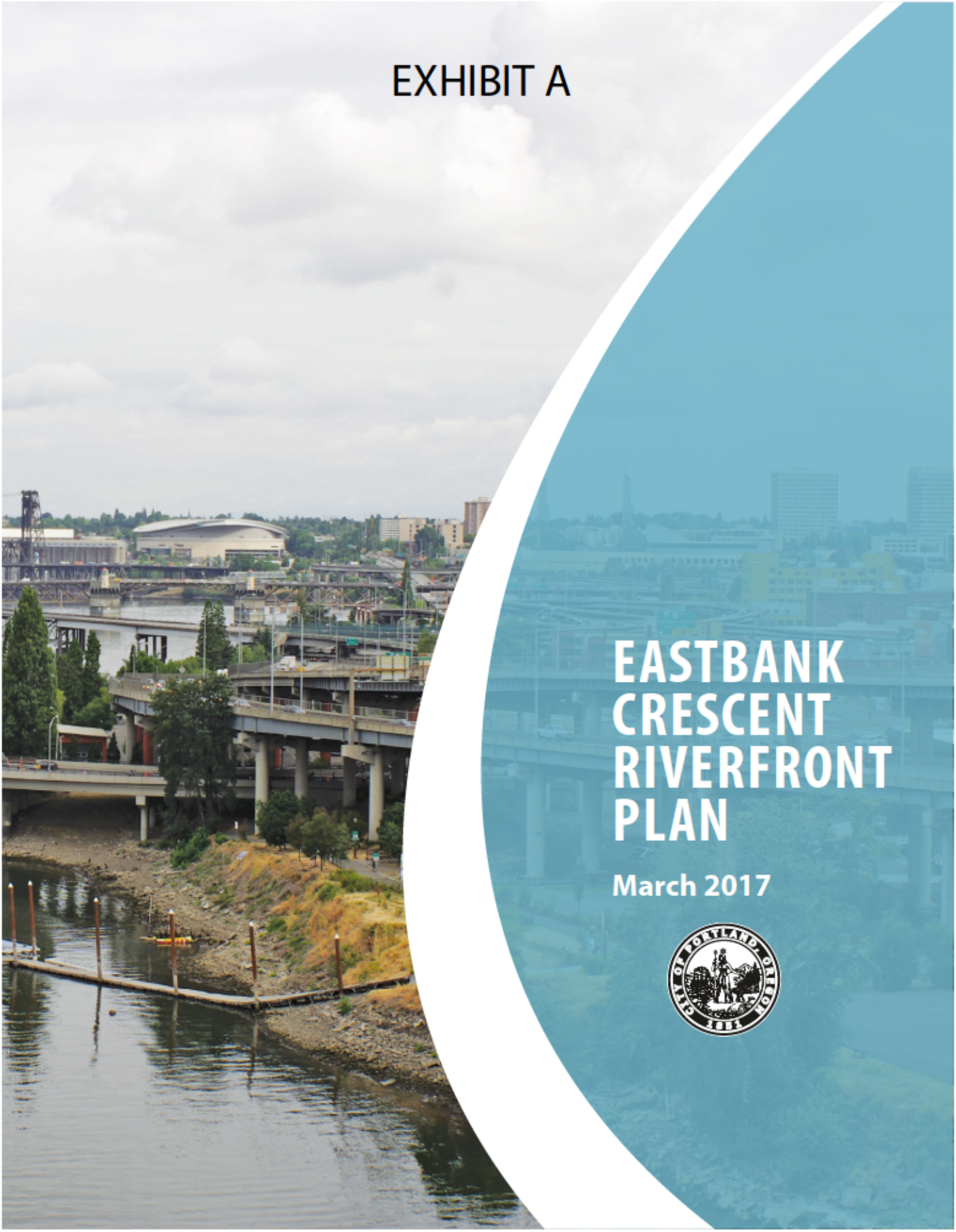
EXHIBIT A



EASTBANK CRESCENT RIVERFRONT PLAN

March 2017

Bureau of Planning and Sustainability | Bureau of Environmental Services | Portland Parks and Recreation | Portland Development Commission

ACKNOWLEDGMENTS

CITY OF PORTLAND

Project Team

Sallie Edmunds, Planning Manager, BPS
Debbie Bischoff, Senior Planner, BPS
Mindy Brooks, Environmental Planner, BPS
Irene Bowers, Senior Project Manager, PDC
Lora Lillard, City Planner, BPS
Lori Grant, Associate Planner, BPS
Irene Bowers, Project Manager, PDC
Brett Horner, Supervising Parks Planner, PP&R
Lisa Huntington, Senior Engineering Associate, BES
Maya Agarwal, City Parks Planner, PP&R
Kaitlin Lovell, Watershed Division Manager, BES
Dawn Sanders, Portland Harbor Superfund Technical Manager, BES

Technical Advisory Committee

Stacey Castleberry, Senior Environmental Planner, BDS
Ethan Brown, Environmental Planner, BDS
Melissa Brown, Environmental Specialist, BES
Paul Ketcham, Environmental Program Manager, BES
Grant Morehead, Transportation Planner, PBOT
Roger Geller, Transportation Planner, PBOT
Michael Frome, Lieutenant, Police
Don Russ, Deputy Fire Chief, Fire
Ray Pratt, Fire Inspector, Fire
Mike Saling, Supervising Engineer, Water
Cherri Warnke, Capital Projects Manager, Water

CONSULTANT TEAM

Mayer-Reed, Inc.

Carol Mayer-Reed
Ryan Carlson
Kerry White

Flowing Solutions

Andrew Jansky

GreenWorks,PC

Mike Faha
Jennifer D'Avanzo

Inter-fluve,Inc.

Gardner Johnston
Bill Norris
Emily Alcott

CITY OF PORTLAND BUREAU ACRONYMS

BDS = Bureau of Development Services
BES = Bureau of Environmental Services
BPS = Bureau of Planning and Sustainability
Fire = Portland Fire and Rescue
PDC = Portland Development Commission
PP&R = Portland Parks and Recreation
Police = Portland Police Bureau
Water = Portland Water Bureau

For more information visit: www.portlandoregon.gov/bps/71051

TABLE OF CONTENTS

Figures, Tables and Concepts


Firestation 1
Hawthorne Bridge
SE Madison St
SE Hawthorne Blvd
RiverEast Center
Holman Dock
SE Clay St
Interstate 5
Willamette River
Pepco Bldg
Marquam Bridge
OMSI
N
Eastbank Crescent Riverfront Site Map
Legend
public trails

SUMMARY

The Eastbank Crescent Riverfront Plan establishes a concept for redevelopment of the riverfront area between the Hawthorne and Marquam bridges on the east side of the Willamette River. It carries out the planning phase of an action in the *Central City 2035 Plan Proposed Draft*. The recommended design concept emphasizes improvements to in-water and riparian habitat and includes a menu of recreation and educational facilities that can be incorporated into public and private development projects. When Portland City Council directs City staff to proceed and funding sources are identified, detailed site planning of concept elements and phased implementation will begin.

The Central City 2035 Proposed Draft includes Implementation Action Willamette River 11: Partner with property owners and other stakeholders to fund and implement a preferred concept for the Eastbank Crescent that includes fish and wildlife habitat, boating, swimming, educational opportunities and enhanced greenway trail.

Background

River planning for the Central Reach is part of the *Central City 2035 Plan*. The Eastbank Crescent was selected as the first area to be studied in detail because of a number of independent activities related to recreation, site planning and environmental improvements that are currently underway. These provide the opportunity for different interests to coordinate an outcome that integrates habitat restoration and public access. The Bureau of Planning and Sustainability (BPS) has been working with property owners; city, state and federal agencies; nonprofit organizations and interested parties to identify opportunities to restore habitat and improve public connections to the Willamette River. After a series of workshops with stakeholders in the Central Reach, BPS staff developed a Willamette River Urban Design Concept, which identified 13 areas with potential for enhancing fish and wildlife habitat, creating active public spaces and improving public access to and into the river in the Central City (Appendix A: Planning Framework).

The Eastbank Crescent is a narrow, crescent-shaped strip of land on the eastern bank of the Willamette River between the Hawthorne and Marquam bridges, due north of the Oregon Museum of Science and Industry (OMSI). Bound on the east by Interstate 5, the site comprises approximately 3 acres on land and 2.5 acres within the water, and includes the Willamette Greenway Trail and the Holman Dock (Figure 1).

Project Goals

The intent of the Eastbank Crescent Riverfront Plan is to provide a realistic, feasible blueprint for redevelopment of the site that will:

- Provide safe public access to and into the Willamette River for swimmers and non-motorized boaters.
- Enhance in-water nearshore habitat for Federal Endangered Species Act (ESA)-listed fish.
- Restore riparian and upland habitat for pollinators, birds and wildlife.
- Incorporate river habitat education opportunities for OMSI.
- Improve the safe movement of pedestrians and cyclists on the Willamette Greenway Trail through the site.
- Integrate multiple uses while minimizing conflicts.
- Activate and enliven the area.
- Create a design that is physically and financially practical to build, maintain and operate.

Figure 1: Eastbank Crescent Aerial

Planning Process

In June 2015, BPS conducted a charrette with public agencies, property owners and design consultants to brainstorm ideas and desired components for redevelopment of the Eastbank Crescent site. Attendees also discussed the information that would be necessary in a planning process, and identified the permits that would be needed to implement site redevelopment.

In October 2015, BPS, in partnership with Portland Parks and Recreation (PP&R), Portland Bureau of Environmental Services (BES) and Portland Development Commission (PDC), commenced a coordinated planning process. A Technical Advisory Committee with staff from multiple city bureaus provided feedback at key junctures. A team of consultants with expertise in urban design, landscape architecture, engineering and river restoration conducted an in-depth evaluation of the existing physical conditions at the site, identified site constraints and opportunities, and developed feasible design concepts for the Eastbank Crescent that include habitat restoration.

Outreach to property owners, users of the site, environmental organizations, boaters, swimmers and other river-related interest groups, as well as state and federal regulatory agencies was conducted throughout the development of design concepts (Appendix D: Outreach and Engagement Summary). The planning process culminated with two facilitated stakeholder sessions in early June 2016 and a public open house in late June 2016, all hosted by the Portland Community College CLIMB Center located adjacent to the site.

Figure 2: Swimming Beach Sites map

Central City Potential Swimming Beach Sites Study

BPS and PP&R conducted a companion study to assess the viability of improving public swimming access into the Willamette River in the Central City. The Central City Potential Swimming Beach Sites Study assessed the below listed five shallow-water sites (Figure 2) that were identified in the Urban Design Concept for the Central Reach to gauge if one or more could provide a safe, accessible public beach.

- Eastbank Crescent
- McCormick Pier
- Hawthorne Bowl
- "Poetry at the Beach"
- Zidell barge way

The study focused on factors necessary for a family-friendly beach suitable for people with a range of swimming abilities. Input from a broad outreach effort found a high level of support for a public beach in the Central City. Study findings provided insight into the characteristics and amenities needed to establish a family-friendly beach, and will inform an integrated design concept for the Eastbank Crescent.

PLANNING CONTEXT

Site History and Ownership

The Eastbank Crescent site has approximately 1,100 feet of shoreline, most of which was altered to its current steep, armored condition prior to 1935. In the early to mid-1900s the site included shipping and industrial uses, with wharves and ship docking along the shoreline (Appendix B: Existing Conditions Report). Historically owned by Portland General Electric (PGE), Station L, a cluster of six industrial buildings built between 1910 and 1929 produced and transmitted electricity from the site until 1975. These uses contaminated the river and land with toxic compounds, and left pilings, riprap and concrete rubble on the riverbank and riverbed. In 1986, PGE donated their land and historic buildings to the Oregon Museum of Science and Industry (OMSI).

OMSI's museum facilities are primarily located south of the Eastbank Crescent site, but they own the southern half of the Eastbank Crescent and the historic Pepco building. A narrow strip of land running east-west owned by the Portland Water Bureau divides OMSI's property. The northern half of the site is owned primarily by the Oregon Department of Transportation (ODOT), which leases property to River East LLC and the PDC. PP&R owns the northernmost segment of shoreline. PDC also leases space within the RiverEast Center for the Portland Boathouse, and leases the riverbank and bed for the Holman Dock from the Oregon Department of State Lands (DSL). See Figure 3 below.

Figure 3: Site Ownership map

Current Uses and Issues

The Eastbank Crescent is used by the public for multiple activities and provides lower quality fish and wildlife habitat in the heart of the City. Public use of the site can lead to conflicts between users, and some uses may be incompatible with restoration and enhancement of habitat.

Fish Habitat

The Willamette River is shallow along much of the Eastbank Crescent. In the summer the beach is exposed, but in the winter and spring the beach becomes in-water habitat. Shallow water areas like this are especially critical for juvenile salmon and trout to rest and feed out of the fast currents of the main channel. Due to filling and hardening of the riverbanks and dredging in the river, there is very little shallow water left in the Central City to provide refuge for migrating fish.

The northern end of the site has the slowest river velocity and most suitable bank conditions for juvenile Chinook salmon during their peak migration in May. The shoreline gets steeper toward the southernmost end of the site, and the quality of fish habitat decreases.

Swimming Beach

The northernmost section of the shore is also the most easily accessible area for people, with an emergent 135-foot beach in the summer. The riverbank is steep throughout the site, with the most gradual slope of 15 percent at the northern end, ranging to nearly 45 percent at the southern end. People walk down the slope from under the Hawthorne Bridge to the beach and can enter the river there.

Holman Dock and Portland Boathouse

The Holman Dock is a light watercraft dock for launching non-motorized boats. It has a steep gangway from the top of the riverbank near the center of the Eastbank Crescent site, which extends to the northwest into the river. Owned and constructed by the PDC as a temporary dock, the gangway down to the dock was in poor condition and needed reconstruction. PDC replaced the gangway in October 2016. The dock remains in poor condition and needs to be replaced.

The Portland Boathouse, home base and boat-storage area for a number of rowing and paddling organizations, is currently

located within RiverEast Center adjacent to the site. The Holman Dock is used extensively by Portland Boathouse members as well as kayakers and other small watercraft users. The dock has also become popular with swimmers and sunbathers because it receives full sun into the early evening. People gathering on the dock can block launching and disembarking boats, and boats maneuvering toward the dock can be dangerous for swimmers.

Greenway Trail

The paved Greenway Trail parallels the Eastbank Crescent's riverbank, in many instances defining the top of the bank and connecting the Eastbank Esplanade to OMSI. The land area east of the trail is flat, with some grassy area and vegetation along the trail. Pavement and buildings define the inland portion of the site and extend under I-5. Entrance to and flow of pedestrian and bicycle traffic along the trail is confusing and congested. Conflicts between bicyclists and pedestrians occur regularly. Pedestrians travel from parking areas to OMSI, cyclists exit the Hawthorne Bridge and enter the trail at a sharp angle, vehicles access OMSI's loading dock, and boats are carried across the trail from the Portland Boathouse to the Holman Dock.

Existing and Proposed Zoning Requirements

Current base zoning at the Eastbank Crescent is Open Space (OS) parallel to the Willamette River, General Employment (EG1) in the northern portion of the site and General Industrial (IG1) in the southern portion. The Greenway General (g) overlay zone applies to the entire site and requires:

- Provision of a public trail easement through the site.
- A 25-foot landscaped setback from the river for new development that is not river dependent or river related.
- Mitigation for negative impacts to existing natural resources.
- Protection of two designated views that are just north of the Marquam Bridge and at the terminus of SE Clay Street, a view street, near Holman Dock.

The *Central City 2035 Plan Proposed Draft* recommends changing the zoning for the Eastbank Crescent as well as applicable zoning provisions in Title 33: Portland Zoning Code. The areas zoned EG1 and IG1 are proposed as Central Employment (EX), which allows for a variety of uses. A limited amount of retail sales and services is proposed to be allowed at this site in the OS zone, along with a bonus system allowing a developer to gain more development opportunity in exchange for dedication of additional open space contiguous to the river setback area.

The Greenway General overlay zone would remain, but would be renamed to River General overlay zone with key changes:

- The river setback would be expanded from 25 feet to 50 feet from the top of bank.
- The landscaping standards would be revised to allow a greater diversity of plantings and tree sizes.
- The Greenway Review would be replaced by River Review.

A new River Environmental overlay zone, River 'e' zone, would be applied to the river, shallow water habitat, riverbank and existing riparian habitat. The river 'e' overlay zone includes standards for some impacts, such as a public trail, and requires review for other impacts, such as a new dock.

The designated viewpoint just north of the Marquam Bridge would continue to require protection and be renumbered CCSE13. SE Clay Street would continue to be a designated view street, and the terminus near the top of the Holman Dock would be numbered CCSE12 and continue to require protection.

Existing Site Conditions and Physical Constraints to Redevelopment

Redeveloping the Eastbank Crescent to restore habitat and provide access to the river will require some excavation and regrading. A riverbank slope of 5:1 or shallower is recommended by the 2001 Willamette Riverbank Design Notebook as optimum for shoreline areas. This slope helps promote a diversity of in-water and riparian habitat types, incorporate habitat complexity and reduce wave-induced erosion.

A gentle beach slope also allows safe and manageable access into the river for people. With its history of industrial and urban use, the site has multiple built features both under and above ground that limit the extent of excavation and bank layback possible to reduce the slope at this narrow site. A detailed analysis of site conditions is provided in Appendix B: Existing Conditions.

Built Environment

Bound by the Hawthorne Bridge, an elevated segment of I-5 and the Marquam Bridge, multiple support footings for these structures surround the site. Based on ODOT's practices, a setback of 30 feet from each footing for any excavation would be required to maintain their structural integrity, the site area available to lay back the bank and reduce bank slope is

significantly reduced. There are also several existing buildings, including the historic Pepco Building, and a radio tower on the OMSI property. OMSI has indicated that they may remove some of the existing buildings closest to the top of the riverbank, but the Pepco Building and radio tower will remain. OMSI is completing a master planning process for their properties, and their plan for future uses will affect the extent of bank layback opportunity on their land.

Underground Facilities

There are a number of underground utilities that restrict or would require alterations to allow regrading of the riverbank. A Portland Water Bureau 30-inch diameter water main carrying water across the river to downtown is buried under the site and riverbed. There are also 10 active PGE transmission cables buried under the site and laid on the riverbed that provide power to downtown. Four cables in the vicinity of the Holman Dock are expected to be taken out of service after 2018. There are four conveyances with outfalls/discharges carrying stormwater from I-5 and surface streets under the site and into the river. One was damaged, causing stormwater to discharge underground into the riverbank. It was abandoned and the stormwater conveyance was rerouted to the south in late 2016.

Soil Contamination

In addition to the structures and underground utilities constraining excavation at the site, former uses in the area have resulted in contamination of river sediments. A remedial action to install a contamination isolation cap on portions of the riverbed and bank at the northern end of the site is planned for Summer 2017. This will alter the riverbed and bank, and will preclude future excavation of the remediated area. While there have not been studies to determine if there are also contaminants in and above the riverbank, it is assumed excavation will expose contaminated soils that will need to be disposed of properly.

Viability of Formalizing a Public Beach at the Eastbank Crescent

As noted above, some sunbathers and swimmers who use the Holman Dock in summer months create difficulties for boat launchers. This also increases the risk of collisions for boats with limited maneuverability such as long racing shells and dragon boats. People are also able to access the river from the north, the least steep section of bank slope at the site, and can wade on the beach that emerges in summer. Organized river swims sometimes depart from the dock or beach, and swimmers have been actively promoting the creation of a safe, more easily accessible beach at the Eastbank Crescent.

The *Central City Potential Swimming Beach Sites Study* identified the factors essential to creation of a safe, family-friendly river swimming beach, assessed the existing conditions at five shallow-water riverfront sites in the Central City, including the Eastbank Crescent. Five sites were ranked according to how well each provided for those factors. Of the five sites, the Eastbank Crescent ranked fourth, as there are a number of impediments to creation of a family-friendly beach. However, it is acknowledged that the Eastbank Crescent and other lower ranked beach sites may be well suited for expert swimmers.

The beach that emerges at low summer flows is comprised of naturally accumulating gravels and sands, but rocks and broken concrete reside just below the water surface and contaminated sediments are within the riverbed. The remediation action to seal the contaminated sediments will change the beach slope and surface and may not provide a foot-friendly surface for wading. The small beach and small adjacent upland area provide limited space for swimmers and sunbathers to gather, and for construction of the amenities typically desired at public beaches such as restrooms and showers.

Access to the river's edge is currently from the Eastbank Esplanade underneath the Hawthorne Bridge, down a steep dirt slope with large boulders and erosion channels. The boulders could be removed, but the steep terrain, location of the bridge footings and limited space render construction of a universally accessible path to the river edge extremely difficult, if not impossible.

The Eastbank Crescent also ranked low in the *Central City Potential Swimming Beach Sites Study* due to the presence of the four stormwater outfalls/discharges, three of which are upstream of the beach area, (one had been routed out of the study area). The remaining outfalls all drain portions of the I-5 Freeway. Rainfall from the freeway collects heavy metals, petroleum products and other contaminants. If left untreated, it is discharged through stormwater conveyance systems directly into the river. While stormwater discharges are less frequent in summer months, contaminants can remain suspended in the water column in low-flow areas and accumulate in sediments.

Other impediments to creating a desirable beach area at the Eastbank Crescent include the high ambient noise levels due to the overhead I-5 traffic and heavy shading of northern portion of the beach and upland area by the Hawthorne Bridge.

Ongoing Activities Influencing Site Redevelopment

There are five activities currently underway or planned for the near future that will affect the final redesign and timing of redevelopment of the Eastbank Crescent to improve fish and wildlife habitat and public use of the site.

1. OMSI Master Plan

OMSI owns approximately half of the Eastbank Crescent site and is completing a master planning process to determine how their entire property will be used in the future. Any site development to implement the master plan will be subject to the zoning regulations in place at the time of permit application.

