Airport was considered for modeling wind waves approaching from the southerly direction. The 100-year (yr) wind speeds for these directions are provided in Table 1.

Table 1: 100-year Wind Speeds and Directions

Return Period Wind Year	Southerly – Renton Airport meters per second (mph)	Northerly – 520 Bridge meters per second (mph)
100-yr	24 (54)	18 (40)

2. Bathymetry Information

The coastal engineering evaluation conducted by Blue Coast utilized coastal bathymetry available to from a Lake Washington digital elevation model (DEM) NOS-NOAA bathymetry dataset. Additionally, site specific bathymetry, shown in Figure 2, was provided to Blue Coast by KPFF and was used to refine the bathymetry data set within the marina site.

3. Floating Breakwater Wave Transmission

The transmission of wave energy through the proposed floating wave attenuator dock units were estimated empirically outside the model using standard methods available in literature. This calculated transmission coefficient (ratio of transmitted wave over incoming wave height) was used as input to the wave model.

The method used to calculate the transmission coefficient was the relation proposed by Macagno referenced in Ruol et al (2013), shown in Equation 1. Different floating attenuator geometry combinations were used as input to Equation 1: widths of 8 feet (ft) and 10 ft and a drafts of 2 ft and 4 ft. Table 2 shows the calculated wave transmission coefficients for the different wave attenuator geometries evaluated.

$$k_{tM} = \frac{1}{\sqrt{1+\left[kw\frac{\sinh kh}{2\cosh(kh-kd)}\right]^2}} \qquad \text{Equation 1}$$

where, k is the wave number, w is the width, h is the depth and d is the draft.

Table 2: Calculated Transmission Coefficients for Different Wave Attenuator Geometries

Attenuator Draft (ft)	Attenuator Width (ft)	Calculated Wave Transmission ($\%k_{tM}$)	Dock Configuration (See Figures 3-5)
2	8 ft	35 %	Option 6
4	8 ft	28 %	Option 3
2	10 ft	28 %	Option 5
4	10 ft	23 %	Option 1 / Option 2 / Option 4

4. Proposed Alternatives: Marina Dock Configurations

KPFF provided Blue Coast with six different dock configurations (listed below) that were evaluated as part of this analysis. These dock configurations are shown in the Figures 3-5.

Description of Marina Configurations:

- Option 1: Current design: 193' x 10' x 4' draft main float
- Option 2: Current design extended (no dog leg): 210.5' x 10' x 4' draft main float
- Option 3: Narrower: 193' x 8' x 4' draft main float
- Option 4: Shorter: 173' x 10' x 4' draft main float (inner float +25’)
- Option 5: Lighter: 193' x 10' x 2' draft main float
- Option 6: Minimum: 173' x 8' x 2' draft main float (inner float +25')

5. Wind Wave Modeling

Wave numerical modeling using northerly and southerly 100-year wind speeds provided in Table 1 to develop predictions of wave characteristics within the Luther Burbank Marina site for proposed dock configurations shown in Figures 3 through 5. The model SWAN (Simulating WAves Nearshore), a third-generation spectral finite difference wave model, was utilized to for this work (Holthuijsen et al., 2006). SWAN utilizes lake bathymetry, incident wave spectra, and local wind conditions to generate and transform waves into the nearshore environment.

The model grid utilized bathymetry data described in Section 2 of this Memorandum. The entire modeling domain is shown in Figure 2. A higher resolved nested grid was used during the modeling in order to accurately transform the waves within the marina vicinity. The largest grid has a grid cell size of 50 ft, and the grid at the project site has a grid cell spacing of 3 ft.

Due to the lack of local wave data no SWAN model calibration for the Luther Burbank project conditions was conducted. Therefore, appropriate factors of safety should be applied to structural calculations conducted using results of the wave modeling provided in this memorandum.

Results for these 100-year wind-wave model simulations for the larger model domain are provided in Figure 6. Results in the vicinity of the Project Site, where the modeling grid had greater resolution with the different dock configurations described in Section 4 are shown in Figures 7-12. Higher waves are represented in red color, and blue color represents smaller or no waves.

Table 3 shows predicted waves at three extraction points inside the marina and one point outside the marine (see Figure 19) for the 6 marina options proposed by KPFF.

Table 3: Predicted Wind-Wave Heights at Specific Points Inside and Outside the Marina

		Sig Wave Height (Hs, ft)			
	Scenario	**P1**	**P2**	**P3**	**P4**
Option 1	100-yr Northerly Wind Waves	1.1	1.3	0.5	1.7
	100-yr Southerly Wind Waves	1.5	1.3	1.1	2.1
Option 2	100-yr Northerly Wind Waves	1.1	1.3	0.5	1.7
	100-yr Southerly Wind Waves	1.6	1.3	1.4	2.1
Option 3	100-yr Northerly Wind Waves	1.1	1.3	0.6	1.7
	100-yr Southerly Wind Waves	1.5	1.3	1.1	2.1
Option 4	100-yr Northerly Wind Waves	1.1	1.3	0.5	1.7
	100-yr Southerly Wind Waves	1.5	1.3	1.2	2.1
Option 5	100-yr Northerly Wind Waves	1.1	1.3	0.6	1.7
	100-yr Southerly Wind Waves	1.5	1.3	1.1	2.1
Option 6	100-yr Northerly Wind Waves	1.1	1.3	0.7	1.7
	100-yr Southerly Wind Waves	1.5	1.4	1.3	2.1

Wave modeling results show that 100-yr southerly winds produced higher wave heights than northerly winds outside and inside the marina. The open entrance at the south side of the marina allows intrusion of southerly waves. Wave extraction in the vicinity of Point 1 presented higher waves indicating that this area is less sheltered from southerly wind-waves. The north side of the marina also allows some wave energy penetration, (near extraction Point 2) however wave energy from northerly winds is less severe than from southerly wind directions. Dock Options 1 and 4 showed the lowest wave height values inside the marina whereas the highest wave height values were observed for Option 6.

The dog leg shown in Option 1 at the south end of the wave attenuator provides additional protection to the finger piers located at the southern end of the wave attenuator dock compared to the extended (no dog leg) Option 2. Wave heights at those finger piers is reduced by 30% for the dog leg Option 1 (see Figure 7) compared to only 10% reduction for the extended (no dog leg) Option 2 (see Figure 8).

6. Boat Wake Modeling

In addition to wind-waves, the project site is also impacted by boat wakes due to vessels traversing past the site, sometimes at high rates of speed. Therefore, additional wave modeling was conducted to evaluate boat wake heights inside the marina for the same 6 Dock Options evaluated for wind-waves (Section 5).

A specific vessel survey identifying types and frequencies of vessels passing the project site was not available for use in this evaluation. Therefore, typical vessels and operational criteria for these vessels were used to inform this evaluation.

Typical wakeboard and waterski boats vary in length from 16 to 24 ft. Based on observed boats on the lake and research conducted by Glamore (2009) on waves generated by waterski and wakeboard boats, a vessel length of 20 ft and an 8 ft beam will produce a wave height of approximately 3 ft and a wave period of 2 seconds. This wake height is expected to decrease exponentially from the sailing line to approximately 1.6 ft outside the marina (Rupretch, J. et al, 2015).

These wake parameters were input in the wave propagation model and tested for the two different traveling direction for the vessel (travelling sound and travelling north) and six different alternatives shown in Figures 3 through 5. The wake model results for these alternatives are shown in Figures 13 through 18, where higher wakes are represented in red color, and blue color represents smaller or no wakes. Table 4 summarizes wave heights for these model simulations at the same four extraction points as the wind-wave modeling results (see Figure 19).

Review of the modeling completed for boat wakes show that boats traveling from the north to the south produce smaller wakes inside the marine than boat travelling from the south to the north for all dock options evaluated. Predicted wake heights inside the marina were similar for all dock options evaluated for the same direction of boat travel.

Similarly, there is little difference in predicted boat wake heights within the marina between the dog leg used in Option 1 compared to the extended (no dog leg) Option 2.

Table 4: Predicted Boat Wake Heights at Specific Points Inside and Outside the Marina

		Wake Height (H, ft)			
	Scenario	**P1**	**P2**	**P3**	**P4**
Option 1	N → S Boat Wake	0.6	0.8	0.3	1.5
	S → N Boat Wake	0.7	0.7	0.5	1.5
Option 2	N → S Boat Wake	0.6	0.8	0.4	1.5
	S → N Boat Wake	0.7	0.7	0.7	1.5
Option 3	N → S Boat Wake	0.6	0.8	0.4	1.5
	S → N Boat Wake	0.7	0.7	0.6	1.5
Option 4	N → S Boat Wake	0.6	0.8	0.3	1.5
	S → N Boat Wake	0.7	0.7	0.6	1.5
Option 5	N → S Boat Wake	0.6	0.8	0.4	1.5
	S → N Boat Wake	0.7	0.7	0.6	1.5
Option 6	N → S Boat Wake	0.7	0.9	0.5	1.5
	S → N Boat Wake	0.8	0.7	0.7	1.5

7. Summary

A coastal engineering analysis was completed to develop winds and wave parameters sufficient for the design and for developing design criteria. Winds applicable to the project area are predominantly from the north-northwest (northerly) and south-southeast (southerly).

100-year southerly winds produced higher waves outside and inside the marina than northerly winds. Southerly wind-waves enter from the south end to the marina producing the higher wave energy inside the marina.

Wind-wave model using Options 1 and 4 predicted the lowest wave height values inside the marina. Option 6 presented the highest waves observed inside the marina due to the lowest draft and shortest width considered.

The dog leg located at the south end of the wave attenuator for Option 1 provides additional protection to the marina compared to the extended (no dog leg) Option 2 by reducing the wind wave heights from 10% to 30% at the finger floats located on the lee side of the wave attenuator dock. This benefit is not seen in the boat wake modeling results.

The highest boat-wake height values were observed when evaluating Option 6 due to the lowest draft (2 ft) and shortest width (8 ft) considered for this alternative. However, the wake model predicted similar wake heights inside the marina for all marina dock configurations.

The 100-year wind-wave produce longer wave periods than boat wake periods and, therefore, higher wave transmission is expected during a large extreme wind event.

8. Closure

This document has been prepared by Blue Coast Engineering LLC. in accordance with generally accepted engineering practices and is intended for the exclusive use and benefit of KPFF and their authorized representatives for specific application to the Luther Burbank project in Lake Washington. The contents of this document are not to be relied upon or used, in whole or in part, by or for the benefit of others without specific written authorization from Blue Coast Engineering LLC. No other warranty, expressed or implied, is made. Blue Coast Engineering LLC and its officers, directors, employees, and agents assume no responsibility for the reliance upon this document or any of its contents by any parties other than KPFF.

9. References

Adapted from the theoretical predictor of J. Cox (1988) to account for angle of wave incidence and to reflect experimental results in 3-D wave fields using irregular waves.

Glamore, W.C. 2009. "A Decision Support Tool for Assessing the Impact of Boat Wake Waves on Inland Waterways." http://www.pianc.org/downloads/dwa/Wglamore_DPWApaper.pdf.

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Ruol, Piero & Martinelli, Luca & Pezzutto, Paolo. (2013). Formula to Predict Transmission for -Type Floating Breakwaters. Journal of waterway, port, coastal, and ocean engineering. 139. 1-8. 10.1061/(ASCE)ww.1943-5460.0000153.

Ruprecht, J. E., Glamore, W.X., Coglan, I.R., & Flocard, F. 2015. Wakesurfing. Some wakes are more equal than others. In Australasian Coasts & Ports Conference 2015: 22nd Australasian Coastal and Ocean Engineering Conference and the 15th Australasian Port and Harbour Conference (. 779). Engineers Australia and IPENZ.

FIGURES

New figures attached, refer to previously provided figures and revised plan set

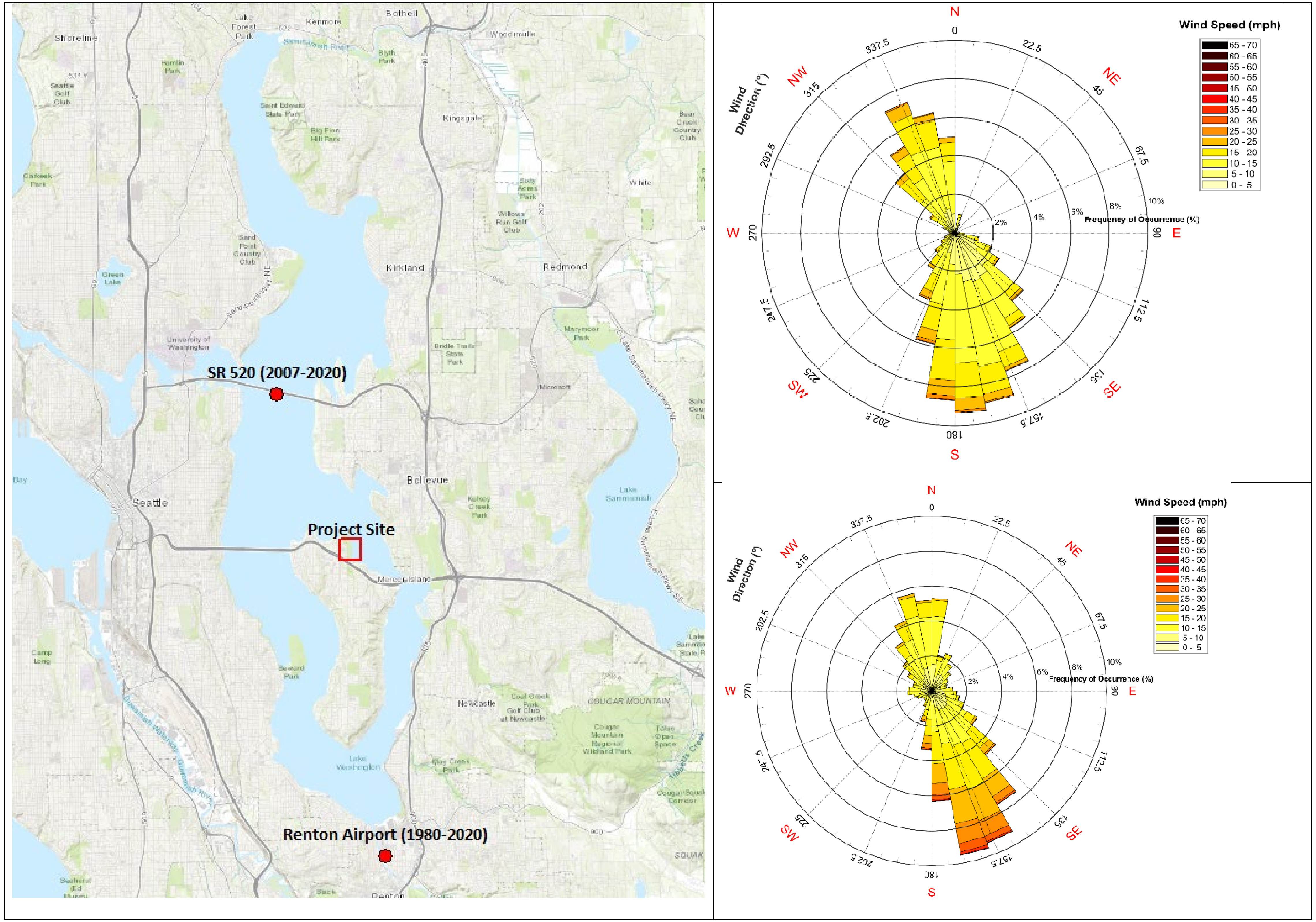


Figure 1. Left: Location of Project Site and Wind Stations used in the Evaluation. Upper Right: Wind Rose for 520 Bridge Station (2007-2020) and Bottom Right: Wind Rose for Renton Municipal Airport (1980-2020)

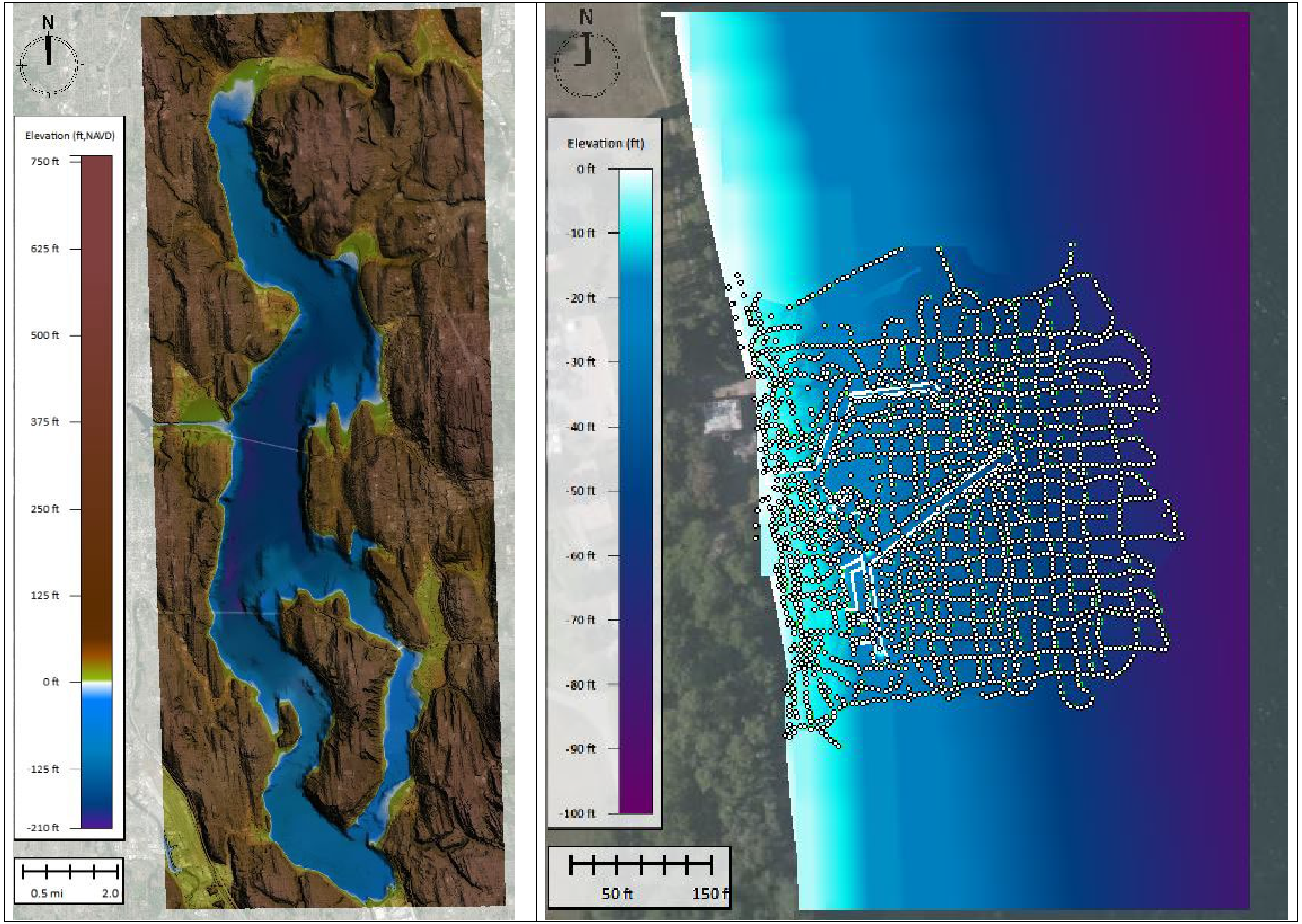
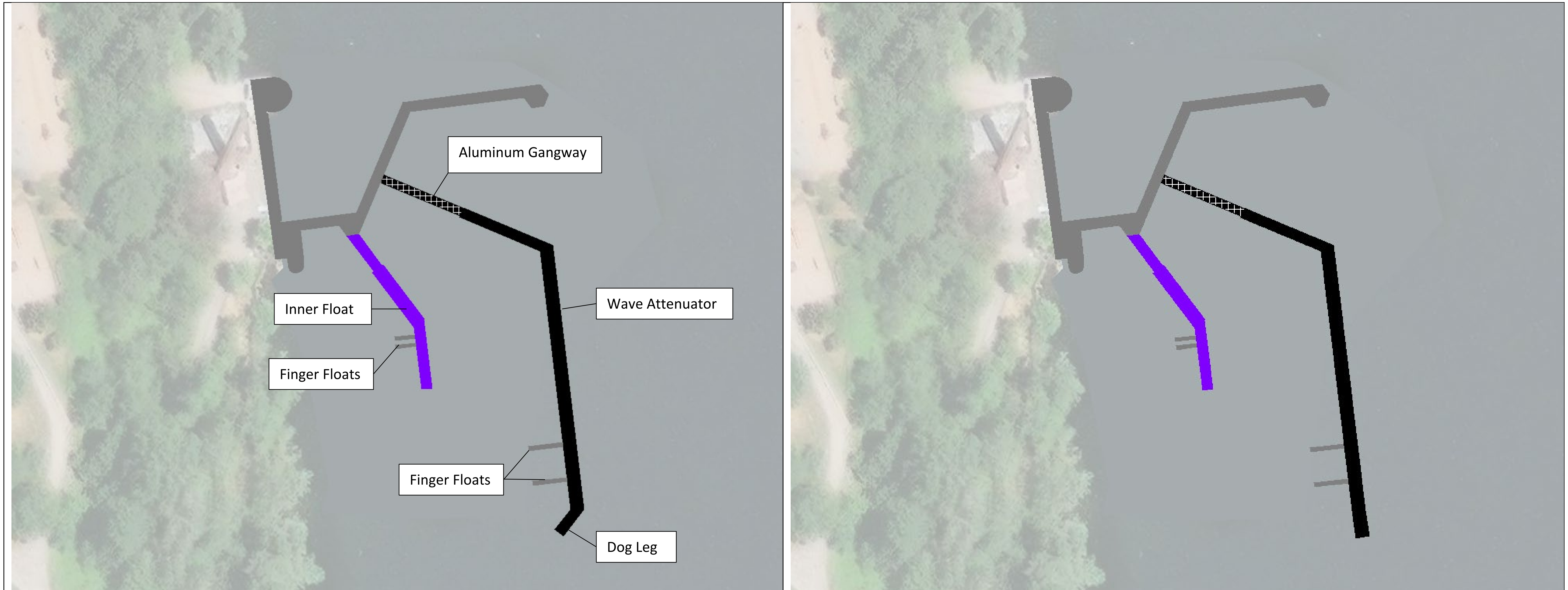


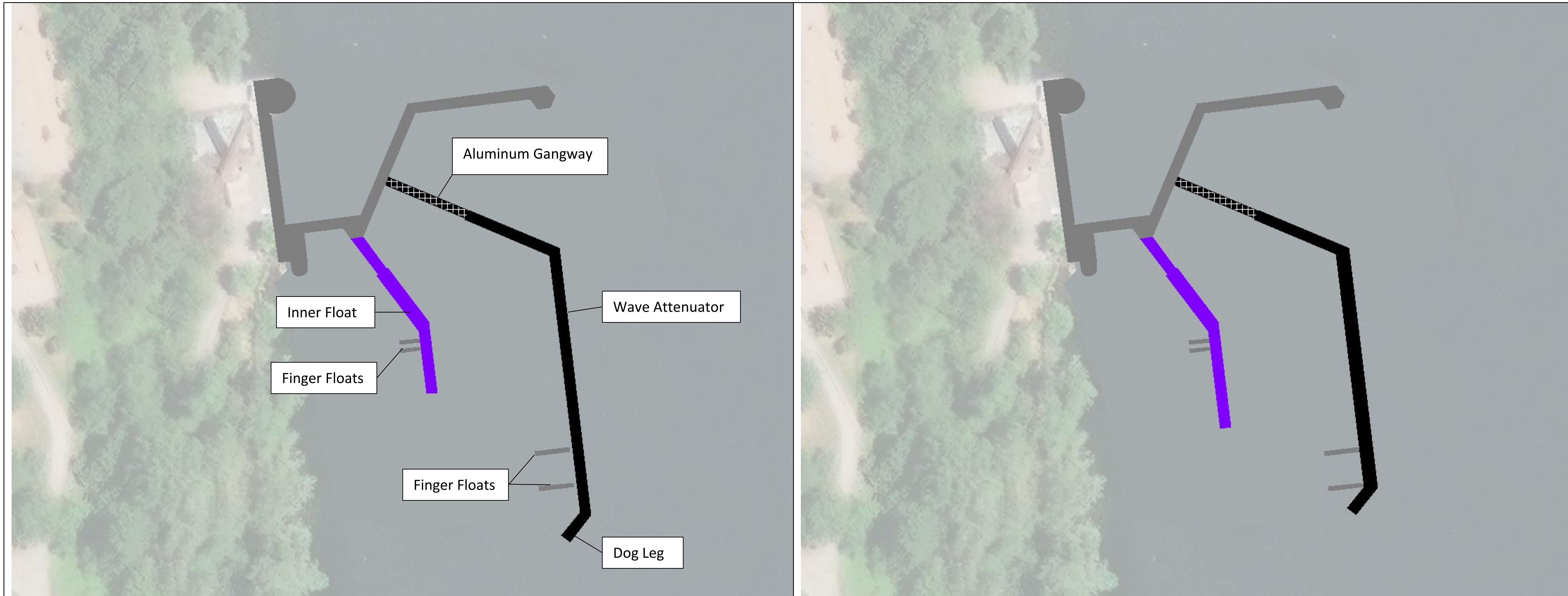
Figure 2. Left: Combined Bathymetry and Topography cropped to Lake Washington and NOAA NOS hydrographic data H11810 (2008) and H11376 (2005). Right: Bathymetric Survey (white dots) merged with NOAA NOS hydrographic data H11376 (2005) at the project site.



Option 1: Current design: 193' x 10' x 4' draft main float – KT = 23 %

Option 1.1: Current design with extension (no dog leg): 210.5' x 10' x 4' draft main float – KT = 23 %

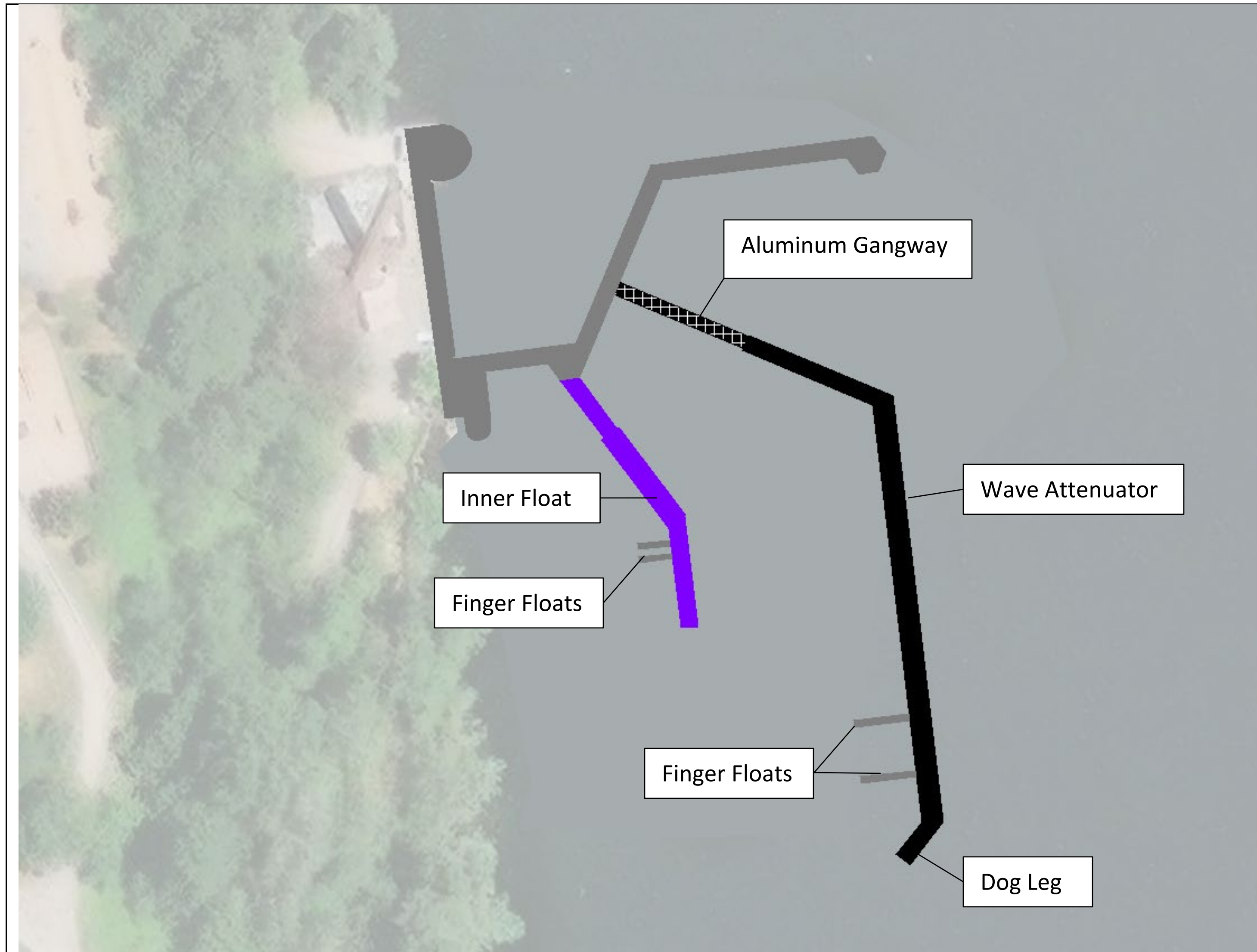
Figure 3: Dock Configurations used in the Wave and Boat Wake Numerical Modeling Evaluation.



Option 2: Narrower: 193' x 8' x 4' draft main float – KT = 28 %

Option 3: Shorter: 173' x 10' x 4' draft main float (inner float +25') – KT = 23 %

Figure 4: Dock Configurations used in the Wave and Boat Wake Numerical Modeling Evaluation.



Option 4: Lighter: 193' x 10' x 2' draft main float – KT = 28 %

Option 5: Minimum: 173' x 8' x 2' draft main float (inner float +25') – KT = 35 %

Figure 5: Dock Configurations used in the Wave and Boat Wake Numerical Modeling Evaluation.

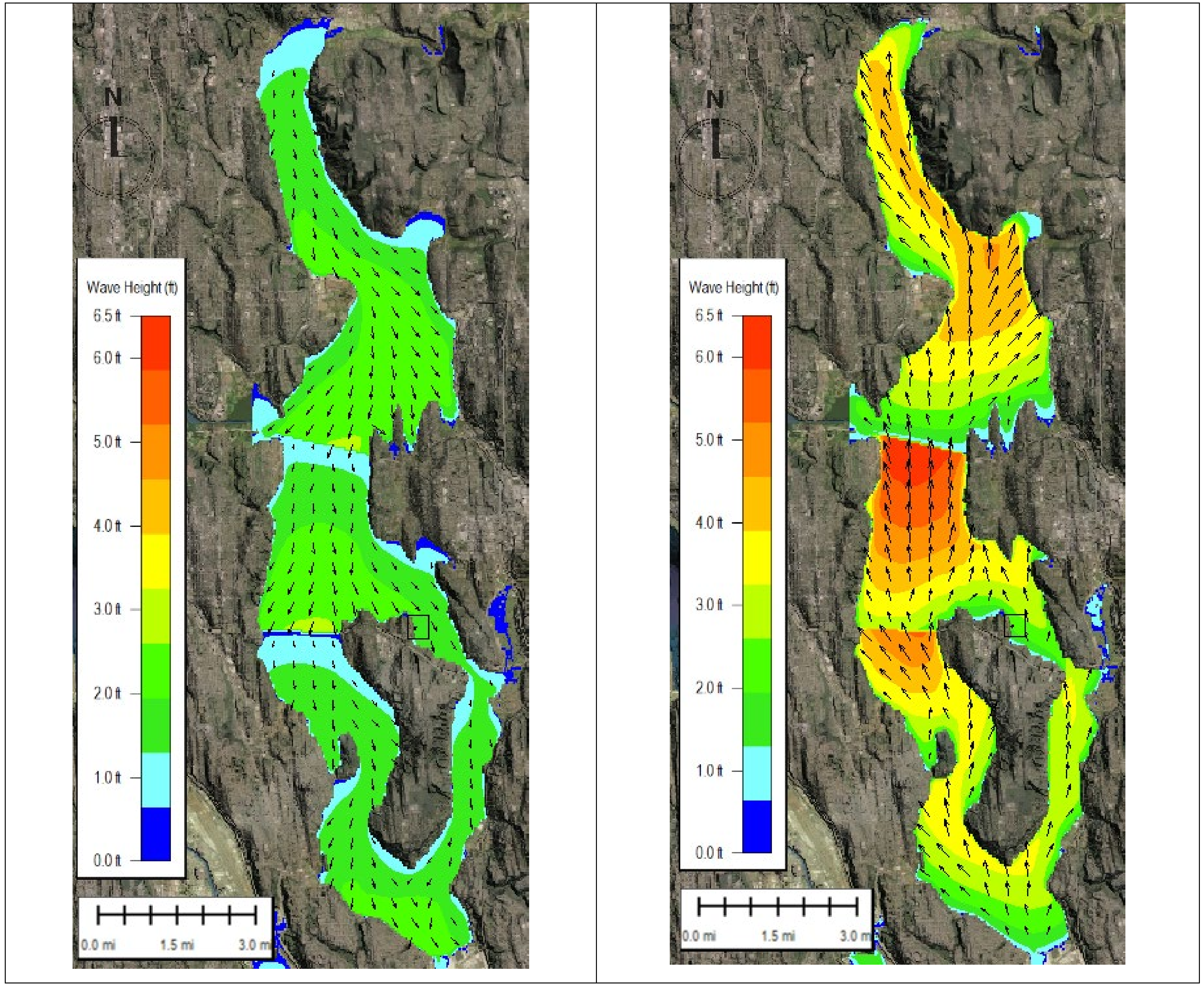


Figure 6. Simulated results for Lake Washington Northerly 100-yr return period wind (left) and 100-yr return period southerly wind (right).