2. Compliance with NOAA Fisheries Biological Opinion

In April 2016 the National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) issued a biological opinion on the effects on endangered or threatened species of the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP). Directives in the biological opinion may require revisions to floodplain development regulations to reduce the impacts of floodplain development on the 13 protected species found in Portland such as increasing mitigation measures when development is allowed. FEMA is expected to issue guidance to communities for implementation of the biological opinion in 2017.

To provide for the necessary mitigation to offset future development in the floodplain, the creation of a "mitigation bank" is identified in the biological opinion. The Environmental Protection Agency defines a mitigation bank as "a wetland, stream or other aquatic resource area that has been restored, established, enhanced, or (in certain circumstances) preserved for the purpose of providing compensation for unavoidable impacts to aquatic resources."

Restoring significant habitat at the Eastbank Crescent, including revegetation of the riverbank, excavation and redesign of the Greenway Trail, could potentially serve as a mitigation bank to compensate for new development elsewhere in the floodplain. If so, funding for the restoration work could be generated through compensatory fees assessed for new floodplain developments.

3. PGE Remediation of Contaminated Sediments

In 2011 PGE determined that sediments in the riverbank and riverbed in the northern portion of the site contain excessive levels of contaminants, including PCBs and dioxins. A remedial action to isolate and prevent movement of contaminants downstream is planned, and the isolation cap, comprised of clean sand and gravel, will cover approximately 1.3 acres of riverbank and bed. The permit requires placement of habitat rock on top of the cap, but there is no requirement to maintain this substrate if currents or boat wakes wash these smaller stones to the south. The remediation work, which will result in raising the riverbed and lower bank by 2 feet is planned for Summer 2017.

4. Future of the Portland Boathouse

The Portland Boathouse is located in the RiverEast Center, just northeast of the site. Members regularly cross the Greenway Trail to carry boats to and from the Holman Dock. The lease for use of the RiverEast Center expires in 2019 and the Portland Boathouse will likely need to relocate. The Portland Boathouse members are investigating relocation nearby among other options. Its future location could affect the status of the Holman Dock.

5. Future of the Holman Dock

The Holman Dock is located on land leased by the Portland Development Commission (PDC) from the Department of State Lands (DSL), and was constructed by PDC as a temporary structure. It is used extensively by rowers and paddlers associated with the Portland Boathouse, light watercraft users who park nearby to launch, and swimmers and sunbathers in sunny summer months. The gangway down to the dock was in poor condition and was replaced in October 2016. During the PGE remediation work in 2017, the dock will be removed and replaced afterwards. Transmission cables and other utilities buried in the riverbed and bank near the dock present challenges to shifting the location of dock at the site in the future. The lease with DSL expires in 2019, but it is anticipated to be extended into the future.

ALTERNATIVE DESIGN CONCEPTS AND COMPONENTS

Two design concepts are presented that take into consideration the goals for redevelopment of the Eastbank Crescent, the many physical constraints of the site and the opportunities raised by ongoing activities at and adjacent to the site. The concepts presented in this section show how a range of components can be incorporated into a redevelopment plan. Input and feedback from Eastbank Crescent property owners, city, state and federal agency staff, stakeholders and the public will help gauge how well the two concepts and their individual components meet the goals of the project, and indicate public priorities for a final design.

Concept 1

See concept illustrations at the end of this section.

Description

The riverbank is regraded and laid back to the extent feasible, from the most gradual 4:1 slope in the northern portion of the site to the current 1:1 slope at the steepest, most pinched portion at the southern end. The bank regrading would allow for a combination of in-water habitat treatments to provide refuge, resting and rearing areas for migrating fish, and establishment of native riparian vegetation for shading, nutrient exchange and high-flow refuge as well as terrestrial wildlife and bird habitat.

The Greenway Trail is relocated eastward of its current location and where possible is realigned to meander along the riverfront. Three view overlooks are cantilevered over the riparian area, and stormwater treatment basins collect rainwater flowing from paved areas of the site, providing educational opportunities about stormwater issues and the benefits of green infrastructure.

The dock is redesigned to take advantage of the reduced riverbank slope, providing a gently sloped gangway from the northernmost overlook to a landing above the river's edge. From the landing, the dock extends northward with the current, and offers a break in river velocity at the beach.

The beach is not expanded or modified, but shallow water habitat is provided at the toe of the slope. Public access from the north to the river's edge is minimally improved by removing boulders and stabilizing soil.

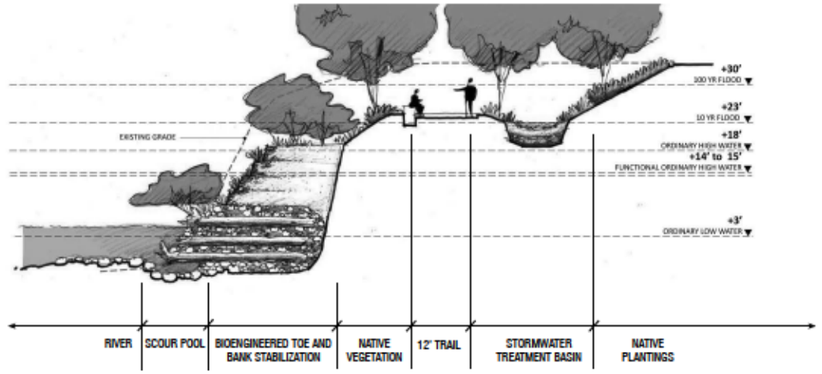
Goals Achieved

1. Provide safe public access to and into the Willamette River, for swimmers and non-motorized boaters.
   - While improvements to the approach to the beach area, such as removing boulders, correcting erosion channels and adding more stable surface materials, could be accommodated in this design concept, access to the river would continue to be via a steep slope beginning under the Hawthorne Bridge. This would limit access to the able-bodied only. Boaters have also made clear that the sharp angle between the gangway and dock would be impossible to navigate while carrying a boat, especially the long shells used by the numerous rowing crews based at the Portland Boathouse.
2. Enhance in-water nearshore habitat for ESA-listed fish.
   - Concept 1 achieves this goal to the greatest extent possible at this site.
3. Restore riparian and upland habitat for birds and wildlife
   - Concept 1 achieves this goal to the greatest extent possible at this site.

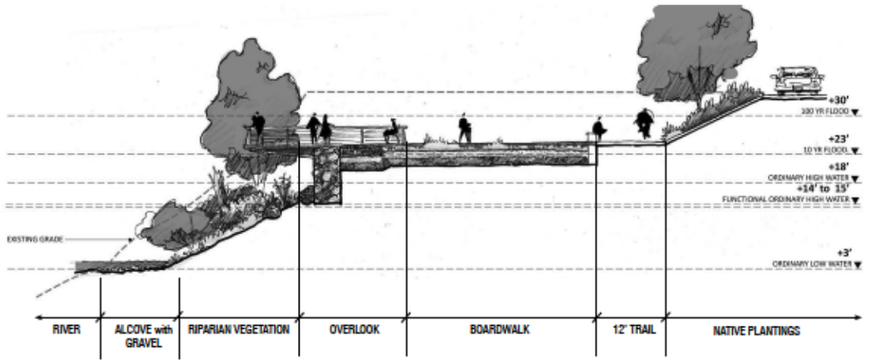
4. Incorporate river habitat education opportunities for OMSI.
   - The three view overlooks and stormwater features provide opportunities for educational signage about the Willamette River, ESA-listed fish, and the mechanics and value of habitat restoration treatments and green infrastructure. The design does not include areas for outdoor classrooms or access by groups to the river's edge for learning opportunities.
5. Improve the safe movement of pedestrians and cyclists on the Willamette Greenway Trail through the site.
   - The realigned trail with a meandering design would serve to slow bicycle traffic through the site. The trail coupled with significant revegetation, however, may reduce sightlines and could result in conflicts between pedestrians and cyclists.
6. Integrate multiple uses while minimizing conflicts.
   - Concept 1 continues the status quo for swimmers, sunbathers and boaters. Direct beach access remains unchanged, and swimmers and sunbathers will continue to use the dock in summer months to gather and enter the river. This creates difficulties for boaters attempting to launch and disembark, and potentially dangerous conditions for swimmers, who can be hard to see from low-riding watercraft.
   - The extensive in-water and riparian habitat restoration would need to be designed to minimize swimmers access near restoration improvements. Habitat structures can also be damaged by boats tying up to them or people climbing on them, and there have been cases at other Willamette River restoration sites where woody structures have been dismantled for fire wood. Measures would also need to be taken to discourage people from leaving the trail and trampling new plantings in the riparian areas.
   - By altering the site from a flat, open inland area with a steep drop-off to the river to a long, more gradual, vegetated slope from the east to the river, the site would be less likely to accommodate camping.
7. Activate and enliven the area.
   - Restoration of riparian habitat and slower traffic on the Greenway Trail would create a passive, natural experience rather than an active public space. Some current users of the flat, open upland area would be displaced.
8. Create a design that is physically and financially practical to build, maintain and operate.
   - Concept 1 was designed based on the most extensive analysis of site conditions to date to address physical feasibility, and an assessment of permitting requirements is summarized in section 4. The extent of regrading and location of the Greenway Trail are subject to the outcomes of ongoing planning activities, especially compliance with the NOAA Fisheries biological opinion and the goals of the OMSI Master Plan. While some stakeholders expressed concern about maintenance of the habitat structures over time and their vulnerability to high water events, agencies reviewing Concept 1 noted that, from a regulatory perspective, the ecological enhancements would be easier to permit.
   - The inherent uncertainties at the site prevent meaningful cost estimates to implement Concept 1 as a whole or by component. Costs associated with regrading will be affected by the extent, if any, of contaminated soils at the site. The development of a floodplain cut mitigation bank could provide a mechanism for funding this project. Some stakeholders pointed out that maintenance costs would likely be lower over time than a redevelopment with significantly more public activity and amenities.

Concept 1: Site view

Concept 1: Sections



A STEEP SLOPE SECTION - 1:1



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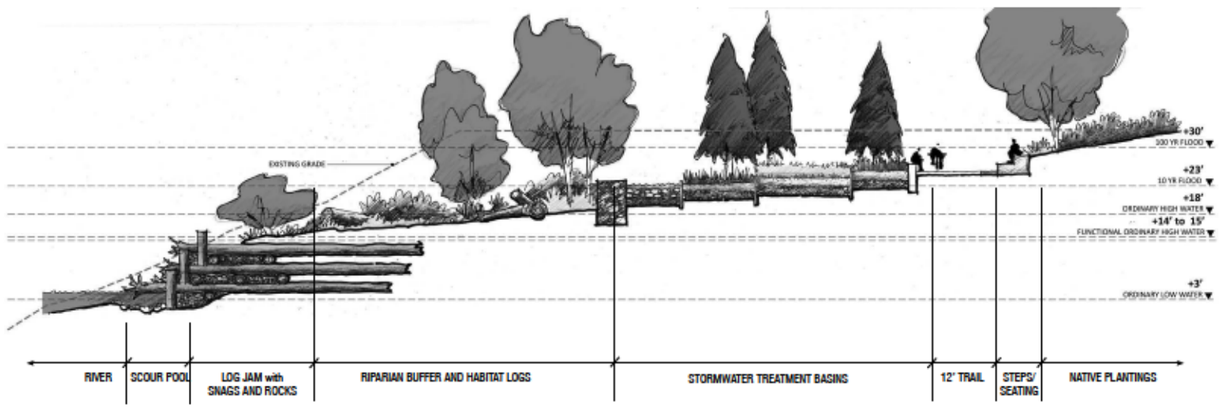


C MODERATE SLOPE SECTION - 3:1

Concept 1: Precedent images

Habitat complexity

Yakama Nations Fisheries – Nasan Creek Upper White Pine Project, Nasan Creek, Washington

Photo credit: Inter-fluve Inc., July 2015

Alcove creation

Clark Public Utilities – Salmon Creek Greenway Project, Salmon Creek, Washington

Photo credit: Inter-fluve Inc., December 2011

Bank revegetation

Concept 2

See concept illustrations at the end of this section.

Description

The riverbank has limited layback with minimal changes to the steep slope, but habitat alcoves, undulating shoreline and in-water habitat structures are introduced to create refuge, resting and rearing areas for migrating fish.

The Greenway Trail is more clearly defined, and a number of measures address traffic flow conflicts. The ramp carrying pedestrians and bicyclists from the eastbound Hawthorne Bridge to an abrupt 90-degree angle entrance to the trail is rerouted to carry traffic to Clay Street. From there, slowed bicyclists have the option of riding east and continuing south on Water Street instead of using the trail. If they head west to the trail, a widened plaza area at the intersection provides more space for cross-traffic. The design also provides a separated grade for boaters crossing the trail to access the dock. At the southern end of the site where the trail is pinched between OMSI and the Marquam Bridge footings, the trail is extended onto a bridge to improve flow.

The dock is redesigned with a gangway elevated over the riverbank leading to a floating dock, providing more gently sloped access to the water. The entrance to the gangway is through an underpass underneath the Greenway Trail to eliminate conflicts between trail users and boaters carrying boats across the trail to the dock. The entrance also reduces direct access to the dock from the trail, potentially discouraging non-boaters from using the dock. A hard-surface boat staging area, allowing boaters to drop off their boat and then park their car, has direct access to the underpass to the dock.

Beach access is improved, and seasonal floating structures are installed to provide swimmers and sunbathers their own place to gather. Under the Hawthorne Bridge, the slope is terraced and a ramp to the toe of the slope provides access to the beach. Although space limits preclude a universally accessible ramp to the river's edge, the design offers easier access down the slope and to the beach. A seasonal, floating dock; seasonal, anchored swimming platforms; and a roped swimming boundary provide a clear separation for swimmers and boaters and access to afternoon and evening sun. The structures would be removed outside of swimming season to limit impacts to migrating fish.

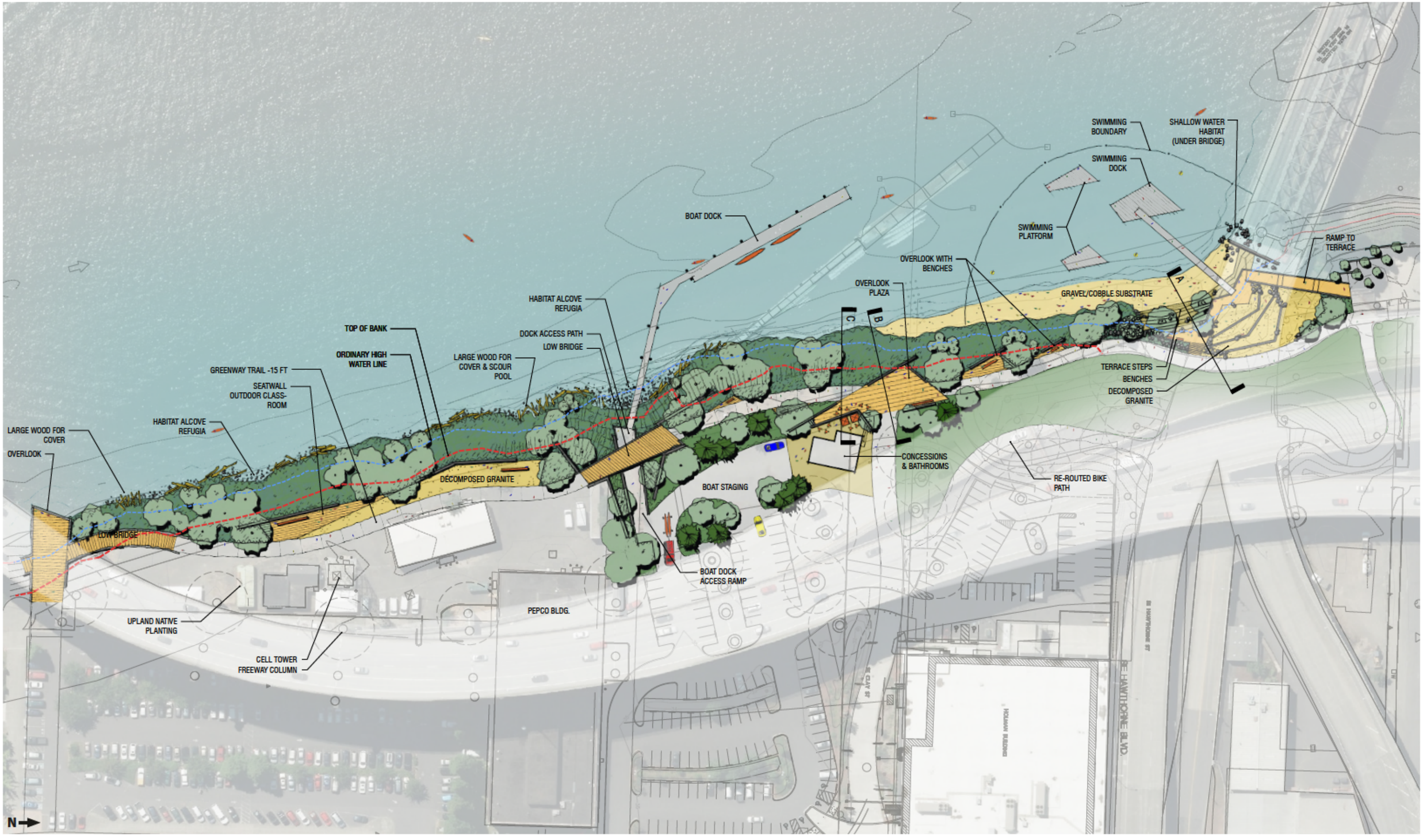
Public space and view overlook opportunities occur in several locations, in addition to the plaza at the intersection of Clay Street with the Greenway Trail. Concept 2 maintains more flat, open land, providing space for gathering and activities, and for amenities such as restrooms, showers and concessions.

Goals Achieved

1. Provide safe public access to and into the Willamette River, for swimmers and non-motorized boaters.
    - The grade-separated ramp to the dock allows people carrying boats to avoid crossing pedestrian and bike traffic. The current ramp to the dock is very steep; the elevated gangway creates the opportunity for a more gently sloping ramp to the dock. The grade-separated ramp also serves to separate dock users as there is no direct access to the Holman Dock from the Greenway Trail; instead, swimmers and sunbathers have direct, improved access from the trail to the beach, seasonal dock and seasonal anchored floating platforms. The clearly delineated swimming area provides safe public access into the Willamette River for swimmers and prevents conflicts with boaters both on the dock and in the water.
2. Enhance in-water nearshore habitat for ESA-listed fish.
    - Concept 2 provides for in-water habitat restoration, creating an undulating shoreline with small alcoves and anchored habitat structures. Without bank layback, however, the banks remain steep and in high-water conditions when habitat restoration areas are completely submerged, do not offer refuge areas for migrating fish.
3. Restore riparian and upland habitat for birds and wildlife.
    - Concept 2 provides for some riparian and upland habitat improvements, but without bank layback, the steep banks are not conducive to revegetation..

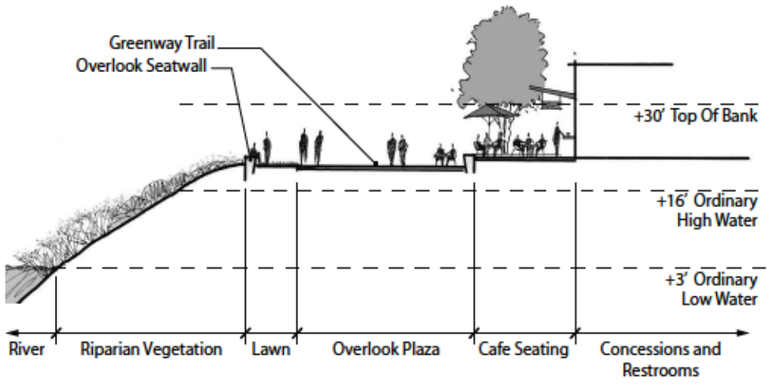
4. Incorporate river habitat education opportunities for OMSI.
    - View overlooks and a public plaza provide opportunities for education signage about the Willamette River and the natural processes and value of habitat restoration. Open public spaces and improved access to the beach provide areas for small group educational opportunities.
5. Improve the safe movement of pedestrians and cyclists on the Willamette Greenway Trail through the site.
    - The more clearly defined Greenway Trail should improve traffic flow, and the realigned off-ramp from the Hawthorne Bridge to Clay Street will reduce conflicts between pedestrians on the trail and cyclists entering the trail. It could also reduce southbound bicycle traffic on the trail by routing cyclists to SE Water Avenue. The grade-separated entrance to the dock will also improve safety on the trail.
6. Integrate multiple uses while minimizing conflicts.
    - Concept 2 maximizes the integration of multiple uses while separating different users. However, increased amenities at the site could draw a higher density of users, which could lead to conflicts.
7. Activate and enliven the area.
    - Concept 2 provides a variety of spaces and facilities to gather, rest and recreate. The upland area could accommodate beach and river-related services, potentially including concessions to serve trail users, boat rentals and lockers, in addition to restrooms and showers.
8. Create a design that is physically and financially practical to build, maintain and operate.
    - As with Concept 1, Concept 2 was designed based on the most extensive analysis of site conditions to date to address physical feasibility. Hard structures included in Concept 2 may be more challenging to permit under local, state and federal requirements.
    - With significantly less regrading than Concept 1, Concept 2 would likely have lower site preparation costs. The greater number of built structures offered by Concept 2 would likely exceed the costs for Concept 1. Again, the inherent uncertainties at the site prevent meaningful cost estimates to implement Concept 2 as a whole or by component.