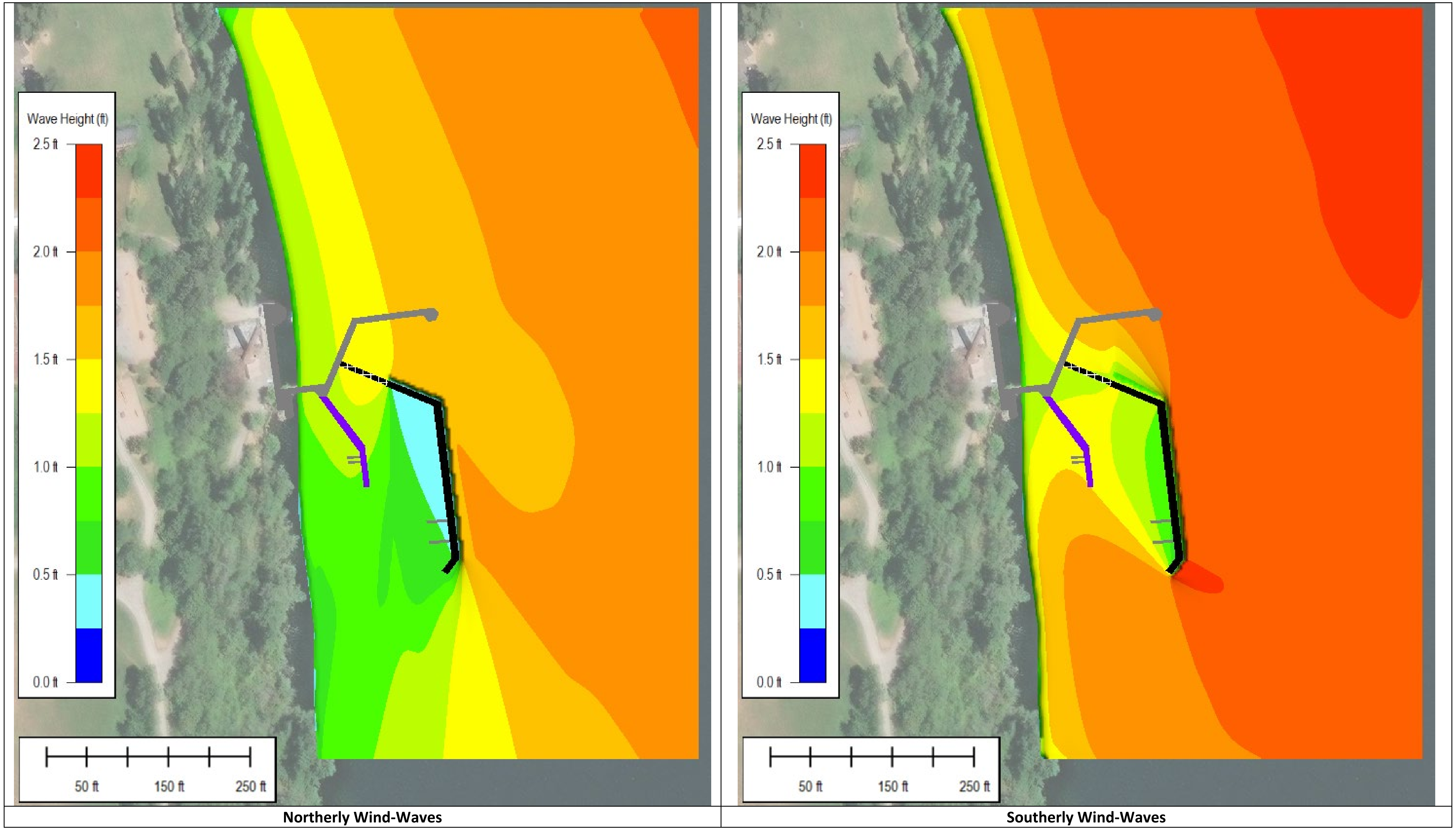


Figure 7: Plan View of Resulting 100-year Significant Wind-Wave Heights for Option 1: Current design: 193' x 10' x 4' draft main float – KT = 23 %

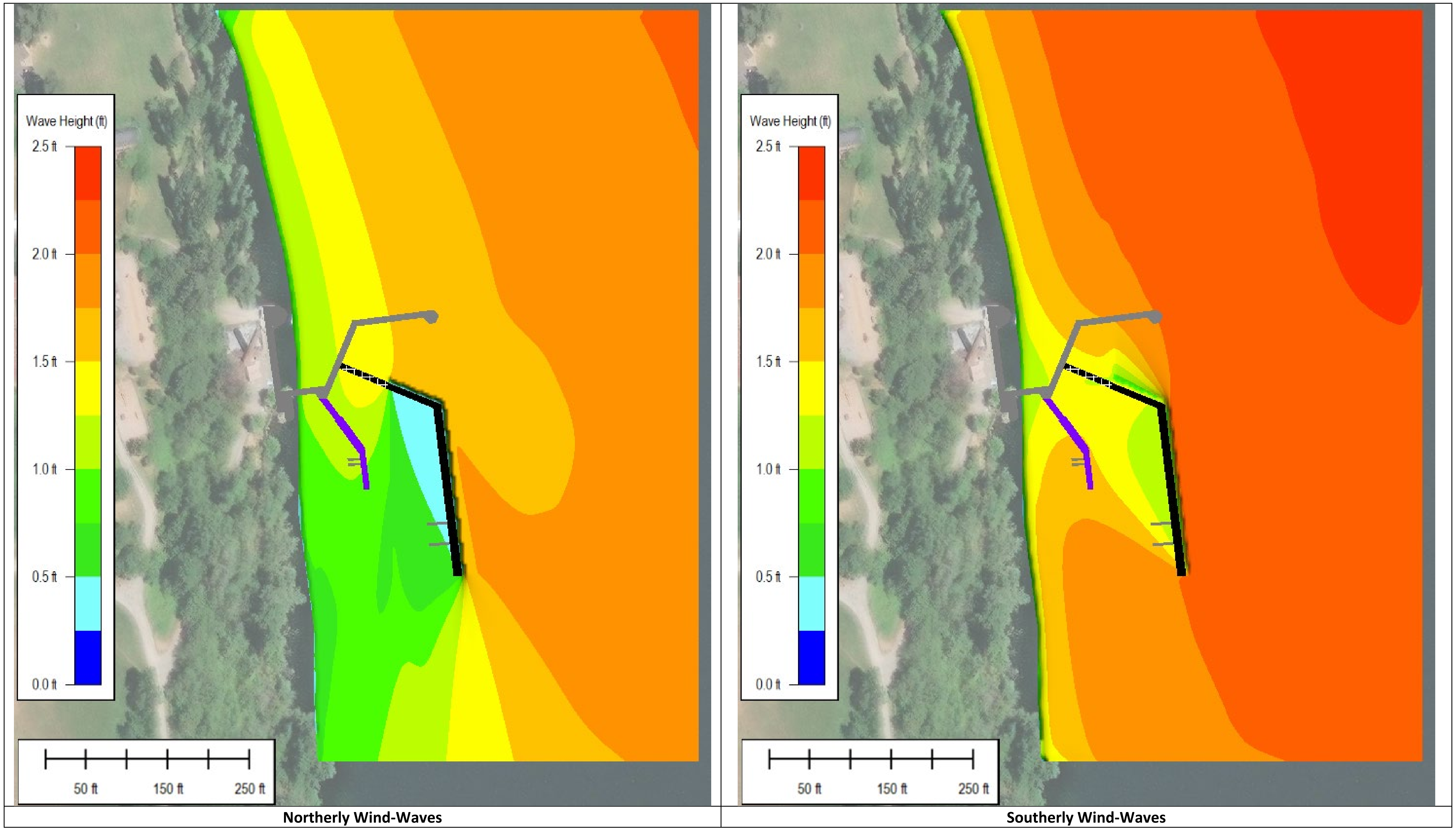
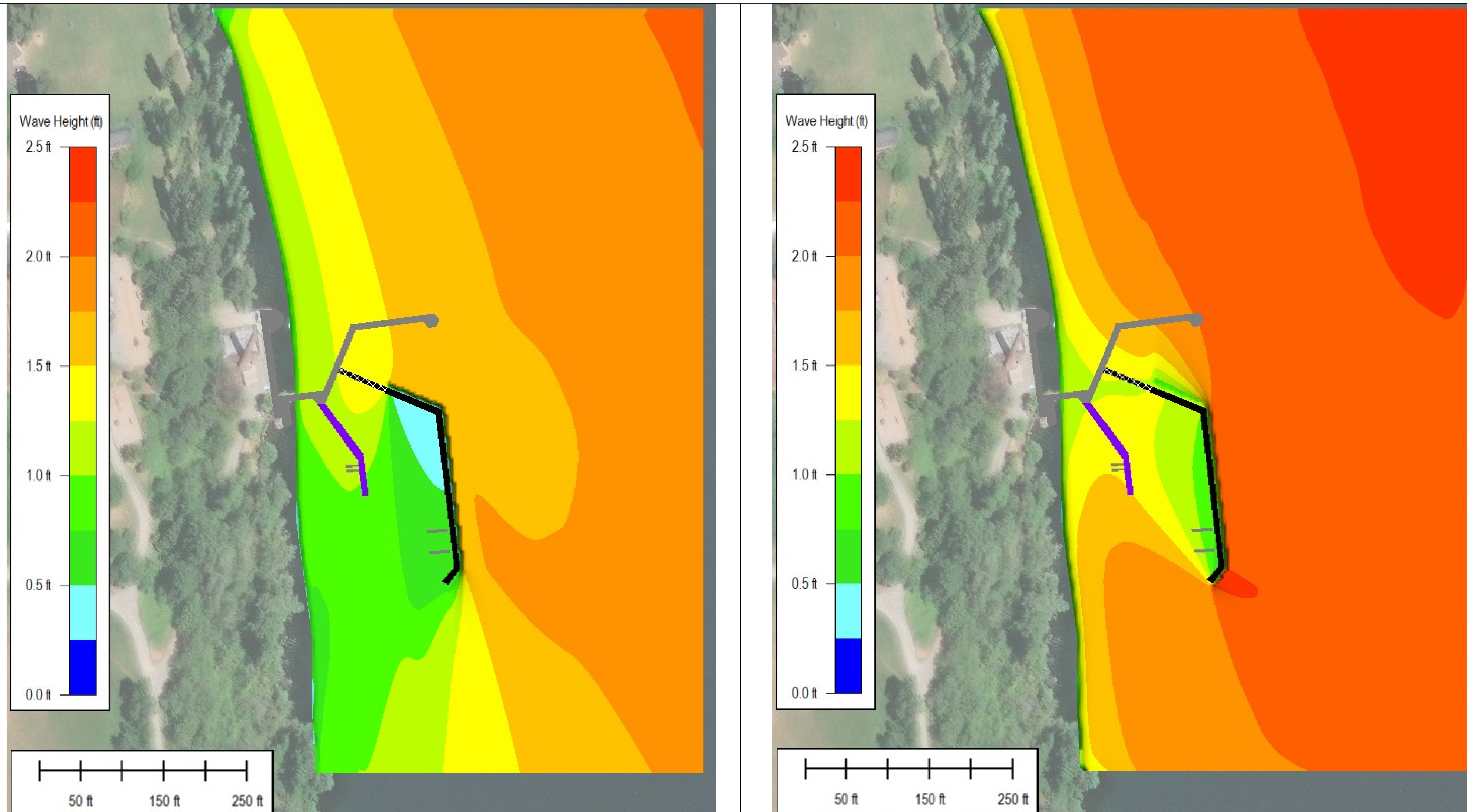


Figure 8: Plan View of Resulting 100-year Significant Wind-Wave Heights for Option 2: Current design extended (no dog leg): 210.5' x 10' x 4' draft main float – KT = 23 %



Northerly Wind-Waves	Southerly Wind-Waves

Figure 9: Plan View of Resulting 100-year Significant Wind-Wave Heights for Option 3: Narrower: 193' x 8' x 4' draft main float – KT = 28 %

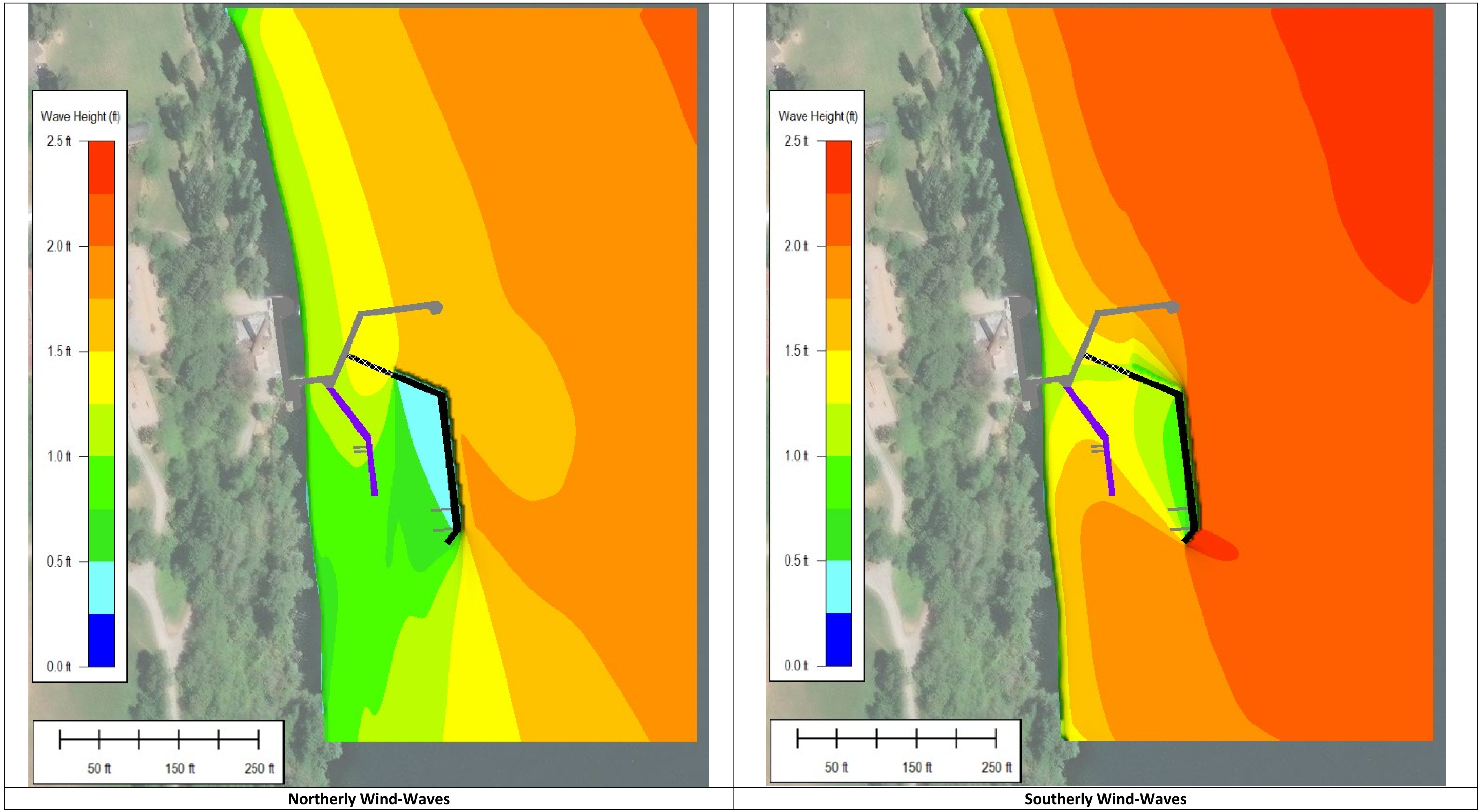


Figure 10: Plan View of Resulting 100-year Significant Wind-Wave Heights for Option 4: Shorter: 173' x 10' x 4' draft main float (inner float +25') – KT = 23 %

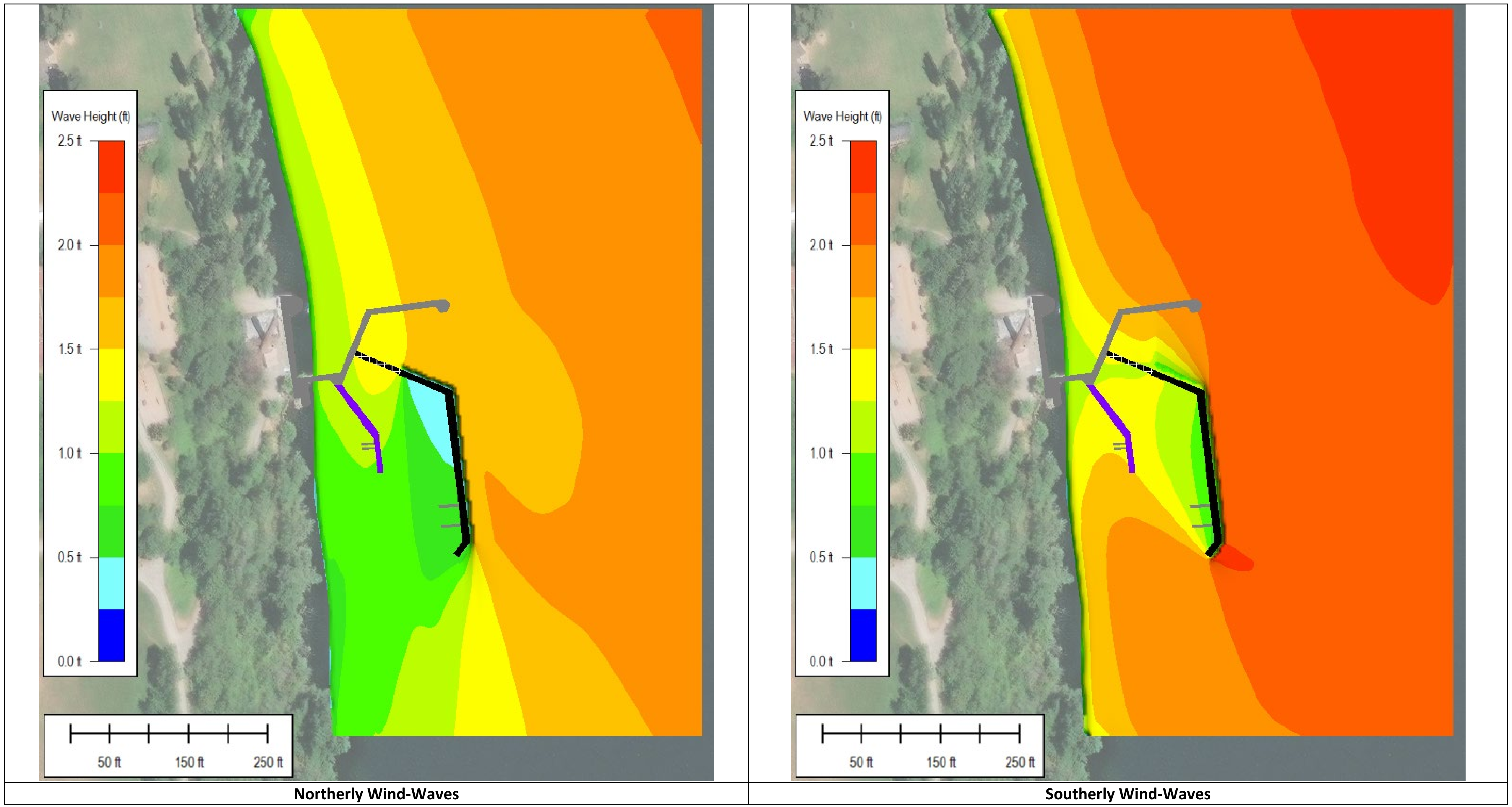


Figure 11: Plan View of Resulting 100-year Significant Wind-Wave Heights for Option 5: Lighter: 193' x 10' x 2' draft main float – KT = 28 %

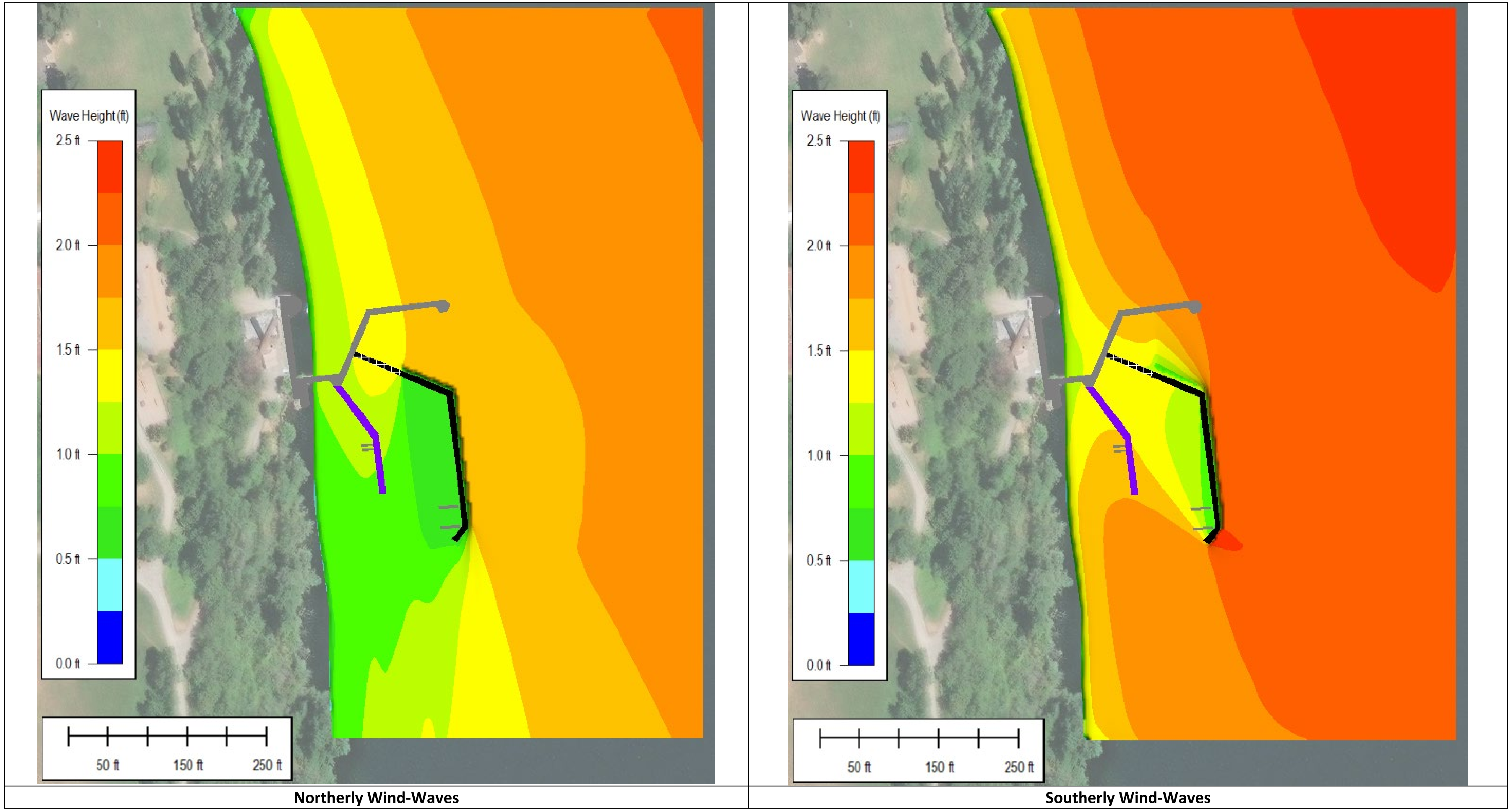


Figure 12: Plan View of Resulting 100-year Significant Wind-Wave Heights for Option 6: Minimum: 173' x 8' x 2' draft main float (inner float +25') – KT = 35 %

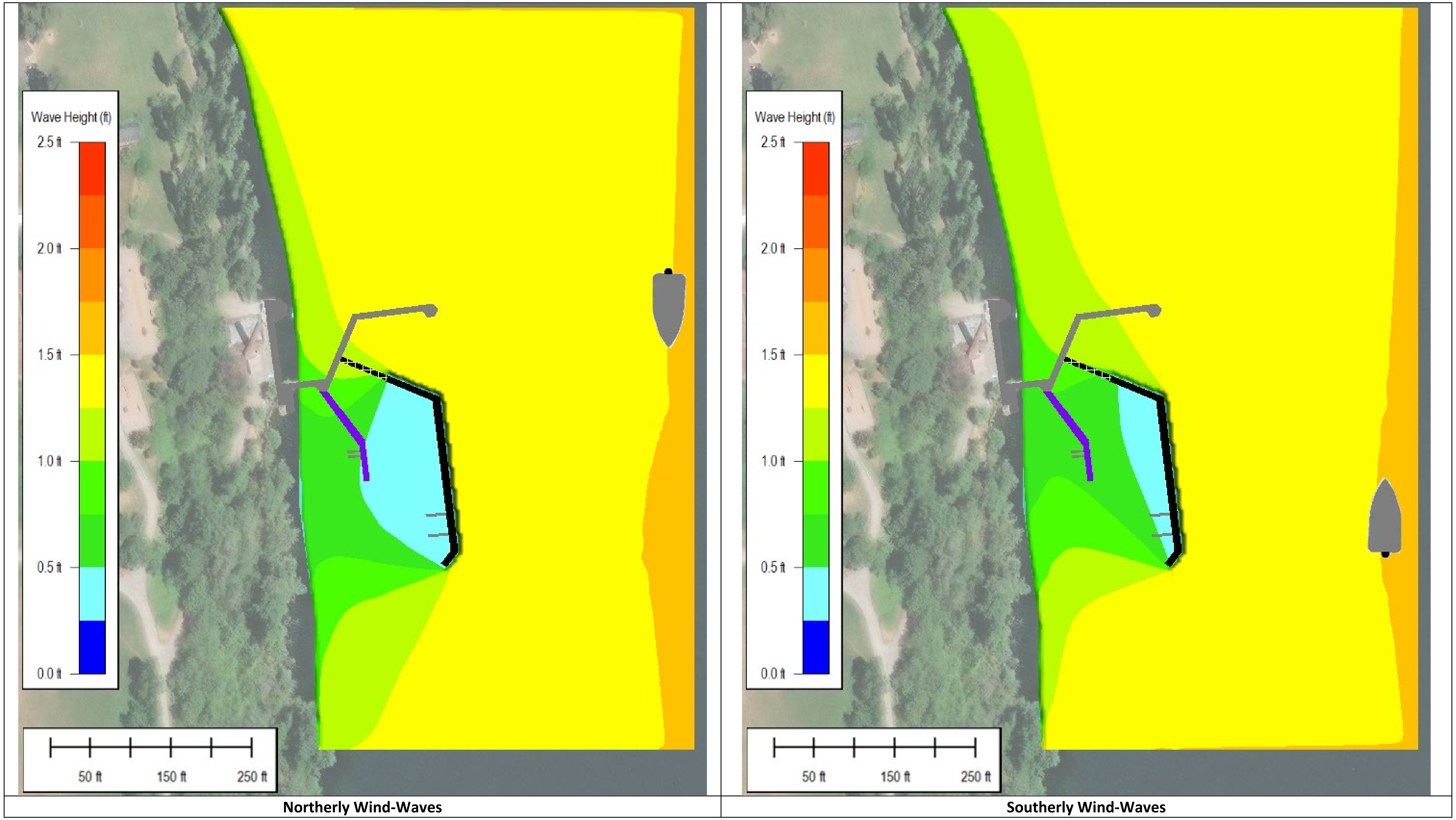
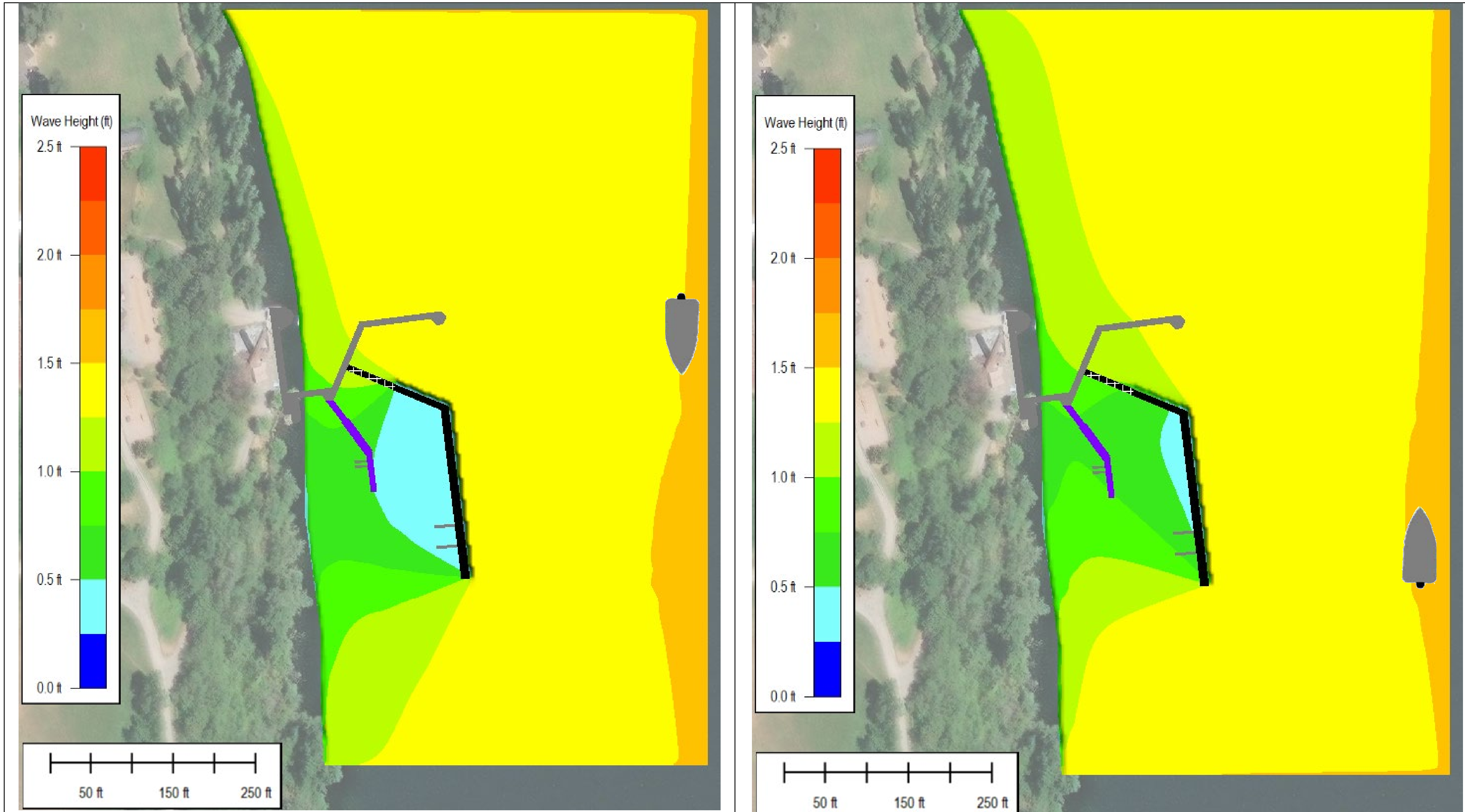


Figure 13: Plan View of Resulting Boat Wake Heights for Option 1: Current design: 193' x 10' x 4' draft main float – KT = 23 %



Northerly Wind-Waves	Southerly Wind-Waves

Figure 14: Plan View of Resulting Boat Wake Heights for Option 2: Current design: 210.5' x 10' x 4' draft main float – KT = 23 %

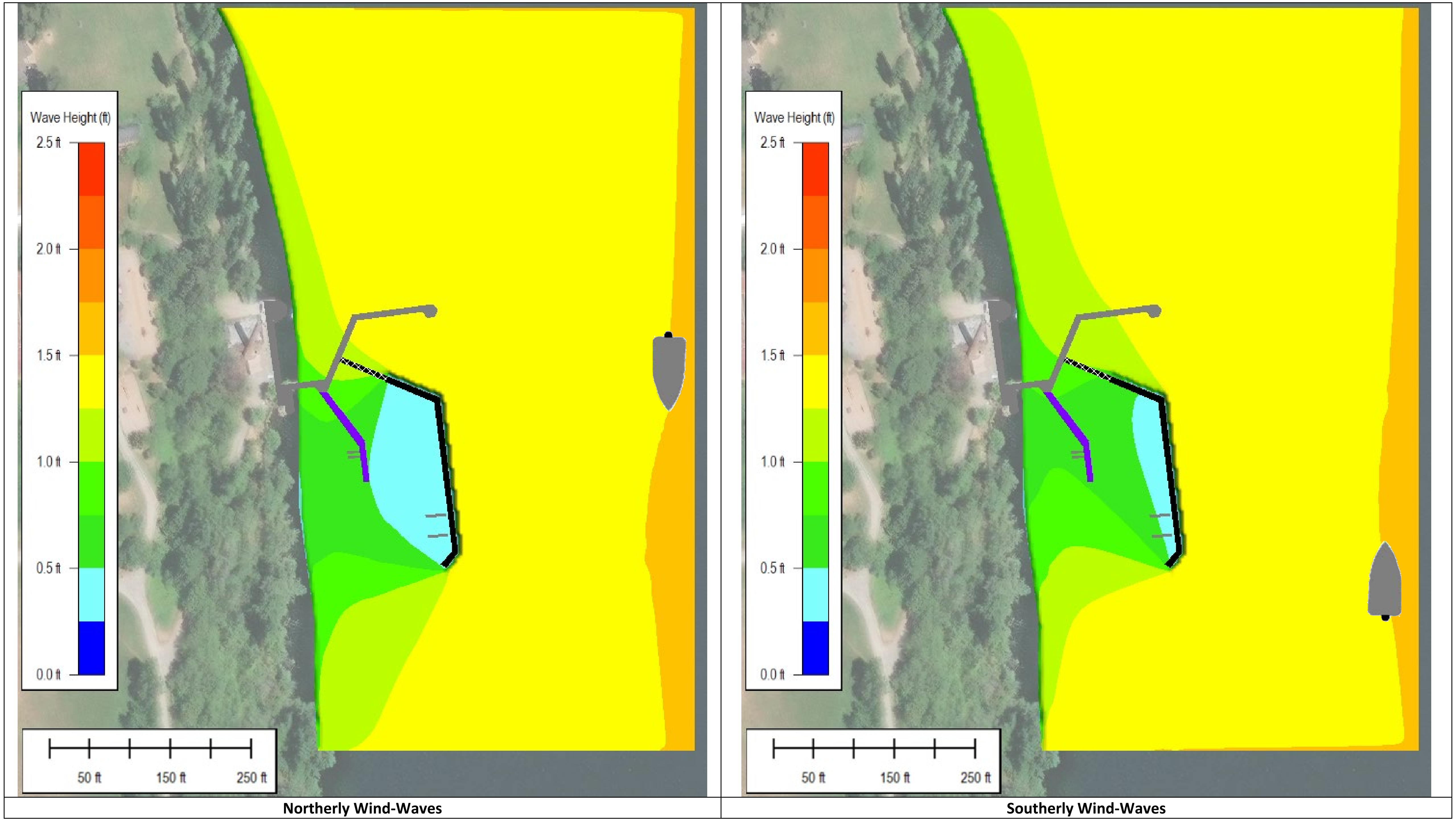
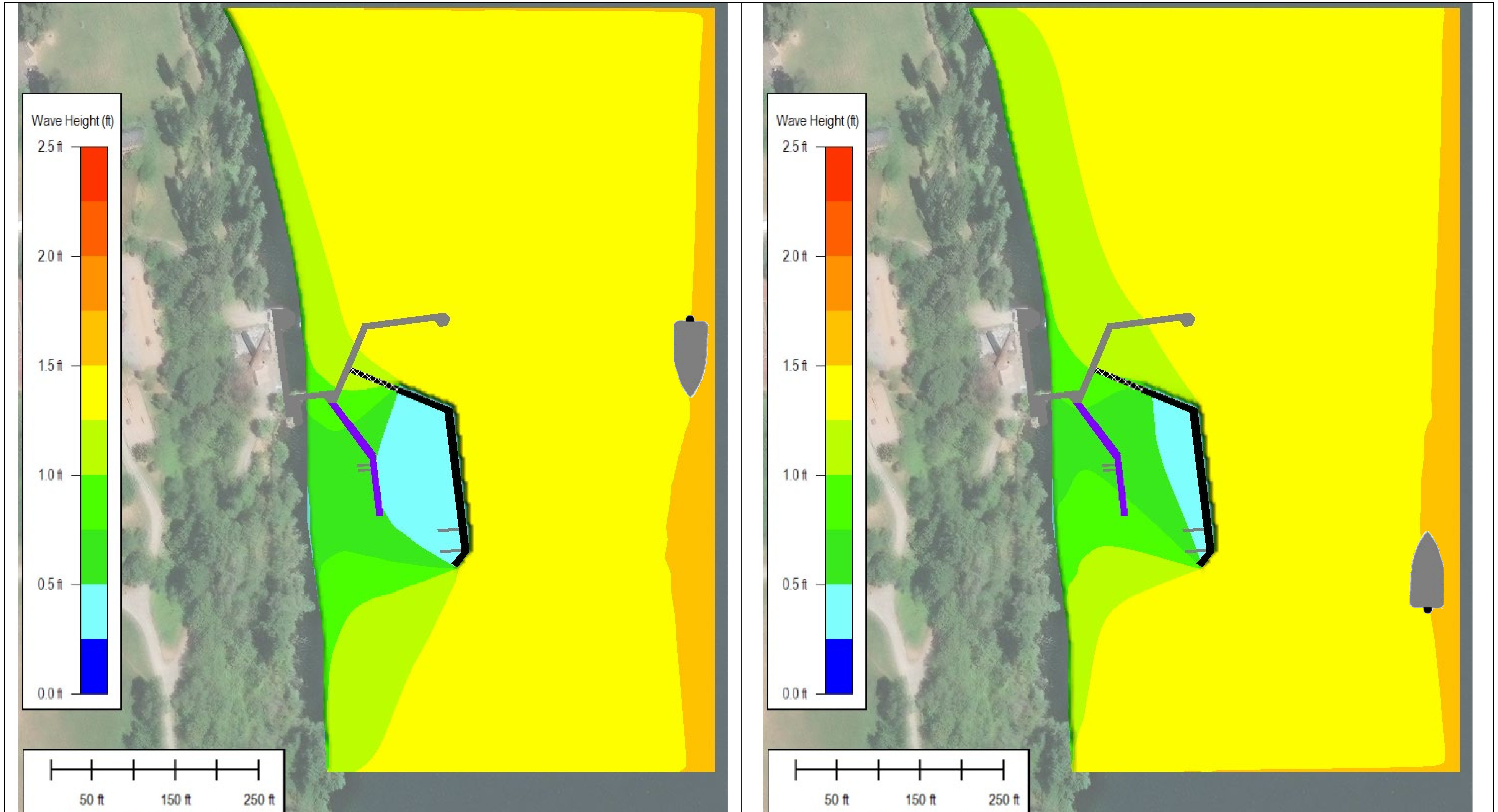


Figure 15: Plan View of Resulting Boat Wake Heights for Option 3: Narrower: 193' x 8' x 4' draft main float – KT = 28 %



Northerly Wind-Waves	Southerly Wind-Waves

Figure 16: Plan View of Resulting Boat Wake Heights for Option 4: Shorter: 173' x 10' x 4' draft main float (inner float +25') – KT = 23 %