Concept 2: Site view

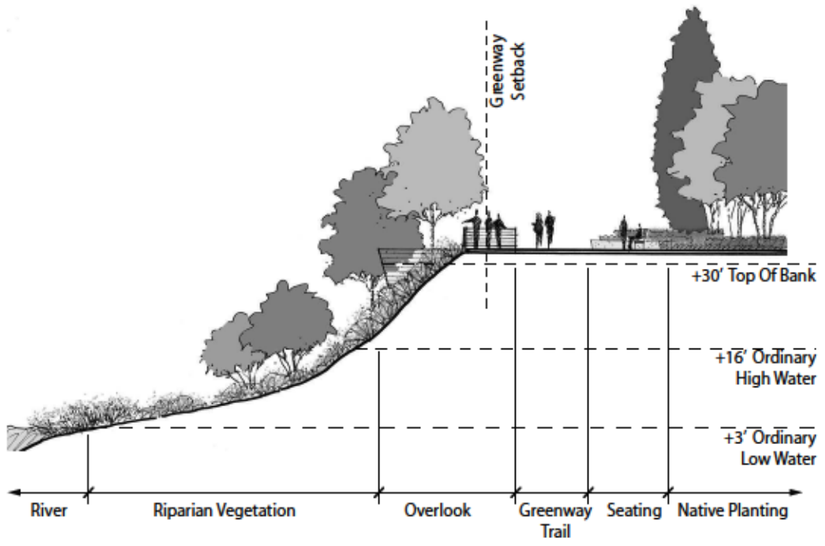


Concept 2: Site Sections

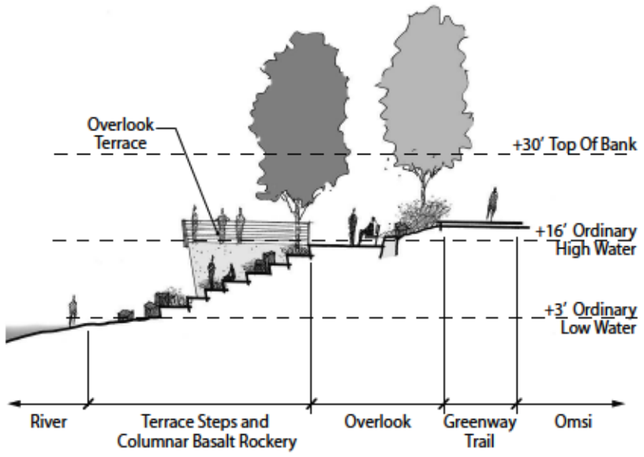
Section A



Section B



Section C



Concept 2: Precedent images

Urban beach

Overlooks

Resting areas

IMPLEMENTATION

The recommended approach for redevelopment of the Eastbank Crescent is to focus efforts on the in-water and riparian habitat improvements of Concept 1, and the recreation and public activity components included in Concept 2, where compatible.

Maximizing habitat restoration is favored by state agencies that own or have permitting responsibilities for redevelopment of the Eastbank Crescent. Ecological enhancements along the Central Reach of the Willamette River would be more readily permitted than hardscaping or constructing recreational facilities in the river or on the riverbank. Optimizing habitat at one of the rare shallow water areas in the Central City is also strongly supported by environmental interests. Further, the City's developing response to the NOAA Fisheries biological opinion and its potential to provide a funding source for redevelopment if significant floodplain capacity and habitat is restored also favors pursuing Concept 1. Details of the floodplain and habitat restoration activities are outlined below, followed by an assessment of the modifications necessary to accommodate the recreation and public activity components that received significant public support.

In-water and Riparian Habitat Improvements

Concept 1 seeks to maximize the ecological potential of the site given existing conditions and constraints. Concept 1 components were incorporated based on the overall habitat objectives as well as the specifics of site topography, channel bed conditions, river hydraulics, as well as the limitations provided by surrounding infrastructure. Concept 1 focuses on linking the aquatic, riparian and upland areas in a way that supports important ecological functions while providing high quality habitat. For example, large wood placed along the shoreline will provide immediate juvenile salmonid cover, while planting native shrubs will ensure a long-term supply of overhanging cover and nutrients.

Laying back the existing steep riverbank is an important component of Concept 1. Bank layback provides a more suitable slope to establish native woody riparian vegetation and decreases the need for hardened bank armoring that can negatively affect shoreline complexity. It also lowers the velocity of the river along the shoreline at high water. The rationale behind the proposed configuration of bank layback is described below; however, the final amount and configuration of bank layback will depend on further coordination with property owners, particularly OMSI, as they undergo their master planning process.

Concept 1 includes varying degrees of bank layback depending on location (Figure 4). Except for the far northern portion of the site where slopes are gentler, existing bank steepness is approximately 1.5-foot horizontal to 1-foot vertical (1.5:1) and the bank is stabilized with riprap and concrete rubble. Under proposed conditions, the riprap and concrete would be removed and the bank would be laid back to a maximum of 4:1. The extent of bank layback is governed by infrastructure constraints, including bridge pier footings, buildings and buried utilities, as well as the landowner approval. The greatest amount of layback could occur in the middle portion of the site, with the degree of layback decreasing toward the southern and northern ends. For approximately 330 feet at the northern end and 150 feet at the southern end, there is no layback proposed due to buried utilities, nearby bridge piers and buildings. The total amount of material that would be excavated as part of the bank layback, as shown, is approximately 20,000 cubic yards.

Figure 4: Existing and proposed (Concept 1) top of bank line showing extent of potential bank layback at the site

The basis for the selection of the various habitat components included in the Habitat Concept is provided in Section 4 of the Existing Conditions Report (Appendix B). As described in the report, opportunities and constraints for restoration were identified within three distinct zones (Figure 5). Zone 1, which is the most northern zone, is most suitable for enhancement of gently sloping shallow water habitat. Zones 2 and 3 are more suited to the creation of complex channel margin habitat, including large wood pools, vegetated overhanging banks and alcoves. Zone 1 is more suitable to public access given the lower bank, more gentle terrain and the existing small beach. For this reason, Concept 1 assumes that public access to the river is focused in Zone 1 as opposed to in Zones 2 and 3.

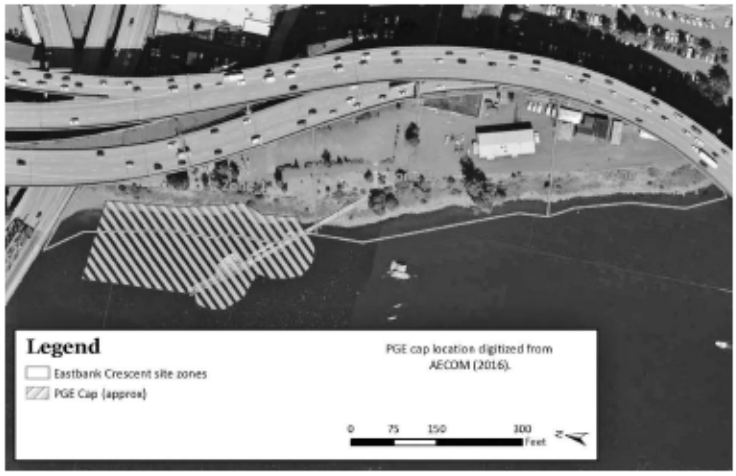


Figure 5: Location of the three zones used to characterize Project Area conditions

Zone 1

Zone 1 has lower banks, shallower water and a gradual sloping beach. It will also be made shallower by the proposed PGE cap, which will be topped with gravel (for additional detail, see Appendix B: Existing Conditions). For these reasons, this area is proposed for enhancement of gently sloping shallow water habitat that primarily supports juvenile Chinook rearing. Sand and gravel could be placed along the shoreline, pending further sediment transport analysis to evaluate stability of placed material and the potential need for long-term replenishment.

Zone 2

In Zone 2, the potential for bank layback is greatest. Proposed habitat enhancements include a complex undulating shoreline with alcoves, large wood jams, scour pools, and overhanging banks and vegetation. The focus here is on salmonid rearing for older juvenile life stages (1+age) as well as adult holding. Calmer refuge from high river flows would be an important aspect, with eddies and quiescent water created by log jams, overhanging banks and alcoves. Overhead and in river cover and complexity will help fish avoid aquatic and avian predators. The overhanging wood and vegetation also provides an important input of food resources to the river. Log jams would be partially buried into the bank for stability and include logs with rootwads extending into the water to maximize habitat complexity (Figure 6). In some cases, log jams may be extended further into the channel to provide greater fish cover and recruitment of wood transported from the south, as well as to create conditions to maintain/refresh the beach habitat in Zone 1. The extent that jams are extended into the channel will depend on hydraulic and feasibility analyses.

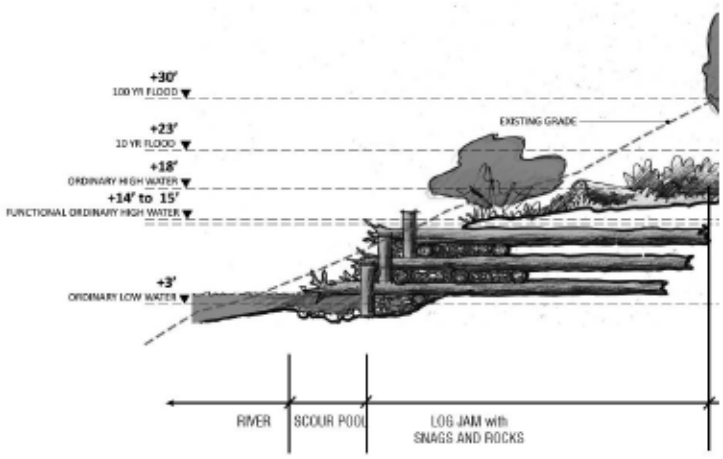


Figure 6: Log jam section (Zone 2)

Pools, which are created by the water scouring the river's edge provide important rearing habitat for juvenile salmanoid, Pools are often found around and beneath log jams (Figure 6). The bank layback of up to 4:1 at its maximum, would allow for the restoration of a diverse native riparian plant community that will support terrestrial and aquatic species. Introduction of large wood in the channel, development of overhanging root masses, natural bank stability, and food sources improve habitat. Riparian plantings will include herbaceous, shrub and tree species depending on elevation above the water and slope.

Zone 3

Proposed treatments for Zone 3 are similar to those in Zone 2. However, habitat improvements are somewhat more limited due to less potential for bank layback. Log jams are still possible here, but would be designed more as log crib structures that also help stabilize the high bank (Figure 7).

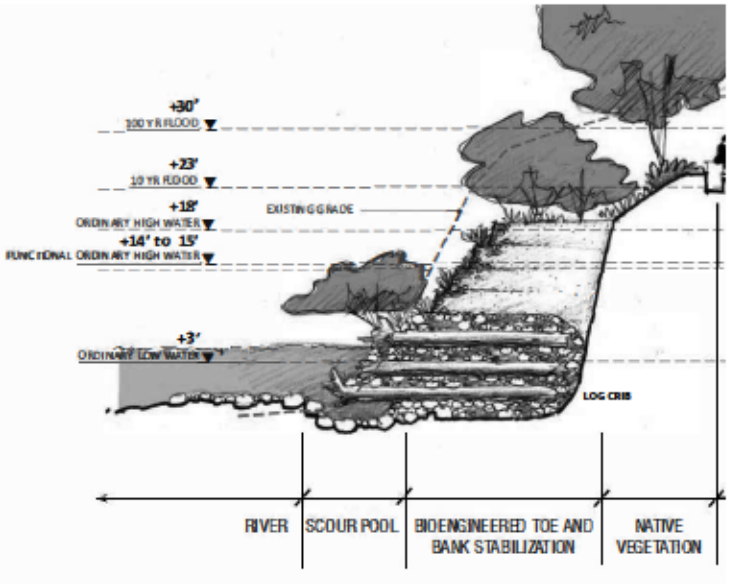


Figure 7: Log crib structure section (Zone 3)

Scour pools and overhanging wood cover would still be incorporated to the extent possible. Steeper slopes also present less opportunity for alcoves. The potential riparian buffer width is also narrower due to surrounding infrastructure and the steeper slopes may affect the ability to establish diverse and robust native riparian plants. Approximately 40 existing abandoned pilings in Zone 3 (Figure 8) would be removed as part of this concept, as they tend to provide habitat for warm-water invasive and piscivorous fish species.

Figure 8: Abandoned pilings (Zone 3)

The upper bank region, which includes riparian and upland areas, will consist of natural and public-use features. The intent of Concept 1 is to maximize the extent of the native plant community in these areas while allowing for some degree of recreation and other uses. In general, fewer public-use features are proposed for areas closer to the water, and more public-use features are planned for areas further from the water.

As described previously, there is more of an emphasis on public access to the river in Zone 1, where access is naturally easier and currently occurs. The primary recreation features include the realigned Greenway Trail, overlooks/viewpoints and the boat dock with associated gangway. There is also the potential for planted stormwater swales adjacent to the Greenway Trail as a means to improve water quality and deter storm runoff from the trail and nearby impervious areas.

As described above and as depicted in the drawings, Concept 1 conveys the overall approach for treatment types and locations. However, during the design phase, more analysis will be required to size and locate specific features and determine the requirements for stability of the bank and placed materials such as large wood. This will likely include hydraulics, sediment transport and geotechnical analysis as well as an evaluation of boat wake and wind effects. Locating existing utilities will also be required and may affect site grading and location of features. Further coordination with property owners and other stakeholders is also likely to affect specific treatment types and locations.

Permitting Considerations

Concept 1, if implemented, would significantly improve ecological conditions at the site, including fish and wildlife habitat, native vegetation and water quality. Numerous permit approvals will be required, but they should be easy to obtain for the project. Table 1 includes a list of the permit approvals that would likely be required; additional permits could be required depending on final design.

Table 1. List of permits that would likely be required

AGENCY	PERMIT REQUIREMENT	CONSIDERATIONS
Federal		
USACE	CWA Section 404 – Dredge and Fill in Waters of the U.S.	May be able to go through a streamlined Nationwide 27 permit. If not, an Individual Permit will be required.
NOAA and USFWS	ESA consultation for listed fish and wildlife species	Section 7 consultation would ideally fit within a restoration program (e.g. SLOPES). Depending on complexity, it may need to go through formal consultation, which will require the preparation of a biological assessment.
USACE	Rivers and Harbors Act	Section 10 prohibits unauthorized obstruction or alteration of the federal navigation channel.
FEMA	No-rise analysis	Likely would fit within the Region 10 Fish Habitat Enhancement Exemption, which requires documentation that any rise is minimal and contained within the site.
State		
DSL	Removal/fill permit	The project could possibly meet the General Authorization for Waterway Bank Stabilization. If not, a Joint Removal-Fill Permit will be required.
DSL	Lease	Uses such as a dock require a lease from DSL.
DEQ	CWA Section 401 – Water Quality Certification	This would likely be waived if it goes through Nationwide 27; but if not, water quality certification will be required. No mitigation requirements are anticipated.
DEQ	1200 C – Stormwater Management Permit	
SHPO	NHPA Section 106 – Cultural Resources Approval	
Local		
City of Portland	Site Development Permit	All development and ground alterations are required to meet City Zoning Code Title 33 and obtain a site development permit, which requires addressing the Stormwater Management Manual and Title 11, Trees.
City of Portland	Building Permit	Development of any structures will be required to meet the building code.

The City of Portland has a signed agreement with federal and state agencies to share and cooperate streamlining the process for public projects that must obtain multiple permits. The Streamlining Team procedures are designed to improve coordination and communication between agencies to produce consistent decisions in a timely manner. Implementation of the *Eastbank Crescent Riverfront Plan* could use this team to coordinate the permitting process.

PERMITTING CONSIDERATIONS – TABLE 1 AGENCY ACRONYMS

DEQ = Oregon Department of Environmental Quality
DSL = Oregon Department of State Lands
FEMA = Federal Emergency Management Agency
NOAA = National Oceanic and Atmospheric Administration
SHPO = Oregon State Historic Preservation Office
USACE = U.S. Army Corps of Engineers
USFWS = U.S. Fish and Wildlife Service

Compatible Component Modifications to Habitat Improvements

Several potential modifications to Concept 1 may be considered for inclusion the final preferred site plan based on review and evaluation of the concept alternatives. The modifications include public-use components of Concept 2. These are briefly described below, including a discussion on any potential implications to habitat features and project permitting.

1. Relocate/reconstruct boat dock gangway

The sharp turn in the dock gangway as shown in Figure 9 is problematic for carrying longer rowing shells down the gangway. Appendix C shows dock design options that were considered. A straighter gangway could be incorporated into Concept 1, which would simply shift the access point to the gangway further south, see Figure 10. The new access point would be closer to the current location of the gangway and closer to the SE Clay Street parking lot.

This modification would encroach somewhat on the wide riparian buffer in Zone 2, but would minimally affect riparian vegetation. This modification would not change permitting requirements or permitting feasibility.

Construction of a new dock would likely trigger waterway lease review and re-application through the Department of State Lands (DSL). It would also likely require a Joint Removal-Fill Permit Application (JPA) for any material (pilings, other permanently anchored structures) placed in wetlands and/or waters. It would require review and approval from the U.S Army Corps of Engineers (USACE) and commenting agencies.

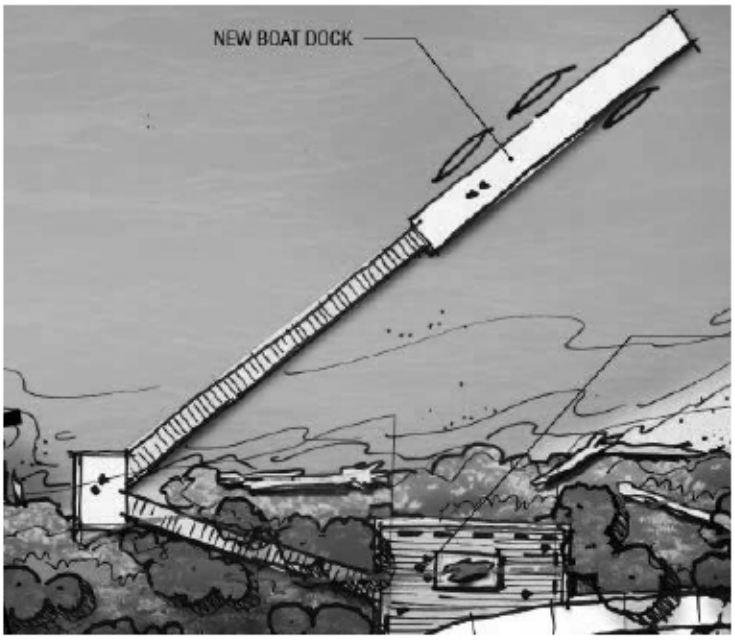


Figure 9: Concept 1 boat dock (rebuilt at existing location)

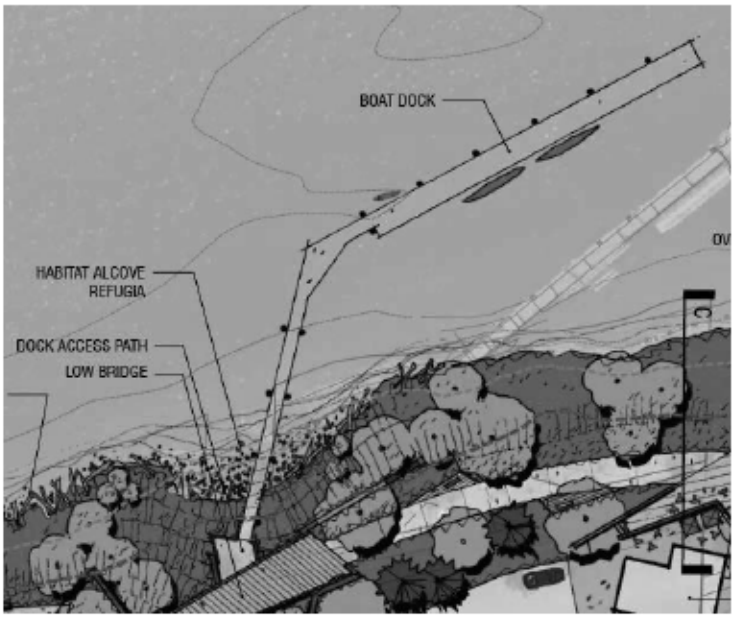


Figure 10: Concept 2, a reconfigured and relocated boat dock

2. Construct grade-separated access from boat staging area to dock

There may be some advantage of a grade separation between the dock gangway and the Greenway Trail in order to avoid user conflicts (Figure 11). This modification could only occur if the gangway is straightened as described in the previous section; however buried utilities along the Clay Street easement would prevent grade separation at this location. This modification would most likely include a trail bridge overpass that crosses over a sunken grade gangway access path. This change could affect the degree of bank layback in this area because the trail will need to be on higher ground to cross over the gangway access path. This change would result in further encroachment into the riparian buffer to allow for side slopes to the sunken grade, overpass structure slopes and footings. However, these impacts would generally occur farther from the water so the shoreline habitat would not be affected greatly. This modification would not change permitting requirements or permitting feasibility.

Implementation of the FEMA Biological Opinion may restrict this option to other locations within the project site, outside of the 100-year floodplain.

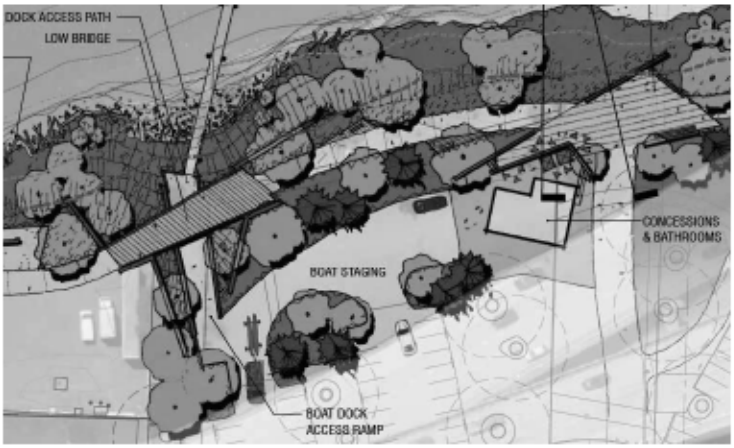


Figure 11: Boat staging area with grade-separated access

3. Construct boat staging area with amenities

Creation of a boat staging area with amenities like changing/rest rooms and concessions, would occur near the access point for a straightened gangway (Figure 11). This would occur at approximately the mid-point of the site at the top of the bank. The greatest impact of this modification on habitat conditions is the degree of bank layback and the riparian buffer. A staging area would need to be located at or very close to the existing top-of-bank elevation. Assuming it is west of the existing parking area, its location would reduce the extent to which the bank can be laid back in this area. This may result in the proposed bank layback of 4:1 being reduced to a 2:1 or 3:1, depending on its size and location. There would be further encroachment into the riparian buffer proposed in Concept 1, especially if the Greenway Trail is moved closer to the shoreline to accommodate the staging area. These impacts could reduce the size and feasibility of alcove habitat and log jams along the shoreline and would affect the width and slope of the riparian buffer. Since most of these changes affect conditions above Ordinary High Water (OHW), there are unlikely to be significant changes to permitting by the resource agencies. This modification would also result in more impervious area than in Concept 1, and additional stormwater runoff management, potentially requiring porous pavement or onsite green infrastructure.

Changes in zoning at the Eastbank Crescent as proposed in the *CC2035 Plan Proposed Draft* could accommodate this modification. The new River General overlay zone would increase the river setback from the top of the bank to 50 feet but would allow river-related and river-dependent uses within the setback. The Proposed Draft would also allow a limited amount of retail sales and services, such as concessions, within the OS zoned area at the site. The need for long term management of constructed amenities at the site, however, will likely be a factor in the City of Portland's permitting decisions. However, more intense review may be required by the City of Portland given the need for long-term management of constructed amenities.

4. Create swimming access, seasonal floating dock

Enhancement of swimming features at the north end of the beach site could include enhanced access to the beach area, more open areas along the bank, and potentially a seasonal dock anchored off the shore (Figure 12). The greatest impact would be on the proposed riparian buffer at the northern portion of Concept 1, which is already fairly narrow (proposed riparian buffer width ranges from 25 to 50 feet).

Fish are present at the site and throughout the Willamette River year round. The primary fish of concern are the sub-yearling Chinook migrating from their natal waters to the Columbia River in spring. In May, the peak migration time for this species, the water is cold and at high flow, and swimming is minimal. However, enhanced public access to the river and the PGE cap could affect the ability to incorporate and maintain logs along the shoreline to enhance habitat for the migrating sub-yearlings. If logs are anchored in place and carefully located, then safety concerns could be minimized. The anchored logs could also be used for sitting and play areas in the summer, while still providing fish habitat during high water periods in the fall, winter and spring.

The floating dock could increase habitat for invasive warm-water fish that prey on juvenile salmon; however, this should be minimal given the seasonal use of the dock and its location off-shore, away from the channel margin. This modification may change permitting requirements or feasibility. Construction of a new swim dock and platforms would require a waterway lease through DSL, and seasonal anchoring in the riverbed may require an easement with DSL. If any fill is required for placement of the swim dock or platforms, a Joint Permit Application for any material (pilings, other permanently anchored structures) placed in wetlands and/or waters would be needed, requiring review and approval from DSL, USACE and commenting agencies. For local permitting, the floating dock would require review and approval from the City for development along the river.

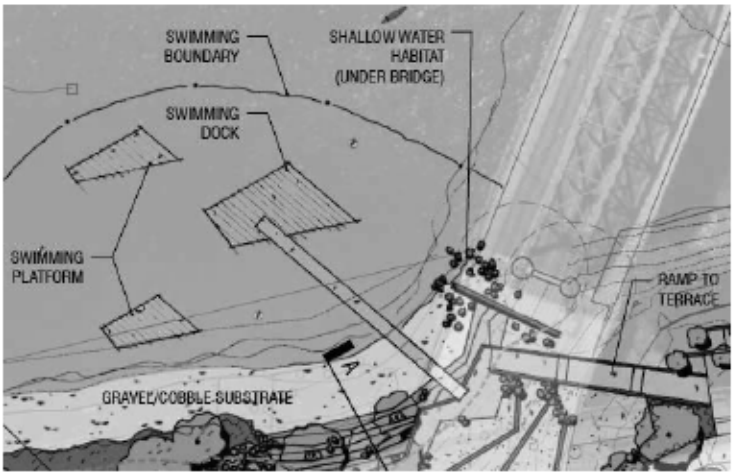


Figure 12: Swimming access and float dock (Zone 1)

Expanded viewpoints/plaza areas

Increasing the number or area of viewpoints and plazas would primarily affect riparian vegetation conditions. These impacts would mostly occur at the top of the bank, with somewhat limited direct impacts to aquatic habitat at the shoreline (Figure 13). Aside from the impacts of the actual footprints of the viewpoints/plazas, if vegetation is controlled to maintain views, then this would create additional impacts to nearby riparian areas. Using elevated and light-penetrating decks would help to minimize impacts and allow for more vegetation to be maintained around and underneath the structures. This modification would not substantially change permitting requirements or feasibility.

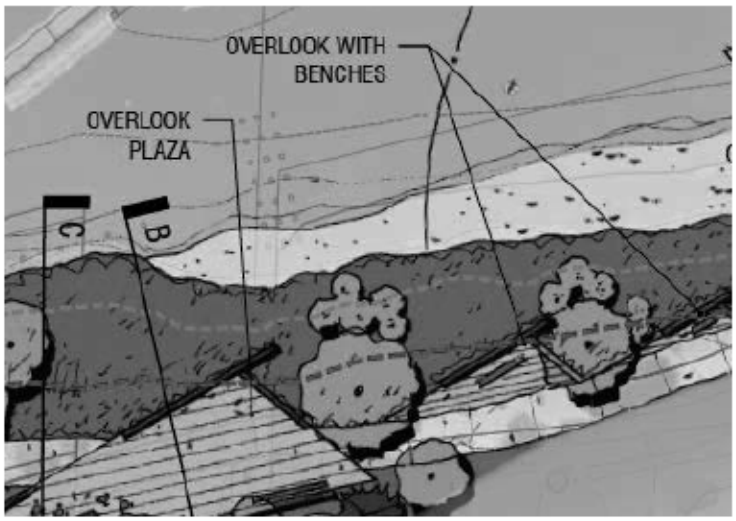


Figure 13: Expanded viewpoints and plazas

6. Route Greenway Trail east

Routing the Greenway Trail to the east, either closer to the I-5 bridge piers or even out to SE Water Avenue, would reduce impacts to the riparian buffer. Benefits may be limited if a pedestrian-only pathway is created along the shoreline. This modification would generally serve to enhance riparian conditions, with indirect and long-term benefits to aquatic habitat along the shoreline. This modification would not be expected to substantially change permitting requirements or feasibility.

7. Reroute eastbound Hawthorne Bridge bicycle/pedestrian off-ramp to Clay Street

Routing the eastbound Hawthorne Bridge bicycle and pedestrian off-ramp to Clay Street would alleviate pedestrian/bicyclist conflicts where the current ramp meets the Greenway Trail (Figure 14). This option would not affect habitat enhancements proposed for Concept 1 because the project site is west of the ramp improvements. This modification would not substantially change permitting requirements or feasibility for the project; however, more intense review may be required by the City of Portland due to rerouting the ramps and connecting them to Clay Street.

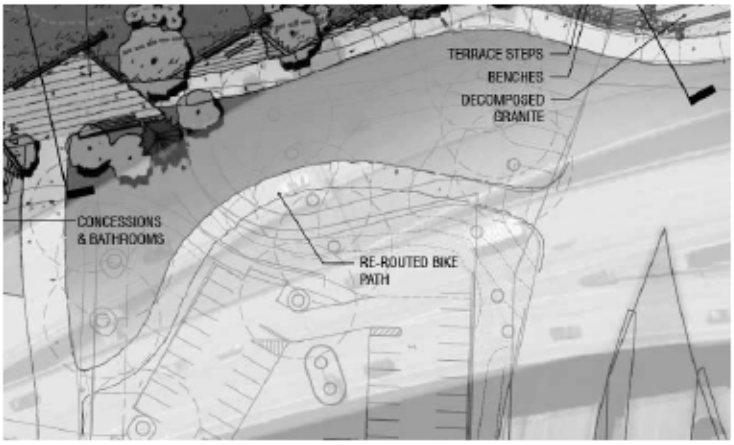


Figure 14: Re-route eastbound Hawthorne Bridge pedestrian and bike path

Conclusions

In general, the modifications described above as part of the Concept 2 discussion are all compatible with Concept 1 and do not significantly reduce the habitat improvements that will be created by the project. In some cases, such as rerouting the Greenway Trail to the east, habitat benefits could increase. Each of these changes are unlikely to significantly change the permitting requirements or the ability to secure all of the necessary permit approvals. However, the more public access uses and features that are incorporated into the site plan, the less likely the project will be able to go through streamlined and programmatic-type permitting avenues, including programmatic ESA-consultation, USACE Nationwide 27 permit, and DSL General Authorization permit process. This does not mean the project cannot be permitted, but the permit process will take longer and may require mitigation measures to off set any impacts.

This document does not include cost estimates for implementation of the *Eastbank Crescent Riverfront Plan*. If directed by the City Council to proceed, costs for implementation, identification of potential funding sources and project phasing would be identified once the detailed site planning elements are established. Final costs would include both construction and soft costs (e.g. design fees, staff and contractor costs, insurance, bonding, permit fees).

APPENDIX A: PLANNING FRAMEWORK

Central City 2035 Plan/ River Plan Central Reach

The *Central City 2035 Plan Proposed Draft* (June 2016) contains an update to the Willamette Greenway Plan (1987) for the Central Reach of the Willamette River. The Eastbank Crescent area is within the Central Reach. Elements of this plan are: a future desired urban design concept for the river and riverfront area, related policy framework and implementation actions including changes proposed to the Official Zoning Maps and Portland Zoning Code. The plan is intended to guide growth, development and public actions over the next 20 years.

Prior to development of the *Central City 2035 Plan Proposed Draft*, a Southeast Quadrant Plan was produced through a public process and approved by the Portland City Council. It provided the vision, policy guidance and implementation recommendations for the Central Eastside district. This quadrant plan has been folded into the *Central City 2035 Plan* (CC2035 Plan).

This appendix highlights key elements of the CC2035 Plan Proposed Draft as they relate to the Eastbank Crescent area of the Central Reach.

Central Reach Urban Design Concept

The Willamette River Central Reach Urban Design Concept was developed with input from people with diverse interests in the riverfront area. It has been refined over the planning horizon based on additional public comment. The concept as shown below in Figure A-1 depicts a multi-functional riverfront for people and wildlife. Figure 1 below identifies major riverfront activity hubs, riverfront attractions, river transit stops and docks, public access to and into the river, riverbank and in-water restoration and enhancement, the greenway trail and potential new riverfront open space areas.

The urban design concept depicts the Eastbank Crescent area as one with a mix of development/activities, in-water recreation and fish/wildlife habitat restoration and enhancement and the greenway trail for pedestrian and bicyclist access.

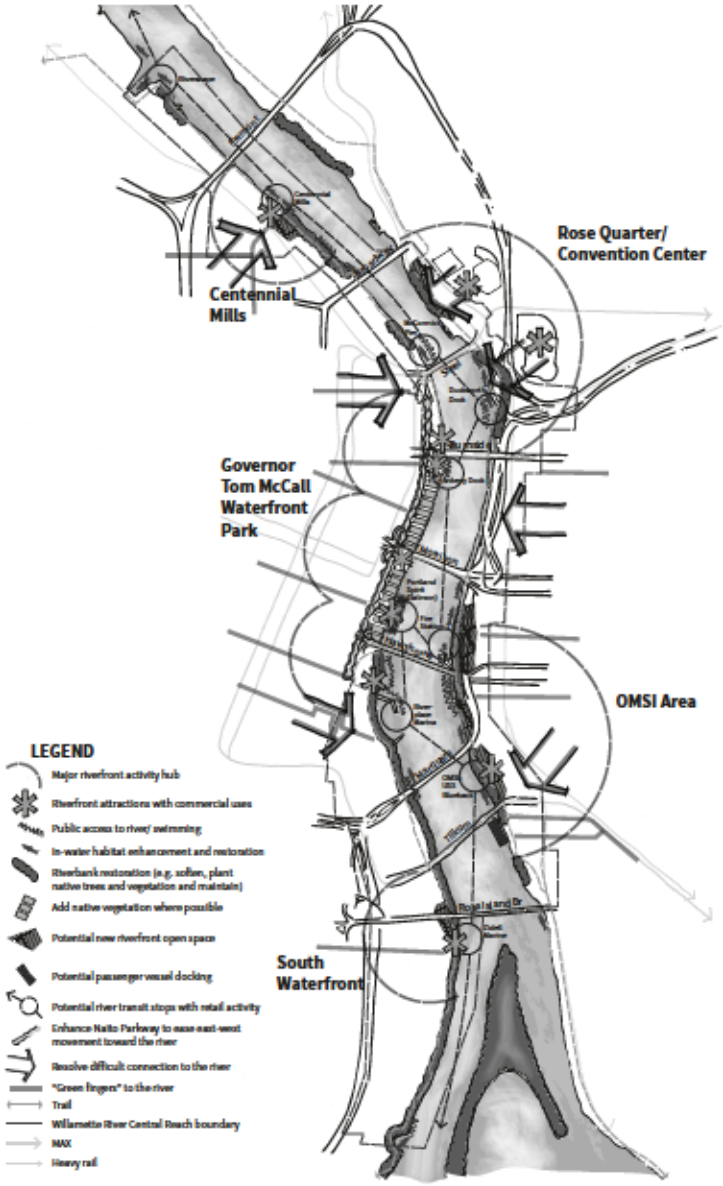


Figure A-1: Willamette River Central Reach Urban Design Concept

Willamette River Policy Framework

The policy framework for Central City's section of the Willamette River reflects the significant role the river has played and continues to play in the downtown area and the greater region. It has been the heart of human settlement, subsistence, commerce and transportation. In recent decades, public spaces like Governor Tom McCall Waterfront Park and the Eastbank Esplanade (greenway trail) have generated high public usage from people who live and work in the Central City but also by other Portlanders, regional residents and visitors. From a habitat perspective, the river and riverfront area are home to and migration corridors for many fish and wildlife including numerous listed species of fish. Urbanization of the central riverfront including sea walls and hardened banks, fill areas and rip rap and public infrastructure have degraded the natural habitat and made it more difficult for public to access the river. The plan aspires to re-connect the public to the river and improve river and riverfront conditions for people and wildlife.

The policy framework, which includes Central City-wide goals and policies and district-specific policies seek to improve upon the key ingredients that have made the Willamette River the most important feature in the Central City. The three Central City-wide goals address the significant role the river plays in the "environmental health, economy, recreation, urban form and character of the Central City". The goals also address a healthy river that supports fish, wildlife and people, and a river and adjacent public areas that are accessible and connected. Implementing policies support the diversity of this multi-functional river, e.g. river recreation, and guide river-oriented development.

There are three Central Eastside district-specific policies in the Central City 2035 Plan Proposed Draft. They encourage an expanded river economy that brings more people to, on and in the river, a riverfront area that improves the physical relationship between buildings, activities and the river, and enhancement and restoration of in-water, riparian and upland habitat by planting native plants and trees and creating complexity in shallow water areas.

Implementing Actions

The *CC2035 Plan Proposed Draft* includes a long list of actions to be implemented over the next 20 years by the City, other agencies, community organizations, private entities and the public. These actions are the primary means for achieving the plan's aspirations as described in the policy framework. Numerous actions relate to the Willamette River, both Central City-wide and for the Eastbank Crescent area. These include:

- An action for the City to partner with property owners and other stakeholders to fund and implement a preferred concept plan for the Eastbank Crescent that includes fish a wildlife habitat, boating, swimming, educational opportunities and enhanced greenway trail.

Central City-wide action that:

- Improve the Willamette Greenway Trail to facilitate the continuity and reduce user conflicts and provide access to the river.
- Enhance and create connectivity between in-water, riverbank and upland areas to maintain and improve fish and wildlife habitat.
- Increase the efficient use of existing docks and river access points to avoid and minimize environmental impacts.

Central Eastside actions that:

- Increase the width of the greenway trail including possible separation of bicyclists and pedestrian.
- Explore concepts and partnerships to enhance fish and wildlife habitat.
- Encourage more year round events and activities around the riverfront areas.
- Provide greenway amenities such as public viewing areas, light watercraft storage, bicycle parking and public restrooms.
- Study the feasibility of building a long-term structure for the Portland Boathouse adjacent to the Willamette River.
- Support opportunities and partnerships to bring major riverfront uses and attractions.

Proposed Zoning Code and Map Amendments

The CC 2035 Plan Proposed Draft contains changes to the Title 33: Portland Zoning Code and the Official Zoning Maps that would affect the Eastbank Crescent area. These include:

- Changing the base zoning from Employment General (EG1) and General Industrial (IG1) to Central Employment (EX) to allow a variety of uses, e.g. retail.
- Replacing the Greenway General "g" overlay zone with the River General "g*" overlay zone.
- Expanding the river setback from 25 to 50 feet from top of bank to allow more room for recreation and natural resources – only river-dependent and river-related and trail uses within the setback.
- Revising landscaping standards to allow more diversity of plantings and tree sizes.
- Applying the River Environmental "e" overlay zone along the river/riverfront to limit the effects of development on natural resources, and require mitigation when resources are impacted.
- Applying the Scenic "s" overlay zone at two viewpoints on the site and restrict tree planting.
- Establishing a Riverfront Open Space bonus to allow a developer to gain more development potential by dedicating public open space contiguous to the river setback area.
- Allowing a limited amount of retail sales and service, e.g. boat rentals, food kiosk outside of the river setback, for public use and enjoyment, at Open Space zoned sites.
- Allowing mapped properties (specifically identified large sites) to (re)develop through a coordinated master plan process that provides more flexibility in site planning.

APPENDIX B: EXISTING CONDITIONS REPORT

EASTBANK CRESCENT HABITAT RESTORATION
EXISTING CONDITIONS REPORT

Prepared for:

ENVIRONMENTAL SERVICES
CITY OF PORTLAND
1120 SW 5th Ave
Portland, Oregon 97204

Prepared by:

GREENWORKS
24 NW 2nd Ave, Suite 112
Portland, Oregon 97209
(503) 222-5612
www.greenworkspc.com

inter·fluve
501 Portway Ave, Suite 101
Hood River, Oregon 97031
(541) 386-9003
www.interfluve.com

September 2016

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CONTENTS

FIGURES AND TABLES

1. INTRODUCTION

1.1. Project Background

The Eastbank Crescent Riverfront Plan (Project) was conceived to fulfill the needs of The City of Portland's Central City 2035 and Willamette River Central Reach plans. Through the Central City 2035 Plan and the River Plan/Central Reach, the City of Portland (City) has been working with property owners, agencies, non-profit organizations and interested parties to identify opportunities along the Willamette River for improved human access into the river; a variety of active destinations; and enhanced fish and wildlife habitat. The Bureau of Planning and Sustainability (BPS) was tasked with leading the preliminary planning effort, with the Bureau of Environmental Services (BES), Portland Development Commission (PDC) and Portland Parks and Recreation (PPR). Two products were developed based on the work with the City and stakeholders including An Urban Design Concept for the Central Reach and A Background Paper: Design Considerations for Willamette River Habitat and Recreation in the Central City.

In spring 2015, Mayor Charlie Hales began working with stakeholders to identify sites where the three elements (public access, activation and habitat) could be improved within the next few years. In support of that effort, Mayor Hales has authorized budget within the 2015/2016 fiscal year budget to scope a project and develop a pre-design for the Eastbank Crescent site.

In June 2015, public agencies and consultants gathered for a charrette to discuss and design concepts for Eastbank Crescent Riverfront Project that incorporated the three elements.

The work on the project continues and an Alternatives Development Meeting will take place on April 21, 2016 to discuss the outcomes from the June 2015 effort as well as constraints and opportunities to move forward with three concepts to present to the public.

1.2. Project Goals and Approach

The project objective of the Eastbank Crescent Riverfront Plan is to create a recreational destination and a fish and wildlife habitat refuge including a new beach and dock to accommodate safety, recreation needs, as well as enhancing and restoring habitat. Overall project goals include:

- Provide safe public access to and into the Willamette River, for swimmers and non-motorized boaters
- Enhance in-water nearshore habitat for ESA-listed fish
- Restore riparian and upland habitat for birds and wildlife
- Incorporate river habitat education opportunity for OMSI
- Improve the safe movement of pedestrians and cyclists on the Willamette Greenway Trail through the site
- Integrate multiple uses while minimizing conflicts

- Activate and enliven the area
- Create a design that is physically and financially practical to build, maintain and operate

BES has been tasked with the habitat restoration component of the project and hired GreenWorks to assist with development of three habitat concepts (referred to as the Eastbank Crescent Habitat Restoration Project). The Eastbank Crescent Habitat Restoration Project's primary goals are to enhance and restore fish and wildlife habitat while improving near-shore and non-motorized river recreation. Habitat enhancement and restoration will seek to improve riverbank and near-shore habitat conditions, including riparian, beach, shallow-water habitat for the benefit of fish, wildlife and people. Below are the specific project objectives for habitat restoration. Habitat treatment types will be evaluated in relation to goals listed above and below and the goals from Central City 2035 Plan, see Section 4.3 – 4.5 and Appendix C for more information on habitat treatment types.