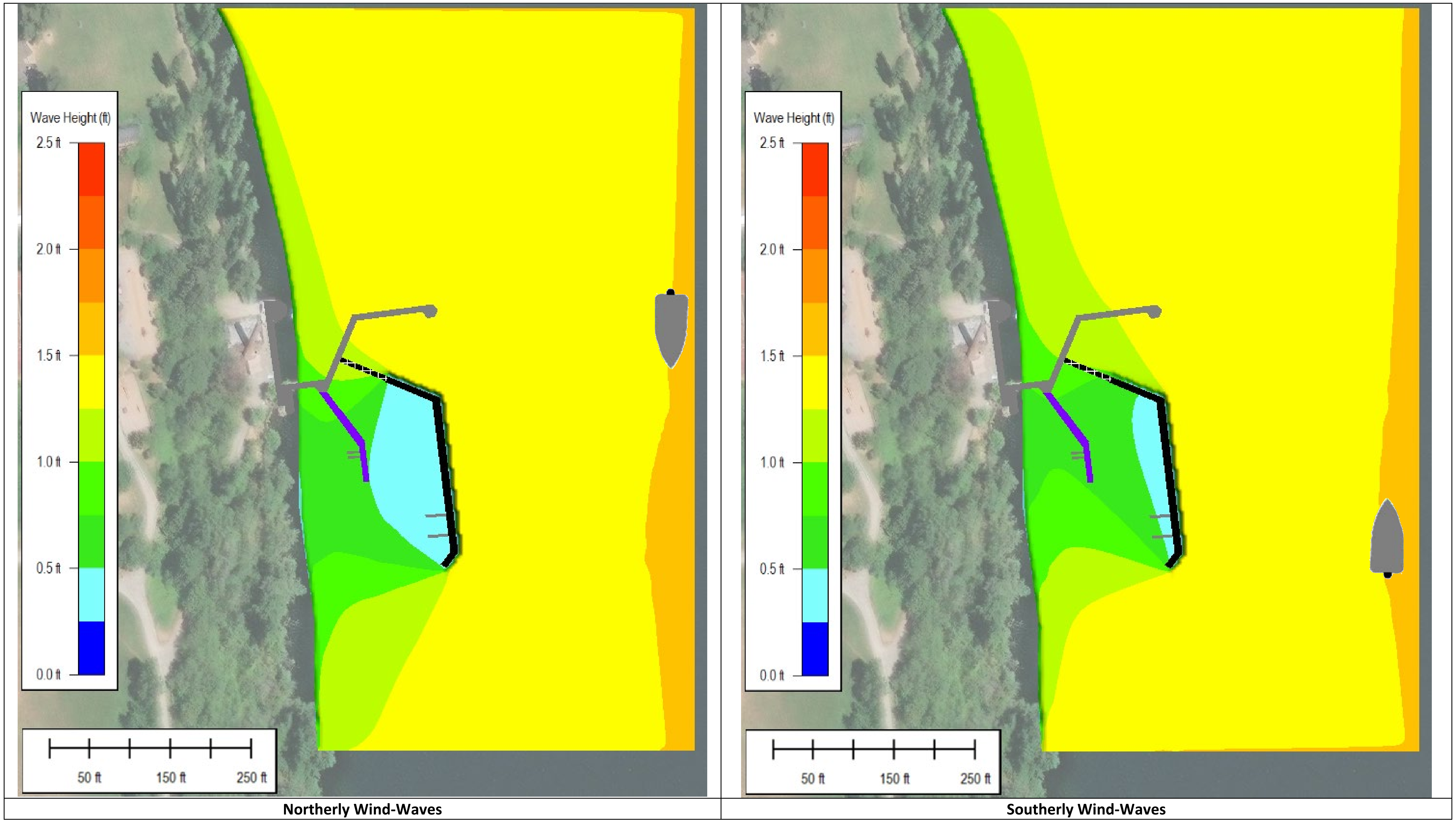


Figure 17: Plan View of Resulting Boat Wake Heights for Option 5: Lighter: 193' x 10' x 2' draft main float – KT = 28 %

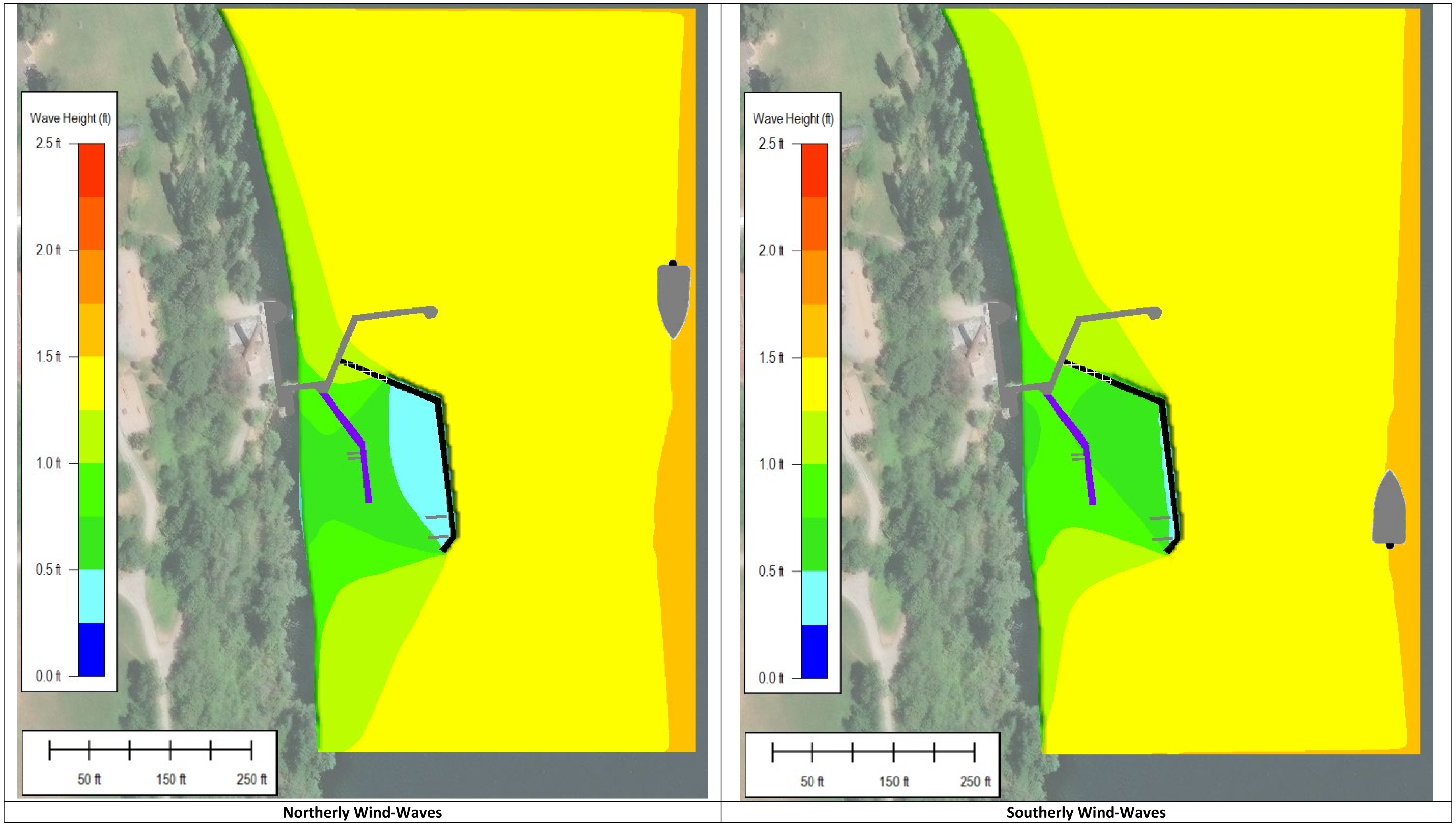


Figure 18: Plan View of Resulting Boat Wake Heights for Option 6: Minimum: 173' x 8' x 2' draft main float (inner float +25') – KT = 35 %

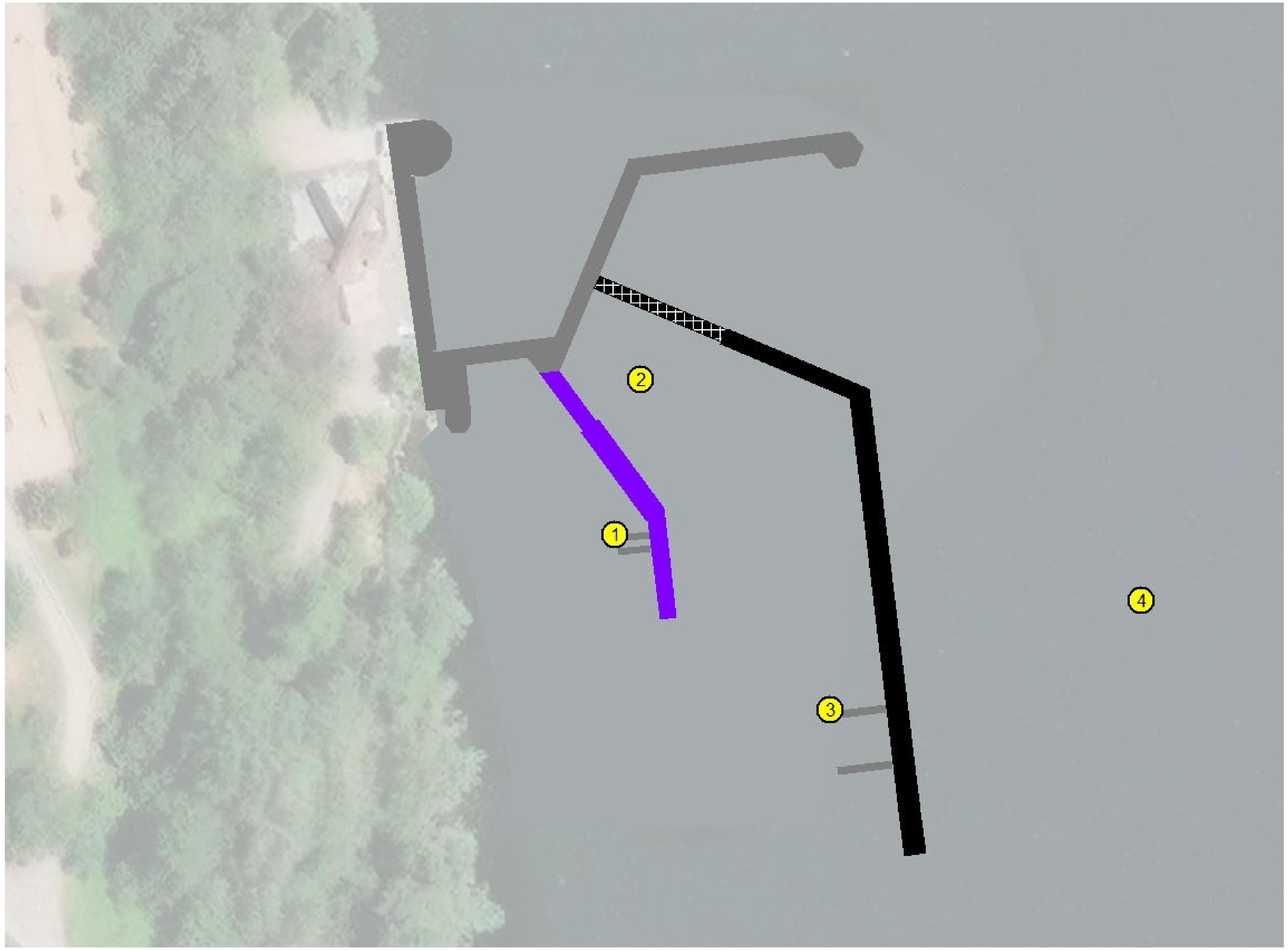


Figure 19: Location of Wave Height Extraction Points Inside the Marina

Appendix F
Tree Report

PUBLIC WORKS DEPARTMENT
CITY OF MERCER ISLAND, WASHINGTON
9611 S.E. 36th St. • Mercer Island, WA 98040-3732
(206) 275-7608 • FAX: (206) 275-7814
www.mercerisland.gov

Luther Burbank Park Waterfront Improvements Tree Report – Revised 3/31/2023

1. Arborists' Qualification

a. Andrew Prince: Andrew Prince has 17 years of experience in restoration and landscape horticulture, and is the Urban Forestry Project Manager for the City of Mercer Island. He holds a Municipal Arborist Specialist Certification from the International Society of Arboriculture. He maintains TRAQ certification through the same agency.
b. Paul West, MFR: Paul D. West has 40 years of experience in the field of landscape horticulture. He holds a Masters of Forest Resources in Urban Horticulture from the University of Washington. He was an ISA Certified Arborist for fifteen years. He held both TRACE and TRAQ qualifications. He has managed numerous capital projects that involve tree retention and protection, including paving, utility and building projects. He was previously the Senior Urban Forester for the City of Seattle Parks and Recreation Department.

2. Site, Project Purpose and Permit Approach

Luther Burbank Park is a 55 acre public park on the north end of Mercer Island. The address is 2040 84th Avenue SE. It slopes to Lake Washington along its eastern and northern boundaries. The site contains ¾ mile of shoreline. The purpose of this project is to increase capacity and accessibility for public shoreline recreation by renovating and improving a fifty year-old outdoor facility. This goal aligns with the Washington State Shoreline Management Act.

Mercer Island City Code 19.10.090 requires a tree plan that encompasses the entire property under permit application. This requirement is reasonable for private development, but would be onerous to execute for a 55 acre park. Furthermore, accepted urban forest management practices in a large public park are markedly different from those in a private development. The applicant plants and removes many trees every year to maintain or improve the long-term public benefit of the tree canopy in the park. Trees are managed as stands and populations as well as individuals. It is for this reason that this work is covered under annual tree permit provision found in MICC 19.10.100 A. To provide a complete understanding of the environmental impacts of the proposed action, this tree report focuses its study on those trees in proximity to the project such that they are likely to be impacted by the development proposal.

3. Tree Descriptions

The attached Tree Inventory (Item #10) provides data on each tree. Trees that are to be removed are described as follows:

Number	dbh (in.)	spp	description	health/ viability
1226	24	Acer macrophyllum	shoreline bank location; historic loss of the top has resulted in a short tree with a deep central cavity	fair
1227	22	Populus nigra (Lombardy Poplar)	Shoreline bank location; typical Lombardy poplar clone with codominant stem, dieback and basal cavities	poor
1228	7.5	Populus nigra (Lombardy Poplar)	Shoreline bank location; Lombardy poplar stump sprout with basal cavity; suppressed	poor
1229	28	Populus nigra (Lombardy Poplar)	Shoreline bank location; typical Lombardy poplar clone with deadwood	fair
1230	9.6	Acer rubra (red maple)	Paved plaza location; nursery-grown transplant has been very suppressed; dieback	poor
1231	7.6	Acer rubra (red maple)	Paved plaza location; nursery-grown transplant has been very suppressed; codominant main stem; dieback	poor
1232	11	Acer rubra (red maple)	Paved plaza location; nursery-grown transplant has been very suppressed; dieback	poor
1233	11	Fraxinus latifolia	Development edge location on the toe of the slope; included bark in subordinant stem	good
1234	47.5	Arbutus menziesii	Steep slope location; codominant trunks, north trunk is dead, south trunk has leaves on two lower scaffolds	poor
1235	14	Salix scouleriana	Steep slope location; extensive basal cavity, decay in basal crotch, extensive deadwood, upper scaffolds resprouted from topping incident	failing
1601	6	Populus nigra (Lombardy Poplar)	multiple subordinant stems; poor rooting on east side	fair
1602	7	Populus nigra (Lombardy Poplar)	multiple subordinant stems; poor rooting on east side	fair

4. Limits of Allowable Disturbance

Construction that may impact trees to be retained includes:

- Trenching operation north of the Boiler Building
- Geogrid installation along the pathways at the Fire Department Connection (FDC)

For those trees that are to be retained inside or in proximity to the limits of work, limits of allowable disturbance have been determined by the experience of the consulting arborist using the following criteria:

- Dripline diameter, trunk diameter and height of the tree
- Tree canopy form (e.g. excurrent, decurrent, columnar, etc.)
- Visual inspection of the ground level around the tree for its potential as rooting habitat (e.g. barriers to root growth like pavement, compaction)
- Visual evidence of tree root presence in the surface of the soil (e.g. surface roots, condition of competing vegetation)
- Root characteristics of subject species
- Soil composition
- Local topography
- Local hydrology including irrigation
- Maintenance practices

The limits set by the consulting arborist have been defined for groups of trees where possible. They have been visually represented in the plan set on sheet __________ (Item #12).

5. Special Instructions for Limits of Disturbance

Standard instructions are detailed in Section 329310 – Tree and Shrub Protection of the Specifications in the project manual and on plan sheet ___________ (Item #12). Additional instructions for one green ash tree (*Fraxinus pennsylvanica*) are shown on the plan sheet and listed here as follows:

1. Surround with tree protection fencing per specification
2. Excavate in this area only when daytime temperatures remain below 70 degrees F.
3. Soil shall be moist to a depth of 10 inches before excavation begins.
4. Excavation shall start closest to the tree and be accomplished by air spade.
5. Excavation shall be continuously observed by the project's consulting arborist.
6. Arborist will determine when excavation has reached the outer limits of significant structural roots.
7. Arborist will direct which roots are to be cut and which roots are to remain and be protected.
8. Remaining excavation may then be allowed by heavy equipment.
9. Exposed roots will be watered and covered until the specified fill material is place on top of them.
10. Fill shall occur within 24 hours following excavation.

6. Removals: Justification

The removals proposed are the minimum required to be able to execute the development proposal. Only one of them (1233) is in good or excellent condition. Three of the removals (1226, 1233 and 1235) are in locations needed for wheelchair accessibility routes. The proposed beach expansion and fire suppression system require the removal of five Lombardy poplars. They are not native and are likely root clones from older trees nearby. The three red maples in the plaza (1230, 1231 and 1232) are nursery cultivars that were planted 50 years ago. They exhibit weak growth and are not expected to grow significantly more or live significantly longer. Two of the trees (1234 and 1235) are in decline and are likely to become a hazard to the buildings.

Twenty new trees will replace the twelve being removed. They will increase the native composition of the shoreline canopy, including six new conifer trees. With maintenance, these trees are likely to exceed the habitat functions of the trees that are being removed.

7. Impacts of Removals on remaining trees

Most of the trees inventoried are not part of larger stands. The exceptions are the large madrona and the native willow on the hillside west of the project (1234 and 1235). The willow is a suppressed edge tree and its removal will have little effect on the trees upslope. The removal of the large madrona will have an effect on the surrounding trees by releasing them. In particular a smaller madrona to the west may benefit from this madrona's removal, not only from increased solar access, but also from the reduction in production of disease inoculum. The madrona is not providing significant wind shelter to other trees and the removal is not expected to increase the risk of windthrow for other trees.

8. Timing and Installation of Tree Protection

Tree protection measures shall be installed by the contractor during the first phase of mobilization onto the site and prior to operation of construction equipment on the site. Measures are typically installed along with TESC measures and are the first inspection item.

9. Locations and Species for Replacement

The Mercer Island Tree Inventory and Replacement Submittal worksheet (Item #11) is provided below. It demonstrates that MICC 19.10.070 A would require the 12 trees proposed for removal be replaced with 28 trees. However, MICC 19.10.070 B4 allows for the city arborist to reduce the number of replacement trees based on hazard, undesired or short-lived specimens, restoration of critical tree areas with native vegetation, or protection of small trees for canopy restoration. Therefore, the Tree Inventory (Item #10) indicates a reduction for specific trees based on these criteria. In total, we are proposing that the city arborist require 18 replacement trees.

The landscape plan proposes the planting of 20 new trees, two in excess of the proposed permit requirement. Replacement tree locations are as shown on Sheet L-010, below.

Common Name	Scientific Name	Min. size at transplant	Quantity
GRAND FIR	ABIES GRANDIS	5-6' HT	3
WESTERN RED CEDAR	THUJA PLICATA	5-6' HT	3
BIG LEAF MAPLE	ACER MACROPHYLLUM	1.5"CAL	4
SWAMP OAK	QUERCUS BICOLOR 'American Dream'	2" CAL	1
VINE MAPLE	ACER CIRCINATUM	5 GAL	9

10. Tree Inventory

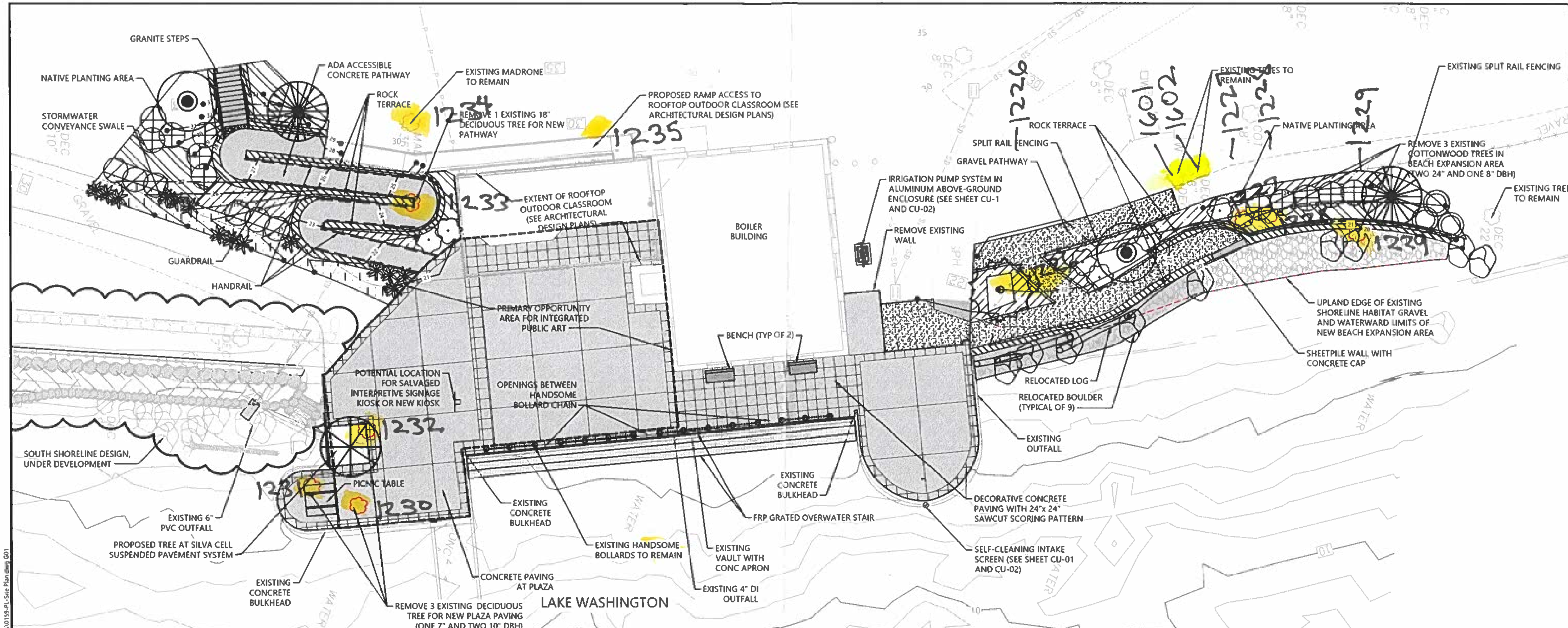
11. Mercer Island Tree Inventory worksheet

12. Tree Protection plan sheet and sample Tree Protection Specification

13. Sheet L-010 Landscape Plan

LUTHER BURBANK WATERFRONT IMPROVEMENT PROJECT **TREE INVENTORY** **September 1, 2021** **Paul West, MFR** **Andrew Prince, CAMS, TRAQ**

Number	dbh (in.)	status	spp	large regulated tree	exceptional	health/ viability	health notes	critical root zone	notes	updated condition February 2023	required replacement	reduced replace	19.10.070 B4 reason
1226	24	remove	ACMA	yes	no	fair	large cavity in central trunk; shortened terminal growth, dieback	not applicable	south trunk likely to fail; target beach and trail		3	2	restoration with native vegetation
1227	22	remove	PONI (Lombardy Poplar)	yes	no	poor	codominant stem, dieback, basal cavities	not applicable			2	1	restoration with native vegetation
1228	7.5	remove	PONI (Lombardy Poplar)	no	no	poor	main stem is a stump sprout, basal cavity, suppressed	not applicable			1	1	restoration with native vegetation
1229	28	remove	PONI (Lombardy Poplar)	yes	no	fair	lots of deadwood	not applicable			3	2	restoration with native vegetation
1230	9.6	remove	ACRU (red maple)	no	no	poor	stunted, lots of dieback	not applicable	tree planted in 1974; has not grown to mature size		1	1	short lived
1231	7.6	remove	ACRU (red maple)	no	no	poor	stunted, codominant main stem, dieback	not applicable	tree planted in 1974; has not grown to mature size		1	1	short lived
1232	11	remove	ACRU (red maple)	yes	no	poor	stunted, dieback	not applicable	tree planted in 1974; has not grown to mature size		2	1	short lived
1233	11	remove	FRLA	yes	no	good	included bark in subordinant stem	not applicable			2	2	
1234	47.5	remove	ARME	yes	yes	poor	codominant main stems; north trunk canopy mostly dead, decline is recent	not applicable	this tree may be dead by the 2024 construction, could be cut to a low (20') snag	north trunk is dead, only two lower scaffolds of south trunk have leaves	6	3	short lived
1235	14	remove	SASC	yes	yes	failing	extensive basal cavity, decay in basal crotch, extensive deadwood, upper scaffolds resprouted from topping incident	not applicable	this tree targets the restroom annex and is likely to fail		6	2	hazardous
1601	6	remove	PONI (Lombardy Poplar)	no	no	fair	multiple subordinant stems; poor rooting on east side	not applicable	root sucker from trail construction in 2008	added 2/23 for fire suppression system	1	1	
1602	7	remove	PONI (Lombardy Poplar)	no	no	fair	multiple subordinant stems; poor rooting on east side	not applicable	root sucker from trail construction in 2008	added 2/23 for fire suppression system	1	1	
											29	18	



LEGEND:

- EXISTING CONTOUR
- EXISTING TREE TO RETAIN
- EXISTING TREE TO REMOVE
- EXISTING UPLAND EDGE OF SHORELINE HABITAT GRAVEL
- EXISTING BOULDER TO RETAIN
- PROPOSED CONTOUR
- DECORATIVE CONCRETE PAVING WITH 24"x 24" SAWCUT SCORING PATTERN
- CONCRETE PAVING WITH SAWCUT JOINT SCORING
- GRAVEL PATHWAY
- EXISTING BOLLARD AND CHAIN TO REMAIN
- HABITAT GRAVEL
- GRAVEL OF COBBLE
- ROCK TERRACE
- GRATED WATER ACCESS STEPS
- GUARDRAIL
- HANDRAIL
- SPLIT RAIL FENCING
- PICNIC TABLE
- BENCH
- EXISTING LARGE WOODY DEBRIS RELOCATED
- PROPOSED TREE
- PROPOSED SHRUBS/GROUNDCOVERS
- RIPARIAN SHRUBS
- GROUNDCOVER
- STORMWATER CONVEYANCE PLANTING
- SALVAGED INTERPRETIVE SIGNAGE KIOSK/NEW KIOSK

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD83 (2011), U.S. SURVEY FEET
2. VERTICAL DATUM: NAVD88

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

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

30% DESIGN SUBMITTAL - NOT FOR CONSTRUCTION

ANCHOR QEA

CITY OF MERCER ISLAND WASHINGTON

REV	DATE	BY	APP'D	DESCRIPTION

REVISIONS

DESIGNED BY A. SPOONER
DRAWN BY T. GRIGA/C WEE
CHECKED BY P. HUMMEL
APPROVED BY A. SPOONER
SCALE AS NOTED
DATE MONTH YYYY

MERCER ISLAND LUTHER BURBANK DOCK REPAIR

COMPOSITE SITE PLAN

G-02

SHEET # 2 OF #

Aug 18, 2021 5:29pm cwee K:\Projects\0159-KPFF Consulting Engineers\Mercer Island Luther Burbank Dock Repair\Construction Plans\0159-PL-Site Plan.dwg G01

CITY OF MERCER ISLAND

COMMUNITY PLANNING & DEVELOPMENT
9611 SE 36TH STREET | MERCER ISLAND, WA 98040
PHONE: 206.275.7605 | www.mercergov.org

MERCER ISLAND TREE INVENTORY & REPLACEMENT SUBMITTAL INFORMATION

EXCEPTIONAL TREES

Exceptional Trees- means a tree or group of trees that because of its unique historical, ecological or aesthetic value constitutes an important community resource. A tree that is rare or exceptional by virtue of its size, species, condition, cultural/historical importance, age, and/or contribution as part of a tree grove. Trees with a diameter of more than 36 inches, or with a diameter that is equal to or greater than the diameter listed in the Exceptional Tree Table shown in MICC 19.16 under Tree, Exceptional.

List the total number of trees for each category and the tree identification numbers from the arborist report.

Number of trees 36” or greater: 1

List tree numbers: 1234

Number of trees 24” or greater (including 36” or greater): 1

List tree numbers: 1234

Number of trees from Exceptional Tree Table (MICC 19.16): 2

List tree numbers: 1234, 1235

LARGE REGULATED TREES

Large Regulated Trees- means any tree with a diameter of 10 inches or more, and any tree that meets the definition of an Exceptional Tree.

Number of Large Regulated Trees on site: 7 (A)

List tree numbers: 1226, 1227, 1229, 1232, 1233, 1234, 1235

Number of Large Regulated Trees on site proposed for removal: 7 (B)

List tree numbers: 1226, 1227, 1229, 1232, 1233, 1234, 1235

Percentage of trees to be retained ((A-B)/Ax100) note: must be at least 30%: >95 %

RIGHT OF WAY TREES

Right of Way Trees- means a tree that is located in the street right of way adjacent to the project property.

Number of Large Regulated Trees in right of way: 0

List tree numbers:

Number of Large Regulated Trees in right of way proposed for removal: 0

List tree numbers: ______________________________

Reason for removal: ______________________________

TREE REPLACEMENT

Tree replacement- removed trees must be replaced based on the ratio in the table below. Replacement trees shall be conifers at least six feet tall and or deciduous at least one and one-half inches in diameter at base.

Diameter of Removed Tree (measured 4.5' above ground)	Tree replacement Ratio	Number of Trees Proposed for Removal	Number of Tree Required for Replacement Based on Size/Type
Less than 10"*****	1	5	5
10" up to 24"	2	4	8
Greater than 24" up to 36"	3	1	3
Greater than 36" and any Exceptional Tree	6	2	12
		TOTAL TREE REPLACEMENTS	28

no replacement tree is needed if the tree fits all of the following;
Less than 10 inches in diameter, not an exceptional tree, and not a replacement tree from another tree permit. *

CAD USER: rluiten PLOT DATE: Mar 09, 2023-03:25pm
PATH: N:\2020\20000291 Luther Burbank Park\Drawings\Current (DWG2018)\C-030-034 UTILITY PLAN.dwg

kpff
1601 5th Avenue, Suite 1600
Seattle, WA 98101
206.622.5822
www.kpff.com

NO.	DATE	BY	REVISION

CITY OF MERCER ISLAND WASHINGTON

LUTHER BURBANK PARK
WATERFRONT IMPROVEMENTS
UTILITY PLAN - OVERALL

DRAWN: DCG	PROJECT NO.: 2200248
DESIGN: SS	SCALE: AS SHOWN
CHECKED: NAW	DATE: 10/07/2022
DRAWING NO.	C-030
SHEET NO.	X OF 44

60% SUBMITTAL

LEGEND:

- EXISTING CONTOUR
- EXISTING TREE TO RETAIN
- EXISTING LARGE WOODY DEBRIS RELOCATED
- PROPOSED TREE
- PROPOSED SHRUBS/GROUNDCOVERS
- RIPARIAN SHRUBS
- GROUNDCOVER
- STORMWATER CONVEYANCE PLANTING

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD83 (2011), U.S. SURVEY FEET
2. VERTICAL DATUM: NAVD88
3. SEE SHEET L02 FOR PLANT SCHEDULE

60% SUBMITTAL

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ANCHOR QEA

NO.	DATE	BY	REVISION

CITY OF MERCER ISLAND WASHINGTON

LUTHER BURBANK PARK
WATERFRONT IMPROVEMENTS

PLANTING PLAN

DRAWN: CW/RF	PROJECT NO.: 2200248
DESIGN: AS	SCALE: AS NOTED
CHECKED: AS/DR	DATE: 10/07/2022
DRAWING NO. L-010	
SHEET NO. 25	OF 44

PLANT SCHEDULE					
COMMON NAME	SCIENTIFIC NAME	SIZE	SPACING	QUANTITY	NOTES
TREES					
GRAND FIR	ABIES GRANDIS	5-6' HT	AS SHOWN	3	1 L-012, 2 L-012, 3 L-012
WESTERN RED CEDAR	THUJA PLICATA	5-6' HT	AS SHOWN	3	
BIG LEAF MAPLE	ACER MACROPHYLLUM	1.5" CAL	AS SHOWN	4	
SWAMP OAK	QUERCUS PALUSTRIS	2" CAL	AS SHOWN	1	
VINE MAPLE	ACER CIRCINATUM	5 GAL	AS SHOWN	9	
HIGH SHRUBS					
INDIAN PLUM	OEMLERIA CERASIFORMIS	2 GAL	AS SHOWN		5 L-012, 6 L-012
MOCK ORANGE	PHILADELPHUS LEWISII	2 GAL	AS SHOWN		
SHRUBS - RIPARIAN					
SWORD FERN	POLYSTICHUM MUNITUM	1 GAL	3' O.C.		5 L-012, 6 L-012
RED FLOWERING CURRANT	RIBES SANGUINEUM	1 GAL	3' O.C.		
NOOTKA ROSE	ROSA NUTKANA	1 GAL	3' O.C.		
THIMBLEBERRY	RUBUS PARVIFLORUS	1 GAL	3' O.C.		
SNOWBERRY	SYMPHORICARPOS ALBUS	1 GAL	3' O.C.		
GROUNDCOVERS					
SWORD FERN	POLYSTICHUM MUNITUM	1 GAL	3' O.C.		4 L-012, 6 L-012
OREGON GRAPE	MAHONIA NERVOSA	1 GAL	3' O.C.		
SHRUBS/GROUNDCOVERS - STORMWATER CONVEYANCE AREA					
RED OSIER DOGWOOD	CORNUS SERICEA	1 GAL	AS SHOWN		4 L-012, 5 L-012, 6 L-012
LADY FERN	ATHYRIUM FELIX FEMINA	1 GAL	AS SHOWN		
SEED MIX - STORMWATER CONVEYANCE AREA					

PLANT QUANTITIES WILL BE PROVIDED AT 90%

CAD USER: chewett PLOT DATE: Oct 11, 2022-02:51pm
PATH: K:\Projects\0159-KPFF Consulting Engineers\Mercer Island Luther Burbank Dock Repair\Construction Plans\0159-PL-PLANTING.dwg

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ANCHOR QEA

NO.	DATE	BY	REVISION

CITY OF MERCER ISLAND WASHINGTON

LUTHER BURBANK PARK
WATERFRONT IMPROVEMENTS

PLANT SCHEDULE

DRAWN: CW/RF	PROJECT NO.: 2200248
DESIGN: AS	SCALE: AS NOTED
CHECKED: AS/DR	DATE: 10/07/2022
DRAWING NO. L-011	
SHEET NO. 26	OF 44

60% SUBMITTAL

US Army Corps of Engineers ®
Seattle District

BIOLOGICAL EVALUATION
FOR INFORMAL ESA CONSULTATION
For: _____ (Corps Reference Number)
Version: May 2012

***** This form is for projects that have insignificant or discountable impacts on listed species. It contains all the information required for a biological evaluation, but in abbreviated form and with minimal instructions on how to fill it out. For more detailed instructions, a format for development of a biological assessment or biological evaluation can be found on the Seattle District Corps website (www.nws.usace.army.mil – click on regulatory and then on endangered species, BA Template). You may also contact the Corps at 206-764-3495 for further information.***

Drawings and Photographs - ***Drawings and photographs must be submitted***. Photographs must be submitted showing local area, shoreline conditions, existing overwater structures, and location of the proposed project. Drawings must include a vicinity map; plan, profile, and cross-section drawings of the proposed structures; and over- and in-water structures on adjacent properties. (For assistance with the preparation of the drawings, please refer to our *Drawing Checklist* located on our website at www.nws.usace.army.mil Select Regulatory – Regulatory/Permits – Forms.) Submit the information to: U.S. Army Corps of Engineers, Regulatory Branch, P.O. Box 3755, Seattle, Washington 98124-3755.

Date: October 2022

SECTION A - General Information			
1. **Applicant name**: Paul West, City of Mercer Island Public Works			
Mailing address: 9611 SE 36th Street, Mercer Island, WA 98040			
Work phone: (206) 275-7833	Home phone:	Email: paul.west@mercergov.org	Fax:
2. **Joint-use applicant name (if applicable)**:			
Mailing address:			
Work phone:	Home phone:	Email:	Fax:
3. **Authorized agent name**: Josh Jensen, Anchor QEA			
Mailing address: 1201 3rd Avenue, Suite 2600, Seattle, WA 98101			
Work phone: (206) 903-3374	Home phone:	Email: jjensen@anchorqea.com	Fax:
4. **Location where proposed work will occur** Address (street address, city, county): Luther Burbank Park: 2040 84th Avenue SE, Mercer Island, WA 98040 Location of joint-use property (street address, city, county): Waterbody: Lake Washington			
¼ Section: SW	Section: 6	Township: 24N	Range: 5E
Latitude: 47.591034 N lat.		Longitude: -122.224481 W. long.	

5. Description of Work:
<u>Include project drawings and site photographs.</u>
Describe the proposed project in detail. Please describe any mitigation that is being proposed for impacts from your project. Attach a mitigation plan as an appendix, if appropriate.

The City of Mercer Island (City) is proposing the Luther Burbank Park Waterfront Improvements Project (Project) to repair, maintain, and enhance the waterfront program at Luther Burbank Park in the City of Mercer Island, Washington (Figure BE-1). Appendix 1 provides detailed Project drawings that are referenced throughout this report.

An overview of the Project components is provided in Appendix 1, Figure 3. The Project includes repairing and replacing portions of the existing dock structures, including repairs to the north dock structure, and replacing and reconfiguring the central and south dock structures to accommodate waterfront programming and current and projected watercraft uses. Other waterside improvements include installing a grated overwater public access platform in the nearshore to improve access to the water along the existing plaza area.

The Project also includes upgrades to the waterfront plaza and Boiler Building. These include Boiler Building repairs (i.e., new roof, seismic retrofits, and new lighting); Boiler Building restroom annex renovation to improve the restroom facilities and construct a new rooftop viewing deck; concession stand repairs; and waterfront plaza renovations and access upgrades.

The Project will improve access to the waterfront by creating new Americans with Disabilities Act (ADA)-accessible routes from the plaza to the viewing deck on the existing Boiler Building annex restroom rooftop, and to the expanded north beach area that will be improved with fish habitat gravel and riparian plantings. The ADA route will connect to the adjacent future south shoreline trail that will be constructed as part of a separate project. The ADA route will also connect to the existing trail that continues north of the Project area. All proposed waterfront improvements including the dock structures and gangways will also meet ADA requirements.

The waterfront plaza renovations and access upgrades will incorporate low impact development (LID) features that will provide stormwater buffering and biofiltration functions similar to a vegetated shoreline. An irrigation intake system will also be installed at the south end of the plaza.

Project details and construction methods are described in the following subsections.

Upland and Shoreline Improvements
The proposed upland and shoreline improvements include the following (Appendix 1, Figures 3 through 6):

- **Boiler Building Repairs:** installing a new roof, seismic retrofits, and new lighting on the existing building
- **Boiler Building Restroom Annex Renovation (Rooftop Viewing Deck):** renovating the existing restrooms, constructing a new rooftop viewing deck, and installing new lighting on the existing building
- **Concession Stand Repairs:** installing improvements and a new electrical panel within the concession area of the existing building
- **Waterfront Plaza Renovations and Access Upgrades:**
  - Installing 1,970 sf of planting and irrigation
  - Installing 1,800 sf of plaza paving improvements
  - Installing three benches and one picnic table
  - Installing 65 lf of a new structural ADA-accessible ramp to the viewing deck
  - Expanding the north beach access with a new 120-lf ADA-accessible pathway connection and beach expansion
  - Installing a 6-foot concrete seatwall at north beach pathway
  - Installing 61 lf of split rail fencing
  - Installing a new 140-lf on-grade pathway connection between the structural ramp, south shoreline trail, and upland plaza
  - Installing granite steps at the new on-grade pathway
- **Shoreline and Beach Enhancements:** expanding the north beach by placing fish habitat gravel landward of the upland edge of the existing beach, relocating boulders and large woody debris (LWD) along the shoreline, enhancing riparian vegetation
- **Waterfront Drainage LID:** installing new site drainage improvements including 2,500 sf of pervious paver drainage design at the plaza, installing a silva cell biofiltration array with a new stormwater outfall to the lake, and complying with all associated storm drainage reporting and compliance requirements
- **Irrigation Intake System Installation:** replacing and installing a new irrigation intake, pump system, and supply lines

Boiler Building Repairs
Exterior repairs to the Boiler Building will include installing seismic retrofits, a new roof, and replacing and installing wall-mounted light fixtures to enhance public safety.

Boiler Building Restroom Annex Renovation (Viewing Deck)
The Boiler Building restroom annex rooftop will be renovated to facilitate a new rooftop viewing deck. The viewing deck will be constructed with Bison wood-paneled deck-surfacing material on pedestals with a 1/2-inch maximum gap for ADA accessibility on top of the existing concrete roof. The existing rooftop elevation is 29 feet, and the

rooftop itself is 40 feet by 21 feet in length and width. The new rooftop will be elevated to approximately 30 feet in height to match the future second level of the Boiler Building and will match the existing extent of the rooftop area. Amenities, such as a new guardrail, light fixtures, new signage displays, and site furnishings, will be installed.

Concession Stand Repairs

The concession stand is located between the Boiler Building and restrooms and is approximately 160 sf in area. An existing casework area on the east side of the wall will be removed and replaced with a new 6-inch concrete wall with concrete counter above. A new sink will be installed in the southwest corner of the concession area and a new electrical panel will be installed in the northwest corner.

Waterfront Plaza Renovations and Access Upgrades

Table 1 describes each Project element and the impervious surface removed, replaced, or installed for each feature. The Project will reduce overall impervious surface area by approximately 5% and will replace approximately 50% of existing impervious surfaces.

Plaza renovations for the Project include removing 5,205 sf of concrete pavers, brick pavers, concrete paving, and a small area of asphalt paving in front of the Boiler Building restroom annex under the breezeway (Appendix 1, Figure 4). Approximately 2,595 sf of existing impervious surface will be replaced, including 2,015 sf of new concrete paving in the western portion of the plaza by the Boiler Building and 580 sf of gravel driveway paving (Appendix 1, Figure 5). Approximately 2,410 sf of pervious pavers will be installed in the eastern part of the plaza (not included in impervious surface calculations). Two benches are proposed along the outside of Boiler Building in the plaza, and one picnic table is proposed at southern end of the plaza.

Table 1
Impervious Surfaces Summary

Project Element	Impervious Surface Removed (sf)	Impervious Surface Replaced (sf)	New Impervious Surface Installed (sf)
Waterfront Plaza			
Concrete pavers, brick pavers, and concrete paving at waterfront plaza	4,425	2,015	n/a
Asphalt paving at Boiler Building restroom annex breezeway	320	n/a	n/a
Driveway and ADA Trail/Ramp			
Gravel driveway paving	580	580	n/a
Gravel on-grade pathway south of plaza	170	n/a	700
Structural concrete ADA-accessible ramp to the new viewing deck	n/a	n/a	260
Rock terrace at on-grade pathway	n/a	n/a	375
Granite steps at on-grade pathway	n/a	n/a	60
North Beach Access			
Gravel pathway at north beach	30	n/a	400
Concrete pathway segment	n/a	n/a	150
Rock revetment at north beach	n/a	n/a	300
Concrete cap for sheetpile wall	n/a	n/a	11
Rock terrace at north beach	n/a	n/a	60
Concrete seatwall	n/a	n/a	11
Total	**5,205**	**2,595**	**2,327**

The Project includes several shoreline trail access improvements (on-grade pathway and ramp, north beach pathway). The new on-grade pathway south of the plaza will be an accessible, crushed rock surfaced pedestrian trail (Appendix 1, Figure 5). Approximately 42 cubic yards of terraced rock wall (375 sf) will be placed to accommodate ADA-accessible slopes along this pathway. A stormwater outfall will be relocated during this construction.

A new structural ADA-accessible ramp is designed to provide access to the new viewing deck and will be located behind the Boiler Building restroom annex on the northwest side of the rooftop. Several footings will be installed to support the viewing deck access ramp, ranging from 3.5 to 5.5 feet deep and requiring excavation of approximately 20 cubic yards of soil total. The ramp will connect to the new on-grade crushed gravel pathway that will lead down to the plaza, dock, and future south shoreline trail. The on-grade pathway will also lead uphill to a new granite step feature that connects to an existing uphill trail network. Construction of the upland trail will be completed with standard heavy equipment including small excavators, small bulldozer, dump truck, and similar equipment.

The north beach access will be expanded with a new ADA-compliant pathway connection (Appendix 1, Figure 5). A gravel pathway will connect to a concrete trail segment leading to a seatwall. A sheetpile wall with concrete cap will be installed at the east end of the trail. The trail will be supported by a rock terrace on the landward side and a rock revetment adjacent to the beach (see sections in Appendix 1, Figure 6).

Shoreline and Beach Enhancements
In addition to improving public access and safety, the design includes shoreline and beach enhancements (Appendix 1, Figure 5). The Project will expand the north beach by placing fish habitat gravel landward of the upland edge of the existing beach, relocate boulders and LWD along the shoreline, and enhance riparian vegetation. The beach expansion includes placing 45 cubic yards of habitat gravel and cobble underlayment (605 square feet) and relocating intermittent boulders and LWD along the existing beach and riparian buffer area. The expanded beach and riparian area will maintain nearshore habitat functions. The planting plan to replace removed riparian vegetation and trees is described later in this section.

Habitat gravel will consist of naturally rounded material that complies with Washington Department of Fish and Wildlife (WDFW) grain size criteria for Lake Washington. Gravel depth is a maximum of 2- to 3-foot thickness on the landward side, tapering on the waterward toe of placement (see sections in Appendix 1, Figure 6). The material will be placed from the upland or by barge using a conveyor (e.g., telebelt or similar) to place the material precisely and evenly. All materials will be sourced from an approved off-site distributor.

Waterfront LID
Approximately 2,410 sf of concrete and brick pavers at the plaza will be replaced with pervious pavers along the eastern edge of the plaza. The pervious pavers will abut the new concrete paving on the western portion of the plaza and will end at the waterfront edge. A silva cell system will be installed under the south end of the plaza to provide biofiltration of stormwater. A new outfall from this system will be installed in the bulkhead south of the pedestrian plaza. A vegetated conveyance swale will be installed along the resurfaced gravel maintenance driveway.

Irrigation Intake System Installation
The irrigation intake system includes installing a new water pump station south of the Boiler Building and a new freshwater intake screen in Lake Washington east of the pump station (Appendix 1, Figure 5). They will connect to upland irrigation systems within the park. Upland work will include installing the pump station, trenching approximately 50 feet east from the pump station under the plaza to the intake screen, and installing pipe bedding material and the piping in the trench.

A coring saw, or similar, will be used to core a hole through the existing retaining wall to insert the intake and filter backwash pipes through the wall and into the lake. A small portion of the lake, in and around the area where the pipe penetration will be constructed through the bulkhead wall, will be temporarily dewatered to allow for drilling through the bulkhead and installation of the screen in the dry. Once the penetration is sealed and grout has cured, the screen will be installed on the end of the pipe and the temporary cofferdam used to dewater that portion of the lake will be removed and the lake will be allowed to submerge the fish screen.

The intake screen will be a self-cleaning suction screen designed to screen fish from entering the intake facilities in compliance with current fish screening guidelines from WDFW and the National Marine Fisheries Service. The irrigation intake system will draw water from Lake Washington at a maximum rate of 0.089 cubic foot per second (40 gallons per minute), as allowed by the approved water right change (Water Right Claim 158498AH).

In-Water and Overwater Activities

The in-water and overwater Project elements are described in this section and shown in Appendix 1, Figures 3, 4, and 7 through 12.

North Dock Repairs

The Project proposes to retain and repair the northernmost segment of the dock (approximately 188 feet long and 8 feet wide; Appendix 1, Figures 7 and 8). Approximately 235 sf of the existing concrete dock connecting to the waterfront plaza will be removed and replaced with fiberglass-reinforced plastic (FRP) grating. Approximately 120 sf of an existing wood finger dock will be removed (Appendix 1, Figure 4).

Some timber piles supporting the north dock have decayed and need repair. The Project includes removing and replacing the top portion of up to five decayed timber piles with ACZA-treated timber. The damaged portions of the pile will be cut away, and a new timber section will be attached to the remaining pile with steel straps (Appendix 1, Figure 9).

As part of the north dock repairs, 38 creosote-treated timber piles will be wrapped with fiberglass jackets (Appendix 1, Figure 8). The area around the bottom of each pile will be excavated a minimum of 2 feet deep to allow the jacket to be extended below the mudline. A marine epoxy grout will be injected between the pile and the jacket. The jackets will isolate the creosote-treated piles from the water to prevent further leaching of creosote into the water column, reducing a source of water pollution into the lake.

Central Dock Reconfiguration

The central dock is a fixed concrete structure (Appendix 1, Figure 2). The existing dock will be entirely removed (Appendix 1, Figure 4) and replaced in a new configuration. The reconfigured central dock will include a wave attenuator/mooring float attached to the existing fixed concrete dock by an ADA-compliant grated gangway (Appendix 1, Figure 7a). The wave attenuator/mooring float will be 10 feet wide with 2 feet of freeboard. To provide adequate wave attenuation, the float material will be concrete, with light penetration options where possible. The bulk of the structure is located as far off shore as practical in approximately 36 to 38 feet of water to reduce the effect of shading on the lake bottom. The float will attach to 16 new steel piles (24-inch diameter; Appendix 1, Figures 10 and 11). Attached to the inside of the wave attenuator/mooring float will be two new grated finger floats, each 25 feet long with 1.5 feet of freeboard (Appendix 1, Figure 7). Elevation and section views of the central dock are provided in Figures 10 and 11.

The intended use of the wave attenuator/mooring float is for small (up to 26-foot) powerboat moorage. The width is designed to attenuate passing vessel wakes and protect moored boats. The wave attenuation function is critical because the area is frequented by wake surfing boats, a recent boating trend that uses back-weighted boats designed to produce large wakes for surfing without the use of the tow rope that is typically required for waterskiing and wake boarding. In the last decade, wake surfing has become popular in Lake Washington. The large waves this generates cause floating docks to pitch excessively. The waves affect the docks intermittently, unpredictably, and without warning. These conditions create unstable surfaces on floating docks, posing a risk to dock users and prohibiting ADA-compliant access. The wave attenuation provided by this mooring float addresses this problem. This project will also install regulatory buoys offshore of the float to inform boaters of wake regulations in proximity to the shoreline.

South Dock Reconfiguration

The south dock is a fixed concrete structure that will be removed (Appendix 1, Figure 4) and replaced in a new configuration. The new south dock is intended for nonmotorized watercraft—kayaks, canoes, rowboats, and small sailboats—to accommodate public use and boating programs such as rentals, classes, and camps. The design includes the reuse of an existing 10-foot by 50-foot grated float and construction of a new 8-foot-wide by 50-foot-long, 9-inch-freeboard general-purpose float (Appendix 1, Figures 7 and 12). The proposed floating structures will connect to the existing fixed dock by an ADA-compliant grated gangway. The floats will attach to five new steel piles (16-inch diameter).

The new general-purpose float will be constructed with a low freeboard to make the use of kayaks and stand-up paddleboards easier and with grated surfacing to meet light transmittance requirements. Two grated finger floats (each 15 feet long by 3 feet wide) will extend from the general-purpose float to provide areas for kayak launching, including one ADA-accessible kayak launch point.

Overwater Access Platform
The Project includes a new grated overwater platform as part of the goal to improve access to the waterfront (Appendix 1, Figure 3). Portions of the “Handsome Bollards” chain will be removed to allow the public past the art feature and onto the platform where they can access the lake at water level. The platform will only provide access to the ordinary high water level and will not descend to the beach substrate. The platform will attach to the existing concrete bulkhead at the plaza as an overwater feature and will be of FRP grating material. The platform is being permitted separately with the U.S. Army Corps of Engineers but will be incorporated with the Project for other permit agencies.

Buoys
To reduce the risks created by passing vessels, the City will replace one buoy and add two new buoys in the lake. Two will be “no wake” buoys located east and southeast of the docks, and one will be a “nonmotorized vessel” buoy located near the south dock (Appendix 1, Figure 7).

Summary of Pile and Overwater Cover Quantities
Table 2 summarizes the in-water piles and overwater cover to be removed, repaired, and installed.

Up to sixty-seven 12- to 14-inch creosote-treated timber piles and two 16-inch concrete encapsulated piles in total will be removed during dock demolition and repair. A total of 23 new steel piles (16- and 24-inch diameter) will be installed for the reconfigured docks, and six new pin piles (6-inch diameter) will be installed for the overwater platform. The Project will result in a net reduction of 40 piles in Lake Washington, and removal or fiberglass encapsulation of creosote-treated timber piles.

Piles will be installed using a water-based pile driver and a vibratory and/or impact hammer. It is anticipated that impact pile driving will be limited to proofing or if obstructions are encountered during vibratory pile driving. During all impact driving, sound-attenuation devices such as wooden cushion blocks or similar devices will be employed to minimize sound-related impacts.

The Project will result in a net reduction of approximately 5 sf of overwater cover (4,665 sf removed and 4,660 sf added). Much of the new overwater cover to be installed for the Project will consist of grated material that will allow light penetration.

Table 2
In-Water and Overwater Work Summary

Project Portion	Element	Features Removed	Features Replaced	Net Change
North Dock Repairs[1]	In-water piles	One 12- to 14-inch creosote-treated timber pile[1]	Not applicable	Net decrease of 1 in-water pile
	Overwater cover	Approximately 355 sf of overwater cover (235 sf of existing concrete dock; 120 sf of one wood finger dock)	235 sf FRP grating	Net decrease of 120 sf overwater cover
Central Dock Reconfiguration	In-water piles	Approximately twenty-six 12-to 14-inch creosote-treated timber piles)	Approximately 17 piles (sixteen 24-inch steel piles; one 16-inch steel pile)	Net decrease of 9 in-water piles
	Overwater cover	Approximately 1,500 sf fixed concrete dock	Approximately 3,160 sf of new overwater cover (2,610 sf of wave attenuator float, 175 sf of two grated finger floats, 375 sf of grated gangway)	Net increase of 1,660 sf overwater cover
South Dock Reconfiguration	In-water piles	Approximately 42 piles (forty 12- to 14-inch creosote-treated timber piles; two 16-inch concrete encapsulated piles)	Approximately six 16-inch steel piles	Net decrease of 36 in-water piles
	Overwater cover	Approximately 2,810 sf existing cover (1,930 sf of fixed concrete dock; 40 sf of aluminum ramp; seven 120-sf wood finger docks)	Approximately 713 sf of new overwater cover (380 sf of general-purpose float, 90 sf of 2 grated finger floats, 225 sf of grated gangway, 18 sf of concrete gangway abutment)	Net decrease of 2,097 sf overwater cover
Overwater Access Platform	In-water piles	Not applicable	Approximately 6 pin piles (6-inch steel piles)	Net increase of 6 in-water piles
	Overwater cover	Not applicable	Approximately 552 sf of grated overwater cover	Net increase of 552 sf overwater cover
Total	**In-water piles**	**Approximately 69 piles removed**	**Approximately 29 piles installed**	**Net decrease of 40 in-water piles**
	Overwater cover	**Approximately 4,665 sf of existing cover removed**	**Approximately 4,660 sf of new overwater cover installed[2]**	**Net decrease of approximately 5 sf of overwater cover**

Note:

1. Table does not include repair and fiberglass encapsulation of existing north dock piles. Up to five 14-inch decayed creosote-treated timber pile tops will be removed and replaced with ACZA treated timber piles and wrapped with fiberglass jacket.
2. Approximately 2,000 sf of new overwater cover will consist of FRP grating.
3. An existing floating wood dock will be removed from the south dock during demolition, temporarily stored on site, and replaced for reuse as part of the reconfigured south dock. This floating wood dock is not included in the overwater cover calculations shown here.

Planting Plan

To construct the new access pathways, plaza paving, and expanded north beach, up to 10 trees located along the shoreline and in the uplands will be removed and replaced with 20 new trees (Table 3; Appendix 1, Figures 13 and 14). Approximately 4,300 sf of riparian and upland vegetation will be removed during construction, and 2,020 sf of native shrub and groundcover vegetation will be installed, including shoreline riparian, upland, and stormwater swale vegetation. Loss of vegetation is due to areas expanded for public access opportunities. The Project will install diverse native planting palette, including variety of groundcover, shrubs, and both deciduous and coniferous trees.

All planting areas will be irrigated and maintained per the park maintenance plan to establish and support species growth. Table 3 summarizes the proposed tree and vegetation removal and replacement activities. All plant installations will occur above the ordinary high water mark.

Table 3
Areas of Vegetation Disturbance and Restoration

Project Component	Location	Quantity or Area
Vegetation removal	North beach	1,800 sf (riparian)
	South on-grade pathway	2,500 sf (upland)
	Total	**4,300 sf removed**
Shrub and groundcover planting	North beach	730 sf (riparian)
	South on-grade pathway	1,290 (upland)
	Total	**2,020 installed**
Tree removal	North beach	4 trees (deciduous)
	South on-grade pathway and ramp	3 trees (deciduous)
	Plaza	3 trees (deciduous)
	Total	**10 trees removed**
Tree installation	North beach	11 trees
	South on-grade pathway	8 trees
	Plaza	1 tree
	Total	**20 trees installed**

For projects that include pile driving

If steel or concrete piles are being installed with an impact hammer pile driver, marbled murrelets may be adversely impacted. For installation of any type of pile with a vibratory pile driver, marine mammals may be adversely impacted. A monitoring plan may be required to ensure protection of these species.

Please fill out the following: (obtain information from contractor)	
5.1 Number of piles being replaced:	Approx. 69 piles will be removed (67 creosote-treated timber and 2 creosote-treated timber encapsulated in concrete) 29 new steel piles installed
5.2 Replacement pile type: (e.g.: ACZA-treated wood, steel, coating used on steel piles)	Replacement piles will be steel
5.3 Replacement pile size: (e.g. 12-inch)	Replacement piles will be 24-inch (16 piles), 16-inch (7 piles), and 6-inch (6 piles)
5.4 Installation method: (e.g.: vibratory, impact hammer)	Vibratory hammer with impact hammer proofing. **Note:** Vibratory or impact installation of wood, concrete, plastic, or other non-metal piles of any size is allowed. Impact installation of steel piles in marine waters is not covered under the programmatic and, in freshwater, is only covered programmatically for steel piles up to 10 inches.
5.5 Anticipated dates, number of minutes and number of days vibratory pile driving	Up to 360 minutes per day (2 to 3 piles per day, 60 to 120 minutes per pile) Up to 15 days (29 piles, 2 to 3 piles per day) Anticipated dates: During the approved regulatory work window for Lake Washington (typically between July 16 and March 15) or an approved extension
5.6 For vibratory installation, will proofing be required? If so, how many pile strikes per pile?	Yes __X__ Number of pile strikes per pile: 30 ______ No ______
5.7 For impact hammer installation, estimate the number of pile strikes required per pile:	30 strikes per pile (proofing only)
5.8 For impact hammer installation or proofing, estimated number of pile strikes per day:	Strikes per day: Up to 90 strikes per day (up to 3 piles per day, 30 strikes per pile) Number of days Up to 15 days (29 piles, 2 to 3 piles per day) Anticipated dates: During the approved regulatory work window for Lake Washington (typically between July 16 and March 15) or an approved extension
5.9 For impact hammer pile driving or proofing, sound attenuation measures:	Wood cushion block

Please fill out the following: (obtain information from contractor)	
5.10 Anticipated dates, number of minutes and number of days of impact hammer pile driving or proofing:	During the approved regulatory work window for Lake Washington (typically between July 16 and March 15) or an approved extension Up to 60 minutes of impact proofing per pile x 29 piles = 1,740 total minutes Up to 3 piles per day = 180 minutes impact proofing per day max. Up to 15 days of pile installation
5.11 Describe substrate into which piling will be driven:	The piles will primarily be installed into very dense glacially consolidated soils.

6. Construction Techniques:
Describe methods and timing of construction to be employed in building the project and any associated features. Identify actions that could affect listed / proposed species or designated / proposed critical habitat and describe in sufficient detail to allow an assessment of potential impacts. Consider actions such as vegetation removal, temporary or permanent elevations in noise level, channel modifications, hydrological or hydraulic alterations, access roads, power lines etc. Also discuss construction techniques associated with any interdependent or interrelated projects.
Address the following:

A. Construction sequencing and timing of each stage (duration and dates):

The Project is anticipated to be constructed in two phases and will occur over 14 months beginning in or around July 2023, or once all permits and approvals are issued. In-water work will occur during the approved regulatory work window for Lake Washington, which is typically between July 16 and March 15 (or an approved extension). Overwater or upland activities may occur outside of the in-water work window. The following construction phase and sequences are proposed:

Phase 1: July 2023-January 2024

- Boiler Building Repairs
- Boiler Building Restroom Annex Renovation
- Concession Stand Repairs

Phase 2: June 2024-November 2024

- North Dock Repairs
- Central Dock Reconfiguration
- South Dock Reconfiguration
- Overwater Access Platform
- Waterfront Plaza Renovation and Access Upgrades
- North Beach Enhancements
- Waterfront LID
- Irrigation Intake System

B. Site preparation:

Prior to earth-disturbing activities, site preparation will include installing best management practices (BMPs) to manage stormwater runoff and prevent erosion from upland areas as described in Section 11. Approximately 4,350 square feet of existing concrete and asphalt paving and concrete and brick pavers will be removed (Table 2). Approximately 4,300 square feet of vegetation will also be removed to prepare the site for construction (Table 3).

C. Equipment to be used:

Upland work will be completed using excavators, backhoes, dump trucks, and other typical heavy construction equipment. Cobbles and habitat gravel will be placed on the north beach from the upland or by barge using a conveyor (e.g., telebelt or similar) to place the material precisely and evenly.

Piles will be installed by a water-based excavator mounted vibratory pile driver and proofed with an impact hammer. During all impact driving, sound-attenuation devices such as a wooden cushion blocks or similar devices will be employed to minimize sound-related impacts. BMPs and noise-attenuation measures will be implemented to minimize impacts to fish and wildlife species as described in Section 11. Existing piles to be removed will be extracted according to the BMP standards provided by the Washington Department of Natural Resources (DNR 2017).

Construction equipment needed to install the new irrigation intake system includes an excavator, backhoe, and coring saw, as detailed in the Biological Evaluation for the Luther Burbank Park Irrigation Intake and Swim Area Maintenance Project (Anchor QEA 2020).

D. Construction materials to be used:

Construction materials to be used for overwater and in-water work include steel piles, light-penetrating fiberglass-reinforced plastic (FRP) grating, untreated timber pile caps, fiberglass and grout for encapsulation of timber piles, and concrete for gangway abutments. Beach enhancement materials will include WDFW-approved habitat gravel and cobbles, LWD, and boulders. Materials used for upland improvements will include concrete, pervious pavers, gravel, split-rail fencing, riprap for rock terrace, and granite steps, as well as interior and exterior building materials (e.g., lighting).

E. Work corridor:

The work corridor includes both upland and in-water construction areas on the Lake Washington shoreline and to a pile depth below the lake OHWM, reaching competent soils.

F. Staging areas and equipment wash outs:

Equipment and materials will be staged in existing cleared upland areas of the park. A barge may be used to stage equipment and materials needed for in-water work. No equipment washouts will be needed.

G. Stockpiling areas:

Stockpiling areas will be the same as those discussed previously for staging (Section F).

H. Running of equipment during construction:

Equipment will run periodically during the 14-month construction period. In-water equipment will run only during the approved regulatory work window for Lake Washington, which is typically between July 16 to March 15 (or an approved extension).

I. Soil stabilization needs / techniques:

Stormwater and erosion control BMPs will be installed to prevent erosion in disturbed upland areas as described in Section 11.

J. Clean-up and re-vegetation:

Upland areas where soils are disturbed will be revegetated as soon as possible. Approximately 20 new trees will be installed in upland and shoreline areas to replace the trees removed for the Project (Table 3). The riparian area along the north beach will be revegetated with native and native-adapted species.

K. Storm water controls / management:

During construction, stormwater control BMPs will be implemented as described in Section 11. The completed Project will include LID measures and stormwater improvements in compliance with stormwater management requirements.

L. Source location of any fill used:

All fill used in upland areas and the cobble/beach habitat gravel to be placed landward of OHWM will be composed of clean materials obtained from a reputable local source.

M. Location of any spoil disposal:

No dredging or spoils disposal is proposed.

7. Action Area

Please describe the action area. The action area means all areas to be affected directly (e.g., earth moving, vegetation removal, construction noise, placement of fill, release of environmental contaminants) and indirectly by the proposed action. (Example: as a direct effect, the action area for pile driving would include the area out to where the noise from the pile driving falls below the level of harm or disturbance for listed species. For vibratory hammer pile driving impacts to killer whales, this level is 120 dB. Action area will include any area where the underwater noise level may exceed 120 dB).

The action area encompasses the location where construction will occur, as well as all areas that may experience direct effects or delayed consequences, and interrelated and interdependent actions. The geographic extent of the action area was defined by the farthest geographic reach of Project actions that may lead to potential impacts on listed species or critical habitat. These include construction-related in-water noise, in-air noise, and turbidity. Visible in-water turbidity will not be allowed to extend beyond 300 feet of pile driving locations, in accordance with state water quality standards (Washington Administrative Code 173-201A), which is well within the portion of the action area where in-water noise impacts would occur.

Existing piles will be removed with a vibratory hammer. Piles will be installed to the extent possible using a vibratory hammer; an impact hammer may be required to proof new piles and has been included as part of this assessment. The action area is defined for the purposes of this Project as the area within the radius required for in-air construction equipment noise and underwater pile driving noise to attenuate to background noise levels (Figure BE-2).

In-Air Noise

The in-air portion of the action area is the distance at which in-air noise attenuates to background sound levels. It was calculated using reference sound levels for the three loudest pieces of equipment that may be used. For this Project, they include an impact pile driver installing 24-inch-diameter steel piles (108 dB), a vibratory pile driver (105 dB), and a concrete drill (93 dB) (WSDOT 2020). The combined sound level for all three of these pieces of equipment is 110 dB.

Ambient noise levels in the area are estimated at 67 A-weighted decibels (dBA) due to their reasonable comparison to that of playgrounds and parks (Awbrey and Bowles 1990). Given the urban setting of the Project area, slightly higher ambient noise levels of approximately 70 dBA were assumed for this analysis.

Traffic on Interstate 90 (I-90) is a major noise source in the Project vicinity. The average annual daily traffic (AADT) for segments of I-90 near Luther Burbank Park was approximately 102,000 vehicles in 2020 (WSDOT 2022). This is equivalent to approximately 10,200 vehicles per hour. Assuming travel speeds of 60 miles per hour on I-90, this traffic volume results in noise levels of approximately 84 dBA equivalent continuous sound level (L_{eq}) at a distance of 50 feet.

The extent to which in-air construction noise will travel away from the Project site depends on whether the vicinity is “hard” (consists of surfaces such as water and pavement that do not absorb noise) or “soft” (with vegetation, topography, or other features that absorb noise). Background noise levels including traffic affect how far construction noise will travel before attenuating to background levels.

Lake Washington acts as a “hard” surface. Using equations from WSDOT (2020), in-air construction noise from the Project will attenuate to background levels at a distance of approximately 4,922 feet (0.9 mile) over Lake Washington (Figure BE-2). The vegetation and topography located west of the construction site on Mercer Island would be considered a “soft” surface. Construction noise is calculated to attenuate to background levels within approximately 1,959 feet (0.4 mile) of the Project site along the eastern side of Mercer Island (Figure BE-2).

Traffic noise from I-90 is calculated to attenuate to background levels within approximately 425 feet of I-90. Because this distance falls within the distance at which construction noise attenuates to background, the extent of construction noise is used for this evaluation.

In-Water Noise

In-water noise has the potential to affect listed salmonids and marbled murrelet that could be present in the action area. The potential area where sound generated from the Project could propagate above ambient levels was calculated using tools available from the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Fish and Wildlife Service (USFWS).

Lake Washington is actively used by boats, and human noise sources include ship traffic and fishing-boat depth sounders. Natural noise sources include waves, wind, rainfall, currents, and biological sound sources (e.g., fish; Carr et al. 2006). Background noise levels are compared to the NOAA threshold levels to determine thresholds of harassment and injury for aquatic species.

No reference underwater sound levels suitable for National Marine Fisheries Service (NMFS) consultation are available for the vicinity of the Project. A 120 dB background sound level for Seattle (in the 1 to 20 kHz broadband range appropriate to fish and marbled murrelet) was used for this analysis (WSDOT 2020). WSDOT also states that this is the ambient underwater noise level for deep freshwater lakes.

The practical spreading loss model was used to estimate the extent of underwater sound from the Project (WSDOT 2020). Piles will be removed from and installed in Lake Washington, in water ranging from approximately 14 to 45 feet deep. The following pile types will be removed or driven as part of the Project:

- Timber piles (12- to 14-inch) will be removed with a vibratory hammer
- Concrete encapsulated piles (16-inch) will be removed with a vibratory hammer
- Steel piles (6-, 16-, and 24-inch) will be installed with a vibratory hammer and proofed with an impact hammer

Installation of 24-inch steel piles is expected to cause the greatest underwater sound of these activities; therefore, sound estimates for driving 24-inch steel piles are used in these calculations. Because no site-specific data are available for estimating the source sounds of 24-inch piles, analyses were conducted using source sound estimates from similar projects. Table 4 summarizes the highest in-water sound levels expected from the Project and the distance at which they attenuate to the background sound level.

Table 4
Underwater Sound Levels for 24-inch Steel Piles Proposed for the Project

Pile Size/Type and Proposed Activity	Peak Level	Single Strike SEL	RMS Level	Attenuation to Background
24-inch steel piles, impact installation[a]	204 dB at 10 meters	174 dB at 10 meters	189 dB at 10 meters	23 miles
24-inch steel piles, vibratory installation[b]	181 dB at 10 meters	153 dB at 10 meters	153 dB at 10 meters	7 miles

Notes:
The impact installation values are unattenuated and therefore conservative.

a. Noise levels for SR 520 Bridge project, 24-inch steel piles driven in 28 feet of water with impact hammer (WSDOT 2020).
b. Noise levels for Prichard Lake Pumping Station (Sacramento), 24-inch steel piles driven in 9 feet of water with vibratory hammer (CalTrans 2020).

Based on the practical spreading loss model and attenuation distances, underwater sound from impact pile driving 24-inch steel pipe piles will require 23 miles to attenuate to the 120 dB RMS background value, and vibratory installation sound will require 7 miles to attenuate to background. However, the actual area of increased underwater sound will be constrained by the shorelines of Lake Washington and will extend approximately 4 miles northwest from the pile driving area at the farthest extent (Figure BE-2).

8. Species Information:

Identify each listed or proposed species, including terrestrial species, as well as designated or proposed critical habitat in the action area. Please include information on which listed species use are expected to be found in the action area and the potential for them to be there during project activities..

To determine what listed or proposed species may occur in the action area, contact NOAA Fisheries at the address listed below and obtain a county list of federally listed/ designated and proposed species and critical habitat from the:

U.S Fish and Wildlife Service at: http://westernwashington.fws.gov/se/SE_List/endangered_Species.asp

National Marine Fisheries Service at:
510 Desmond Dr., SE # 103
Lacey, WA 98503
(360) 753-9530
http://www.nwr.noaa.gov

The following species are listed as of August 11, 2011:

USFWS SPECIES
BIRDS
Marbled murrelet
Northern spotted owl
Short-tailed albatross
Western snowy plover

MAMMALS
Canada lynx
Columbia white-tailed deer
Gray wolf (western WA)
Gray wolf (eastern WA)
Grizzly bear
Woodland caribou
Pygmy rabbit (Columbia Basin DPS)

INSECTS
Oregon silverspot butterfly

PLANTS
Bradshaw's desert parsley
Marsh sandwort
Showy stickseed
Wenatchee Mtns. Checker-mallow
Golden paintbrush
Kincaid's lupine
Nelson's checker-mallow
Water howellia
Spalding's catchfly
Ute ladies'-tresses

FISH
Bull trout, Columbia River
Bull trout, coastal-Puget Sound
Dolly varden, coastal-Puget Sound

NMFS SPECIES
FISH
Chum, Columbia River
Chum, Hood Canal summer
Chinook, lower Columbia River
Chinook, upper Columbia River spring
Chinook, Puget Sound
Chinook, Snake River fall
Chinook, Snake River spring-summer
Chinook, upper Willamette River
Coho, lower Columbia River
Sockeye, Ozette Lake
Sockeye, Snake River
Steelhead, upper Columbia River
Steelhead, middle Columbia River
Steelhead, lower Columbia River
Steelhead, Snake River
Steelhead, upper Willamette River
Steelhead, Puget Sound
Sturgeon, Green (southern DPS)
Eulachon, Pacific (southern DPS)
Bocaccio (Georgia Basin DPS)
Rockfish, canary (Georgia Basin DPS)
Rockfish, yelloweye (Georgia Basin DPS)

MARINE MAMMALS
Humpback whale
Blue whale
Fin whale
Sei whale
Sperm whale
Southern resident killer whale
Steller sea lion

REPTILES-AMPHIBIANS
Leatherback sea turtle
Loggerhead sea turtle
Green sea turtle
Olive Ridley sea turtle

Table 5 presents a summary of threatened and endangered species potentially occurring in the action area based on species lists provided by NMFS (2022) and USFWS (2022). The NMFS species list encompasses the entire north Puget Sound region, while USFWS provides site-specific species lists. The table also identifies whether critical habitat has been designated by the NMFS or USFWS for those species within the Project vicinity. The Project will occur during the approved in-water work window for the site when the species listed in Table 5 are unlikely to be present.