Specific objectives of habitat restoration alternatives are to:

- Provide improved habitat complexity at the river's edge to allow for rearing and refuge for resident and anadromous fish species.
- Improve riparian area conditions to improve the microclimate, enhance the food web and improve the riverine processes necessary for improved water quality, hydrology, habitat and biological communities.
- Provide educational opportunities for restoration strategies along large river systems in urban areas and showcase/demonstrate how active river uses and habitat restoration can be collocated.

As part of this Eastbank Crescent Habitat Restoration Project, GreenWorks and subconsultant, Interfluve, are creating this Existing Conditions Report to inform how recreation, access and habitat can be evaluated and designed at the site. Based background on information and site analysis, this report discusses the constraints and opportunities of the Eastbank Crescent Project Area and provides recommendations for siting of the beach and dock, while detailing habitat enhancement opportunities and habitat treatment types. After the Existing Conditions Report is reviewed by the BES, BPS, BDC and PPR, and general location for placement of the beach, dock and habitat restoration components are agreed upon, three restoration options will be developed.

2. SITE HISTORY AND CONTEXT

2.1. Location

The Eastbank Crescent site (Project Area) includes approximately 1,100 feet of shoreline between the Hawthorne and the Marquam bridges on the east riverbank of the Willamette River (Figure 1). The Project Area is highly visible to the public from the river, Eastbank Esplanade and freeway bridges. The City identified this as a candidate site for habitat and recreation improvements based on existing conditions in the Central Reach of the Willamette River.

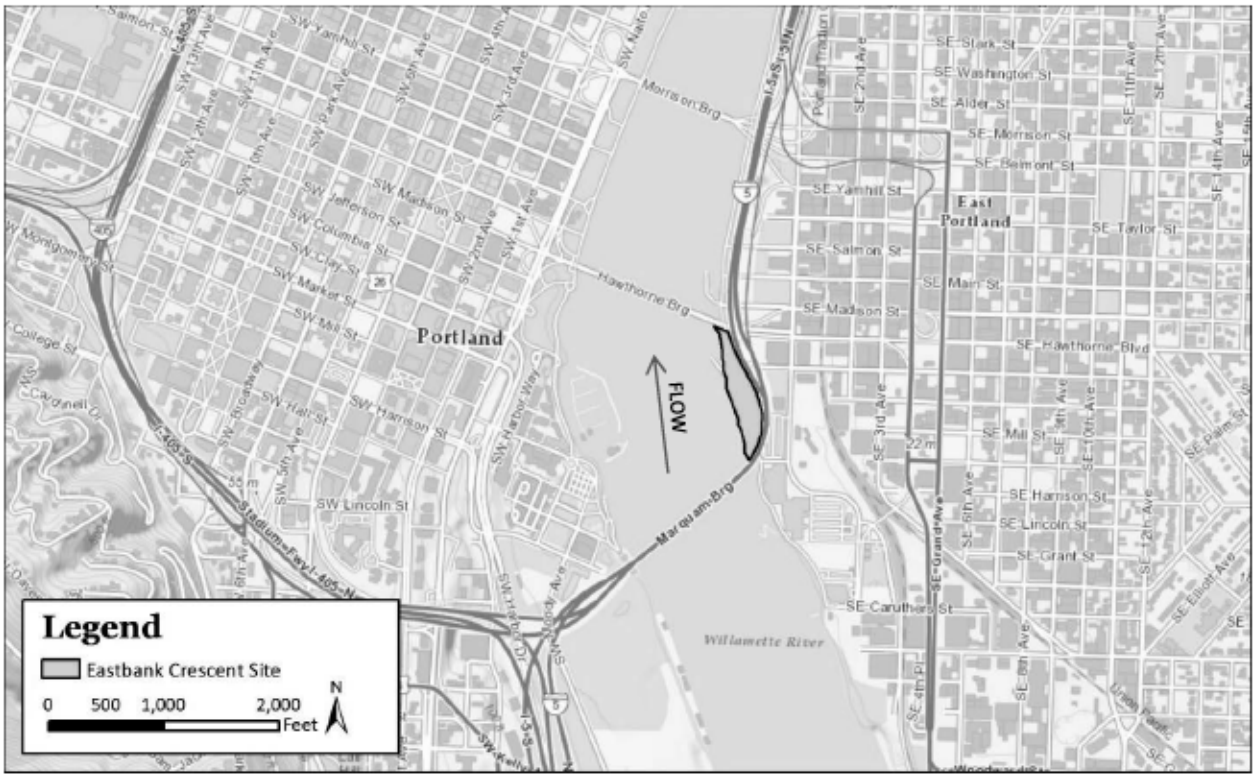

Figure 1. Site Location Map

2.2. Historic Context and Land-use

The Willamette River in the Portland area historically had an extensive network of interconnected channels, open slack waters, emergent wetlands, riparian forests and mature upland forests on the surrounding hillslopes. Several off-channel lakes provided high-quality rearing habitat for a variety of species (Primozich and Bastasch, 2004). Native vegetation in the low riparian areas and forested wetlands included black cottonwood, Oregon ash, and willow.

Land in the Project Area began to develop in the 1850's with European settlement along the Willamette River. Efforts to deepen the channel began in the 1860's, with floodplain filling and channel straightening. Portland's population was growing immensely during this time as were roads and water transportation. In the early to mid-1900's, new transportation access led to development in the Project Area including shipping and manufacturing centers for wheat, lumber and salmon, an iron works

company, an electric power company, machine shops and the Holman Building. The shoreline contained many wharves where commercial and industrial businesses would dock ships and boats. Other uses within the Project Area included ship building and freight yards.

Most of the bank had been stabilized by at 1935, with some natural shoreline north of the Marquam Bridge on the opposite side of the river (Figure 2). Banks along the Project Area appear very steep, and buildings and pavement were in place before the Interstate-5 interstate highway (I-5) was installed in 1963 (Figure 3). In 1966, the I-5 segment from the Marquam Bridge over the Willamette River was constructed. I-5 has increased impervious surfaces along the Willamette River, led to increased urbanization, and narrowed the potential riparian corridor in many areas.

Today the channel is up to 46 feet deep near the Project Area and the floodplain is either non-existent, or is physically separated from the river channel and rarely inundated. The banks of the lower Willamette River have been altered over time. Most of the lower river's bank habitat is developed and armored with pilings, dock and seawall structures, pavement, rock/fill or riprap and contains a mix of native, non-native, and invasive plants. The urban and industrial uses conducted on the floodplain during the twentieth century have contributed to the contamination of the river and land with toxic compounds.

Current land use includes open space, industrial and commercial. With the installment of the Eastbank Esplanade in 2001, the Holman Dock in 2005, and the SE Clay Street connection to the greenway trail, site users include, bicyclists, commuters, runners, walkers, rowers, dragon boaters, sunbathers, and swimmers. The Project Area also attracts homeless activity due to the vicinity of the I-5 overpass used as shelter and the flat ground at the top of bank of the Willamette River.

Figure 2. Historical Photograph from 1935

Figure 3. Historical Photograph from 1963

2.3. Ownership

The Project Area was historically owned by Portland General Electric (PGE). Today there are multiple land owners including Oregon Museum of Science and Industry (OMSI), Oregon Department of Transportation (ODOT), PPR and Portland Water Bureau. PGE donated the southern half of the land to OMSI in the early 1990's. Land to the north of OMSI is owned by ODOT. ODOT has easements associated with the Hawthorne Bridge and Interstate 5 and leases its property to River East, LLC and PDC. In the past few years, OMSI has expressed interest in habitat restoration and educational opportunities on their land. For me information, see Section 4.1.1.

3. SITE ANALYSIS

3.1. Site Analysis Methods and Overview

The site analysis is based on existing studies as well as field surveys performed as part of this effort. Existing information has been collected by numerous agencies for a variety of projects that pertain to the Project Area (Appendix B). This includes water quality studies, habitat assessments, fisheries studies, hydrology investigations, hydraulics analyses, project designs, and various planning efforts. Relevant information from these existing sources was compiled, and in some cases further analyzed, to support planning and design work at the Project Area.

Two of the key studies that provided useful site-specific information include the Portland Harbor Superfund Site and the PGE Isolation Cap Project. Portland Harbor, extending from the Columbia Slough to the Broadway Bridge, was listed as a Superfund site in 2000 by the US Environmental Protection Agency due to contaminated water and sediments. Investigative work associated with the Superfund site has provided data on sediment sizes and distributions, potential contamination of sediments, patterns in physical disturbances, analysis of bathymetric changes, and Willamette River flow characterizations. The other very relevant study is the PGE Isolation Cap Project located at RM 13.1. This project, slated for construction in 2017, is proposing to cap contaminated sediments documented within a portion of the downstream nearshore area of the Project Area using sand and gravel layered on the riverbed. This study has provided hydraulic and hydrodynamic fluvial analyses, bathymetric mapping, and an evaluation of propeller and wave effects from commercial and recreational vessels near the project site. Once constructed, the PGE project will also affect bathymetry and topography in the downstream portion of the Project Area, making it very relevant to project planning and design.

In addition to the use of existing information, field surveys were performed by Inter-Fluve to document existing conditions and to field verify available datasets. Survey work included a topographic survey of bank cross-sections, top-of-bank locations, and site features including utilities, highway support columns, building corners, and other features that may be critical for initial project planning and design.

An overview of the Project Area showing various site features and the proposed PGE isolation cap is included in Figure 4.

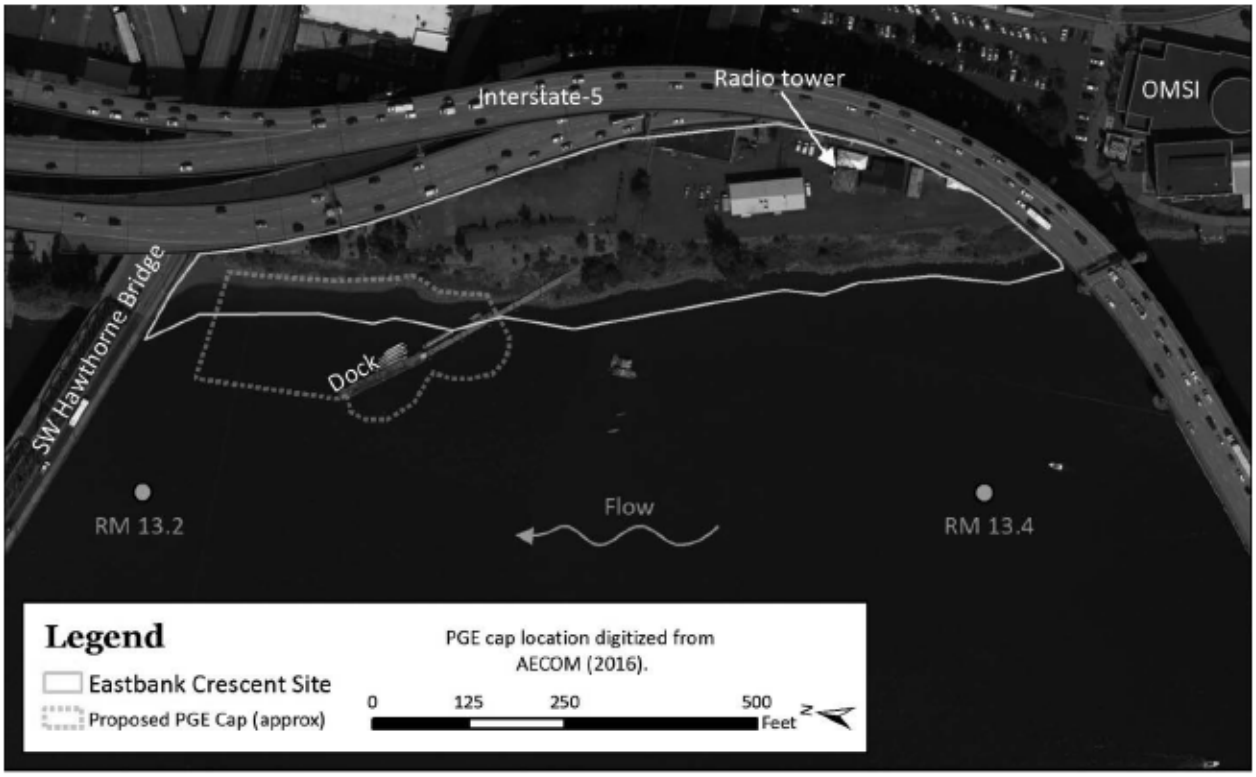

Figure 4. Eastbank Crescent Project Area

3.2. Topography and Bathymetry

The Project Area extends along the east bank for approximately 1,100 feet between the Hawthorne Bridge and the Marquam Bridge. The bank in this area exhibits relatively uniform conditions with subtle differences in bank slope, height, and river channel depth. For the purposes of the site analysis, the Project Area was split into three zones that represent the variation in conditions across the site. These zones are depicted in Figure 5 and are referenced throughout the following site analysis sections. In general, Zone 1 exhibits low bank height, with shallow water depths and low bed slopes. Zone 3 exhibits higher and steeper banks, with deeper water and steeper bed slopes. Zone 2 is intermediary between Zones 1 and 3. There is a slight inflection point just upstream of the boundary between Zones 1 and 2 where the bank to the north bends to the east. This may have some effects on near-bank hydraulic and sediment conditions, and is discussed later in this document. Additional information on bank and nearshore conditions, including depths, reference water levels, and representative cross-sections is depicted in Appendix A.

The river at the Project Area is approximately 1,400 to 1,500 feet wide and flows northwest. The thalweg of the Willamette River shifts from the east to west bank in the downstream direction (Figure 6). The south end of Zone 3 is very close to the channel thalweg, while the thalweg is on the west bank at the Hawthorne Bridge near the north end of Zone 1. The deepest bed elevation in this section of river is located across from Zone 2, at approximately -36 feet (City of Portland [COP] datum) (for reference, ordinary low water (OLW) is 3.0 ft COP). Shallow water can be seen near bridge pilings, with scour holes downstream. Along the east bank, in the Project Area, depths range from -22 ft COP at the upstream end to -2 ft COP at the downstream end. Bathymetry surveys in recent years depict a deep scour hole

under the boat dock that extends to approximately -22 ft COP. This scour hole, which exposed the City water main and PGE electrical lines, was filled with riverbed stone in March 2016 by PGE.

The river bank within the Project Area drops off steeply from the top of bank to the toe (Figure 6). Bank heights (vertical change in elevation) measured from toe to top of bank range from approximately 10 feet in the downstream portion of the Project Area to over 20 feet near the upstream end just north of the Marquam Bridge piers. Bank slopes range from gradual 15% slopes up to nearly 45% (1:1) slopes.

The average streambank slope becomes progressively shallower moving in the downstream direction. Zone 3 contains the steepest slopes and highest banks; Zone 2 has a mixture of steep and shallow slopes; and Zone 1 has the shallowest slopes and lowest banks.

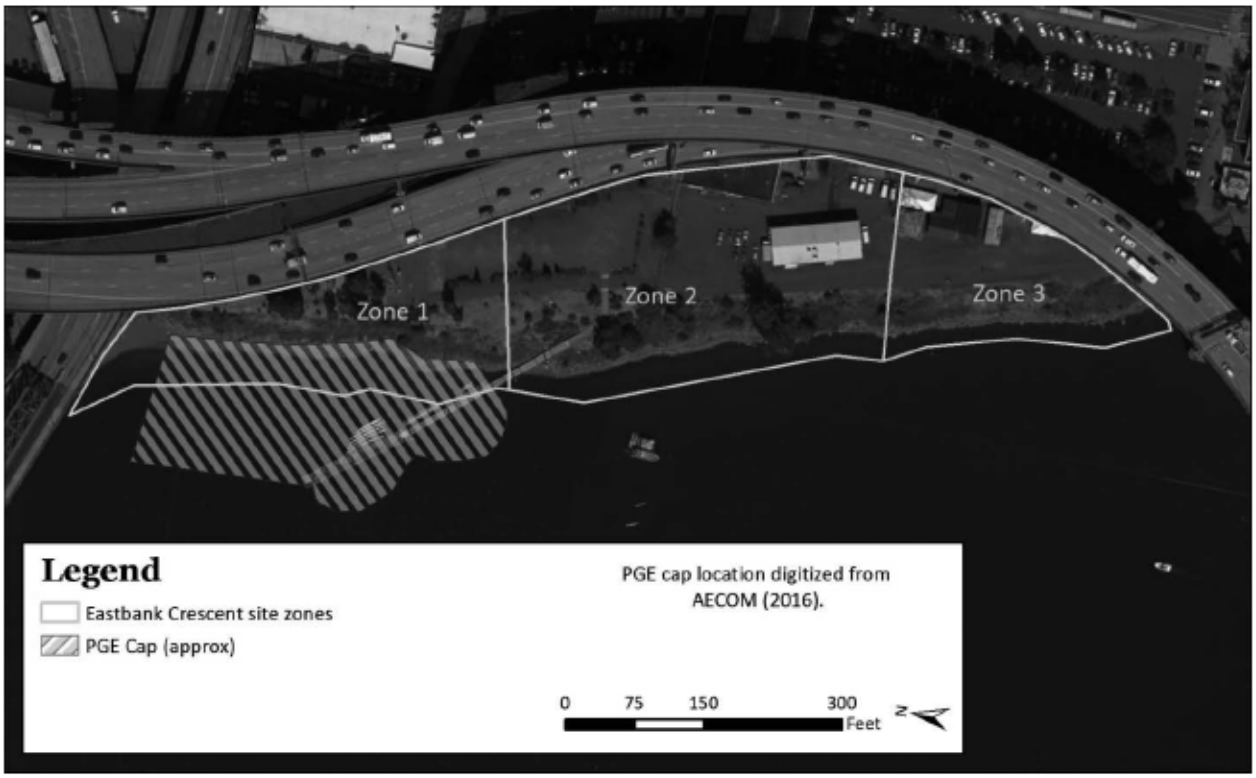

Figure 5. Eastbank Crescent Project Area Zones

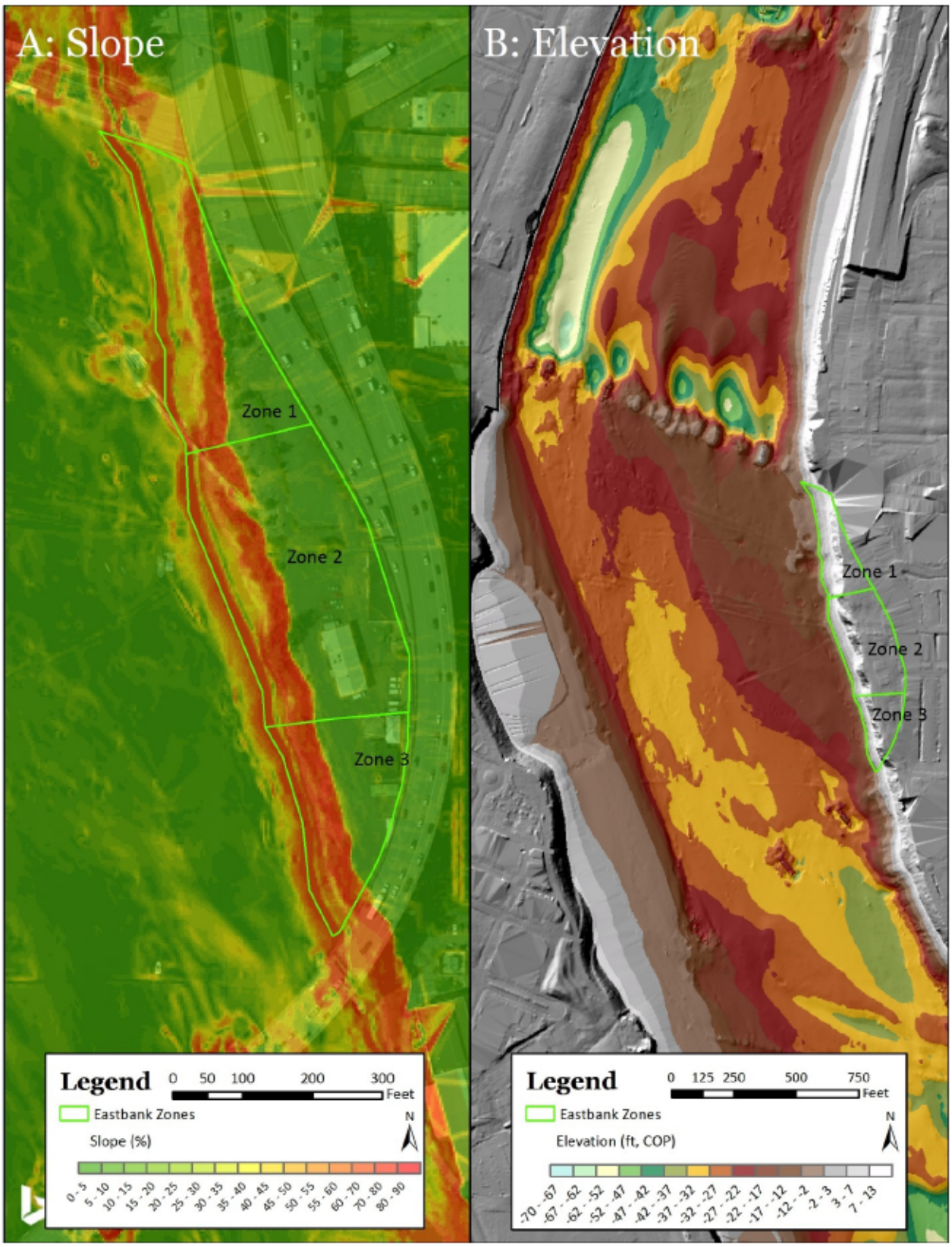

Figure 6. River Channel Slope and Elevation Variation at the Project Area

3.3. Hydrology

The lower Willamette River has a low gradient as it runs through Portland to its confluence with the Columbia River. The river is tidally-influenced and backwatered by the Columbia River up to Willamette Falls at RM 26.5. The Project Area is located between RM 13.1 and 13.5, which is roughly halfway from the mouth to Willamette Falls. Even during low flow stages, the Columbia River backwater and tidal signal affect stage elevations in the Willamette River. Diurnal tidal fluctuations in the Willamette's water surface elevations range from <1 foot to 4 feet depending on the time of year (Tetra Tech 2012). The highest flows in the Willamette occur in the winter, between November and February. Tidal fluctuations during high flows are much less pronounced than during low flows, which typically occur between July and November (Figure 7). The flow and/or stage of various flow events are included in Table 1.