Table 5
Species and Critical Habitat with Federal ESA Status Likely to Occur in the Action Area

Common Name (Scientific Name)	Jurisdiction	ESA Status	Critical Habitat
Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound ESU	NMFS	Threatened	Designated
Steelhead (*O. mykiss*) Puget Sound DPS	NMFS	Threatened	None designated within the action area.
Bull trout (*Salvelinus confluentus*) Coastal-Puget Sound DPS	USFWS	Threatened	Designated
Marbled murrelet *(Brachyramphus marmoratus*)	USFWS	Threatened	None designated within the action area.

USFWS (2022) identifies the following additional listed and candidate species as potentially occurring in the action area; however, these species are not addressed in this Biological Evaluation due to lack of suitable habitat within and adjacent to the action area, for reasons listed below:

- **Streaked horned lark** (*Eremophila alpestris strigata*)**:** The streaked horned lark was listed as threatened in 2015 under the ESA. Streaked horned larks require open prairie or coastal habitat with no trees and few shrubs. There are no known breeding populations of streaked horned larks in King County and the action area lacks suitable habitat (Stinson 2016).
- **Yellow-billed cuckoo** (*Coccyzus americanus*)**:** Yellow-billed cuckoos are now functionally extirpated in the state, with 16 of 20 sightings from 1974 and 2016 occurring in eastern Washington (Wiles and Kalasz 2017). The action area lacks large patches of riparian habitat suitable for the species.
- **Monarch butterfly** (*Danaus plexippus*): Adult monarch butterflies feed on nectar from a wide variety of flowers. Reproduction is dependent on the presence of milkweed, the sole food source for larvae (Federal Register Vol. 85, No. 243). The number of monarchs in Washington is relatively low and they are most likely to occur in eastern Washington. Monarchs migrating south through Washington often concentrate along the Columbia and Snake Rivers (WDFW 2022a).

NMFS (2022) identifies the additional species of bocaccio (*Sebastes paucispinis*; Puget Sound/Georgia Basin DPS); yellow rockfish (*Sebastes ruberrimus*; Puget Sound/Georgia Basin DPS); green sturgeon (*Acipenser medirostris*; Southern DPS); and killer whale (*Orcinus orca*; Southern Resident DPS) as potentially occurring in the north Puget Sound region. However, the action area is not used by these species because Lake Washington does not provide marine or estuarine habitat.

9. Existing Environmental Conditions:
Describe existing environmental conditions for the following:

A. Shoreline riparian vegetation and habitat features

Lake Washington is a large, freshwater lake that occupies approximately 34 square miles between the metropolitan cities of Seattle and Bellevue. The water levels in Lake Washington are seasonally managed by the U.S. Army Corps of Engineers to accommodate water usage, navigation, fish passage, and salinity control. The park's shoreline is characterized by various conditions including a developed concrete shoreline and undeveloped vegetated areas. Within the Project area, the shoreline condition, categorized by the south, central, and north areas, includes the following (Appendix 1, Figure 2):

- The south Project area shoreline is located south of the waterfront plaza. This area consists of small areas of lawn, shrubby riparian vegetation along the lake shore, a gravel driveway, and trees/shrubs and invasive vegetation farther upslope. Improvements to the south shoreline trail (outside the Project area) are being permitted as part of a separate project.
- The central Project area shoreline, adjacent to the waterfront plaza, has a vertical bulkhead slope. The lake bottom substrate contains sand and silt with small rocks and remnant concrete and timber debris from past uses. The central shoreline is mostly developed, and vegetation is limited to dense non-native aquatic vegetation, Eurasian milfoil (*Myriophyllum spicatum*), found near the park's shoreline.
- The north Project area shoreline consists of a small gravel beach with fringing trees and shrubs, with a trail, grass lawn areas, and trees located farther upslope.

Lake Washington provides habitat for a variety of aquatic species. Fish species occurrence and migration documented in Lake Washington, according to the Washington Department of Fish and Wildlife (WDFW) SalmonScape and Priority Habitats and Species websites (WDFW 2022a, 2022b), includes bull trout (*Salvelinus confluentus*), Chinook salmon (*Oncorhynchus tshawytscha*), Puget Sound steelhead (*O. mykiss*), sockeye salmon (*O. nerka*), and coho salmon (*O. kisutch*). The WDFW Priority Habitats and Species data (WDFW 2022b) do not identify any documented occurrences of terrestrial priority species or priority habitats in the Project area of the park.

B. Aquatic substrate and vegetation (include information on the amount and type of eelgrass or macroalgae present at the site)

The aquatic substrate is primarily silt and sand due to the lake environment. No eelgrass is present because the Project area is not within a marine environment. Eurasian milfoil (*Myriophyllum spicatum*) occurs in Lake Washington at the Project site.

C. Surrounding land/water uses

Existing structures in the Project area include the dock and Boiler Building (Appendix 1, Figure 2). The Boiler Building is located within the waterfront plaza west of the dock and is currently used for park storage and restrooms. The shoreline is defined by a vertical concrete bulkhead spanning approximately 200 linear feet (lf). The bulkhead delineates the plaza area, which includes concrete paving and pavers. To the north of the dock along the plaza's shoreline bulkheads is an art installation called "Handsome Bollards" that includes a series of bollards approximately 6 feet apart with bronze hands that hold a metal chain. Current access to the plaza is limited to the gravel maintenance driveway at the south end of the Project area and an asphalt pathway at the north end.

Existing stormwater features include a stormwater conveyance swale that abuts the western edge of the gravel maintenance driveway and drains to an existing catch basin. The catch basin drains to the lake through a 6-inch PVC storm drain to an outfall south of the plaza. Two additional catch basins located north of the plaza, between the asphalt pathway and Boiler Building, drain to the lake through a 6-inch PVC storm drain and outfall in the north end of the plaza. The northern outfall runs underneath the plaza and through the existing bulkhead to the lake.

Two decommissioned underground storage tanks (USTs) associated with previous boiler plant operations are located in the Project area. These are registered with the Washington State Department of Ecology. Petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and metals (barium, chromium and lead) associated with the tanks have been detected in site soils (GeoEngineers 2022) at concentrations below Model Toxics Control Act Method A cleanup levels. The City has engaged a geotechnical consultant to develop a soil management plan should any contaminated soils be encountered during construction. Any contaminated materials removed from the site will be properly disposed of at an approved upland landfill.

The existing dock (Appendix 1, Figure 2) is a fixed 5,500-square-foot (sf) dock structure with wood and concrete decking, supported by 107 creosote-treated timber piles (14- to 16-inch-diameter). The deck is solid concrete with no grating and currently impedes light transmission to the aquatic environment. The existing dock structure includes three main segments, each measuring 8 feet wide. Eight narrow (22- by 4-foot) timber fixed dock fingers provide moorage opportunities for small powerboats along the existing dock. A 500-sf float and gangway (ramp) flank the existing dock structure. The float is intended to be reused in the new design.

In 2014, the City conducted an assessment of shoreline and overwater structures, including an underwater structural assessment of the dock, and noted degraded conditions (OAC 2014). Shoreline structures observed within the Project area include the concrete bulkhead, brick and concrete pavers at the plaza, and the gravel maintenance road. The concrete bulkhead was found to be in good condition; however, the brick pavers and the maintenance road appeared to present hazards. The brick pavers were found to be a potential tripping hazard with uneven surfaces, and the maintenance road showed signs of erosion from runoff on the road and adjacent areas. Overwater structures observed within the Project area include the concrete dock, finger docks, and the timber piles. The concrete dock and creosote-treated timber piles were found to be in good condition. Structural issues were noted in relation to the timber cap beams and mooring piles on the south end of the dock. The cap beams and mooring piles showed signs of decay and were recommended for repair.

As discussed previously, the Project area is developed with public recreation facilities. Outside of the Project area, approximately 20 acres of the park is undeveloped open space that supports a variety of wildlife, including 135 species of birds, 50 species of waterfowl, raccoons, beavers, muskrats, tree frogs, and rabbits (City of Mercer Island 2022). Habitat for many of the terrestrial species is provided by wetlands that occupy the north and south ends of the park, outside of the Project area. The park also contains areas with maintained lawns surrounded by stands of trees.

D. Level of development

The park itself has generally low levels of development. The areas surrounding the park are generally more urbanized and zoned for single family properties.

E. Water quality

The Washington State Department of Ecology water quality atlas (Ecology 2022) indicates several pollutants on the 303d list in Lake Washington, meaning that the pollutants exceed water quality standards and there is no cleanup plan. The south end of Lake Washington near the Cedar River confluence contains dioxin, PCBs, DDE, dieldrin, chlordane, and bacteria. South of the SR 520 bridge, pollutants include bacteria, dioxin, DDD, DDE, mercury, PCBs, chlordane, and dieldrin. There are no mapped 303d pollutants adjacent to the Mercer Island shoreline or the Project site (Ecology 2022).

F. Describe use of the action area by listed salmonid fish species.

Listed salmonids known to occur in Lake Washington include Chinook salmon, winter steelhead, and bull trout, as discussed below (WDFW 2022b, 2022c).

Chinook Salmon
Chinook salmon spawn in several streams draining to Lake Washington. Those nearest the Project site include May Creek and the Cedar River, both located south of and outside the action area.

Chinook Salmon mostly use Lake Washington as a migratory corridor from their natal stream to the marine environment or as an extended rearing location before outmigrating to the marine environment (Tabor et al. 2006). Most of the wild juvenile Chinook salmon enter Lake Washington from the Cedar River from January through June. Portions of the existing Lake Washington shoreline have degraded habitat that is poorly suited for protection from predators and migration of Chinook salmon.

Small juvenile Chinook salmon concentrate in shallow water, approximately 0.4 meter (1.3 feet) in depth, and prefer low-gradient shorelines with small substrates such as sand and gravel (Tabor and Piaskowski 2002). As juvenile Chinook salmon grow larger, they move into water 2 to 3 meters (6.6 to 10 feet) deep by mid-June. Juvenile Chinook salmon also prefer a diverse shoreline with open areas, woody debris, and overhanging vegetation as refuge from predators during the day (Tabor and Piaskowski 2002). Other studies have shown that most (more than 80%) juvenile Chinook salmon are found at sites with overhanging vegetation and small woody debris, as compared to sites without vegetation and small wood (Tabor et al. 2004).

Steelhead

Two populations of Puget Sound steelhead inhabit the Lake Washington basin. The Cedar River population is of natural origin, while the north Lake Washington population is introduced. Both populations of winter-run steelhead have recently undergone steep declines in abundance.

Winter-run and ocean-maturing steelhead return as adults to Puget Sound tributaries from December to April (PSBRT 2005). Spawning occurs from January to mid-June, with peak spawning occurring from mid-April through May. The majority of steelhead juveniles reside in freshwater for 2 years prior to immigrating to marine habitats, with limited numbers migrating as 1- or 3-year-old smolts. Smoltification and seaward migration occur principally from April to mid-May (PSBRT 2005). The inshore migration pattern of steelhead in Puget Sound is not well understood; it is generally thought that steelhead smolts move quickly offshore (PSBRT 2005).

Winter steelhead spawn in the Cedar River, south of the action area. Little information is currently known about juvenile steelhead use of Lake Washington. WDFW researchers have captured steelhead migrants in the Cedar River from mid-April through the end of May (Volkhardt et al. 2006), but if or how they use the nearshore area of the lake has not been determined.

Bull Trout

Lake Washington provides potential rearing, foraging, and migration habitat for bull trout. Adult and subadult bull trout have been observed infrequently in the lower Cedar River, Lake Washington, and at the Ballard Locks. The WDFW Priority Habitats and Species mapping indicates Dolly Varden/bull trout rearing in Lake Washington (WDFW 2022b). However, no bull trout spawning activity or juvenile rearing has been observed and no distinct spawning populations are known to exist in the Lake Washington basin outside of the upper Cedar River above Lake Chester Morse. This upper Cedar River population is mainly adfluvial, moving between Lake Chester Morse, the Cedar River, and the Rex River throughout the year. Surface water temperatures in Lake Washington and the Ship Canal are too warm for bull trout during late spring through early fall, and these high temperatures likely limit residence time for bull trout that may enter the lake through the locks. Observations of bull trout in the locks suggest that migration is occurring from other watersheds. (SPU 2015, King County 2000).

G. Is the project located within designated / proposed bull trout or Pacific salmon critical habitat? If so, please address the proposed projects' potential direct and indirect effect to primary constituent elements (Critical habitat templates can be found on the Corps website at: http://www.nws.usace.army.mil/Missions/CivilWorks/Regulatory/PermitGuidebook/EndangeredSpecies.aspx, select Forms, Tools and References; Forms and Templates; Critical Habitat Assessment Forms.

Lake Washington is designated as critical habitat for Chinook salmon (Federal Register Vol. 70, No. 170) and for bull trout foraging, migration, and overwintering (Federal Register Vol. 70, No. 185). Lake Washington is not designated as critical habitat for steelhead, although the Cedar River is (Federal Register Vol. 81 No. 36). Project effects on physical and biological features (PBFs) for these species are discussed below.

Chinook Salmon

Table 6 lists the PBFs for Chinook salmon and steelhead, PBF presence in the action area, and how PBFs would be affected by the Project. The PBFs that are present in the action area include numbers 2 and 3. Construction of the Project would result in short-term impacts on these PBFs but would provide a long-term benefit after Project completion.

Table 6
Salmon and Steelhead PBFs and Project Effects

PBF	Presence in Action Area	Project Effects
(1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development.	Not present. No spawning occurs within the action area or in Lake Washington.	Not applicable.
(2) Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.	Chinook salmon rear in Lake Washington, although rearing habitat is degraded. Steelhead use of the lake for rearing is unknown.	Project construction would cause short-term turbidity and underwater noise that could disturb rearing fish. However, construction would occur during the in-water work window, when listed salmonids are least likely to be present. The Project would permanently remove several trees and riparian shrub vegetation along the lake shoreline above the OHWM. While all of the trees and some riparian vegetation would be replaced, this would cause a slight reduction in shade and food sources for fish. In the long term, the Project would improve rearing habitat by shifting part of the dock into deeper water; removing creosote-treated timber piles from the aquatic environment; and installing grated surfaces in the gangway and float decking to the extent practicable.
(3) Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.	Potentially present in action area in terms of salmon and steelhead movement between different parts of Lake Washington, and between the lake and spawning streams.	In-water construction equipment could temporarily modify nearshore fish migration corridors. However, construction would occur during the in-water work window, when salmonids are least likely to be present. The Project would improve migratory habitat by reducing the number of piles in the lake.
(4) Estuarine areas free of obstruction with water quality, water quantity and salinity conditions supporting juvenile and adult physiological transitions between fresh-and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels, and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.	Not present. Lake Washington does not provide estuarine habitat.	Not applicable.

PBF	Presence in Action Area	Project Effects
(5) Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.	Not present. Lake Washington does not provide nearshore marine habitat.	Not applicable.
(6) Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.	Not present. Lake Washington does not provide offshore marine habitat.	Not applicable.

Bull Trout

Table 7 lists the PBFs for bull trout, PBF presence in the action area, and how PBFs would be affected by the Project. The PBFs that are present in the action area include numbers 2, 3, and 8. Construction of the Project would result in short-term impacts on these PBFs but would provide a long-term benefit after Project completion.

Table 7
Bull Trout PBFs and Project Effects

PBF	Presence in Action Area	Project Effects
(1) Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.	Not present in Lake Washington or action area. The lake shorelines are highly modified, and connections to groundwater that would provide thermal refugia are likely minimal.	Not applicable.
(2) Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including, but not limited to permanent, partial, intermittent or seasonal barriers.	Potentially present in action area in terms of bull trout movement between different parts of Lake Washington, and between the lake and the Cedar River.	In-water construction equipment could temporarily modify nearshore fish migration corridors. However, construction would occur during the in-water work window, when bull trout are least likely to be present. The Project would improve migratory habitat by reducing the number of piles in the lake.
(3) An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.	Present in Lake Washington and possibly the action area. The lake supports numerous warmwater fish species and likely abundant macroinvertebrates that provide food for those fish. The lake is fresh water and does not support marine forage fish.	Project construction would cause short-term turbidity and underwater noise that could disturb fish prey species. However, construction would occur during the in-water work window, when listed salmonids are least likely to be present. The Project would permanently remove several trees and riparian shrub vegetation along the lake shoreline above the OHWM.

PBF	Presence in Action Area	Project Effects
		While all of the trees and some riparian vegetation would be replaced, this would cause a slight reduction in shade and food sources for prey species. In the long term, the Project would improve prey habitat by shifting part of the dock into deeper water; removing creosote-treated timber piles from the aquatic environment; and installing grated surfaces in the gangway and float decking to the extent practicable.
(4) Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes with features such as large wood, side channels, pools, undercut banks and substrates, to provide a variety of depths, gradients, velocities, and structure.	Not present in Lake Washington or action area. The lake shoreline is highly modified and simplified.	Not applicable.
(5) Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shade, such as that provided by riparian habitat; and local groundwater influence	Not present in Lake Washington or action area. High lake water temperatures likely limit residence time of bull trout in the lake (SPU 2015).	Not applicable.
(6) Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount (e.g., less than 12 percent) of fine substrate less than 0.85 mm (0.03 in.) in diameter and minimal embeddedness of these fines in larger substrates are characteristic of these conditions.	Not present in Lake Washington or action area. The lake receives stormwater runoff from surrounding urbanized areas. Stormwater likely carries large volumes of sediments into the lake.	Not applicable.
(7) A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, they minimize departures from a natural hydrograph.	Not present in Lake Washington or action area. The lake's water levels are controlled by the U.S. Army Corps of Engineers.	Not applicable.

PBF	Presence in Action Area	Project Effects
(8) Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.	Potentially present in Lake Washington and action area. Some parts of the lake have poor water quality, but the area around Mercer Island does not contain mapped water quality impairments (Ecology 2022).	Construction would occur during the in-water work window, when bull trout are least likely to be present. Construction would result in short-term turbidity, but the Project would result in a long-term benefit to water quality by removing creosote-treated piles from the lake and improving stormwater management at the waterfront plaza.
(9) Few or no nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass; inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.	Not present in Lake Washington or action area. The lake is used by numerous warmwater predatory species.	Not applicable.

H. Describe use of the action area by other listed fish species (*green sturgeon, eulachon, bocaccio, canary rockfish and yelloweye rockfish)*.

The action area is not used by these species because it does not provide marine or estuarine habitat.

I. Is the project located within designated/proposed critical habitat for any of the species listed below? If so please address the proposed projects' potential direct and indirect effect to primary constituent elements. Please see the NOAA-Fisheries and US Fish and Wildlife websites (www.nwr.noaa.gov and www.fws.gov/pacific respectively) for further information.

Southern resident killer whale	*Marbled murrelet*
Northern spotted owl	*Western snowy plover*
Green sturgeon	*Eulachon*

The action area is not located within critical habitat for any of the listed species.

J. Describe use of action area by marbled murrelets. How far to the nearest marbled murrelet nest site or critical habitat? Some information is available on the Fish and Wildlife Service website: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B08C.

The nearest designated critical habitat for marbled murrelets is approximately 30 miles east of the action area. The action area lacks old-growth forest habitat required for murrelet nesting, and there are no known nest sites in the action area (WDFW 2022b). Marbled murrelets typically use nearshore marine waters for foraging. However, the species is known to use lakes for feeding and has been sighted on Lake Washington in the past (early 1900s; Carter and Sealy 1986). Studies in the upper Cedar River watershed found a few marbled murrelets present (Cooper et al. 2008). Therefore, the species is assumed to be potentially present at low numbers in the action area.

K. Describe use of action area by the spotted. How far to the nearest spotted nest site or critical habitat? Some information is available on the Fish and Wildlife Service website: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B08B.

The Project is in an area that does not include suitable nesting and foraging habitat for northern spotted owls (*Strix occidentalis caurina*). The WDFW PHS maps do not document northern spotted owls in the vicinity of the Project (WDFW 2022b). The nearest critical habitat for northern spotted owl is approximately 30 miles east of the Project area.

L. **For marine areas only:** Describe use of action area by Southern Resident killer whales. How often have they been seen in the area and during what months of the year? For information on noise impacts on killer whales and other marine mammals, please see the National Marine Fisheries website: http://www.nwr.noaa.gov/Marine-Mammals/MM-consults.cfm.

The Project is not located within a marine area, and no Southern Resident killer whales are present.

M. **For marine areas and Columbia River:** How far is the nearest steller sea lion haulout site from the action area? Describe their use of the action area. See the National Marine Fisheries website: http://www.nwr.noaa.gov/Marine-Mammals/MM-consults.cfm for information on the steller sea lion and location of their haulout sites.

The Project is not located within a marine area or the Columbia River, and no Steller sea lions are present.

N. **For marine areas only: Forage Fish Habitat** – only complete this section if the project is in tidal waters.

Check box if Washington Department of Fish and Wildlife (WDFW) documented habitat is present. Go to the WDFW website for this information: http://wdfw.wa.gov/fish/forage/forage.htm, then search for each species under the link to Biology, then the link to Documented Spawning Grounds (if available, please attach a copy of the Hydraulic Project Approval from WDFW):

Surf Smelt: ☐ **Pacific Herring:** ☐ **Sand Lance:** ☐

Check box if the proposed action will occur in potentially suitable forage fish spawning habitat:

Surf Smelt: ☐ **Pacific Herring:** ☐ **Sand Lance:** ☐

If no boxes are checked, please explain why site is not suitable as forage fish spawning habitat.

Please describe the type of substrate and elevation and presence of aquatic vegetation at the project area. For example:
At +10 to +5 feet above MLLW, there is no aquatic vegetation, the substrate consists of large cobbles.
At +5 to +1 foot above MLLW, there is eelgrass and the substrate consists of fine sand.

The Project is not located within a marine area, and no forage fish are present.

10. Effects Analysis

Describe the direct and indirect effects of the action on the proposed and listed species as well as designated and proposed critical habitat within the action area. Consider the impact to both individuals and the population. Discuss the short-term, construction-related, impacts as well as the long-term and permanent effects.

Direct Impacts

Direct impacts to listed species as a result of the Project could include the following:

- Construction noise (in-air and in-water)
- Short-term turbidity during in-water work
- Disturbance of benthic species
- Removal and replanting of riparian vegetation
- Dock reconfiguration, with reduction in overwater cover/shading, reduction in number of piles, and shifting of docks into deeper water
- Improvement in water quality due to removal/encapsulation of creosote-treated timber piles and installation of waterfront LID
- Construction and operation of new intake of lake water for irrigation
- Construction and operation of new stormwater management system elements and relocated stormwater outfall
- Erosion during upland ground disturbance

These potential impacts are described below. The Project has been designed to avoid and minimize impacts on listed species and aquatic habitats. In addition, the conservation measures described later in this document will be implemented to avoid and minimize impacts during construction.

In-Air Noise

Impact pile driving can interfere with or mask marbled murrelet in-air communications during foraging. However, limited impact pile driving (proofing) of 24-inch steel piles is not typically expected to cause these impacts. To provide a worst-case assessment for the Project, an area of 138 feet from the pile driving locations is shown in Figure BE-3 where there is the potential for masking of in-air sound communication of marbled murrelets if impact pile driving were to occur for any greater length of time based on guidance from USFWS (WSDOT 2020).

Given the very low number of marbled murrelet observations and lack of suitable nesting habitat in the Project vicinity, it is highly unlikely that individual murrelets would be present within 138 feet of pile driving activities. In addition, Project construction noise is expected to attenuate to background levels within 1 mile or less of the Project site and therefore would not affect potentially suitable nesting habitat in the upper Cedar River watershed or other undeveloped areas. It is possible that a murrelet could experience increased noise levels while flying through the action area to or from inland nesting sites, but effects on in-air behavior or communications are unlikely.

In-Water Noise
Construction noise from pile driving could have a direct impact on fish or marbled murrelets, or may cause them to avoid the Project area. The effects of underwater noise related to pile driving are dependent on several factors, including the size, type, and depth of the animal; the depth, intensity, and duration of the pile driving sound; the depth of the water column; the substrate of the habitat; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. The level of noise effects will be related to the received level and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The farther away from the source, the less intense the exposure should be. The surrounding environment will attenuate or enhance the distance that underwater sound waves will travel depending on a variety of variables. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. Soft substrates such as sand will absorb or attenuate the sound more readily than hard substrates (e.g., rock) that may reflect the acoustic wave. Soft, porous substrates also require less time to drive the pile and require less forceful equipment, which decreases the underwater noise duration, intensity, and effect.

Chinook salmon, steelhead, and bull trout. Table 8 lists the distances at which pile driving noise is anticipated to attenuate to agency-accepted injury and disturbance thresholds for salmonids (Figure BE-4; WSDOT 2020). As stated earlier, driving of 24-inch steel piles was analyzed as the Project activity likely to result in the greatest level of underwater sound. The use of vibratory hammers minimizes the noise levels generated from pile installation and therefore the magnitude of the effects to listed salmonid species. However, impact driving will be necessary in order to proof the piles and reach appropriate supporting substrates. There is the potential for Chinook salmon, bull trout, and steelhead to be injured or to experience behavioral effects during pile driving. Behavioral effects are more likely given the larger extent of underwater noise during limited impact proofing of piles (2.5 miles). Injurious effects would be limited to areas within 50 meters (164 feet) of impact pile driving and could likely be avoided by fish during limited pile proofing.

Table 8
In-Water Noise Threshold Injury and Disturbance Distances for Salmon and Steelhead

	Distance for Pile-Related Noise to Attenuate to Threshold			
Pile Size/Type and Proposed Activity	**Fish Injury (all fish sizes): 206 dB peak**	**Fish Injury (fish ≥2 grams): 187 dB cSEL**	**Fish Injury (fish <2 grams): 183 dB cSEL**	**Behavioral Effects: 150 dB RMS**
Install 24-inch steel piles (impact)	7 meters (23 feet)	27 meters (89 feet)	50 meters (164 feet)	3,981 meters (2.5 miles)
Install 24-inch steel piles (vibratory)	n/a[1]	n/a[1]	n/a[1]	16 meters (52 feet)

Note:
1. Injury thresholds do not apply for fish when assessing vibratory pile driving (CalTrans 2020).

Marbled murrelet. There are no published studies specific to the effects of impact pile driving underwater sound on marbled murrelets. Impact pile driving could result in auditory injury (hearing damage) or non-auditory injury (barotrauma), based on data from other species. Marbled murrelets have been observed to continue foraging within 300 meters of active pile driving operations despite elevated underwater sound. Masking of underwater sound communication is possible if impact pile driving occurs for extended periods (WSDOT 2020). However, impact driving for this Project is limited to proofing only.

Table 9 lists the distances at which pile driving noise is anticipated to attenuate to agency-accepted injury and disturbance thresholds for marbled murrelet (WSDOT 2020). As stated earlier, driving of 24-inch steel piles was analyzed as the Project activity likely to result in the greatest level of underwater sound. Behavioral and auditory impacts are possible if murrelets are diving within the areas shown in Figure BE-3, which are limited to within 10 feet of impact pile proofing. Behavioral effects are possible within 2.5 miles of impact proofing. However, impacts to marbled murrelets are unlikely because the species is not known to regularly forage in Lake Washington.

Table 9
In-Water Noise Threshold Injury and Disturbance Distances for Marbled Murrelet

Pile Size/Type and Proposed Activity	Distance for Pile-Related Noise to Attenuate to Threshold		
	Auditory Injury: 202 dB SEL	Non-auditory Injury: 208 dB SEL	Behavioral Effects: 150 dB RMS
Install 24-inch steel piles (impact)	3 meters (10 feet)	1 meter (3 feet)	3,981 meters (2.5 miles)
Install 24-inch steel piles (vibratory)	n/a[1]	n/a[1]	16 meters (52 feet)

Note:
1. Injury thresholds do not apply for marbled murrelet when assessing vibratory pile driving (WSDOT 2020).

Turbidity

Removing, installing, and encapsulating piles and excavating below the OWHM to install cobble underlayment at the north beach may cause a temporary and minor increase in turbidity. Turbidity occurs when suspended organic and inorganic particles in the water column scatter light wavelengths and reduce the light available to underwater environments. The extent of sediment suspension is a byproduct of several factors, including physical properties of the sediment, site conditions, and nature and extent of debris and obstructions. Sediment plume sizes typically decrease exponentially with movement away from the construction activities both vertically and horizontally, as well as with time due to movement of suspended material downstream (Nightingale and Simenstad 2001).

Suspended sediment and turbidity can affect fish (particularly salmon) via several mechanisms, including direct mortality, gill tissue damage, physiological stress, and behavioral changes. The level of impact to individuals depends on the amount of time an individual is exposed to suspended sediments, the concentration of suspended sediment in the water column, the composition of the sediments (fine-grained versus coarse-grained, chemical associations, etc.), and the concentration of contaminants associated with the sediments. Impacts could result in lethal or sublethal physical or behavioral responses from aquatic organisms depending on the extent of turbidity.

Turbidity resulting from in-water work will not be allowed to exceed 300 feet from construction per state water quality standards (WAC 173-201A). Fish would be able to move away from the construction area to avoid turbidity. In-water work will be restricted to the approved in-water work period (July 16 to March 15) to minimize impacts on salmonid species. BMPs will be implemented during construction to limit turbidity (Section 11).

Disturbance of Benthic Species
Removing, installing, and encapsulating piles and excavating below the OWHM to install cobble underlayment at the north beach will cause a temporary disturbance of benthic species on the lake bottom, leading to a temporary and minor loss of foraging opportunities for bull trout, steelhead, and Chinook salmon in the vicinity of the Project. The recolonization of the area with benthic species is expected to occur quickly.

Removal and Replanting of Riparian Vegetation
The Project includes removing several trees and riparian vegetation to install the new rock terrace supporting the ADA-accessible trail near the north beach. While this represents a relatively small amount of vegetation removal relative to vegetation throughout the Park, and some of the vegetation to be removed consists of non-native invasive species, it is a loss of potential shade and sources of invertebrate prey for fish species. The Project includes replanting riparian vegetation (see Appendix 1, Figures 13 and 14). Western red cedars will be installed near the north beach, providing additional shading for the lake. There will be a minor temporal loss of riparian vegetation functions while the new plantings grow to maturity.

Dock Reconfiguration
The completed Project will provide a minor benefit to aquatic habitat in Lake Washington. A net reduction of 40 piles and 5 sf of overwater cover would occur. Creosote-treated piles will be replaced with steel piles, or encapsulated in fiberglass, improving water quality. Existing concrete decking will be replaced with grating, allowing better light penetration. The center and south docks will be shifted waterward to open up the nearshore habitat for use by salmonids.

Water Quality Improvements
The Project will benefit water quality in Lake Washington by removing or encapsulating creosote-treated timber piles and installing new LID features (pervious pavers and silva cell at the plaza, vegetated stormwater swale near the south trail).

Lake Water Irrigation Intake
The Project includes installing a new intake for irrigation water from Lake Washington. The intake will be screened to prevent fish entrainment. The volume of water to be used is minor relative to the size of the lake (a maximum rate of 0.089 cubic foot per second [40 gallons per minute] as allowed by the approved Water Right Claim 158498AH). The immediate area around where the pipe penetration will be constructed through the bulkhead wall will be temporarily dewatered to allow for drilling through the bulkhead and installation of the screen in the dry. A hole will be drilled through the existing concrete bulkhead for the intake pipe. Noise, turbidity, and disturbance effects on aquatic species will be minimal due the short construction timeframe for the intake, small area affected, and existing degraded quality of habitat near the bulkhead.

Stormwater Management System and Outfall
Installation of 2,410 sf of pervious pavers to replace concrete and brick pavers at the plaza, addition of a silva cell biofiltration system under the south end of the plaza, and construction of a new vegetated swale along the gravel driveway could result in soil erosion, which would be minimized as discussed below. Relocation of the stormwater outfall in the bulkhead south of the plaza would require temporary dewatering of a small area of the lake nearshore to allow construction in the dry. Effects on aquatic species will be short-term and minimal due the small area affected and the degraded quality of habitat near the bulkhead. These improvements will slightly improve water quality in Lake Washington by more effectively removing sediment and other pollutants from stormwater and attenuating peak stormwater runoff compared to existing conditions.

The existing site sheetflows directly into the waterway over concrete, gravel, and vegetated areas. No treatment, infiltration potential or flow control is provided in the existing developed areas. The project will reduce the peak runoff by providing infiltration potential and by reducing impervious surfaces. Approximately 2,410 square feet of impervious pavement will be converted to pervious pavers, with only a total of 1,600 square feet of new and replaced gravel pedestrian paths and access road proposed. The net reduction in impervious surfaces will decrease the peak stormwater runoff flow rate. The pervious pavers and silva cell will remove sediment and other pollutants that would have been conveyed to Lake Washington in the existing conditions. Overall the project will result in no pollution-generating surfaces.

The existing concrete bulkhead will be cored for the placement of the new outfall from the silva cell and the cored hole will be grouted to the outfall. The existing 4-inch diameter ductile iron outfall will be abandoned with a grout plug.

Erosion from Upland Areas
The upland components of the Project will require vegetation removal, grading, and installation of surfacing materials such as concrete, pavers, and gravel. These activities have the potential to result in erosion of soils, which could be washed into the lake if not properly controlled and result in turbidity and sedimentation of aquatic habitat. The BMPs listed in Section 11 will be followed to ensure that disturbed soils are properly managed during construction to avoid these impacts.

Delayed Consequences
It is possible, but highly unlikely, that fuel or lubricants from construction equipment could enter the water. The measures described in Section 11 will be implemented to avoid spills and respond to any accidental releases of these materials to the water.

11. Conservation measures:
Conservation measures are measures that would reduce or eliminate adverse impacts of the proposed activity (examples: work done during the recommended work window (to avoid times when species are most likely to be in the area), silt curtain, erosion control best management practices, percent grating on a pier to reduce shading impacts).

Proposed work window:

In-water work will occur during the in-water work window for Lake Washington which is anticipated to be July 16 to March 15 (or an approved extension).

Other conservation measures:

To avoid or minimize potential adverse impacts to the aquatic environment, the following additional BMPs will be employed during construction:

- Applicable permits for the Project will be obtained prior to construction. Work will be performed according to the requirements and conditions of these permits.
- The contractor will be responsible for the preparation and implementation of a spill plan to be used for the duration of construction, which will include spill prevention, control, and response BMPs. In addition, the spill plan will outline roles and responsibilities, notifications, inspections, and response protocols to be implemented in the event of an inadvertent spill during construction.
- The contractor will supply to the Project Engineers a Temporary Erosion and Sediment Control (TESC) Plan and/or a Construction Stormwater Pollution Prevention Plan (SWPPP) that will use BMPs to prevent erosion and sediment-laden runoff from leaving the site. These plans will be implemented prior to the start of ground-disturbing activities. All areas disturbed by Project construction will be stabilized as soon as possible to prevent erosion and re-vegetated as soon as practicable post-construction and prior to the removal of TESC/SWPPP measures.

- Excess or waste materials will not be disposed of or abandoned waterward of the OHWM or allowed to enter waters of the state.
- No petroleum products, chemicals, or other toxic or deleterious materials will be allowed to enter surface waters.
- Barges will not be allowed to ground out during construction.
- A temporary floating debris boom will be installed around the work area. The contractor will be required to retrieve any floating debris generated during construction using a skiff and a net. Debris will be disposed of at an appropriate upland facility.
- Demolition and construction materials will not be stored where wave action or upland runoff can cause materials to enter surface waters.
- No uncured concrete or grout will be in contact with surface waters.
- Piles will be removed as practicable, using best efforts, equipment preferences, and BMPs identified in Washington Department of Natural Resources *Puget Sound Initiative Derelict Creosote Piling Removal: Best Management Practices for Pile Removal and Disposal* (WDNR 2017).
- All creosote-treated materials will be disposed of in a landfill or recycling facility approved to accept these types of materials.
- Vibratory pile driving will be used to the maximum extent practicable, with limited impact pile driving to reach required pile depths and for pile proofing. During all impact driving, sound-attenuation devices such as a wooden cushion blocks or similar devices will be employed to minimize sound-related impacts, as determined through federal Endangered Species Act consultation.
- New light fixtures on overwater structures will be directed away from the water to the extent practicable to minimize impacts on aquatic species.
- Geotechnical engineering recommendations will be incorporated into the Project.
- Any contaminated soils encountered in the vicinity of the two decommissioned underground storage tanks will be identified and handled according to a soil management plan developed by a qualified engineer.
- Any additional measures required by the agencies during Endangered Species Act consultation will be incorporated into the Project to avoid impacts on federally listed species.

12. Determination of Effect:
Provide a summary of impacts concluding with statement(s) of effect, by species. Even projects that are intended to benefit the species might have short-term adverse impacts and those must be addressed. Only the following determinations are valid for listed species or designated critical habitat:

No effect. Literally no effect. No probability of any effect. The action is determined to have 'no effect' if there are no proposed or listed salmon and no proposed or designated critical habitat in the action area or downstream from it. This effects determination is the responsibility of the action agency to make and does not require NMFS review.

May Affect, Not Likely to Adversely Affect (NLAA) – Insignificant, discountable, or beneficial effects. The effect level is determined to be 'may affect, not likely to adversely affect' if the proposed action does not have the potential to hinder attainment of relevant properly functioning indicators and has a negligible (extremely low) probability of taking proposed or listed salmon or resulting in the destruction or adverse modification of their habitat. An insignificant effect relates to the size of the impact and should never reach the scale where take occurs. A 'discountable effect' is defined as being so extremely unlikely to occur that a reasonable person cannot detect, measure, or evaluate it. This level of effect requires informal consultation, which consists of NMFS and/or USFWS concurrence with the action agency's determination.

May Affect, Likely to Adversely Affect (LAA) **This form is not appropriate for use with a project that is LAA listed species. Please see the Biological Assessment (BA) template on the Corps website:** **http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=REG&pagename=mainpage_ESA**

Potential impacts to listed species include limited physical and behavioral impacts from turbidity, disturbance of benthic food resources, removal of riparian vegetation, and in-air and in-water noise as a result of construction activities. Based on the guidance and definitions provided above and the previously discussed Project effects, the effect determinations for species present in Lake Washington is that the Project **may affect and is likely to adversely affect Puget Sound Chinook salmon, Puget Sound bull trout, and Puget Sound steelhead.** Justification for these determinations is as follows:

- Noise levels from impact pile driving may exceed both behavioral and auditory injury thresholds for fish during the in-water work period. Behavioral effects would extend to approximately 2.5 miles from the pile driving locations during impact proofing. Injurious effects would be limited to approximately 164 feet around the pile driving locations and would be easier for fish to avoid. Vibratory pile driving will be used to the maximum extent possible to minimize underwater noise impacts, with impact pile driving limited to proofing. Work will occur during the approved in-water work period, or an approved extension, when salmonids are least likely to be present.
- Temporary turbidity and suspended sediments could temporarily disrupt fish in the Project area. Turbidity will be minimized during construction through implementation of BMPs. It is likely that turbid sediments will disseminate to background levels within 300 feet of the in-water activity, in compliance with Washington State water quality standards.
- Disturbance of substrate and benthic and epibenthic prey will occur during in-water work. This effect will be short term and temporary due to expected rapid recovery of the benthic community following this work, and no long-term modifications of salmonid prey species habitats are expected.
- A limited amount of riparian vegetation will be removed near the north beach, resulting in a minor loss of shade and source of organic materials to the lake. Vegetation will be replanted, including coniferous trees.

- Portions of the existing docks will be moved into deeper water, benefiting juvenile salmonids that may use nearshore areas. The Project will reduce the number of piles in the lake and will incorporate grated surfacing to reduce shading, thereby reducing areas for species that prey on juvenile salmonids.
- The Project will improve water quality by removing or encapsulating creosote-treated timber piles from the lake and improving stormwater management at the site.
- Installation and operation of the irrigation intake will result in minor, temporary construction impacts when the immediate area is dewatered, and would not affect aquatic habitat in the long term because the intake will be screened.
- The BMPs described in Section 11 will avoid and minimize erosion from upland areas and the potential for accidental releases of fuels or other toxic materials during construction.
- Operations will be stopped temporarily if injured, sick, or dead listed species are located in the Project area. The contractor will follow appropriate notification protocol as described in all permits issued for this work.

Based on the guidance and definitions provided above and the previously discussed Project effects, the effect determination is that the Project **may affect but is not likely to adversely affect marbled murrelet** for the following reasons:

- Underwater noise levels from impact pile driving may exceed both behavioral and auditory injury thresholds for marbled murrelet during the in-water work period. Behavioral effects would extend to approximately 2.5 miles from the pile driving locations during impact proofing. Injurious effects would be limited to approximately 10 feet around the pile driving locations. Vibratory pile driving will be used to the maximum extent possible to minimize underwater noise impacts, with impact pile driving limited to proofing. Marbled murrelets have been rarely sighted in Lake Washington and are highly unlikely to occur immediately adjacent to impact pile driving locations. In addition, the Lake Washington shoreline includes populated urbanized areas associated with recreational boat traffic that are unfavorable to marbled murrelets.
- Marbled murrelets could encounter elevated in-air noise levels while moving to and from nesting habitat in the upper Cedar River watershed, but this area supports very few nests. The Project will not disturb suitable nesting habitat for marbled murrelets.
- Marbled murrelets may forage in lakes but are more commonly associated with marine habitat near nest sites. Very few marbled murrelets have been reported foraging in Lake Washington.

Based on the guidance and definitions provided above and the previously discussed Project effects, the effect determination for salmonid species likely to be present in Lake Washington is that the Project **may affect and is likely to adversely affect** designated critical habitat for Puget Sound Chinook salmon and Coastal-Puget Sound bull trout. Critical habitat for steelhead and marbled murrelet is not present within the action area. Justification for these determinations is as follows:

- Removal of riparian vegetation will result in a minor reduction in shading and organic material input to shallow nearshore areas. Vegetation will be replanted, including shade-providing coniferous trees, but will take time to become reestablished.

- BMPs will be employed, as described in Section 11, to minimize potential impacts to listed salmonids due to accidental releases of fuels, eroded soils, or other materials to the lake.
- Increased turbidity and disturbance of benthic prey species during in-water construction activities will be short-term and localized.
- The Project will result in no net increase in overwater cover and will incorporate light-penetrating materials to the maximum extent possible. Portions of the dock will be moved to deeper water, improving nearshore habitat for juvenile salmonids.
- Removing creosote-treated piles and installing upgraded stormwater management features will improve water quality.
- Installation and operation of the irrigation water intake has been permitted under an existing water right and will have only minor, temporary impacts during dewatering to install the intake. The intake will be screened to prevent fish entrainment.

13. EFH Analysis

Essential Fish Habitat (EFH) is broadly defined by the Act (now called the Magnuson-Stevens Act or the Sustainable Fisheries Act) to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". This language is interpreted or described in the 1997 Interim Final Rule [62 Fed. Reg. 66551, Section 600.10 Definitions] -- Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include historic areas if appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

Additional guidance for EFH analyses can be found at the NOAA Fisheries web site under the Sustainable Fisheries Division.

A. Description of the Proposed Action (may refer to BA project description)

The Project is described in Section A.5.

B. Addresses EFH for Appropriate Fisheries Management Plans (FMP)

The objective of this assessment is to describe potential adverse effects to designated Essential Fish Habitat (EFH) for federally managed fish species within the action area. It also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the Project.

This document was also prepared as a resource document for concurrent EFH consultation with NMFS for compliance with the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and the 1996 Sustainable Fisheries Act (SFA). EFH is defined by the Magnuson-Stevens Act in 50 Code of Federal Regulations 600.905-930 as, "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The action area includes designated EFH for Pacific salmon (PFMC 2021). The federally managed species with EFH in Puget Sound are Chinook, coho, and pink salmon. The objective of this assessment is to describe potential adverse effects to designated EFH for these federally managed fisheries species within the action area. It also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the Project.

The action area includes habitats that have been designated as EFH for Pacific salmon EFH (NOAA 2022). This EFH includes the following:

- Pacific coast salmon EFH includes those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. In estuarine and marine areas, salmon EFH extends from the extreme high tide line in nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (200 nautical miles or 370.4 km) offshore. Managed salmon stocks include Chinook, coho, pink (odd-numbered years only), and any salmon species listed under the ESA that is measurably impacted by Council fisheries (PFMC 2021).

The objective of this assessment is to describe potential adverse effects to designated EFH for federally managed fisheries species within the action area. It also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the Project. EFH and life-history stages for species that may occur in the Project vicinity are listed in Table 10.

Table 10
Managed Species and Life-History Stages with Designated Essential Fish Habitat that May Occur in the Action Area

Species	Adult	Spawning/ Mating	Juvenile	Larvae	Eggs/ Parturition
Chinook salmon	X		X		
Coho salmon	X		X		
Puget Sound pink salmon	X		X		

C. Effects of the Proposed Action

i. Effects on EFH (groundfish, coastal pelagic, and salmon EFH should be discussed separately)

Potential adverse effects on EFH include temporary and localized minor turbidity effects and in-water noise during pile driving. Direct and indirect effects on EFH and the impact avoidance, minimization, and conservation measures that avoid and minimize impacts are identified in Table 11.

Table 11
Impact Mechanisms of Proposed Project on Essential Fish Habitat

Affected EFH	Impact Mechanism	Impact Avoidance and Minimization and Conservation Measures
Pacific salmon EFH (water column)	Project activities would result in short-term and localized turbidity during pile removal, pile driving, and encapsulation of piles with fiberglass. These activities would also temporarily disturb benthic species that may serve as prey for salmonids. These activities are anticipated to have insignificant effects on EFH. Turbidity and benthic disturbance would be temporary and localized and are not expected to impact primary productivity and food resources for Pacific salmon.	The Project is timed to occur during the in-water work window for protection of listed fish species.
Pacific salmon EFH (water column)	There is a nominal chance that an unintentional release of fuel, lubricants, or hydraulic fluid from land-based construction equipment could enter waterbodies. Eroded soils from upland construction areas could enter the lake, causing sedimentation and turbidity. Salmonid species are mobile and would be expected to avoid areas where unsuitable conditions exist.	Construction contractors would be required to implement BMPs to prevent or respond to spills and avoid soil erosion and runoff.
Pacific salmon EFH (aquatic habitat)	Impact pile driving would result in short-term, localized increases in underwater noise levels. Effects on salmonid behavior could occur within 2.5 miles of pile driving locations. Injurious effects are unlikely due to the small area of noise that would exceed injury thresholds.	The Project is timed to occur during the in-water work window for protection of listed fish species.
Pacific salmon EFH (aquatic habitat)	The Project would result in a minor reduction in riparian vegetation and associated shading/organic input along the lake shore until new plantings become established. Removal/encapsulation of creosote-treated timber piles and installation of stormwater LID features would improve water quality. Moving portions of the dock to deeper water would improve nearshore habitat for juvenile salmonids. The irrigation intake will be screened to prevent fish entrainment.	Replacement riparian vegetation, including coniferous trees, will be planted near the north beach.

ii. Effects on Managed Species (unless effects to an individual species are unique, it is not necessary to discuss adverse effects on a species-by species basis)

There are no unique effects to an individual managed species as a result of the Project.

iii. Effects on Associated Species, Including Prey Species

No impacts on the health or availability of prey species are anticipated.

iv. Cumulative Effects

There are no future state, tribal, local, and private actions in the vicinity of the Project that are reasonably certain to occur within the Project footprint that would result in cumulative effects to EFH.

D. Proposed Conservation Measures

See proposed conservation measures in Section 11 of this BE.

E. Conclusions by EFH (taking into account proposed conservation measures)

The proposed Project is anticipated to have temporary and insignificant effects to EFH. Therefore, it is concluded that the Project **will not adversely affect** Pacific salmon EFH.

14. References:

Include any studies or papers that support statements made in this form (example: reference the source for the listed species that are covered).

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15. Appendices:

As needed include mitigation, revegetation plans, monitoring plans, results of studies, water quality information, etc.

FIGURES

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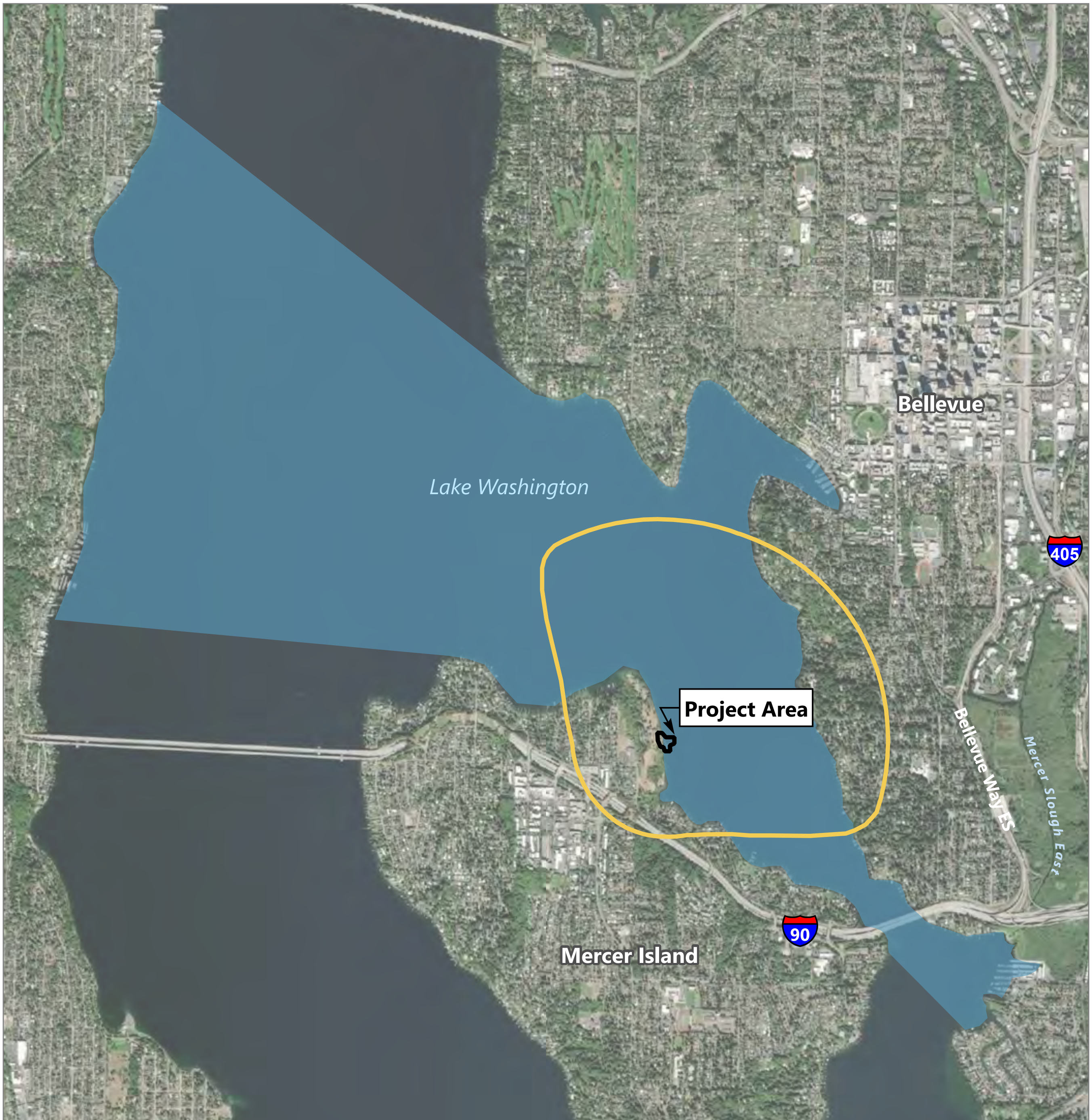
Figure BE-1
Vicinity Map
Biological Evaluation
Luther Burbank Park Waterfront Improvements



LEGEND:

- Project Area
- In-Water Noise Attenuation to Background (120 dBA): Constrained by Land Masses
- In-Air Noise Attenuation to Background (70 dBA) – Hard Surface: 0.9 mile
- In-Air Noise Attenuation to Background (70 dBA) – Soft Surface: 0.4 mile

NOTE:
1. Aerial imagery: ESRI Streaming Imagery

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Feet

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Figure BE-2
Action Area

Biological Evaluation
Luther Burbank Waterfront Improvements

LEGEND:

- Project Area
- Distance for In-Air Masking – Impact Pile Driving: 138 feet
- In-Water Non-auditory Injury (208 dB SEL) – Impact Pile Driving: 3 feet
- In-Water Auditory Injury (202 dB SEL) – Impact Pile Driving: 10 feet
- In-Water Behavioral Effects (150 dB RMS) – Vibratory Pile Driving: 52 feet
- In-Water Behavioral Effects (150 dB RMS) – Impact Pile Driving: 2.5 miles

NOTE:
1. Aerial imagery: USA NAIP Streaming Imagery

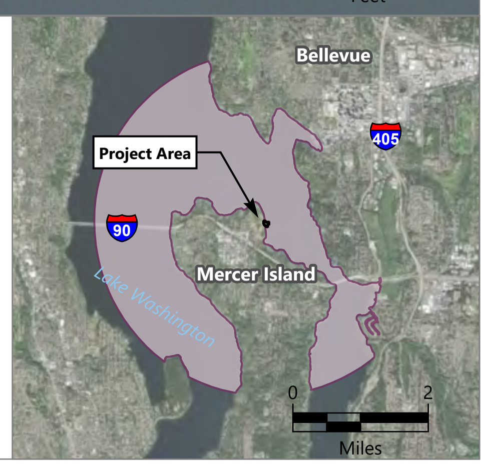

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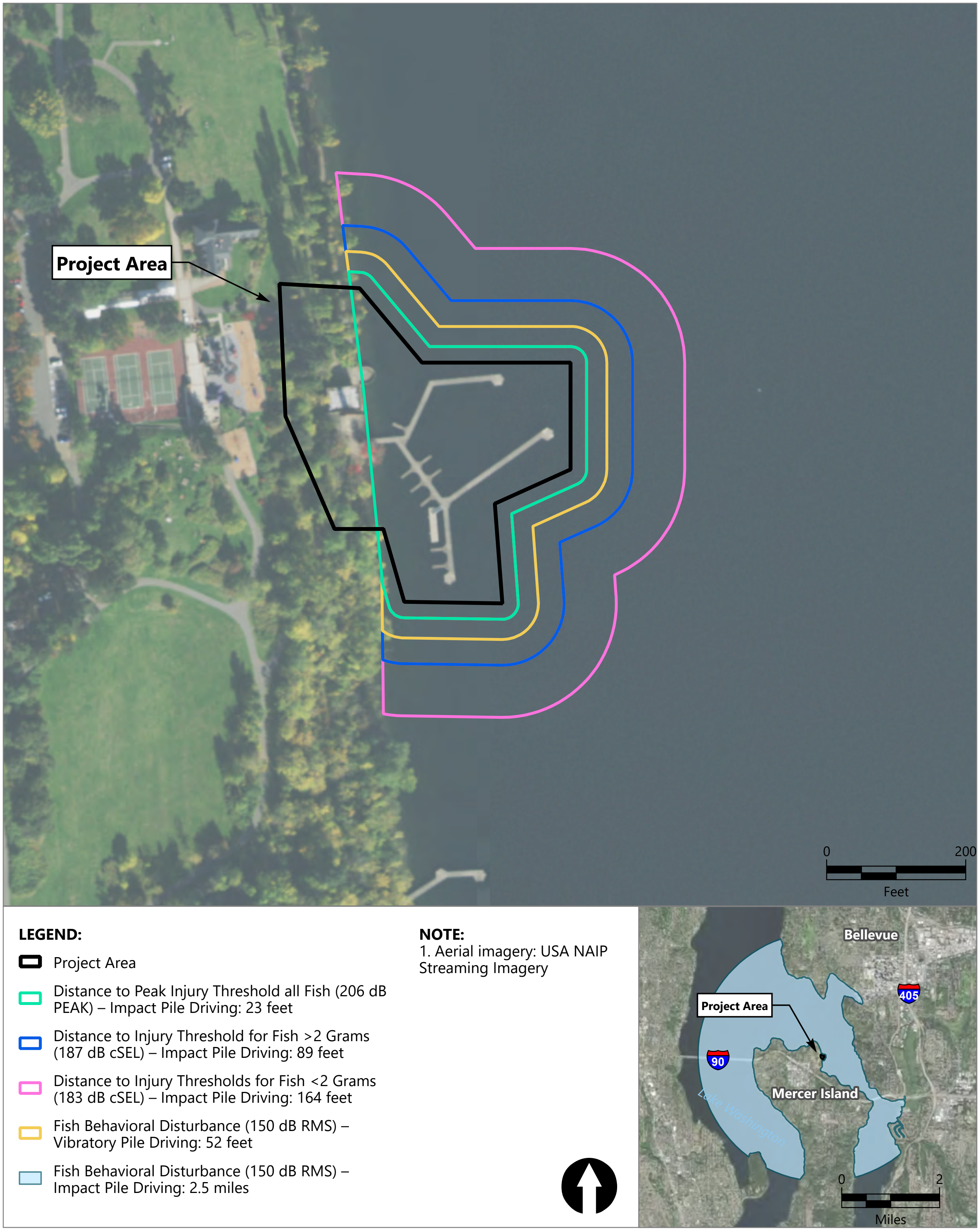
Figure BE-3
In-Air and In-Water Noise Thresholds for Marbled Murrelet

Biological Evaluation
Luther Burbank Waterfront Improvements



LEGEND:

- Project Area
- Distance to Peak Injury Threshold all Fish (206 dB PEAK) – Impact Pile Driving: 23 feet
- Distance to Injury Threshold for Fish >2 Grams (187 dB cSEL) – Impact Pile Driving: 89 feet
- Distance to Injury Thresholds for Fish <2 Grams (183 dB cSEL) – Impact Pile Driving: 164 feet
- Fish Behavioral Disturbance (150 dB RMS) – Vibratory Pile Driving: 52 feet
- Fish Behavioral Disturbance (150 dB RMS) – Impact Pile Driving: 2.5 miles

NOTE:
1. Aerial imagery: USA NAIP Streaming Imagery

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Figure BE-4
In-Water Noise Thresholds for Chinook Salmon and Steelhead

Biological Evaluation
Luther Burbank Waterfront Improvements

APPENDIX 1
PROJECT DRAWINGS

Sheet List Table	
Sheet Number	Sheet Title
1	Vicinity Map
2	Existing Conditions
3	Project Overview
4	Demolition and TESC Site Plan
5	Upland and Shoreline Project Plan
6	Upland and Shoreline Cross Sections
7	In-Water and Overwater Construction Plan
8	North Dock Pier Repair and Fiberglass Encapsulation Details
9	North Dock Pile Repair Details
10	Central Dock Reconfiguration - Elevation View
11	Central Dock Reconfiguration - Section View and Pile Schedule
12	South Dock Reconfiguration - Elevation View
13	Planting Plan
14	Plant Schedule

VICINITY MAP

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

PROPOSED: REPAIR AND REPLACE DOCK STRUCTURES AND COMPLETE UPLAND IMPROVEMENTS

PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

HORIZONTAL DATUM: WASHINGTON STATE PLANE, NORTH ZONE, NAD83
VERTICAL DATUM: NAVD88

LATITUDE: 47.591034 N
LONGITUDE: -122.224481 W
S-T-R: 6-25N-5E

IN: LAKE WASHINGTON
NEAR/AT: MERCER ISLAND
COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

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1201 3rd Ave, Suite 2600
Seattle, WA 98101
206-287-9130

FIGURE: 1 of 14

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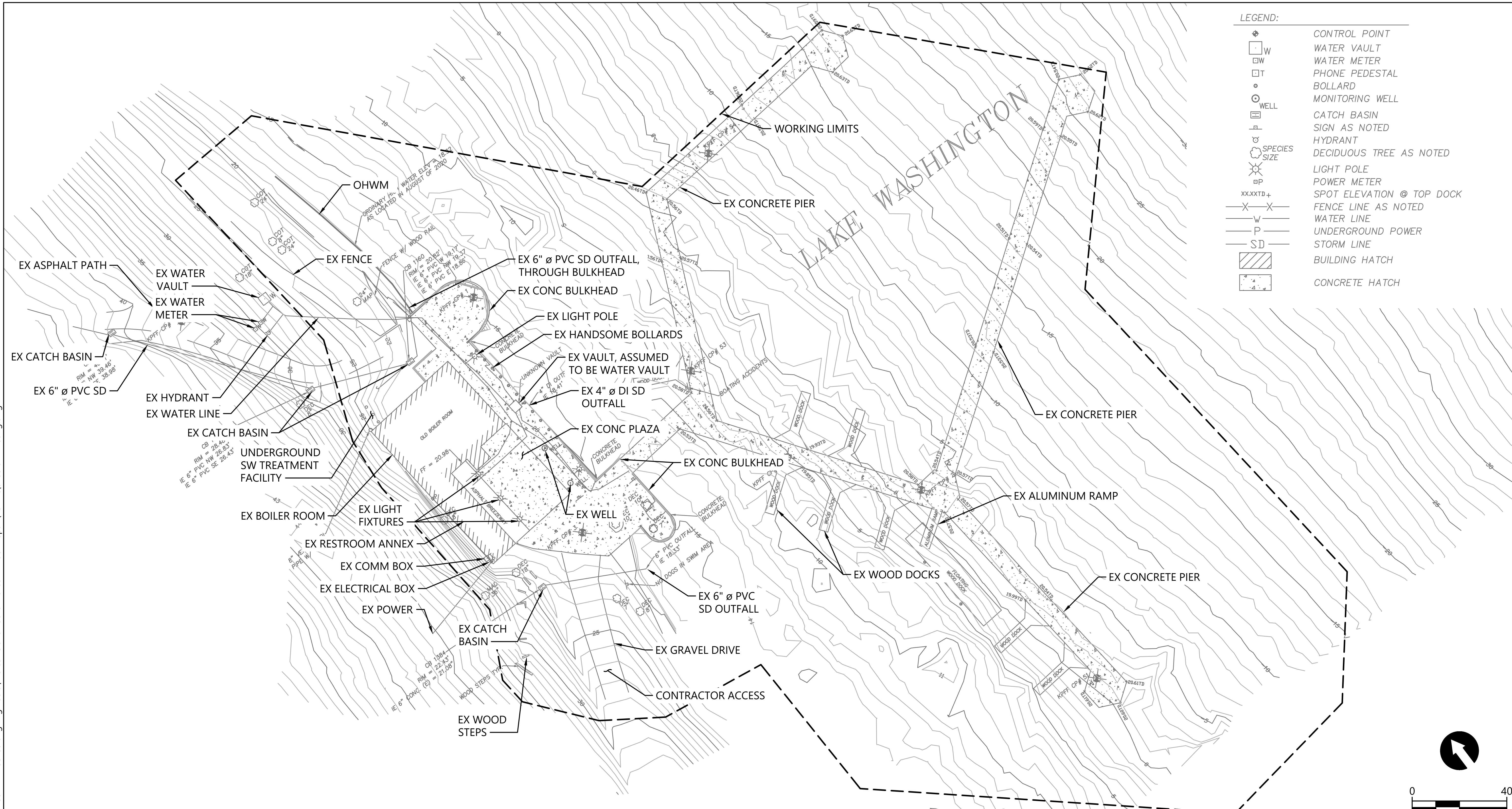

EXISTING CONDITIONS

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

PROPOSED: REPAIR AND REPLACE DOCK STRUCTURES

PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

HORIZONTAL DATUM: WASHINGTON STATE PLANE, NORTH ZONE, NAD83
VERTICAL DATUM: NAVD88

LATITUDE: 47.591034 N
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S-T-R: 6-25N-5E

IN: LAKE WASHINGTON
NEAR/AT: MERCER ISLAND
COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

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Seattle, WA 98101
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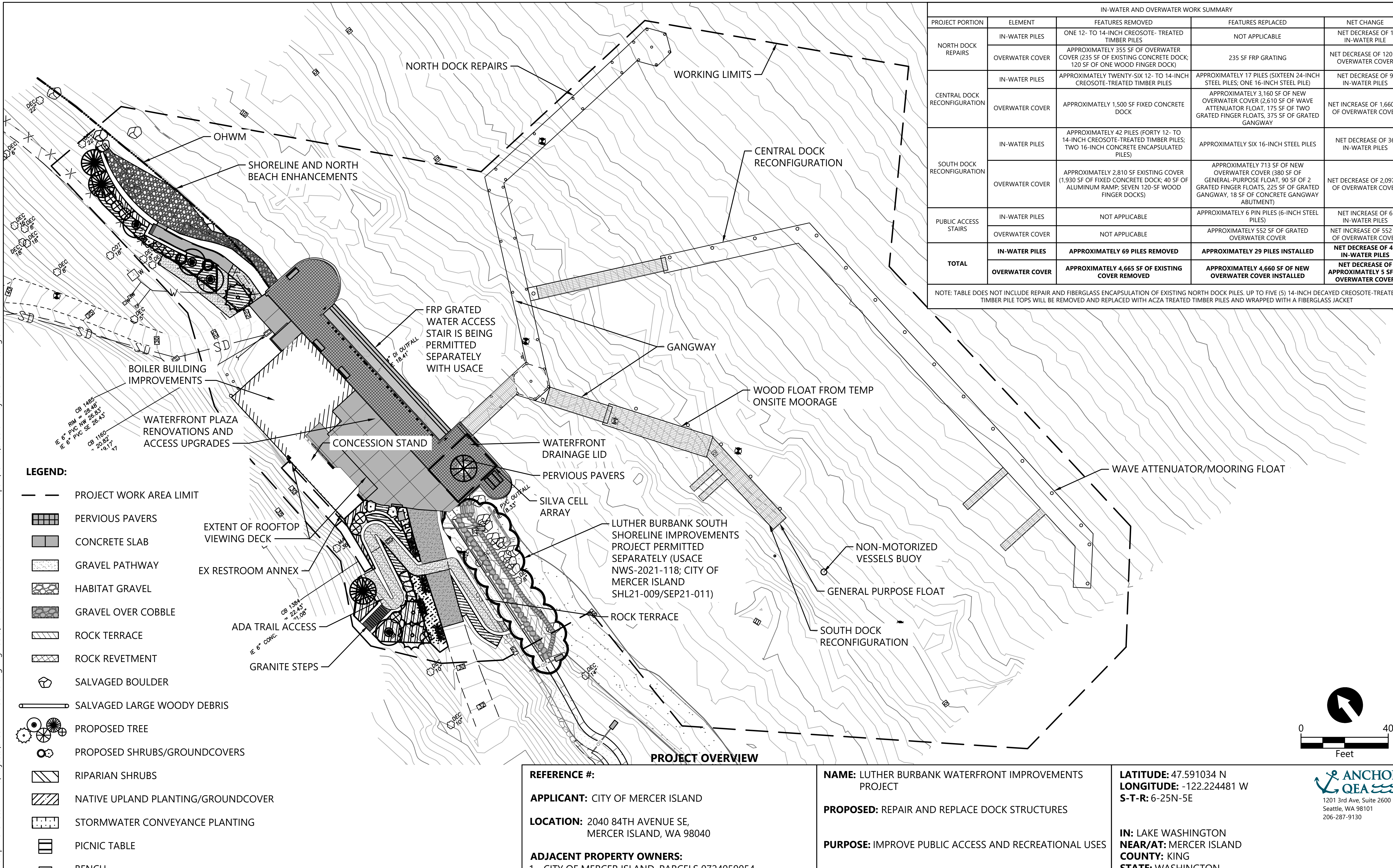
FIGURE: 2 of 14

SOURCE: SURVEY PROVIDED BY KPFF

IN-WATER AND OVERWATER WORK SUMMARY				
PROJECT PORTION	ELEMENT	FEATURES REMOVED	FEATURES REPLACED	NET CHANGE
NORTH DOCK REPAIRS	IN-WATER PILES	ONE 12- TO 14-INCH CREOSOTE- TREATED TIMBER PILES	NOT APPLICABLE	NET DECREASE OF 1 IN-WATER PILE
	OVERWATER COVER	APPROXIMATELY 355 SF OF OVERWATER COVER (235 SF OF EXISTING CONCRETE DOCK; 120 SF OF ONE WOOD FINGER DOCK)	235 SF FRP GRATING	NET DECREASE OF 120 SF OVERWATER COVER
CENTRAL DOCK RECONFIGURATION	IN-WATER PILES	APPROXIMATELY TWENTY-SIX 12- TO 14-INCH CREOSOTE-TREATED TIMBER PILES	APPROXIMATELY 17 PILES (SIXTEEN 24-INCH STEEL PILES; ONE 16-INCH STEEL PILE)	NET DECREASE OF 9 IN-WATER PILES
	OVERWATER COVER	APPROXIMATELY 1,500 SF FIXED CONCRETE DOCK	APPROXIMATELY 3,160 SF OF NEW OVERWATER COVER (2,610 SF OF WAVE ATTENUATOR FLOAT, 175 SF OF TWO GRATED FINGER FLOATS, 375 SF OF GRATED GANGWAY	NET INCREASE OF 1,660 SF OF OVERWATER COVER
SOUTH DOCK RECONFIGURATION	IN-WATER PILES	APPROXIMATELY 42 PILES (FORTY 12- TO 14-INCH CREOSOTE-TREATED TIMBER PILES; TWO 16-INCH CONCRETE ENCAPSULATED PILES)	APPROXIMATELY SIX 16-INCH STEEL PILES	NET DECREASE OF 36 IN-WATER PILES
	OVERWATER COVER	APPROXIMATELY 2,810 SF EXISTING COVER (1,930 SF OF FIXED CONCRETE DOCK; 40 SF OF ALUMINUM RAMP; SEVEN 120-SF WOOD FINGER DOCKS)	APPROXIMATELY 713 SF OF NEW OVERWATER COVER (380 SF OF GENERAL-PURPOSE FLOAT, 90 SF OF 2 GRATED FINGER FLOATS, 225 SF OF GRATED GANGWAY, 18 SF OF CONCRETE GANGWAY ABUTMENT)	NET DECREASE OF 2,097 SF OF OVERWATER COVER
PUBLIC ACCESS STAIRS	IN-WATER PILES	NOT APPLICABLE	APPROXIMATELY 6 PIN PILES (6-INCH STEEL PILES)	NET INCREASE OF 6 IN-WATER PILES
	OVERWATER COVER	NOT APPLICABLE	APPROXIMATELY 552 SF OF GRATED OVERWATER COVER	NET INCREASE OF 552 SF OF OVERWATER COVER
TOTAL	**IN-WATER PILES**	**APPROXIMATELY 69 PILES REMOVED**	**APPROXIMATELY 29 PILES INSTALLED**	**NET DECREASE OF 40 IN-WATER PILES**
	OVERWATER COVER	**APPROXIMATELY 4,665 SF OF EXISTING COVER REMOVED**	**APPROXIMATELY 4,660 SF OF NEW OVERWATER COVER INSTALLED**	**NET DECREASE OF APPROXIMATELY 5 SF OF OVERWATER COVER**
NOTE: TABLE DOES NOT INCLUDE REPAIR AND FIBERGLASS ENCAPSULATION OF EXISTING NORTH DOCK PILES. UP TO FIVE (5) 14-INCH DECAYED CREOSOTE-TREATED TIMBER PILE TOPS WILL BE REMOVED AND REPLACED WITH ACZA TREATED TIMBER PILES AND WRAPPED WITH A FIBERGLASS JACKET				



SOURCE: SURVEY AND PIER PLAN CAD FILE PROVIDED BY KPFF.