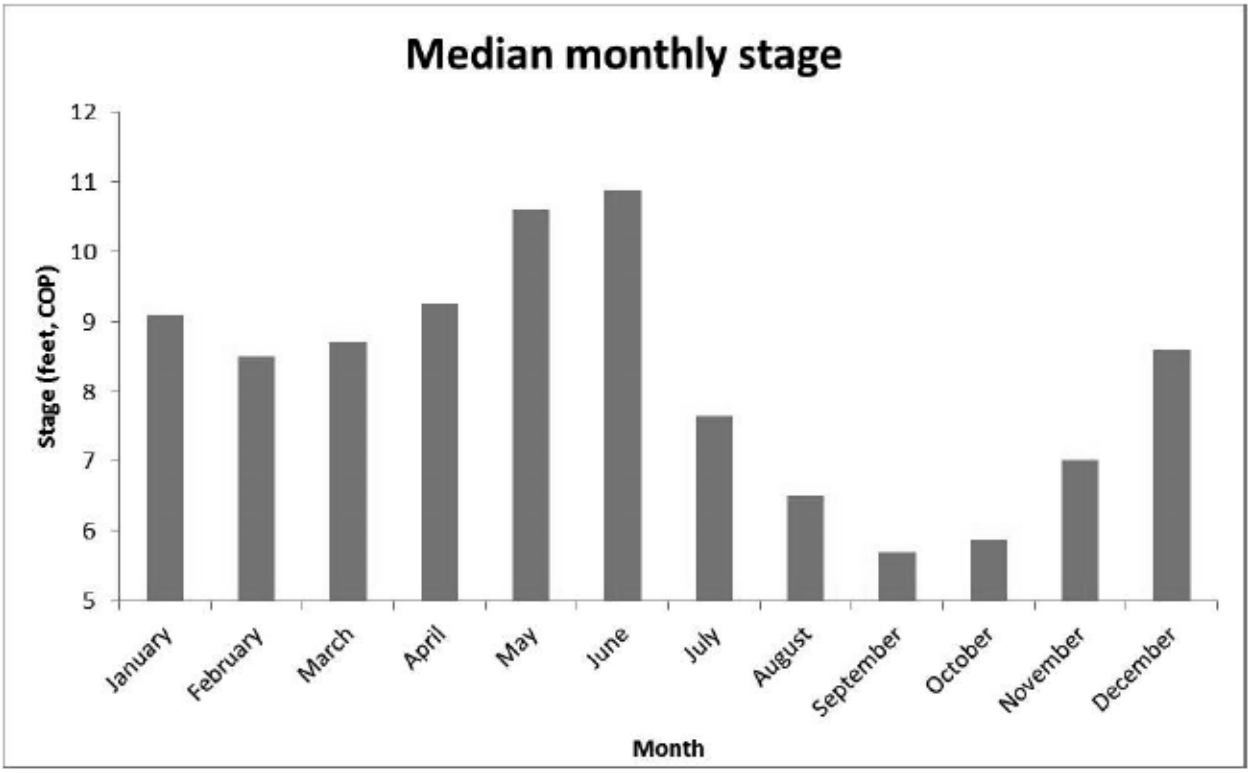

Figure 7. Median Monthly Stage. Data from Morrison Street Gage located ~0.5 miles downstream (USGS gage # 14211720) based on 26 years of data (1988 – 2015).

Table 1. Discharge and/or stage for various flow events on the Willamette River at downtown Portland (URS 2014).

Flow Event	Discharge (cfs)	Stage (ft in COP Datum)
Ordinary Low Water		3.0
Median May Flow		10.6
Regulatory Ordinary High Water		18
2-year recurrence flood	152,656	
10-year recurrence flood	217,920	
50-year recurrence flood	259,414	
100-year recurrence flood	274,030	29.6

3.4. Channel Hydraulics

Existing Available Hydraulic Data

Hydraulics analysis information for the Project Area primarily comes from analyses performed as part of the PGE RM 13.1 project. Although the PGE project is located in the downstream portion of the Project Area, the hydraulics information covers the full extent of the Project Area. The PGE RM 13.1 hydraulic analysis efforts included development of a one-dimensional (1-D) HEC-RAS model and a two-dimensional (2-D) MIKE 21 model to estimate site-specific velocities and flood elevation impacts; a boat propeller wake analysis to inform design of cap and armor layers; and Acoustic Doppler Current Profiler (ADCP) bathymetry and velocity data collection.

In 1-D models, hydraulic parameters such as water surface elevation and velocity are output from the model as an average for each cross section. The 1-D model developed for the PGE project is a step backwater model that estimates site hydraulics developed from calculations at discrete cross sections along the river. It was verified by comparing velocity measurements to velocities predicted by the model and were found to be accurate to ±0.1 feet per second (fps) within a range of 0.4 to 0.6 fps. The 1-D model was developed primarily to validate input parameters and to evaluate a 100-year flood event, confirming that there was no rise in the 100-year flood elevation resulting from the PGE cap project.

The MIKE 21 2-D model is developed from a horizontal mesh or grid where hydraulic parameters such as water surface elevation and velocity are output at each cell in the mesh and are averaged throughout the depth of each cell. The 2-D model provides better resolution for site-specific velocity since velocity is expected to vary substantially within a cross section of the Willamette River. The 2-D model was used to develop a stable rock size for the riverbed at the PGE isolation cap project location.

Existing hydraulic modelling provides some insight into existing hydraulics within the Project Area and provides a framework and model layout for future use. However, hydraulics have been run only for flood flows (100-year, regulatory event) and consequently provide little insight to near-shore velocities at flows relevant to fish use and habitat function. Going forward in the design process, the 1-D model will be useful for documenting Federal Emergency Management Agency (FEMA) regulatory requirements. Most notably, FEMA's requirement of no rise in the 100-flood elevation. Two-dimensional modeling will be more appropriate for matching design elements to design criteria related to habitat use.

Velocity

There is information on flow velocities in the Project Area from measurements and modeling completed as part of the PGE RM 13.1 project. Velocities during a 100-year flood event were estimated to be 4 to 5 fps (URS 2014). Under ordinary flow conditions, current velocities along the bank are relatively small. ADCP surveys conducted for the PGE RM 13.1 project on June 26, 2013 indicated that surface velocities within the PGE project area decreased in the downstream to upstream direction, with averages ranging from 0.5 feet per second (fps) near the riverbank to an average of 0.7 fps near the western boundary of the PGE project area (URS 2014). The velocities recorded on June 26, 2013 correspond to a daily river discharge of 15,600 cfs and a stage height of approximately 10.88 feet (COP datum) recorded at the Morrison Street gage (for comparison, median June stage is 10.9 feet, COP). Velocities were relatively constant through the water column. There is no measured velocity data available for the upstream portion of the Project Area; however, it is assumed from site observations and bathymetry conditions

that velocities would be similar or slightly greater than those measured in the downstream portion of the Project Area.

Recent field observations suggest that near-bank velocities are higher in Zones 2 and 3 compared to Zone 1. This is likely due to the inflection point in the bank, which is located just upstream of the intersection of Zones 1 and 2. The dock, also located in this area, is likely contributing to observed differences in velocity. During field surveys, the dock was observed to create a velocity shear line (e.g. eddy line). This structure appears to create a velocity shadow with a downstream eddy of lower velocity. However, this hydraulic effect may only occur near the water surface zone that is affected by the dock.

Boat Wakes and Propeller Wash

Boat wakes and propeller wash are a potential source of bank erosion and scour along the Project Area. Small recreational vessels are relatively common through this reach, especially during the summer months, with occasional effects from larger vessels. For the PGE RM 13.1 project, the potential effects of boat wakes and propeller wash on sediments and shorelines were analyzed in order to determine the size of rock that would remain stable when exposed to these forces (AECOM 2016). The results of this study identified that a cobble size material (approximately 5-inch diameter) was necessary to remain stable from propeller wash. A wave-wake analysis produced a stable rock size of approximately 4-inches diameter for wave erosion.

In 2014, a bank stability assessment for Swan Island (located downstream of the Project Area at approximately RM 3) found that the scour potential from boat wake-induced waves was larger than that of flow-induced scour at the Swan Island site. Flow-based velocities and shear stresses under the 100-year event were generally low and the overall magnitudes of combined velocities and shear stresses over the range of the Swan Island site were not very large; the highest velocities were less than 2.5 fps for all cases (Tetra Tech 2014). While the results of the Swan Island bank stability assessment may provide some insight for current analyses at the Project Area, there are certain geomorphic contextual differences. For instance, fetch length and bank slopes differ between Swan Island and Project Area. The size and types of boats expected in the areas may also be different. These differences make significant comparisons of the two assessments difficult.

These studies suggest that boat traffic will likely have a significant effect on hydraulic conditions and bank erosion along the banks in the Project Area. These effects may be more significant than the effects of large floods in that they occur much more frequently and are a potential source of chronic bank instability. Design of near-shore habitat treatments will need to take these conditions into consideration.

3.5. Erosion and Sediment Dynamics

The sediment at the Project Area is governed by erosional processes, depositional processes, and also the legacy of past fill and placement of bank armoring. Sediment conditions observed on the channel bed include primarily sand, with various amounts of coarser material including gravel, cobble, and small boulder sized material. The larger coarse material is angular and is likely sourced from past fill material placed along the bed and banks of the river.

The lower Willamette River through this reach is, in general, a low gradient, tidally-influenced depositional zone; and the Project Area itself is on the inside of a bend, with a shallower bar form compared to the deeper thalweg on the west bank. However, historical changes to the river, including

substantial artificial channel confinement, likely served to increase the sediment transport capacity of the reach as a whole. In addition, supply of bedload may have decreased as a result of past upstream bank armoring and watershed development. These conditions would suggest that sediment transport may have increased in relation to deposition, resulting in a period of non-equilibrium conditions and a coarsening of the channel bed.

The historical trend of increasing sediment transport capacity (relative to deposition) of this reach is supported by a study of bathymetric change that was performed by the LWG in 2002. This study estimated changes in channel bathymetry from 1888 to 2001 and from 2002 to 2009. Preliminary results from this analysis show deepening of the channel in the vicinity of the Project Area from 1888 to 2001. Deepening upstream of the dock in zones 2 and 3 was between 10-20 feet, while deepening between the dock and the Hawthorne Bridge was 0-10 feet (LWG 2002). From 2002 to 2009, there was relatively little change in bathymetry in the Project Area. These results may indicate that past channel changes occurred but have now stabilized, which could be the result of either a resumption of an equilibrium sediment transport regime or the establishment of coarse, erosion-resistant lag deposits on the channel bed. Regardless, the presence of general bed stability is an important consideration with respect to project planning, and indicates that further significant channel bed changes across the Project Area as a whole may be unlikely.

The investigative work associated with the design of the PGE RM 13.1 project concluded that the site was primarily a depositional zone with significant scour not expected under ordinary flow conditions (AECOM 2016). Nevertheless, we do know that significant scour is possible if abnormal conditions develop or in response to structures that affect channel hydraulics. This is evident from the scour hole that developed under the dock as well as the observed scour patterns at the Hawthorne Bridge piers (Figure 6).

As for specific information on existing sediment conditions in the Project Area, we can glean some limited information from sediment samples taken from within and nearby the Project Area as part of the Sediment Profile Image (SPI) survey (LWG 2002). The SPI survey was performed as part of the Portland Harbor Remedial Investigation/Feasibility Study to "provide reconnaissance information on physical and biological features of surface sediments in the Lower Willamette River from Ross Island to the Columbia River" (LWG 2002). There were two samples taken just upstream of the Project Area (84C & 84D) and two samples taken in the downstream portion of the Project Area (83F & 83G) (see Figure 8 for location information). In the upstream sediment samples, the SPI survey classified sample 84D (located close to the riverbank) as debris with an indeterminate sediment size class. Sample 84C was located further out into the main channel and was classified as both transport and depositional, with phi class grain sizes of -1 to -2 (2-4 mm, very fine gravel classification in the Wentworth class definitions). In the downstream sediment samples, the SPI survey classified the physical characteristics for sample 83G (located very near to the riverbank) as a sediment transport site. This sample is located upstream from the area identified in field observations as a slightly depositional (beach) zone. Grain sizes at sample site 83G were in the phi class 4 – 3, a very fine sand. Sample 83F (located slightly further from the riverbank than 83G) had a physical feature characterization of debris with a resulting indeterminate grain size. The results from the SPI survey indicate there are sediment transport as well as depositional processes occurring in and nearby to the Project Area.

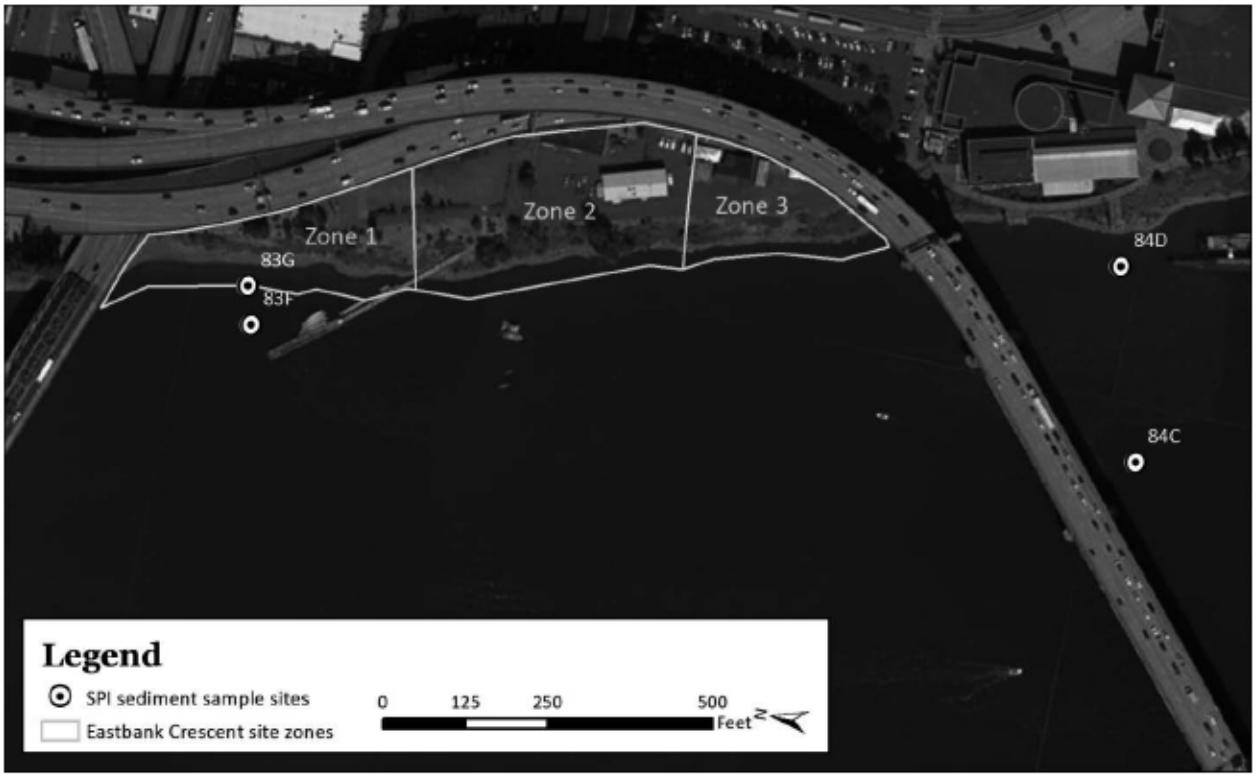

Figure 8. Sediment Sample Locations Taken by LWG (LWG 2002).

3.6. Bank Condition and Stability

Although there have been few studies of bank stability in the Lower Willamette River, banks within this reach are thought to be stable, in part due to the highly developed banks of the Portland Metro region within this reach (AECOM 2016). Riverbank conditions in the Project Area in particular are highly altered from natural conditions. Steep banks have been covered in riprap and concrete rubble, in addition to metal and other litter deposited by the river during higher flows. Years of industrial usage of the Project Area has resulted in compacted soils, limited large vegetation along the bank, and the dominance of invasive plant species, see Section 2.2. The riprap and rubble provides controls for bank stability; however, there are limited natural controls such as vegetative roots or downed woody debris.

Conversion of the existing armored bank to a more naturalized and vegetated bank would have important habitat benefits. However, bank stability will be reduced, especially in the short-term, if vegetative treatments alone are used. Future habitat work on the bank will need to use detailed hydraulic modeling of proposed conditions to ensure that treatments will achieve the necessary stability given nearby infrastructure that could be put at risk. Nevertheless, given the relatively modest flood velocities predicted from the existing hydraulic models, it is assumed that a number of different bio-engineering techniques could be used to protect the bank from erosion while also providing important habitat benefits. These techniques could include rigid or semi-rigid structural components combined with vegetative plantings to achieve multiple objectives.

3.7. Large Wood

The volume of large wood (LW) present in shallow water habitat within the Project Area is critically low. At least 9 pieces of large wood were documented as embedded in the river sediment during debris surveys in 2015 for the PGE RM 13.1 project. The debris survey did not cover the entirety of the Project Area, and it is assumed there are additional pieces of LWD buried or partially buried in the bed throughout the remainder of the Project Area.

Minimal additional data are available on LW presence or movement through the lower Willamette River. Field observations show that LW is regularly rafted against the boat dock, indicating that there is some movement of LW through the channel, likely during higher winter flows (Figure 9). However, there are no large or permanent woody structures or jams that provide habitat complexity below the surface found within the Project Area.

Photo by IFI, December 2015

Figure 9. Woody Debris Racked Up Against Boat Dock

3.8. Vegetation

Compared to other riverbank areas along this section of the lower Willamette River, there is relatively high vegetative cover within the Project Area. However, compared to natural conditions, vegetation is sparse and the vegetation community is dominated by invasive species. Vegetation was typically

observed above 10 feet COP datum and was occasionally observed at lower elevations (for reference, ordinary high water is 18 feet, COP). The percentage of riverbank (up to top of bank) that is covered by vegetation (not including grass) is approximately 70%, which was calculated by digitizing vegetated areas based on aerial imagery from June 2014. The Project Area as a whole – including upland areas as well as river banks – has approximately 25% vegetative cover (Figure 10).

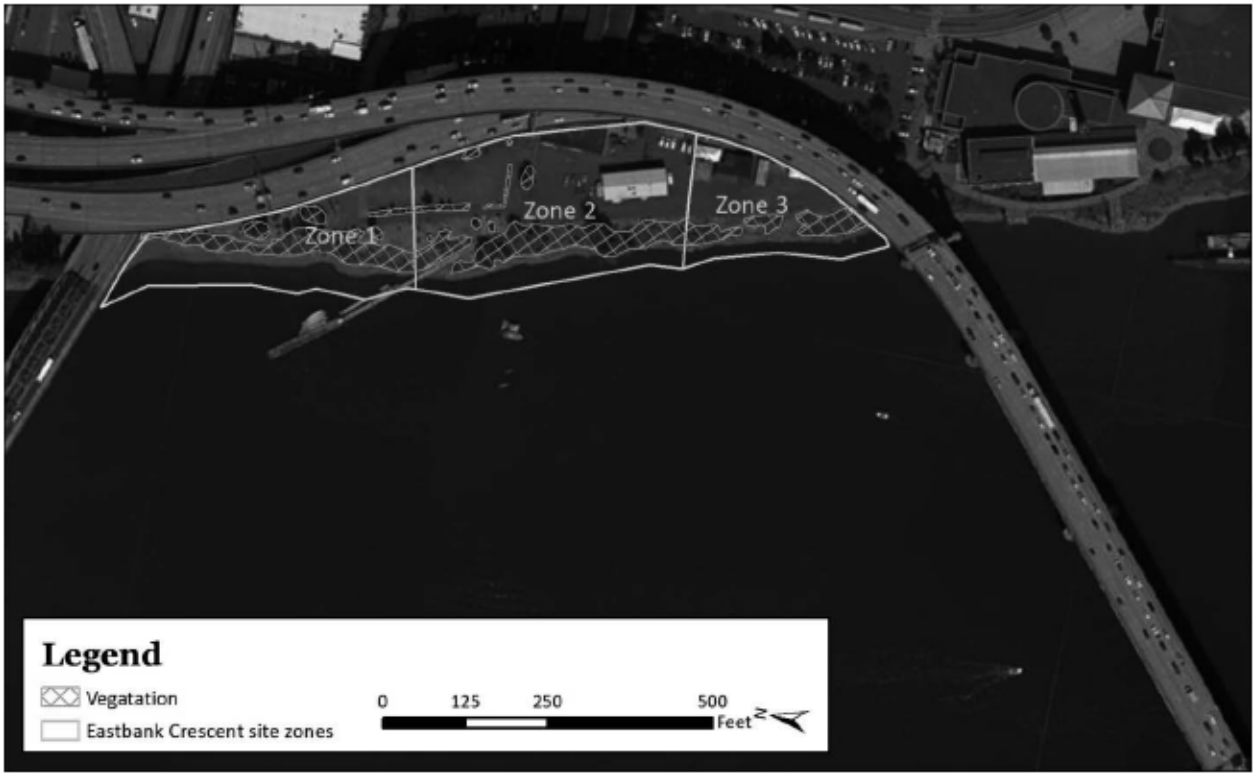

Figure 10. Vegetative Cover in the Project Area

The vegetation along the bank is dominated by Himalayan blackberry interspersed between riprap and rubble (see Figure 11 –Figure 16). There are few mature trees; the largest being 3 large (24-inch diameter) cottonwoods located below the top of riverbank in the downstream portion of the Project Area. Evidence of beaver activity is present on the trees (Figure 12). The riverbanks downstream of these trees are largely covered only in blackberry (Figure 13).