PROJECT OVERVIEW

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

PROPOSED: REPAIR AND REPLACE DOCK STRUCTURES

PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

HORIZONTAL DATUM: WASHINGTON STATE PLANE, NORTH ZONE, NAD83
VERTICAL DATUM: NAVD88

LATITUDE: 47.591034 N
LONGITUDE: -122.224481 W
S-T-R: 6-25N-5E

IN: LAKE WASHINGTON
NEAR/AT: MERCER ISLAND
COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

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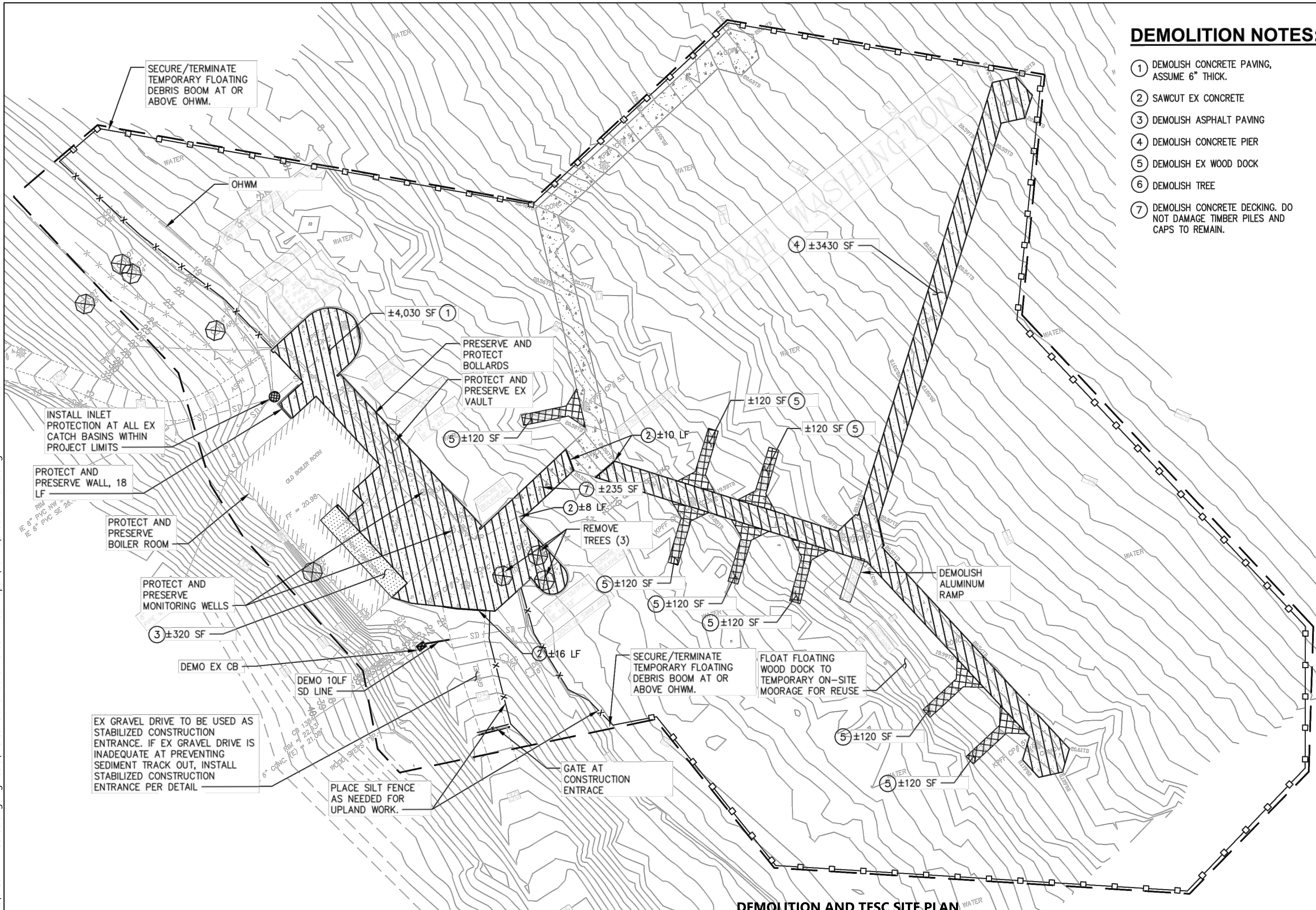
Seattle, WA 98101
206-287-9130

FIGURE: 3 of 14



DEMOLITION NOTES:

1. DEMOLISH CONCRETE PAVING, ASSUME 6" THICK.
2. SAWCUT EX CONCRETE
3. DEMOLISH ASPHALT PAVING
4. DEMOLISH CONCRETE PIER
5. DEMOLISH EX WOOD DOCK
6. DEMOLISH TREE
7. DEMOLISH CONCRETE DECKING. DO NOT DAMAGE TIMBER PILES AND CAPS TO REMAIN.

NOTES:

1. CONTRACTOR SHALL INSTALL TESC MEASURES BEFORE COMMENCEMENT OF ANY OTHER WORK ON SITE.
2. CONTRACTOR SHALL MAINTAIN ACCESS AND PROTECT WATER VALVES, MONITORING WELLS, OVERHEAD LIGHTS AND LIGHT POLES. CONTRACTOR SHALL REPAIR OR REPLACE ALL ITEMS DAMAGED DURING CONSTRUCTION.
3. ALL DEMOLISHED MATERIAL SHALL BECOME THE PROPERTY OF THE CONTRACTOR. CONTRACTOR SHALL BE RESPONSIBLE TO DISPOSE OF DEMOLISHED AND EXCAVATED MATERIAL AT A PERMITTED DISPOSAL FACILITY.
4. CONTRACTOR SHALL INSTALL TESC MEASURES BEFORE PAVEMENT REMOVAL AND EXCAVATION.
5. CONTRACTOR SHALL PROVIDE SWEEPING AS NEEDED.
6. CONTRACTOR SHALL COORDINATE WITH SITE OWNER TO DETERMINE AN APPROPRIATE STOCKPILE LAYDOWN AREA WITHIN PROJECT LIMITS. SEE DETAIL 2 ON SHEET D-011.
7. INLET PROTECTION SHALL BE PLACED IN ALL CATCH BASINS IN THE VICINITY OF THE PROPERTY LIMITS PRIOR TO THE COMMENCEMENT OF WORK AND MAINTAINED FOR THE DURATION OF THE PROJECT.
8. UPON COMPLETION OF PROJECT CONTRACTOR SHALL CLEAN AND RE-INSTALL INLET PROTECTION AND LEAVE IN PLACE WITHIN PROPERTY LIMITS.

LEGEND:

- OHWM LINE
- PROJECT WORK AREA LIMITS
- TEMPORARY FLOATING DEBRIS BOOM
- SILT FENCE
- INLET PROTECTION
- REMOVE TREE
- DEMOLISH CONCRETE
- DEMOLISH ASPHALT
- DEMOLISH WOOD DOCK

0 40
Feet

DEMOLITION AND TESC SITE PLAN

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REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

PROPOSED: REPAIR AND REPLACE DOCK STRUCTURES

PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

HORIZONTAL DATUM: WASHINGTON STATE PLANE, NORTH ZONE, NAD83
VERTICAL DATUM: NAVD88

LATITUDE: 47.591034 N
LONGITUDE: -122.224481 W
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IN: LAKE WASHINGTON
NEAR/AT: MERCER ISLAND
COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

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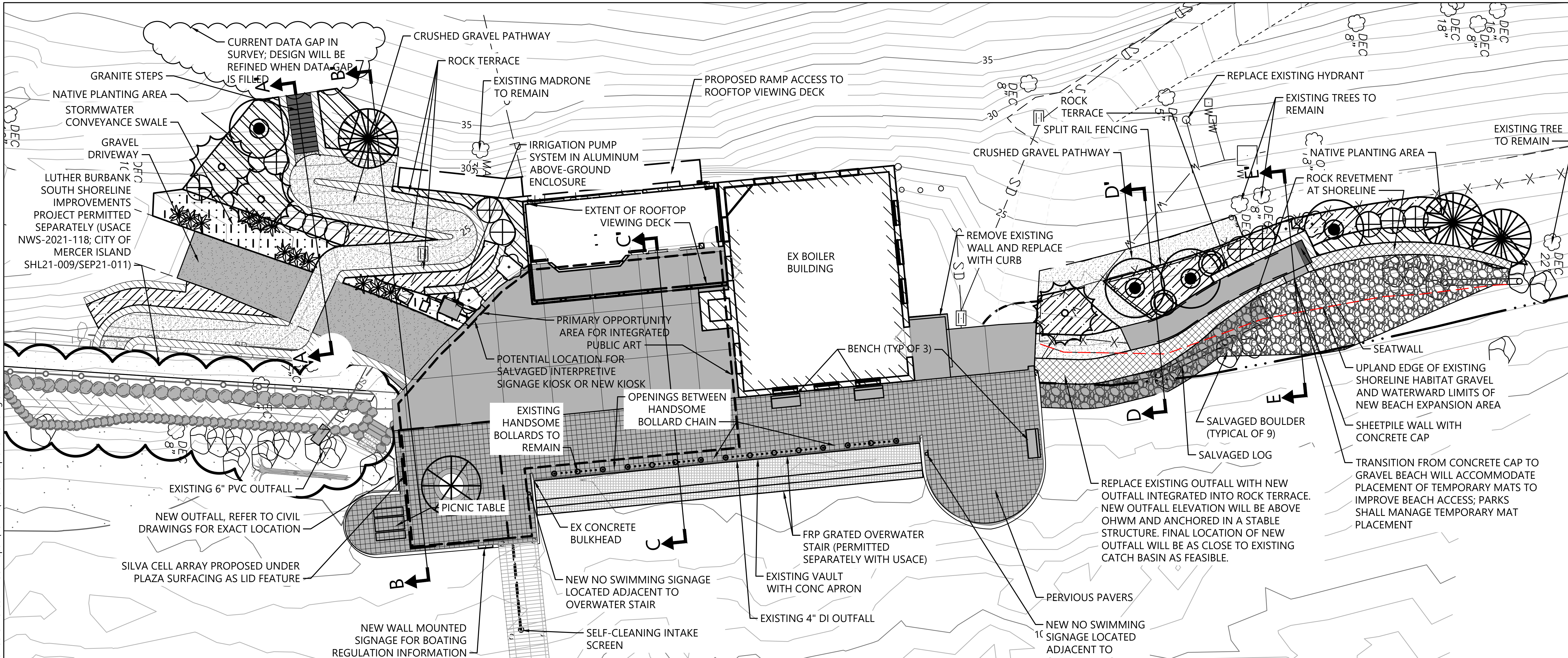
SOURCE: DEMOLITION AND TESC SITE PLAN PROVIDED BY KPFF.



LEGEND:

- EXISTING CONTOUR
- EXISTING TREE TO RETAIN
- EXISTING UPLAND EDGE OF SHORELINE HABITAT GRAVEL
- EXISTING ORDINARY HIGH WATER LINE
- EXISTING BOULDER TO RETAIN
- PROPOSED CONTOUR
- PERVIOUS PAVERS
- CONCRETE SLAB ON GRADE WITH SAWCUT JOINT SCORING
- CRUSHED GRAVEL PATHWAY
- GRAVEL DRIVEWAY PAVING
- EXISTING BOLLARD AND CHAIN TO REMAIN
- HABITAT GRAVEL
- GRAVEL OVER COBBLE
- ROCK TERRACE
- ROCK REVETMENT
- FRP GRATING
- HANDRAIL
- SPLIT RAIL FENCING
- PICNIC TABLE
- BENCH
- SALVAGED LOG
- SALVAGED BOULDER
- PROPOSED TREE
- PROPOSED SHRUBS/GROUNDCOVERS
- RIPARIAN SHRUBS
- NATIVE UPLAND PLANTING/GROUNDCOVER
- STORMWATER CONVEYANCE PLANTING

0 20 Feet

SOURCE: SURVEY AND PIER PLAN CAD FILE PROVIDED BY KPFF.

UPLAND AND SHORELINE PROJECT PLAN

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

PROPOSED: REPAIR AND REPLACE DOCK STRUCTURES

PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

HORIZONTAL DATUM: WASHINGTON STATE PLANE, NORTH ZONE, NAD83

VERTICAL DATUM: NAVD88

LATITUDE: 47.591034 N
LONGITUDE: -122.224481 W
S-T-R: 6-25N-5E

IN: LAKE WASHINGTON
NEAR/AT: MERCER ISLAND
COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

FIGURE: 5 of 14

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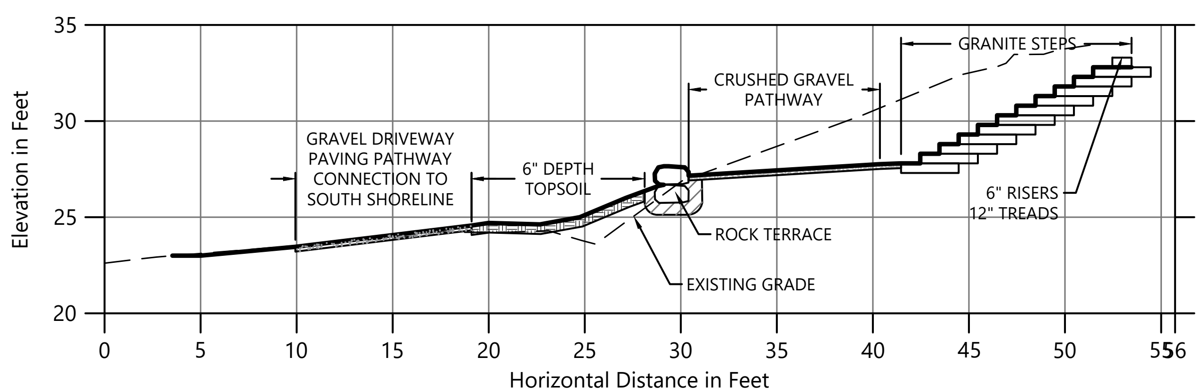
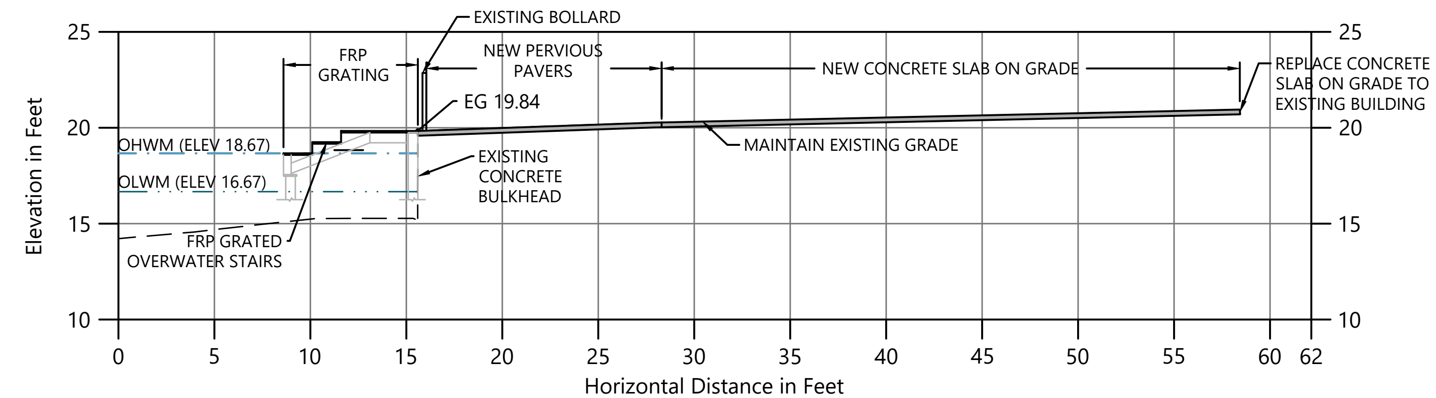
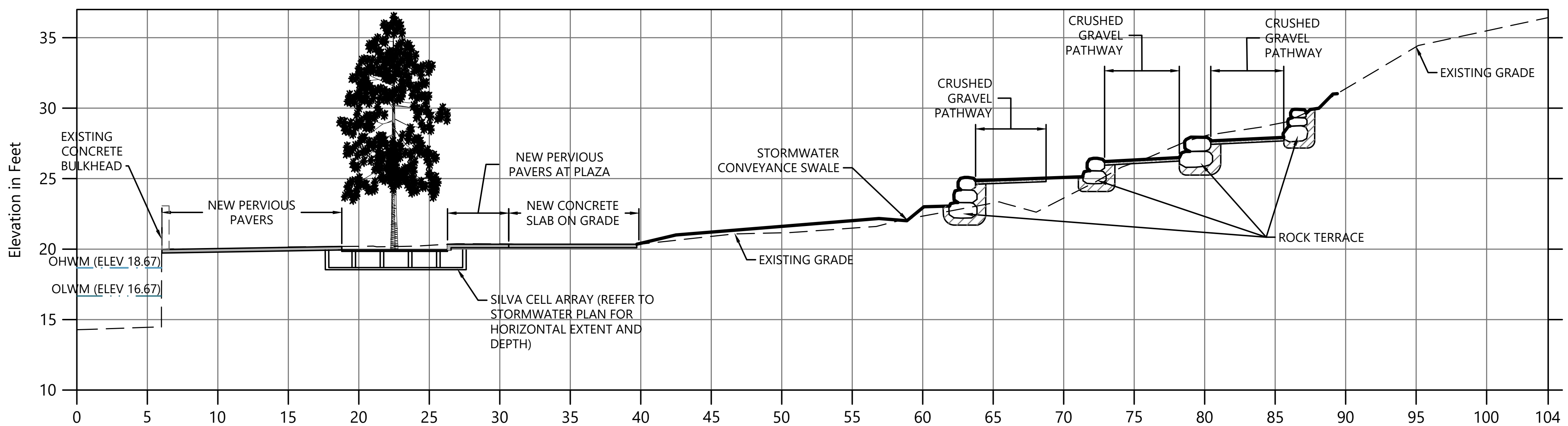


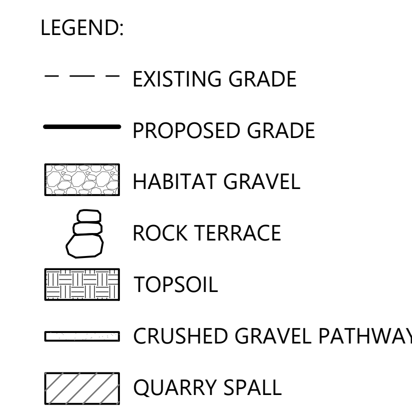
CROSS SECTION A-A'

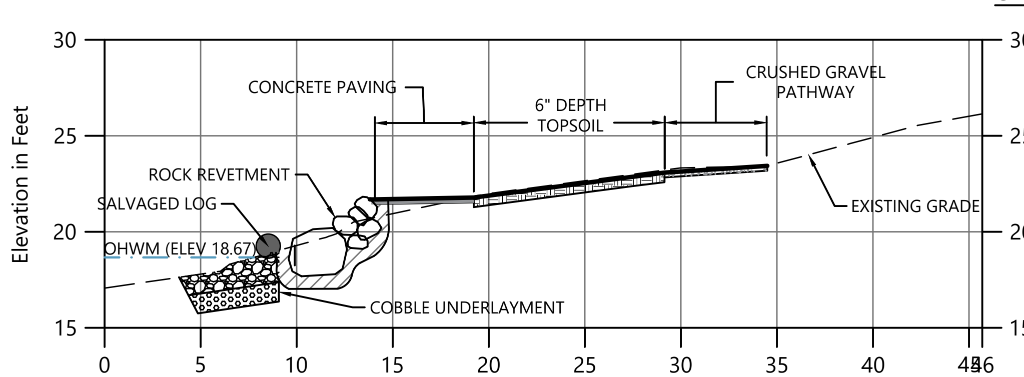


CROSS SECTION C-C'

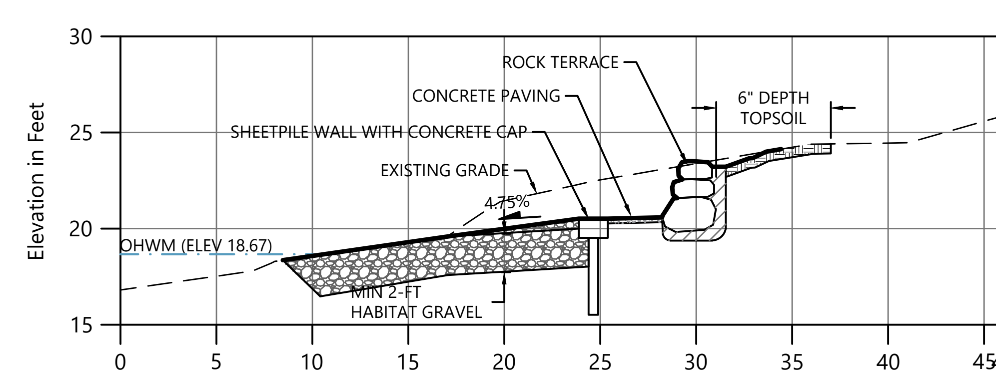


CROSS SECTION B-B'

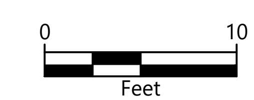




CROSS SECTION D-D'



CROSS SECTION E-E'



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SOURCE: SURVEY PROVIDED BY KPFF

UPLAND AND SHORELINE CROSS SECTIONS

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

PROPOSED: REPAIR AND REPLACE DOCK STRUCTURES

PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

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NEAR/AT: MERCER ISLAND
COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

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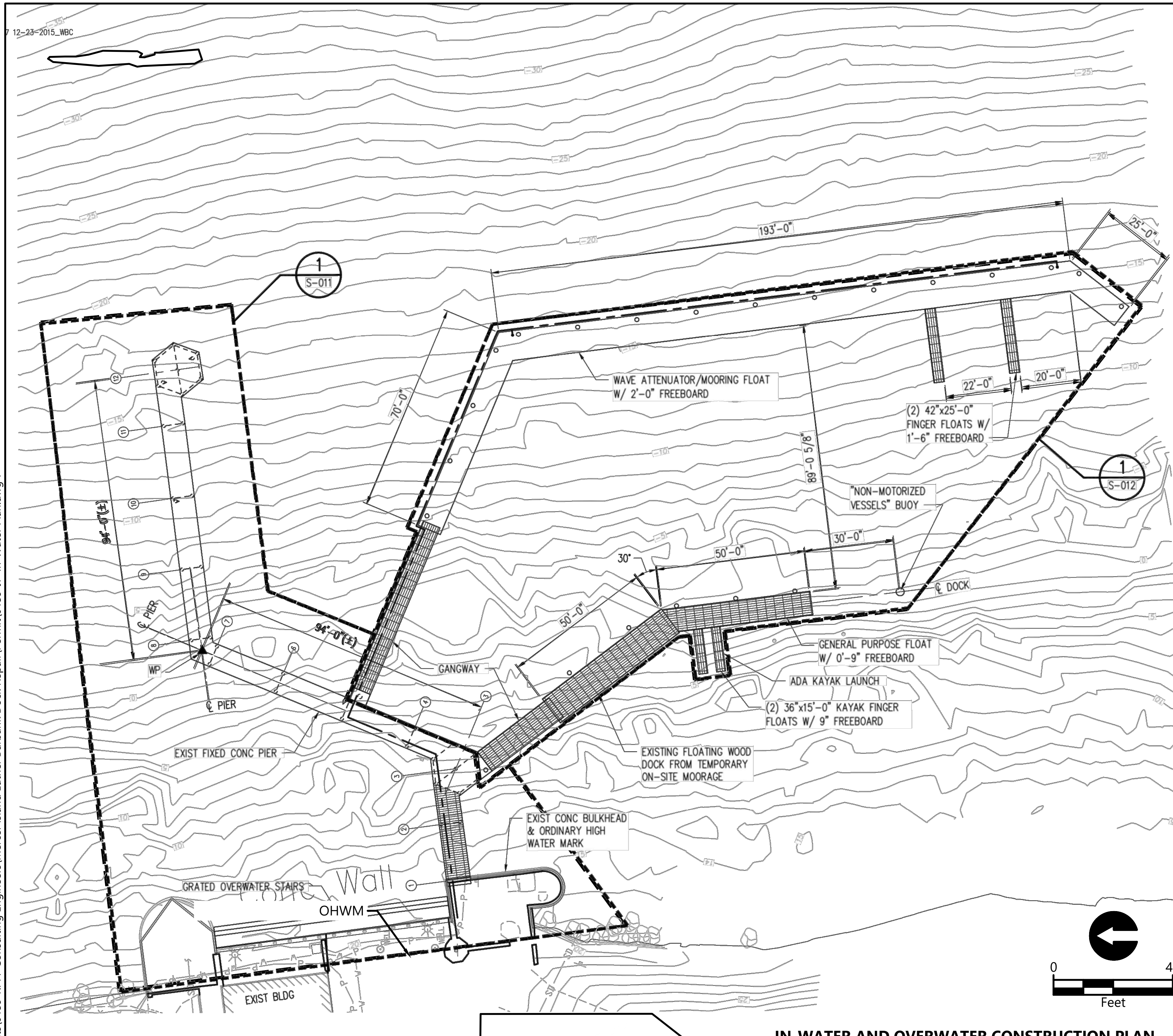
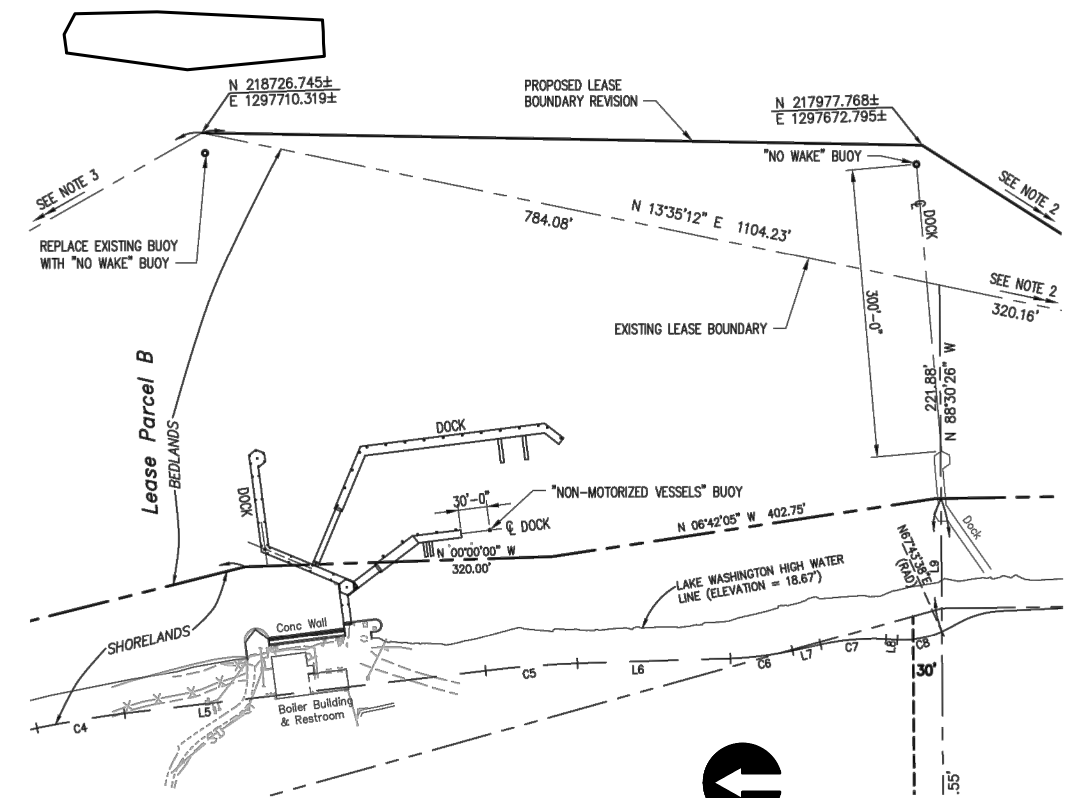
FIGURE: 6 of 14



NOTES:

1. PROPOSED IMPROVEMENTS OVERWATER COVERAGE: ±4425 SF.
2. EXTENDS TO EXISTING BOUNDARY CORNER AT N 217653.411, E 1297450.919.
3. EXTENDS TO EXISTING BOUNDARY CORNER AT N 220320.192, E 1296873.931.



BUOY PLAN

0 100 200 300

SCALE IN FEET

IN-WATER AND OVERWATER CONSTRUCTION PLAN

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

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PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

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VERTICAL DATUM: NAVD88

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NEAR/AT: MERCER ISLAND
COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

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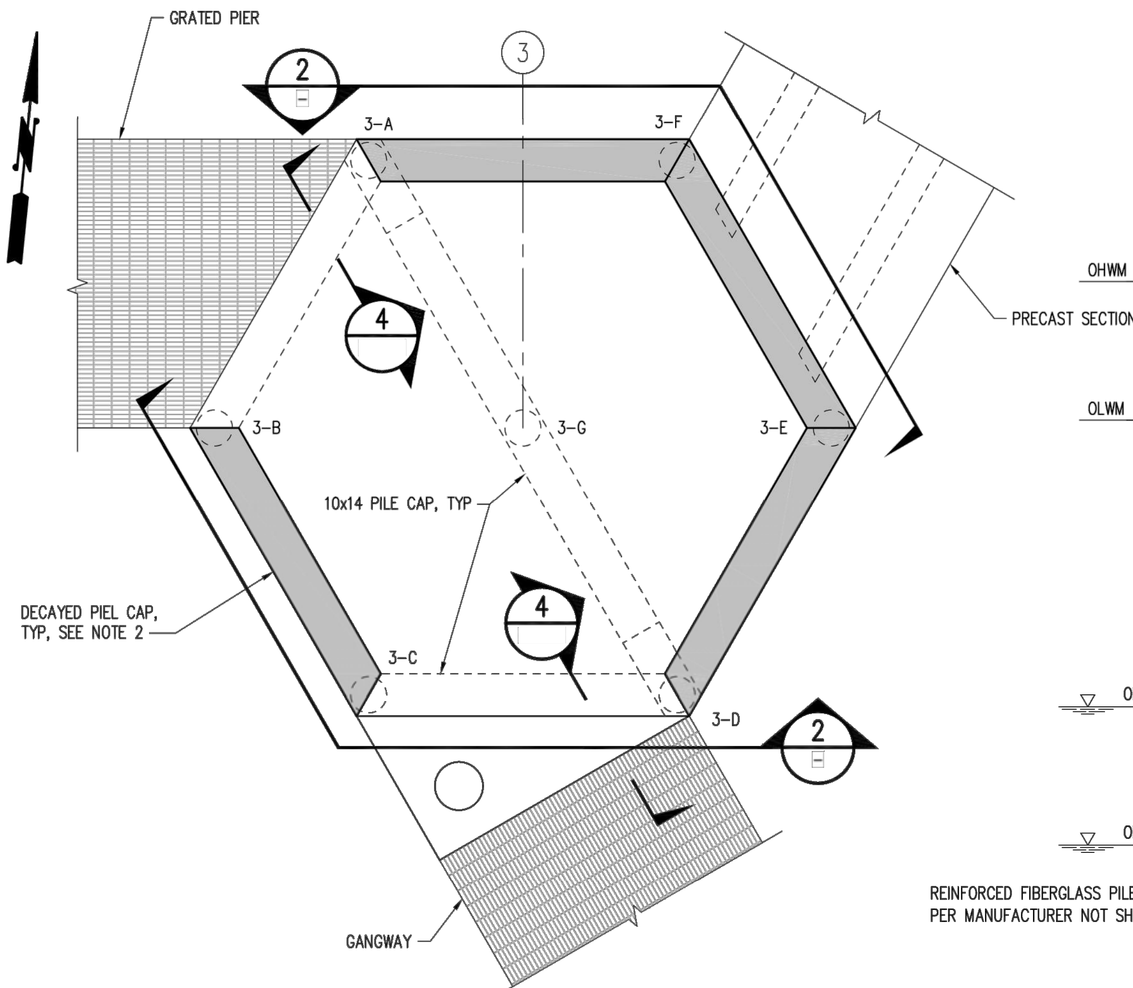
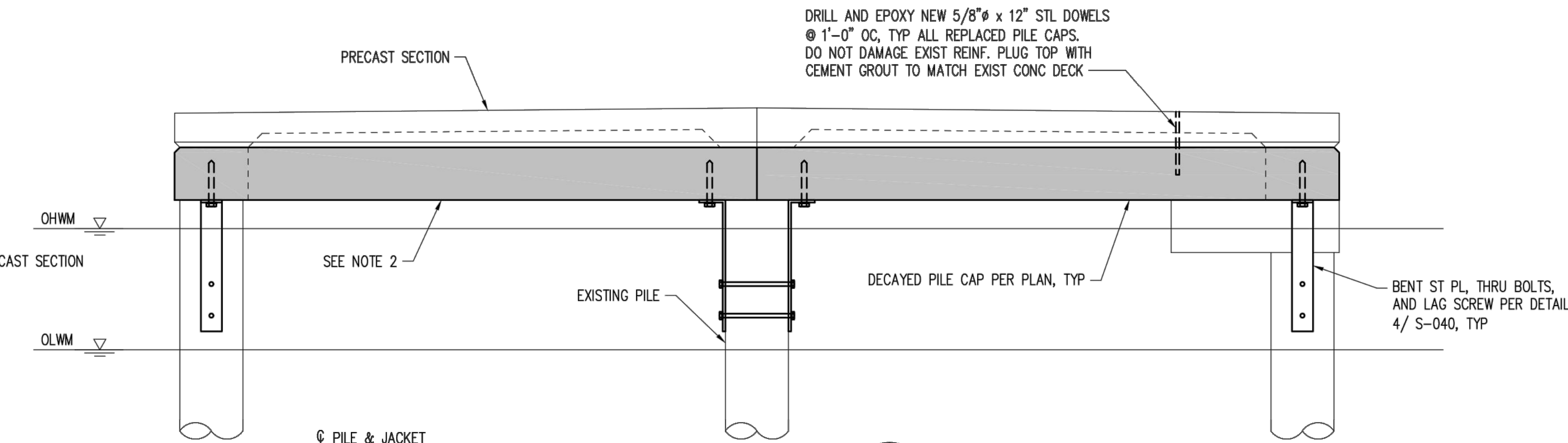
Seattle, WA 98101
206-287-9130

FIGURE: 7 of 14

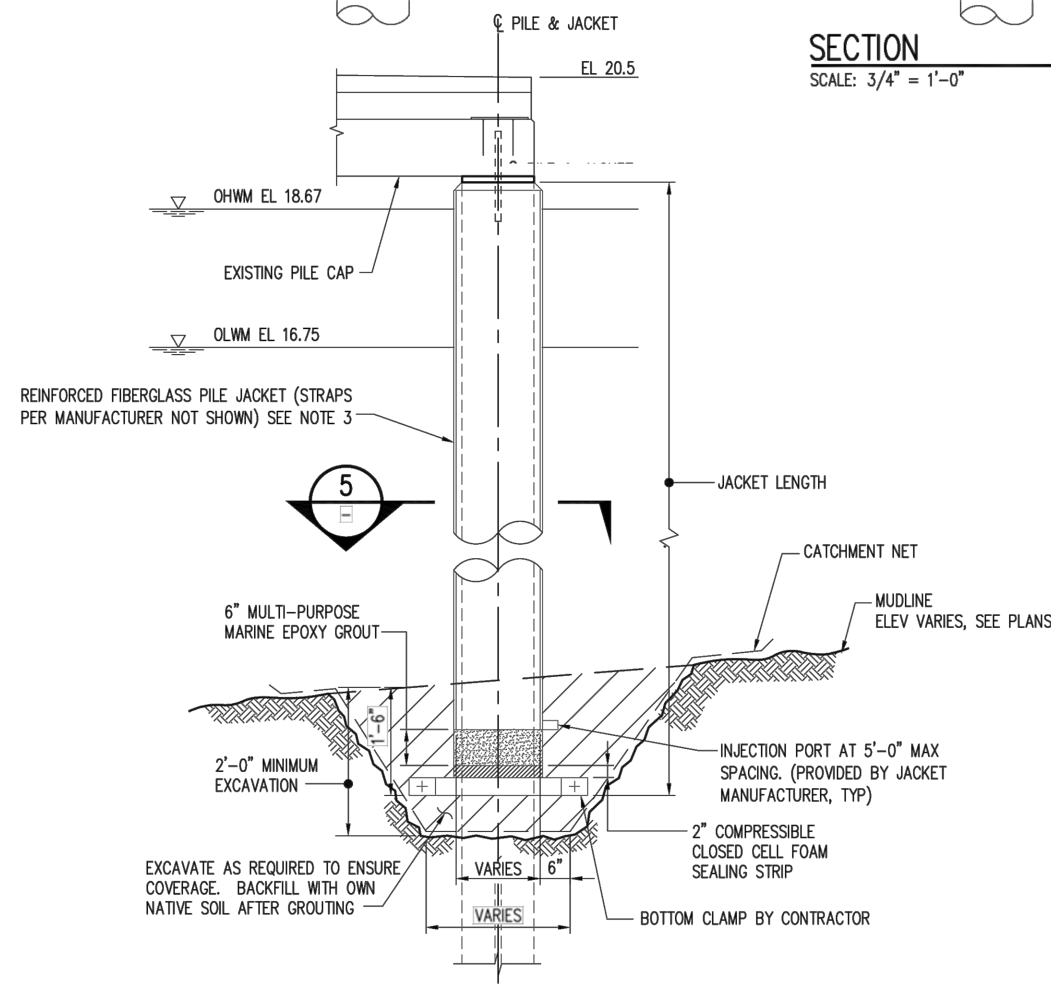
SOURCE: IN-WATER AND OVERWATER CONSTRUCTION PLAN PROVIDED BY KPFF.