The vegetation present in Zones 1 and 2 consists primarily of Himalayan blackberry along the river banks. Native trees and shrubs, such as alder, willow, Indian plum, sequoia, red currant, Oregon grape, and salmonberry have been planted near the top of bank and in the upland portions of these zones, from the boundary with the OMSI-owned property north to the Hawthorne Bridge (Figure 14 and Figure 15). These trees and shrubs are doing well in the upland portions of the Project Area; however, the riverbank plantings of similar native species are being encroached upon by the invasive blackberry and other species (Figure 16). Zone 3 vegetation is located solely on the river banks, and consists of Himalayan blackberry.

Photo by Inter-Fluve, Inc.

Figure 11. Blackberry and Riprap on Downstream Portion of Riverbank in Zone 3.

Photo by Inter-Fluve, Inc.

Figure 12. Large Cottonwood Trees in Zone 2. Note the large slabs of concrete rubble surrounding and extensive beaver activity on these trees.

Photo by Inter-Fluve, Inc.

Figure 13. Himalayan Blackberry on the Riverbank of the Northern Portion of the Project Area in Zone 1.

Photo by Inter-Fluve, Inc.

Figure 14. Landscaped Native Vegetation in the Upland. Note the number of tents and homeless shelters present.

Photo by Inter-Fluve, Inc.

Figure 15. Another image of landscaped native vegetation planted within the upland portions of the northern half of the Project Area in Zone 1.

Photo by Inter-Fluve, Inc.

Figure 16. Native Plants Located on the Riverbank in Zone 2.

3.9. Fisheries and Aquatic Resources

The Project Area is located in the Lower Willamette River (LWR) management unit (ODFW). This unit extends from Willamette Falls downstream to the confluence with the Columbia. The LWR is of high ecological significance because all anadromous fish that spawn in the Upper Willamette River upstream of Willamette Falls (UWR) pass through this reach. Many populations use this reach multiple times throughout their lifecycle; steelhead trout are iteroparous, meaning that they may not expire after spawning, thus returning to the ocean for another rearing season before coming back to the river to spawn again and again. Tributaries of the LWR such as Johnson Creek provide spawning habitat for cutthroat trout, steelhead, and coho salmon, and are known overwintering grounds for juvenile salmonids (Tinus et al. 2003, Primozich and Bastasch 2004). Although the LWR mainstem does not have a unique, locally spawning anadromous fish population, most native fish species including juvenile salmonids are found here year-round (Primozich and Bastasch 2004). The LWR provides critical habitat for the following Evolutionarily Significant Units: UWR Chinook, UWR steelhead, Lower Columbia River (LCR) Chinook salmon, Columbia River chum salmon, LCR coho salmon, and LCR steelhead.

The LWR provides rearing and migratory habitat for both UWR and LCR fish stocks. Subyearling Chinook from the Willamette River (spring), West cascade tributary (fall and spring), Spring Creek Tule (fall), and Upper Columbia River (summer/ fall) Chinook salmon stocks have all been found in the LWR in the vicinity of the Project Area (Teel et al. 2009). Juvenile salmonids from other stocks may also utilize this habitat as they migrate downstream through the Columbia River.

Four anadromous species of Pacific salmon and trout (salmonids) pass through this reach twice in their lifecycle; once as juveniles that require complex habitat to rest, feed and avoid predators, and again as returning adults that require habitat to rest and avoid predation as they migrate up into their spawning reaches. Pacific lamprey also migrate through the reach twice and have been found spawning in tributaries of the LWR (Tinus et al. 2003). Their habitat requirements vary from those of salmon, but the objectives of using the area are the same: resting, feeding, and predator avoidance. White sturgeon stage in the area after spawning in May and June, preparing to migrate to the estuary where they reside through the fall and either return to spawn or head out to the ocean to feed (Melissa Brown, BES, pers. communication). Resident largescale suckers are abundant along the shoreline throughout the year, as are prickly and reticulate sculpin.

The UWR supports salmonid species with unique life histories. Willamette Falls (RM 26) is a channel-spanning basalt waterfall that was historically only passable periodically during winter and spring high flow periods by winter steelhead and spring Chinook. This limited passability led to unique run timings, isolation from other stocks, and significant local adaptation relative to other Columbia River populations (Primozich and Bastasch 2004). Run timings of these upper Willamette fish are remarkably similar to fish in the Clackamas River - a tributary to the Willamette, which enters just downstream of Willamette Falls. Clackamas River populations likely originated from upper Willamette fish that could not pass the falls and strayed into the Clackamas. Pacific lamprey migrate up and over Willamette Falls and into spawning grounds upstream during lower flows; however, they have been observed moving through the falls reach at various times of the year (Melissa Brown, BES, pers. communication).

Species, life stages, habitat preference, migration rate

Juvenile salmonids use habitat in the LWR year-round. While residence times are short, significant rearing and growth occurs in this reach. Spring Chinook juveniles are most abundant in the LWR, while juvenile fall Chinook, coho, and steelhead are found in lower numbers in the LWR. Figure 17

demonstrates key migration periods of different LWR juvenile and adult salmonid species. Figure 18 shows how migration timing relates to river discharge. This information can be useful for planning for the specific type and location of fish enhancement features.

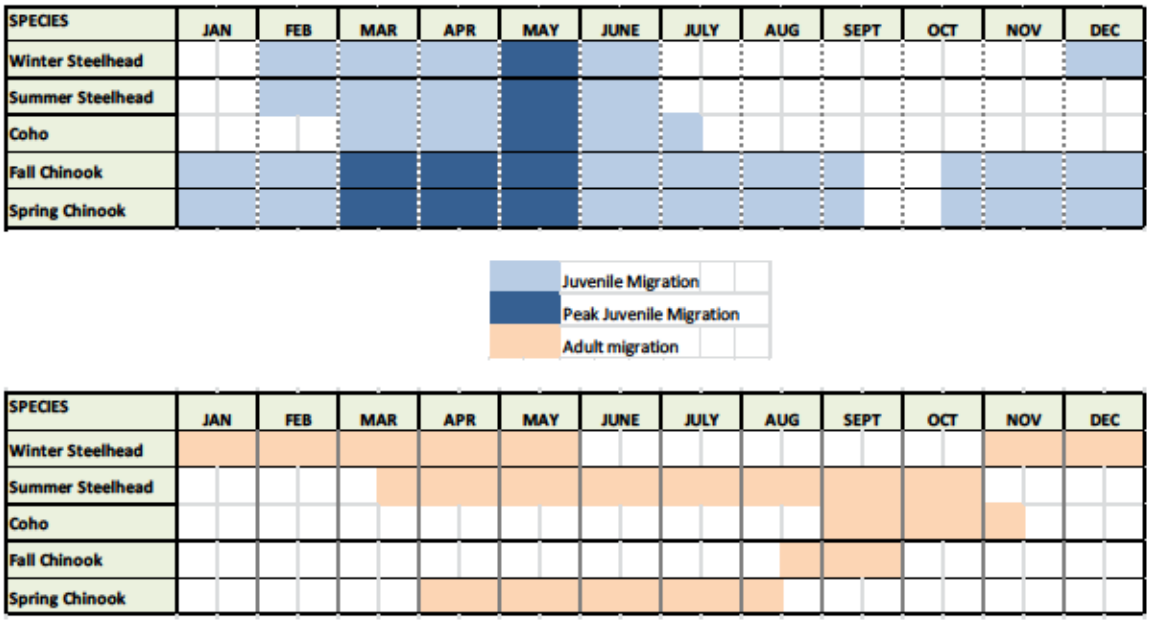

Figure 17. Migration Timing of Anadromous Salmonids in the Lower Willamette River. Adult fish data are from Willamette Falls fish counts and juvenile data are from Friesen (2005).

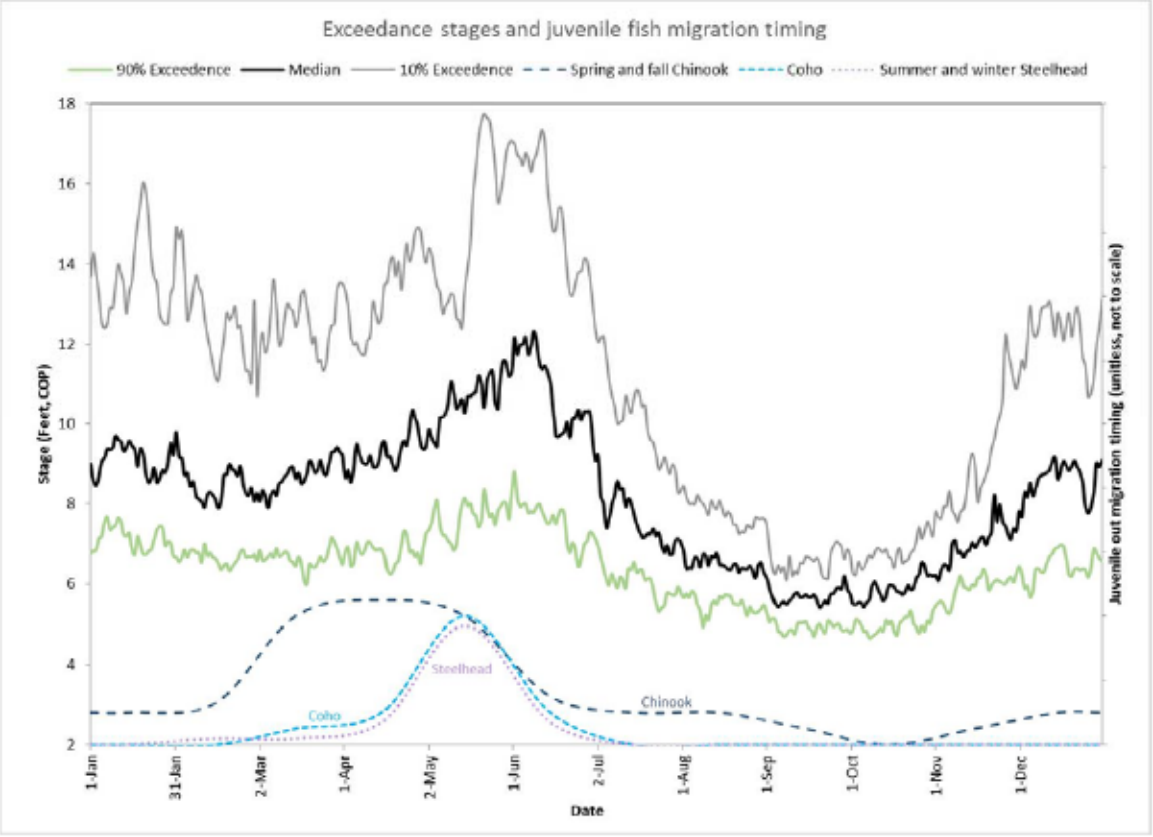

Figure 18. Exceedance Plot and Fish Timing Data. Exceedance Plot data are from Morrison Street Gage (USGS gage #14211720). Fish timing data are from Oregon Department of Fish and Wildlife and do not reflect actual abundance (Friesen 2005, Friesen et al. 2007).

Spring Chinook

UWR spring Chinook salmon are a federally listed threatened species native to the Willamette River watershed. UWR spring Chinook include spring Chinook produced in the Clackamas River and upstream of Willamette Falls, and are considered one of the most genetically distinct populations of Chinook in the Columbia River basin (Beamesderfer et al. 2011). UWR Chinook salmon are supplemented by six hatchery programs in the basin, while Columbia River stocks are supported by multiple hatchery programs throughout the Columbia River basin. Juvenile spring Chinook represent 87% of all juvenile salmonids migrating through the LWR (Friesen 2005). Of these fish, 69% emigrate as yearlings with the remaining 31% emigrating as subyearlings (Schroder et al. in press). Life history diversity of Willamette River Chinook stocks is high, with six different life histories and seven demographically independent populations contributing differently to smolt production over eight brood years of study (Schroder et al. in press, Beamesderfer et al. 2011). The relative contribution of each life history to total Chinook recruitment is highly variable over years and provides resilience to this population (Schroder et al. in press). Juveniles that emigrate as yearlings are the most dominant life history type for Chinook in the LWR.

Juvenile Chinook are found in the LWR from late fall through the following summer with peak abundances in winter and spring (Friesen 2005). Average residence times for yearling Chinook in the LWR range from 1.3-4.9 days. Juvenile Chinook accelerate as they travel downstream through the Willamette River to the Columbia River Estuary (Schroder et al. in press, Friesen 2005).

Coho

Lower Columbia River Coho salmon are a threatened species native to the Clackamas River and other LWR tributaries (Johnson and Tryon Creeks), and have been introduced above Willamette Falls (Primozich and Bastasch 2004). Juvenile coho comprised 9% of total juvenile salmonids captured during ODFW sampling. Average migration time for juvenile coho was 8.7 days, and these fish are usually only present during the winter and spring (Friesen 2005). Currently, there are no coho salmon hatchery programs in the UWR basin. The Eagle Creek National Fish Hatchery on the Clackamas River, below Willamette Falls, continues to produce hatchery coho.

Winter steelhead

UWR winter steelhead are a threatened stock native to the Willamette River watershed, while summer steelhead are hatchery fish from an out-of-basin Skamania River broodstock. UWR winter steelhead include all winter steelhead produced upstream of Willamette Falls, and do not include Clackamas River winter steelhead (Beamesderfer et al. 2011). There are four demographically independent populations of UWR winter steelhead (Beamesderfer et al. 2011). The LWR is also designated critical habitat for LCR steelhead, which utilize LWR tributaries for spawning and the mainstem for rearing and migration (Primozich and Bastasch 2004). Steelhead comprise 3% of juvenile salmonids migrating through the LWR, spend an average of 2.5 days in the LWR, and are present in winter and spring (Friesen 2005).

Fall Chinook

Fall Chinook historically would not have been able to pass through Willamette Falls in the fall and as such are not native to the UWR (Primozich and Bastasch 2004). Fall Chinook in the Willamette River have been introduced through a hatchery program. Roughly 6% of juvenile Chinook migrating through the LWR are fall run fish that emigrate primarily as subyearlings (Schroeder et al. 2003). *Habitat preference and feeding*

Throughout the LWR, yearling juvenile Chinook and steelhead are primarily found in off-shore habitats feeding on zooplankton. These species have not demonstrated to select for specific habitat types (shallow water, deep water, etc.) in the LWR (Friesen et al. 2007, personal communication with T. Friesen, 2016). Telemetry studies have demonstrated that juvenile coho prefer nearshore areas, selecting for beaches and against riprap areas. Observations indicate that subyearling Chinook are abundant in the LWR, and use beach habitats extensively (Friesen et al. 2007, personal communication with T. Friesen, 2016). Sampling conducted by the City of Portland BES also suggests that shallow water with sandy substrate and submerged willow or tall riparian canopy is selected for by juvenile Chinook (personal communication, M. Brown, BES).

Juvenile salmonids are actively feeding and growing as they migrate downstream through the LWR. Marked hatchery Chinook were found to grow 1-14mm in the LWR while unmarked subyearlings grow 1-6mm over the same distance (Friesen et al. 2007). These fish select very highly for daphnia, which comprise 90% of stomach contents by number (Friesen 2005). Daphnia and other zooplankton are usually consumed by juvenile salmonids in highly modified reservoir systems where habitat is highly modified and other prey sources are scarce (Rondorf et al. 1990). Beach habitats have high species diversity, taxa richness, and macroinvertebrate assemblages that may provide a food source for subyearling Chinook and coho, which appear to select for those habitats (Friesen et al. 2005). Near-shore habitats provide predator avoidance and easily navigable feeding grounds for these species (personal communication, T. Friesen 2016).

3.10. Streambank and Nearshore Habitat

Historical and present habitat conditions

The LWR historically provided high quality rearing habitat for juvenile salmonids. The Willamette River in Portland, a significant habitat area of the Columbia River estuary, had an extensive network of interconnected channels, slack waters, wetlands, riparian forest, and mature upland forests on the surrounding hillslopes. Off-channel lakes historically provided high-quality rearing habitat for a variety of species (Primozich and Bastasch, 2004).

Human impacts have severely reduced habitat quality in this reach. Late 19th century efforts to improve Portland's shipping and trading economy resulted in the deepening of the channel to accommodate large ships, increasing the depth to 17 feet, then 30; the current depth of the channel is now maintained at 46 feet (Tetra Tech 2012). In addition to channel dredging, floodplain lakes were diked and drained, and the floodplain was filled in. The riverbanks were steepened and hardened. These activities resulted in widespread losses of floodplains, side-channel habitat, and riparian vegetation. There was also a 79% loss of shallow water habitat in the LWR. Shallow water habitat has been defined by the City of Portland as 20 feet below ordinary low water. These shallow water habitats provide important rearing habitat for multiple aquatic species. In particular, shallow water habitat is important for subyearling juvenile Chinook rearing success (Primozich and Bastasch 2004).

In today's lower river, shallow water habitats are limited by the lack of habitat complexity, absence of native and multi-layered riparian vegetation, and substantial riverbank modifications. The greatest extent of shallow water habitat in the vicinity of the Project Area is located along the western riverbank, opposite the proposed RM 13.1 PGE cap (AECOM 2016). Within the Project Area itself, nearshore aquatic habitat is moderate to relatively deep, though there is a shallower area near the footings of the Hawthorne Bridge. Nearshore habitat may also be negatively affected by the presence of derelict wooden pilings from previous industrial uses within the Project Area. After the completion of the PGE sediment isolation cap construction, it is anticipated this portion of the nearshore habitat will become shallower. The proposed final sediment layer on the surface of the cap is currently under review by regulators for fish habitat suitability.

Riparian habitat areas are narrow and lack a diversity of vegetation that can provide cover and food to a variety of fish and wildlife. Although the river and its remaining floodplain and riparian vegetation still support over 200 species of birds and wildlife that live or migrate through Portland each year, connectivity between terrestrial habitats within and surrounding urban areas is a concern (BPS 2014). I-5 and the surrounding roadways are large physical and aural barriers to many species, migratory or stationary.

Contemporary existing upland and terrestrial habitat within the Project Area is fairly limited. A majority of the available land is covered by buildings or asphalt parking areas and a pedestrian-bike trail. The freeway overpasses and bridges with high-traffic use surround the Project Area, limiting the connectivity and value of the upland terrestrial habitat. The riparian bank is fairly steep and covered in riprap and rubble. Some species, however, have adapted to urban infrastructure in the area – a pair of nesting Peregrine falcons has been observed on the Marquam Bridge (Kaitlin Lovell, BES, personal communication).

Nearshore habitat requirements and availability

An objective of this project is to maximize rearing habitat opportunities for native fish and wildlife species. Habitat elements will be designed to increase habitat diversity and key habitat quantity which are two limiting factors for focal species in the LWR (cutthroat trout, winter steelhead, spring Chinook, and coho) (Primozich and Bastasch 2004). Juvenile salmonid use of shorelines has been shown to be related to depth, lateral bed slope, velocity, and substrate (Dauble et al. 1989, Curet 1993, Key et al. 1996, Tiffan et al. 2006a). Warmer temperatures in shoreline areas during winter and year-round protection from predation by large piscivorous fish may also be factors that favor rearing along shallow nearshore areas (Key et al. 1994). Shallow water provides protection from piscivorous predators and may provide additional growth and feeding advantages such as an easy-to-hold position, warmer waters that maximize growth in winter, and plenty of drifting food organisms.

The presence of large substrate (i.e. riprap) in river habitats has been shown to be negatively correlated with subyearling Chinook rearing in the Columbia and Willamette Rivers. In a study of shoreline habitat-type preferences in McNary Reservoir (Lake Wallula), Garland et al. (2002) found that substrate size was the most important factor in determining fish presence, with dominant substrates larger than 0.84 feet (i.e. riprap) having the lowest probability of fish presence. Similar results were obtained in McNary Reservoir by Key et al. (1996), who also noted that predator species were often located in riprap areas. Friesen et al. (2007) found that juvenile coho in the Willamette select against riprap areas, and recommends that riprap be removed or limited because it attracts crayfish and predatory fish such as smallmouth bass that may feed on juvenile salmonids as well. Even though subyearlings do not appear to use riprap for rearing habitat, they must move through these areas during their migration and are at risk of predation during these periods. Riprap also does a poor job of producing invertebrate prey that are critical to the survival of fish in rearing habitats.

Several studies have identified depth and lateral bed slope criteria that define suitable rearing habitat for juvenile salmonids in the Columbia River. Velocity also affects habitat suitability, and may be useful in the future for comparing existing and proposed habitat area. Subyearling juvenile Chinook in the Hanford Reach were associated with lateral bed slope less than 30%, and catches decline significantly on slopes >40% (Tiffan et al. 2002). These fish were usually captured within 82 feet of shore and in water shallower than 6.6 ft.

In order to understand the current and future potential availability of suitable habitat for subyearling Chinook at the Eastbank Crescent site, we calculated the amount of habitat meeting the 6.6 depth and <40% bed slope criteria. This analysis was performed at three different stages, using mean May stage (10.6 ft COP) to correspond with peak juvenile migration, 10% May exceedance (19 ft COP), and OLW (3 ft COP). As the Willamette River stage fluctuates, the band of water that is less than 6.6 feet deep also fluctuates, and the lateral bed slope of the river bottom varies. Habitat was calculated at these three different stages to see if the relative importance of zones changes under different river stages (Figure 19).