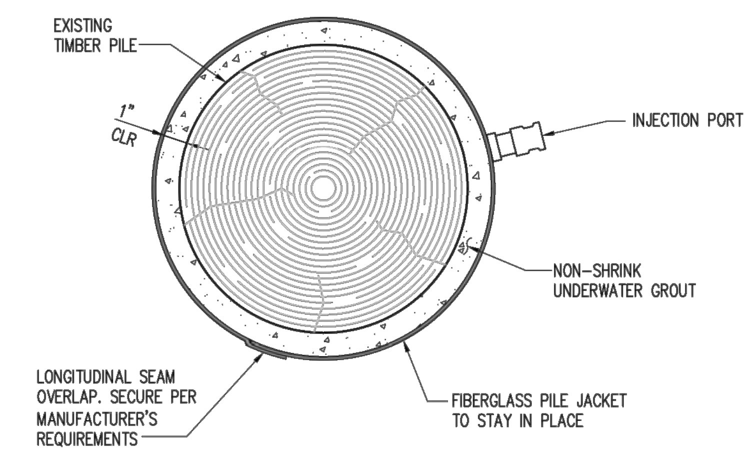
DETAIL 1
SCALE: 3/8" = 1'-0"



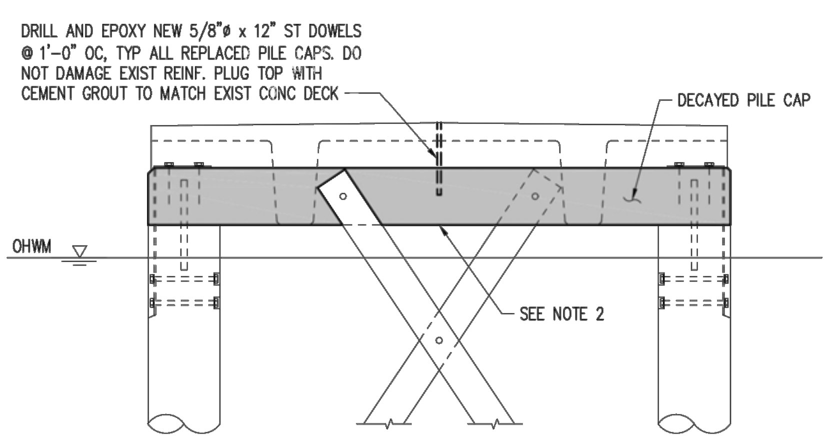
SECTION 2
SCALE: 3/4" = 1'-0"
S-040



SECTION 4
SCALE: 3/4" = 1'-0"



SECTION 5
SCALE: 3" = 1'-0"



NOTES:

1. SEE DRAWINGS S-030 THRU S-032 FOR EXISTING CONDITIONS.
2. EXTRACT DECAYED PILE CAPS FULL LENGTH WITHOUT DAMAGING EXISTING CONC DECK AND TIMBER PILES, AND REPLACE WITH TREATED 10x14 TIMBERS. REPLACE CONNECTING HARDWARE SHOWN IN EXISTING CONDITIONS UNO.
3. PLACE JACKETS AROUND ALL (38) PILES, INCLUDING PILES REPAIRED PER DETAIL 6/S-040.

NORTH DOCK PIER REPAIR AND FIBERGLASS ENCAPSULATION DETAILS

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

PROPOSED: REPAIR AND REPLACE DOCK STRUCTURES

PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

HORIZONTAL DATUM: WASHINGTON STATE PLANE, NORTH ZONE, NAD83

VERTICAL DATUM: NAVD88

LATITUDE: 47.591034 N
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IN: LAKE WASHINGTON
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COUNTY: KING
STATE: WASHINGTON

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DATE: OCTOBER 2022

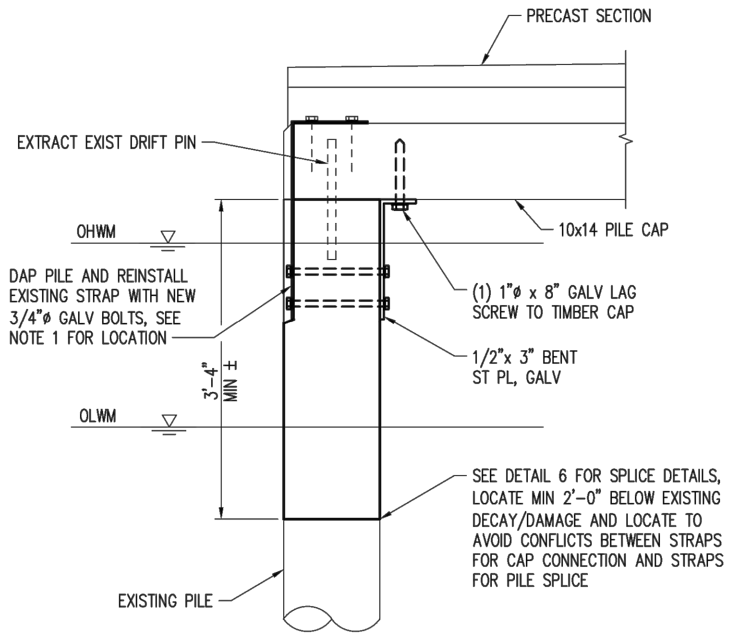
FIGURE: 8 of 14

SOURCE: NORTH DOCK PIER REPAIR AND FIBERGLASS ENCAPSULATION DETAILS PROVIDED BY KPFF.

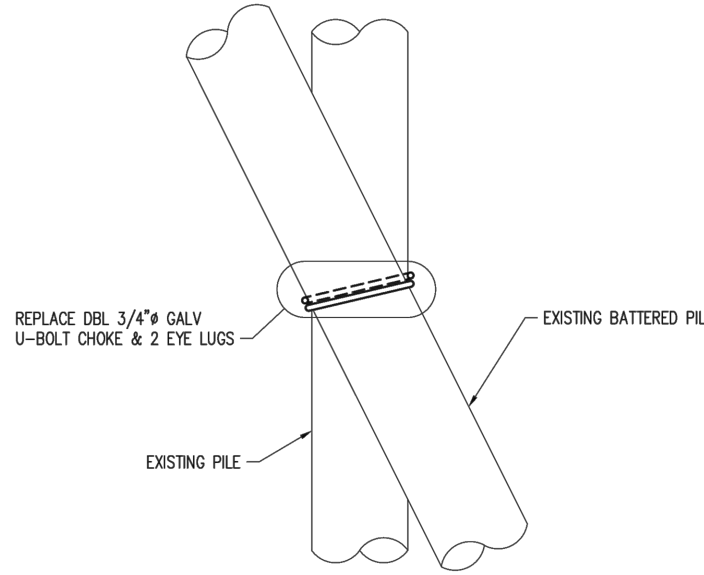
Oct 19, 2022 1:50pm chewett K:\Projects\0159-KPFF Consulting Engineers\Mercer Island Luther Burbank Dock Repair\Permit\0159-JP-Dock Details.dwg 8

NOTES:

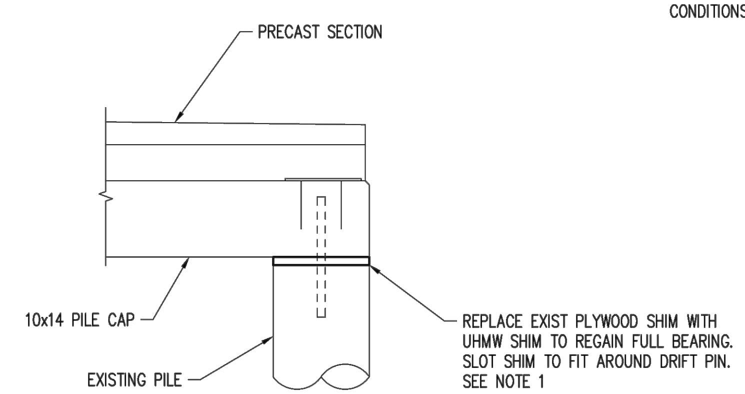
1. SEE DRAWINGS S-030 THRU S-032 FOR EXISTING CONDITIONS.
2. EXTRACT DECAYED PILE CAPS FULL LENGTH WITHOUT DAMAGING EXISTING CONC DECK AND TIMBER PILES, AND REPLACE WITH TREATED 10x14 TIMBERS. REPLACE CONNECTING HARDWARE SHOWN IN EXISTING CONDITIONS UNO.



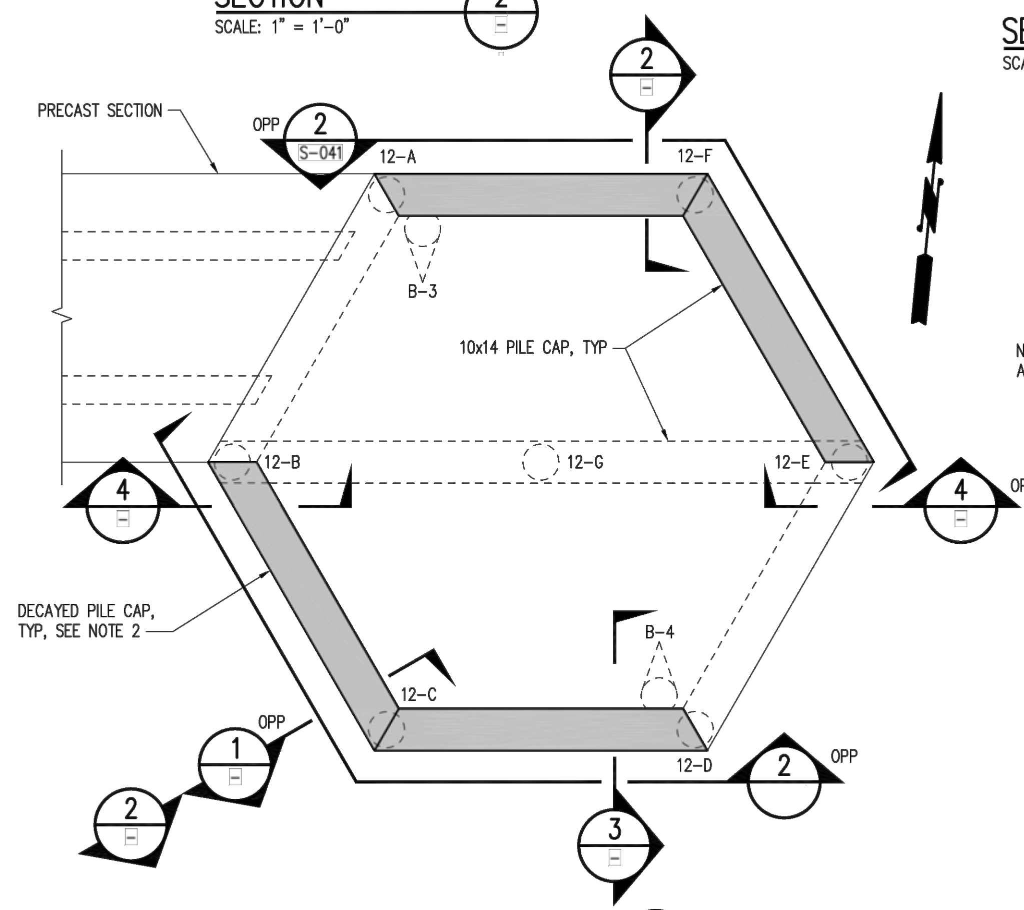
SECTION 1
SCALE: 1" = 1'-0"



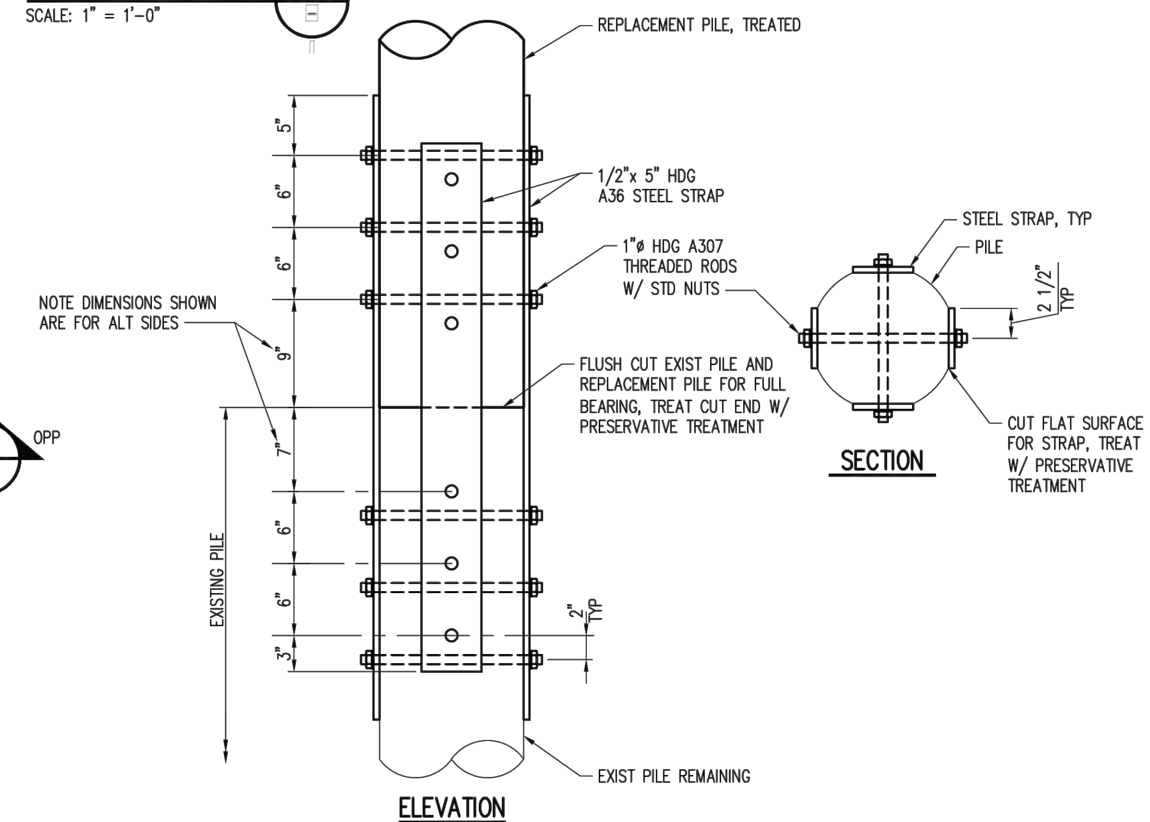
SECTION 2
SCALE: 1" = 1'-0"



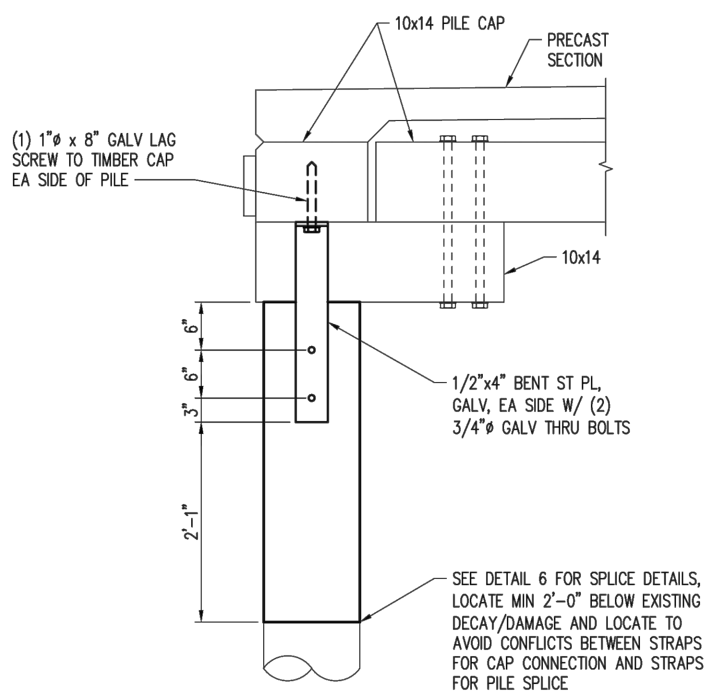
SECTION 3
SCALE: 1" = 1'-0"



DETAIL 5
SCALE: 3/8" = 1'-0"



DETAIL 6
SCALE: 1 1/2" = 1'-0"



SECTION 4
SCALE: 1" = 1'-0"
S-041

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Oct 19, 2022 1:51pm chewett

SOURCE: NORTH DOCK PILE REPAIR DETAILS PROVIDED BY KPFF.

NORTH DOCK PILE REPAIR DETAILS

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

PROPOSED: REPAIR AND REPLACE DOCK STRUCTURES

PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

HORIZONTAL DATUM: WASHINGTON STATE PLANE, NORTH ZONE, NAD83
VERTICAL DATUM: NAVD88

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COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

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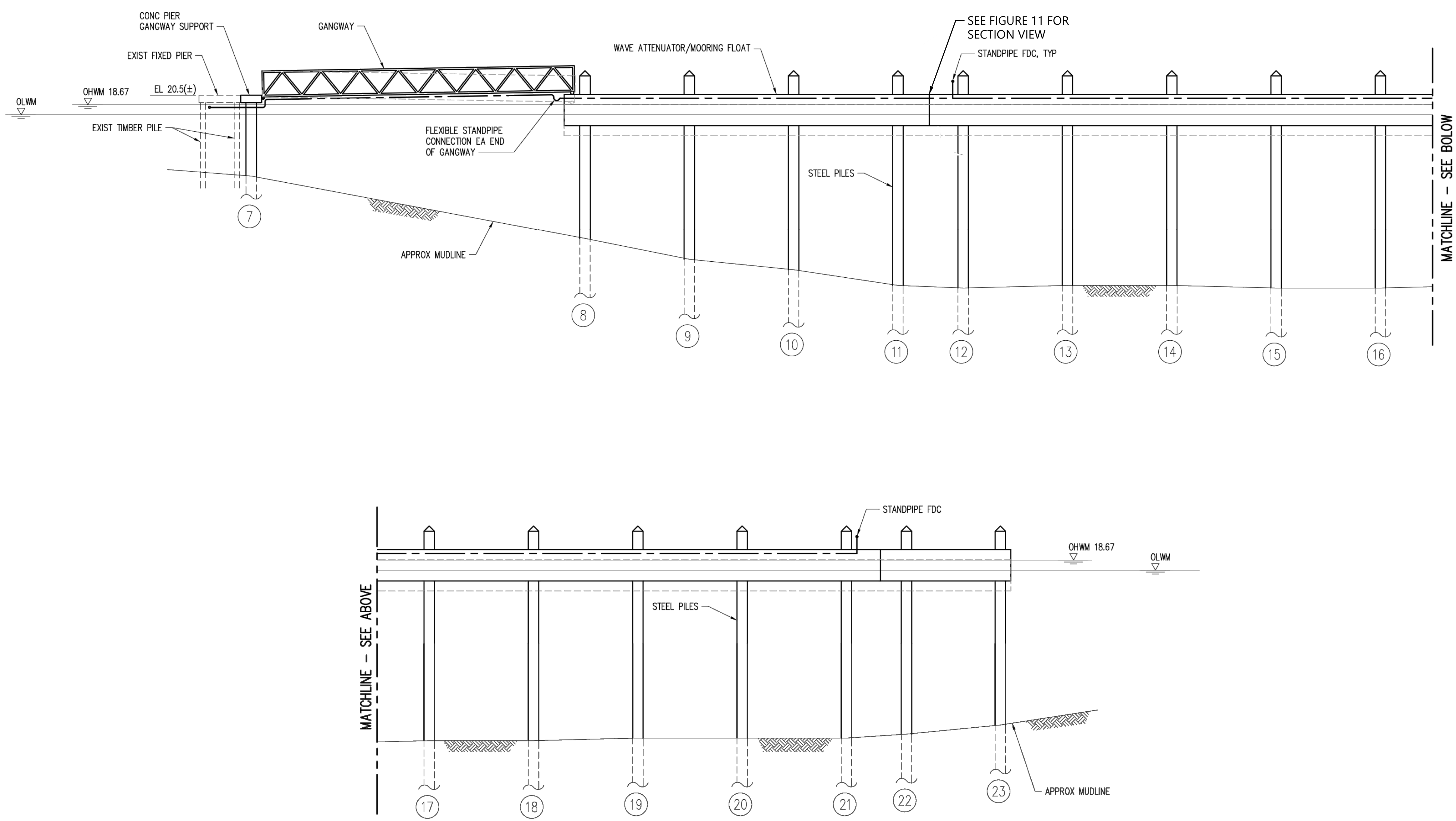
Seattle, WA 98101
206-287-9130

FIGURE: 9 of 14



CENTRAL DOCK RECONFIGURATION - ELEVATION VIEW

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

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LATITUDE: 47.591034 N
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IN: LAKE WASHINGTON
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COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

ANCHOR QEA
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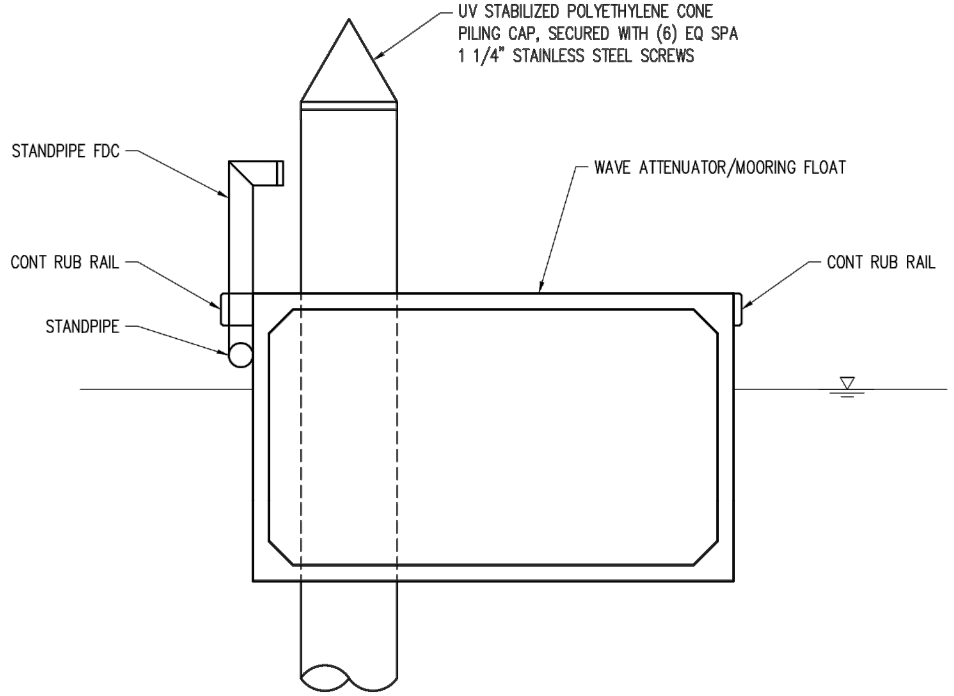
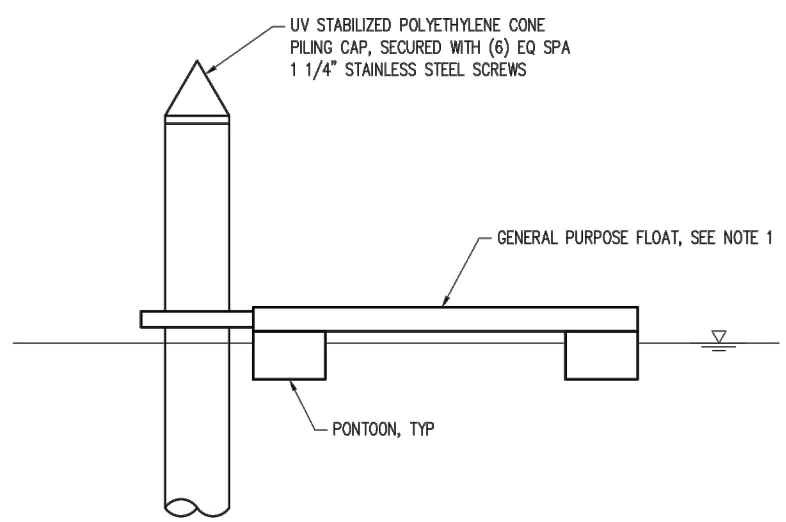
Seattle, WA 98101
206-287-9130

FIGURE: 10 of 14

SOURCE: CENTRAL DOCK RECONFIGURATION - ELEVATION VIEW PROVIDED BY KPFF.



SECTION 1
SCALE: 1/2" = 1'-0"



SECTION 1
SCALE: 1/2" = 1'-0"

NOTE: 40% MINIMUM LIGHT TRANSMISSION IS REQUIRED

PILE SCHEDULE*

Pile ID	Nominal Dia (in)	Wall t (in)	Cutoff Elev (ft)	Approx Mudline Elev (ft)	Embed (ft)	Tip Elev (ft)
1	16	0.625	20.00	9.00	20.00	-11.00
2	16	0.625	22.00	2.75	20.00	-17.25
3	16	0.625	22.00	-0.25	20.00	-20.25
4	16	0.625	22.00	-1.75	20.00	-21.75
5	16	0.625	22.00	-1.50	20.00	-21.50
6	16	0.625	22.00	-1.00	20.00	-21.00
7	16	0.625	20.00	5.50	20.00	-14.50
8	24	0.625	25.00	-7.50	28.00	-35.50
9	24	0.625	25.00	-10.75	28.00	-38.75
10	24	0.625	25.00	-13.00	28.00	-41.00
11	24	0.625	25.00	-16.00	28.00	-44.00
12	24	0.625	25.00	-16.50	28.00	-44.50
13	24	0.625	25.00	-16.25	28.00	-44.25
14	24	0.625	25.00	-16.25	28.00	-44.25
15	24	0.625	25.00	-16.25	28.00	-44.25
16	24	0.625	25.00	-16.25	28.00	-44.25
17	24	0.625	25.00	-16.00	28.00	-44.00
18	24	0.625	25.00	-15.75	28.00	-43.75
19	24	0.625	25.00	-15.50	28.00	-43.50
20	24	0.625	25.00	-15.50	28.00	-43.50
21	24	0.625	25.00	-15.50	28.00	-43.50
22	24	0.625	25.00	-14.75	28.00	-42.75
23	24	0.625	25.00	-12.75	28.00	-40.75

*PILE SCHEDULE INCLUDES ALL PILES FOR THE PROJECT EXCEPT SIX 6-INCH-DIAMETER PIN PILES FOR NEW OVERWATER STAIR. SCHEDULE DOES NOT INCLUDE EXISTING PILES TO BE REPAIRED.

CENTRAL DOCK RECONFIGURATION - SECTION VIEW AND PILE SCHEDULE

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

PROPOSED: REPAIR AND REPLACE DOCK STRUCTURES

PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

HORIZONTAL DATUM: WASHINGTON STATE PLANE, NORTH ZONE, NAD83
VERTICAL DATUM: NAVD88

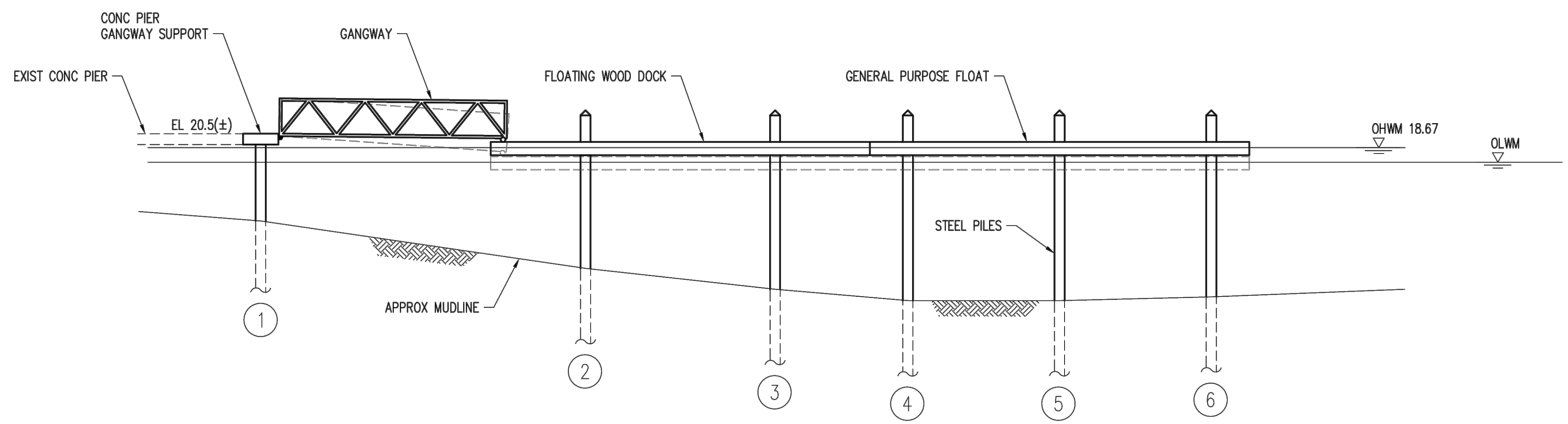
LATITUDE: 47.591034 N
LONGITUDE: -122.224481 W
S-T-R: 6-25N-5E

IN: LAKE WASHINGTON
NEAR/AT: MERCER ISLAND
COUNTY: KING
STATE: WASHINGTON

DATE: OCTOBER 2022

ANCHOR QEA
1201 3rd Ave, Suite 2600
Seattle, WA 98101
206-287-9130

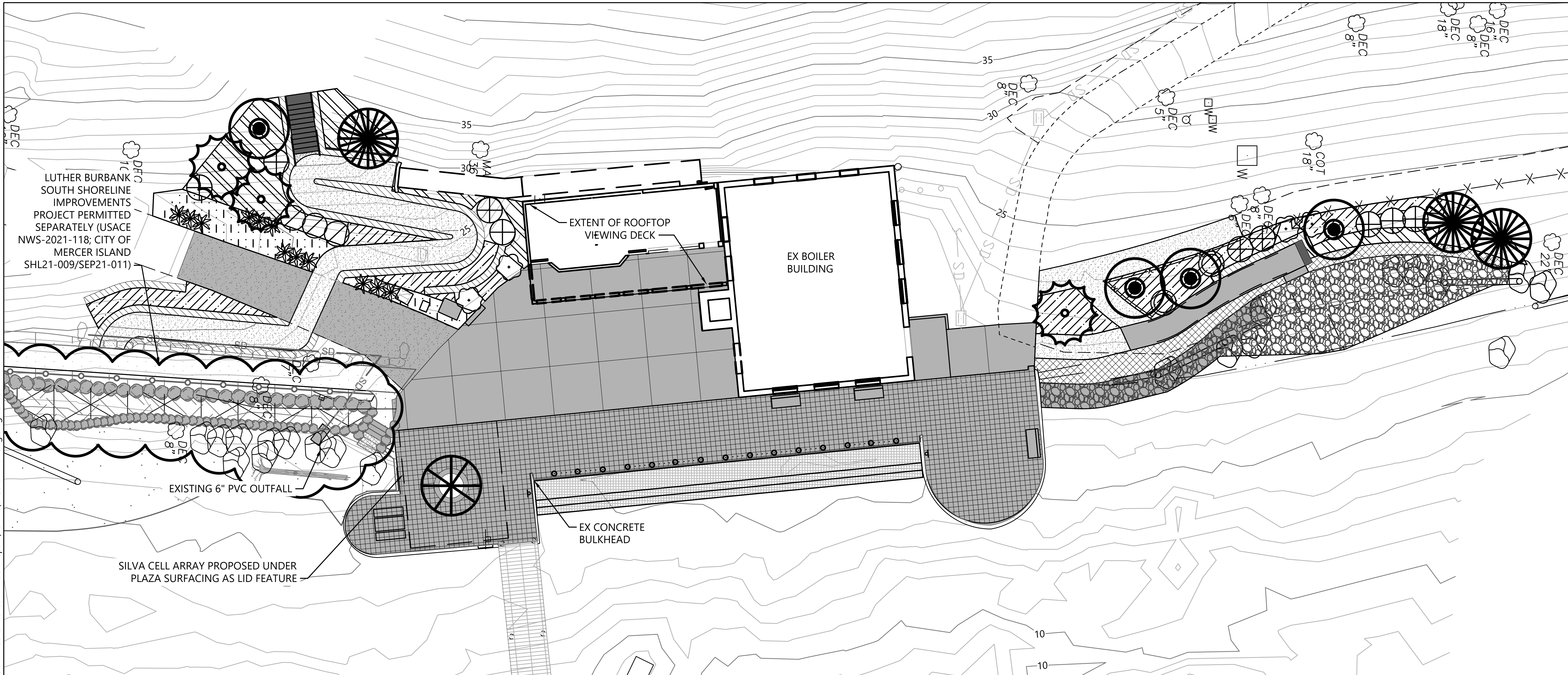
SOURCE: CENTRAL DOCK RECONFIGURATION - SECTION VIEW AND PILE SCHEDULE PROVIDED BY KPFF.



SOUTH DOCK RECONFIGURATION - ELEVATION VIEW

REFERENCE #: **APPLICANT:** CITY OF MERCER ISLAND **LOCATION:** 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040 **ADJACENT PROPERTY OWNERS:** 1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002	**NAME:** LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT **PROPOSED:** REPAIR AND REPLACE DOCK STRUCTURES **PURPOSE:** IMPROVE PUBLIC ACCESS AND RECREATIONAL USES **HORIZONTAL DATUM:** WASHINGTON STATE PLANE, NORTH ZONE, NAD83 **VERTICAL DATUM:** NAVD88	**LATITUDE:** 47.591034 N **LONGITUDE:** -122.224481 W **S-T-R:** 6-25N-5E **IN:** LAKE WASHINGTON **NEAR/AT:** MERCER ISLAND **COUNTY:** KING **STATE:** WASHINGTON **DATE:** OCTOBER 2022	ANCHOR QEA 1201 3rd Ave, Suite 2600 Seattle, WA 98101 206-287-9130 **FIGURE:** 12 of 14

SOURCE: SOUTH DOCK RECONFIGURATION - ELEVATION VIEW PROVIDED BY KPFF.



LEGEND:

- EXISTING CONTOUR
- EXISTING TREE TO RETAIN
- EXISTING ORDINARY HIGH WATER LINE
- EXISTING BOULDER TO RETAIN
- PROPOSED CONTOUR
- PERVIOUS PAVERS
- CONCRETE SLAB ON GRADE WITH SAWCUT JOINT SCORING
- CRUSHED GRAVEL PATHWAY
- GRAVEL DRIVEWAY PAVING
- EXISTING BOLLARD AND CHAIN TO REMAIN
- HABITAT GRAVEL
- GRAVEL OVER COBBLE
- ROCK TERRACE
- ROCK REVETMENT
- FRP GRATING
- HANDRAIL
- SPLIT RAIL FENCING
- PICNIC TABLE
- BENCH
- SALVAGED LOG
- SALVAGED BOULDER

LEGEND (PROPOSED PLANTING):

- PROPOSED TREE
- PROPOSED SHRUBS/GROUNDCOVERS
- RIPARIAN SHRUBS
- NATIVE UPLAND PLANTING/GROUNDCOVER
- STORMWATER CONVEYANCE PLANTING

0 20 Feet

SOURCE: SURVEY AND PIER PLAN CAD FILE PROVIDED BY KPFF.

K:\Projects\0159-KPFF Consulting Engineers\Mercer Island Luther Burbank Dock Repair\Permit\0159-JP-Planting.dwg 13

Oct 19, 2022 1:51pm chewett

PLANTING PLAN

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE, MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

PROPOSED: REPAIR AND REPLACE DOCK STRUCTURES

PURPOSE: IMPROVE PUBLIC ACCESS AND RECREATIONAL USES

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FIGURE: 13 of 14

PLANT SCHEDULE

COMMON NAME	SCIENTIFIC NAME	SIZE	SPACING
TREES			
GRAND FIR	ABIES GRANDIS	5-6' HT	AS SHOWN
WESTERN RED CEDAR	THUJA PLICATA	5-6' HT	AS SHOWN
BIG LEAF MAPLE	ACER MACROPHYLLUM	1.5" CAL	AS SHOWN
SWAMP OAK	QUERCUS PALUSTRIS	2" CAL	AS SHOWN
VINE MAPLE	ACER CIRCINATUM	5 GAL	AS SHOWN
HIGH SHRUBS			
INDIAN PLUM	OEMLERIA CERASIFORMIS	2 GAL	AS SHOWN
MOCK ORANGE	PHILADELPHUS LEWISII	2 GAL	AS SHOWN
SHRUBS - RIPARIAN			
SWORD FERN	POLYSTICHUM MUNITUM	1 GAL	3' O.C.
RED FLOWERING CURRANT	RIBES SANGUINEUM	1 GAL	3' O.C.
NOOTKA ROSE	ROSA NUTKANA	1 GAL	3' O.C.
THIMBLEBERRY	RUBUS PARVIFLORUS	1 GAL	3' O.C.
SNOWBERRY	SYMPHORICARPOS ALBUS	1 GAL	3' O.C.
GROUNDCOVERS			
SWORD FERN	POLYSTICHUM MUNITUM	1 GAL	3' O.C.
OREGON GRAPE	MAHONIA NERVOSA	1 GAL	3' O.C.
SHRUBS/GROUNDCOVERS - STORMWATER CONVEYANCE AREA			
RED OSIER DOGWOOD	CORNUS SERICEA	1 GAL	AS SHOWN
LADY FERN	ATHYRIUM FILIX-FEMINA	1 GAL	AS SHOWN
SEED MIX - STORMWATER CONVEYANCE AREA			

PLANT SCHEDULE

REFERENCE #:

APPLICANT: CITY OF MERCER ISLAND

LOCATION: 2040 84TH AVENUE SE,
MERCER ISLAND, WA 98040

ADJACENT PROPERTY OWNERS:
1 - CITY OF MERCER ISLAND, PARCELS 0724059054, 0124049018, 0124049002

NAME: LUTHER BURBANK WATERFRONT IMPROVEMENTS PROJECT

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