The habitat areas for each zone were divided by zone shoreline length to calculate area of habitat per lineal foot of shoreline (Figure 20). Zone 1 has the most suitable habitat, followed by Zone 2, then Zone 3. Zones 1 and 2 have suitable habitat at all stages while Zone 3 did not provide habitat during OLW. Unsuitable slope was the variable most limiting habitat suitability in the Project Area.

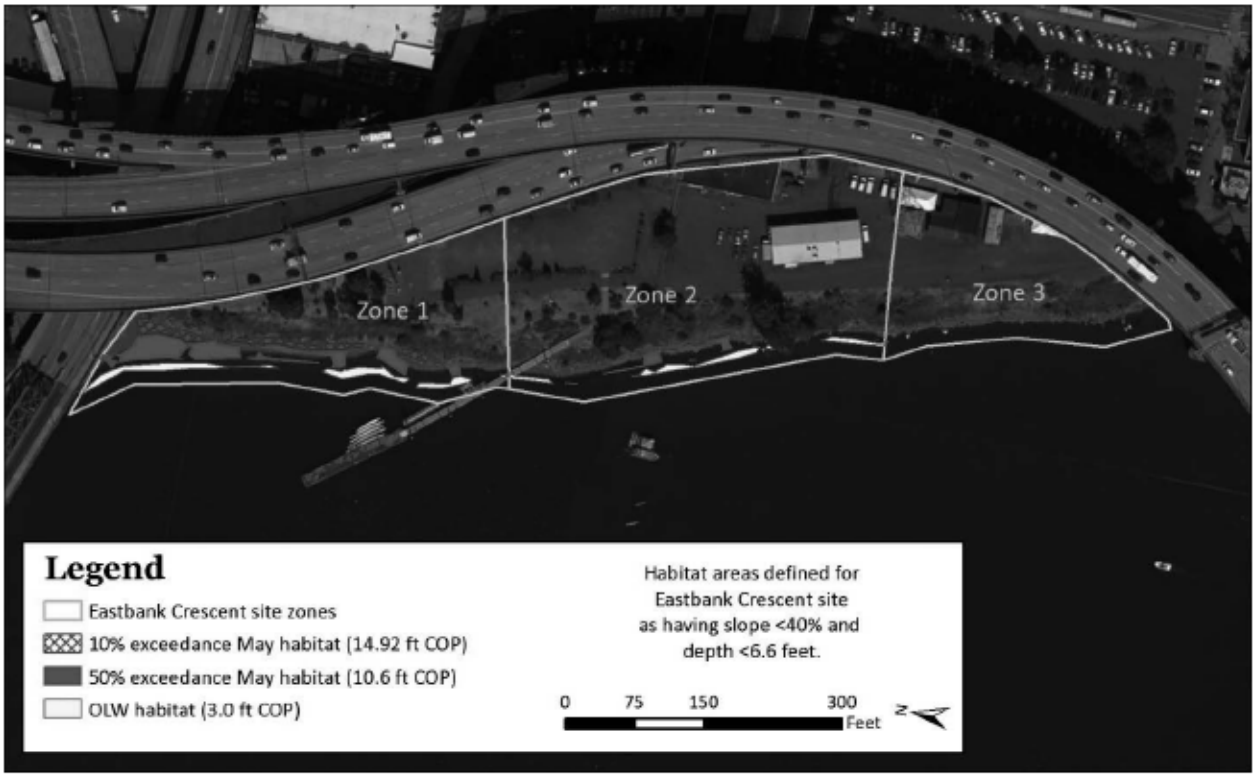

Figure 19. Habitat Polygons with Project Area. Note: 10% and 50% May exceedance polygons overlap in Zone 1.

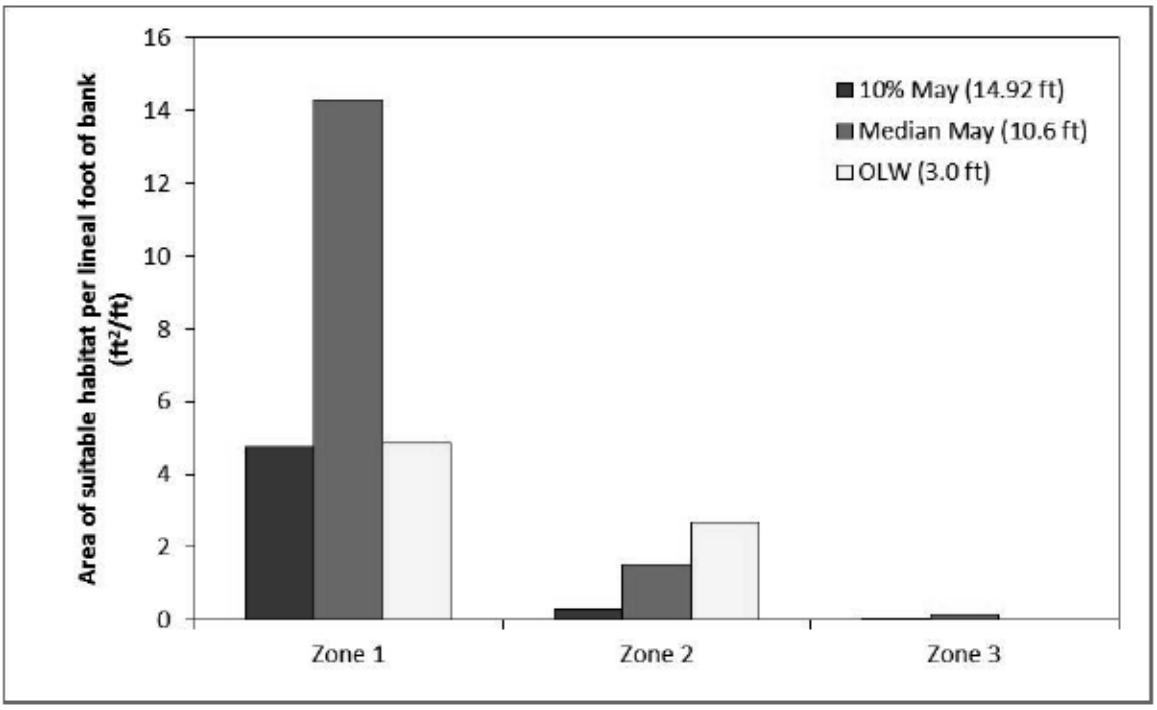

Figure 20. Habitat Area by Zone in the Project Area

The PGE cap that is planned for this site in 2017 is expected to locally alter the bed elevation and slope in the downstream portion of the Project Area (Figure 21). This is expected to increase the availability of shallow water rearing habitat for subyearling Chinook and juvenile coho salmon. Note that the PGE cap material is currently under review by regulators with respect to its suitability as fish habitat.

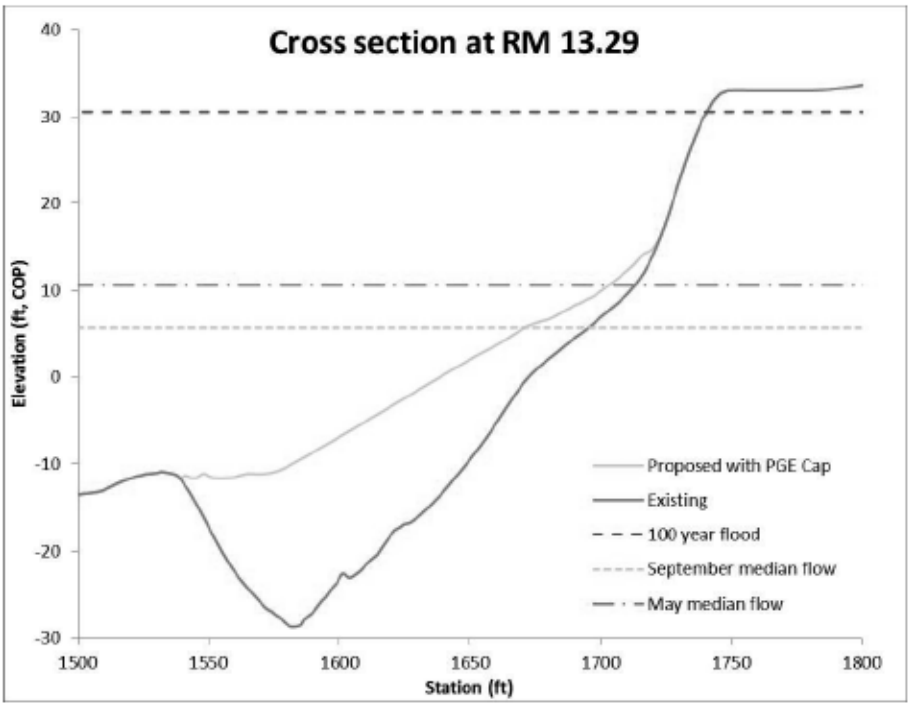

Figure 21. Near-shore Bed Depth and Slope Change Cross-Section due to PGE RM 13.1 Cap Project.

Habitat structure and predator-prey dynamics

Large wood, overhanging banks, and other habitat attributes are important components of the natural function and habitat of the lower Willamette River; however, the potential influence of habitat structure on predator-prey dynamics is a potential concern that should be considered in restoration planning. Northern pikeminnow, smallmouth bass, largemouth bass, and walleye are known to inhabit the LWR. Bass and northern pikeminnow (native to the Columbia basin, including the Willamette River) in particular are lie-in-wait predators that hide under overhanging cover and ambush prey as they pass by. All four species show clear selection for nearshore habitat and are specifically associated with pilings in the LWR (Friesen 2005, personal communication, T. Friesen 2016). There is some concern that pilings and simplified overhanging cover such as floating docks in the LWR may attract these species and increase predation rates and reduce survival and habitat suitability for juvenile salmonids.

Although this is a potential concern, there is uncertainty with respect to the degree of potential impact in the Project Area. Whereas high predation rates of these species on salmonids in the mainstem Columbia has been documented (Tabor et al. 1993, Sanderson et al. 2009), there is little evidence of predation by these species on juvenile salmonids in the LWR (Friesen 2005). However, it is reasonable to believe that similar predation rates on juvenile salmonids occur in the LWR and it is possible that certain habitat elements that benefit piscivorous species could lead to greater predation rates.

Based on these considerations, it is assumed that removing the remnant pilings in the Project Area would provide benefits to salmonids. It is also recommended to further investigate and consider how habitat restoration components, including large wood, overhanging cover, boulders, and other structural elements may influence predator-prey dynamics and to configure restoration treatments to discourage their use by piscivorous fish to the extent possible. Designing habitat features that exclude fish larger than yearling salmonids would be most beneficial. In general, it is assumed that complex large wood structures will provide a net benefit to juvenile salmonids by improving habitat diversity and key habitat quantity, two limiting factors for focal species in the LWR (Primozich and Bastasch 2004).

4. SITE CONSTRAINTS AND OPPORTUNITIES

4.1. Existing Land Uses

4.1.1. Property Ownership and Lease Agreements

The Project Area is located between the Hawthorne and Marquam bridges on the east riverbank of the Willamette River, bordered by the River to the West and I-5 to the east. There are multiple property owners related to the Project Area: OMSI, ODOT, Portland Parks and Recreation and the Portland Water Bureau. In addition, ODOT leases part of its property to Rivers East, LLC and Portland Development Commission (Figure 22). PDC currently leases space from River East, LLC for Portland Boathouse and from Department of State Lands for the Holman Dock, however both the leases expire in 2019. There are three City-owned rights-of-way that extend to the river. Oregon Department of State Lands (DSL) has jurisdiction below the ordinary high water mark.

4.1.2. Land Use

The paved Greenway Bike and Pedestrian Trail parallels much of the Eastbank Crescent's river bank, in many instances defining the top of bank. The trail is a narrow asphalt pathway intended for combined bicycle and pedestrian use, connecting the northern Eastbank Esplanade to OMSI. The beach on the north side of the project area is used in summer months for river access and swimming. Homeless tents are found under the footings of the freeway and Hawthorne Bridge in the northern portion of the Project Area and occasionally extend out into the upland areas within the Project Area.

Current zoning of the property within the Project Area includes open space along the river, general employment in the north portion of the Project Area and general industrial to the south. Proposed updates to the zoning include changing industrial zoning to central employment zoning.

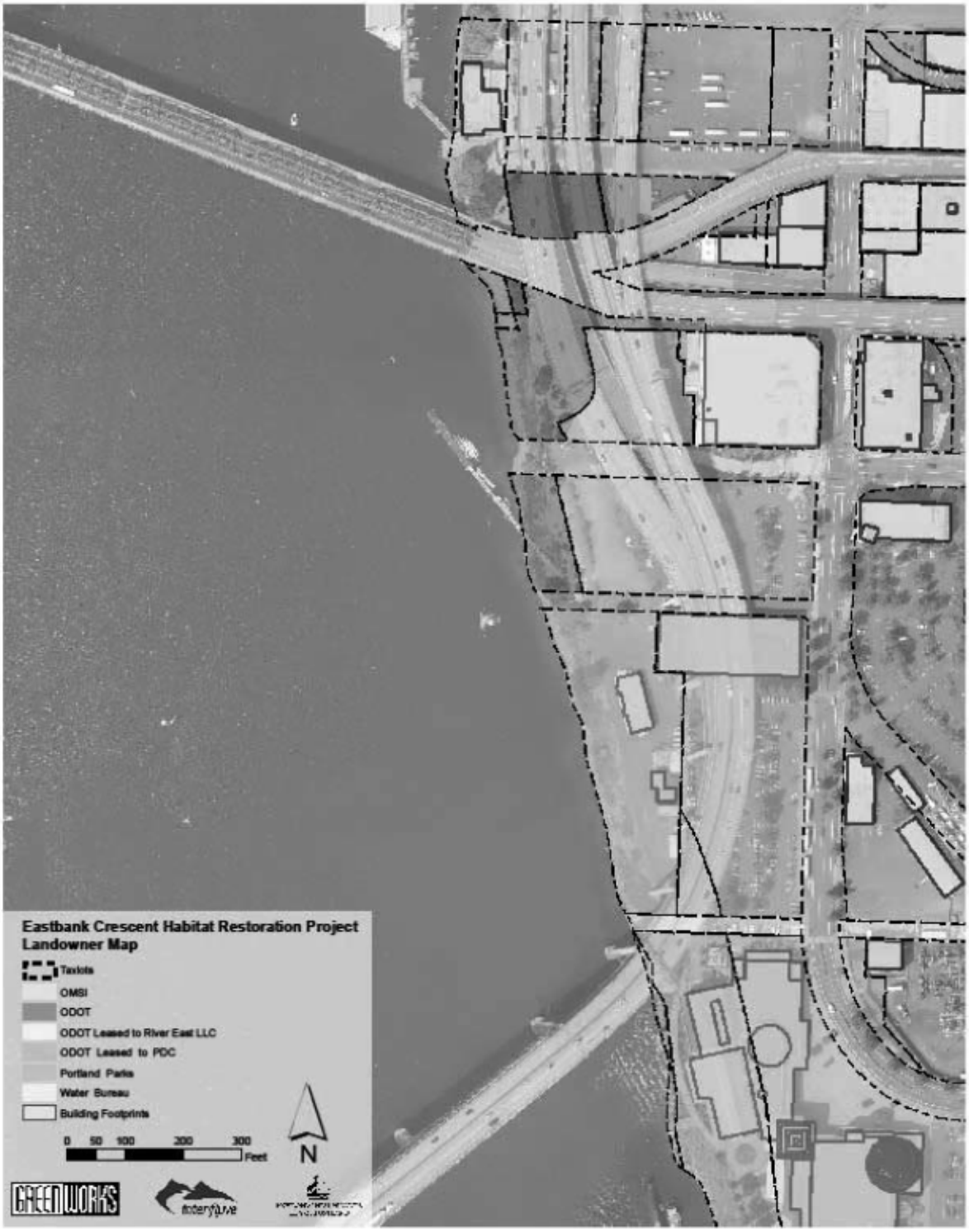

Figure 22. Landowner Map

4.1.3. Buildings and Structures

Buildings

There are several buildings and other structures located within and adjacent to the Project Area that pose limitations on the extent and type of enhancement measures. These are depicted in the Constraints Map in Appendix A and include the Pepco Building, a radio tower, and several smaller structures owned and utilized by OMSI. It is our understanding that OMSI would consider removal or relocation of the smaller OMSI buildings. However, the Pepco Building including riverside vehicular access and the radio tower will remain. For the purposes of this preliminary assessment, we have assumed a no-excavation buffer of 30 horizontal feet from these structures. This buffer, along with a buffer around bridge piers discussed below, is depicted in the Constraints Map in Appendix A.

Footings and Pilings

Upland construction activities will not occur within 30 feet of any bridge and freeway footings to minimize the risk of damage. Site surveys have noted locations of all bridge footings within the Project Area, to incorporate 30-foot setbacks into habitat restoration construction plans (Appendix A, Opportunity and Constraints Map).

Also of note within the Project Area remnant portions of derelict wooden pilings are present at the toe of the riverbank (Figure 23 and Appendix A, Constraints Map). Historically, wharves and a dock used for industrial business, such as ship building and shipping, were located within the in-water Project Area (URS 2014). Old pilings such as these were typically coated with creosote prior to installation to make them water resistant, which is toxic to aquatic organisms. Piscivorous fish species such as bass have been shown use pilings as habitat (Friesen 2005). PGE is proposing to remove or cut and bury all pilings within the cap area. We recommend the remaining pilings be removed.

Dock

A light watercraft dock, the Holman Dock, is located within the public waterway in the Project Area and is owned by PDC. Installed in 2005, the dock is anchored via metal pilings and is used primarily by recreational, non-motorized boats, such as kayaks and rowing shells. Public access to the dock is via a planked walkway from the top of the riverbank. The existing dock is slated for as part of the PGE cap work.

While options exist for moving the dock to a new location within the site, they are limited by the location of existing utilities. The current dock is situated between the buried water main/PGE electrical lines and an additional six buried electrical lines to the south. If the dock were moved upstream, it may need to be moved upstream of the more southern electrical lines to ensure piling installation would not interfere with the electrical lines. Although both of these general locations are possible, there are a couple of considerations that may favor keeping the new dock more or less in its existing location. This includes: 1) keeping the dock towards the northern portion of the site could help to concentrate human access to the water toward this end of the Project Area, thereby keeping the southern portion as more of a limited-access area that focusses more on habitat enhancement; and 2) the existing dock location provides a bit of a velocity break and debris catcher, which could provide benefits to the beach area at the northern portion of the site where more human access and use is anticipated.

Photo by Portland BES.

Figure 23. Derelict Piling Remnants in Zone 3

4.1.4. Utilities

Outfalls

There are numerous stormwater outfalls within and adjacent to the Project Area (Site Map and Constraints Map, Appendix A). Observations by Oregon Department of Environmental Quality (DEQ) water quality permit program representatives as well as city and agency records suggest that most of these outfalls are currently inactive (URS 2014).

Overland stormwater discharges to the river through three ODOT-owned and operated stormwater outfalls: one that drains from the I-5 access ramp, another from one located just north of the OMSI property and a third outfall from the Marquam Bridge. Additional outfalls with unknown ownership or status drain stormwater from properties adjacent to the Eastbank Crescent site. The ODOT outfall near the Hawthorne Bridge will be protected as a part of PGE's remediation work. To date, it is assumed the other two ODOT stormwater lines will also remain intact.

There is another known active stormwater outfall within the Project Area that belongs to the City of Portland (Outfall 33). An assessment in 2014 (URS) determined that the outfall infrastructure is damaged, resulting in stormwater discharging underground upstream of its terminus, into the riverbank. Outfall 33 is selected for abandonment and stormwater will be rerouted by the City prior to completion of the PGE remediation work.

It is assumed for the purposes of this project that any other existing outfalls (with the exception of the three active ODOT outfalls) will be re-configured as part of the alternatives design process. Additional investigation will be necessary during future phases of the project to confirm these assumptions.

Water

An active 30-inch diameter, concrete-lined steel water main owned by the City is located within the Project Area (Appendix A, Site Map) at an elevation of approximately -32 feet COP where it crosses under the riverbed. A majority of the pipe is buried about 15 feet beneath the existing sediment surface. At the riverbank and to the east, however, the pipe generally follows the ground surface contours and at the top of the bank is only buried approximately 3.5 feet deep. Earthwork will therefore need to be limited in the area near the pipe location. A scoured depression previously formed adjacent to the water main under the dock, leaving the pipe exposed along the bed of the river. The scour hole was filled in by PGE in March 2016.

Electrical

There are ten active submerged transmission cables, owned by PGE, within the Project Area (Appendix A, Site Map and Constraints Map). Four of the cables are located near RM 13.5 and three of the cables carry 15 kV each, while the fourth carries 35 kV. Installed around 1996, these cables are expected to remain in service through 2018. Initially, the cables were laid directly on the river bed. However, after the scoured depression, the cables were exposed, suspended across the top of the depression. PGE filled the scour hole in March 2016. The additional six lines are near RM 13.2, south of the Holman dock. These cable lines are active.

4.1.5. Bank Armoring

The Project Area contains significant bank armoring along slopes ranging from gradual 15% to relatively steep 45% slopes (AECOM 2016). The majority of the riverbank is covered with large riprap, cobbles, and rubble remains from previous activities at or near the site (Figure 24). A small exception to the continuous riprap armor is located at the northernmost end of the Project Area, where finer sand and gravel sediments are combined with riprap and concrete rubble (Figure 25).

Photo by Inter-Fluve, Inc.

Figure 24. Concrete Rubble Remains in Zone 3.

Photo by Inter-Fluve, Inc.

Figure 25. Small sand and gravel mixed in with larger riprap and rubble in Zone 1.

4.1.6. Beach

Located at the northern edge of the Project Area is a small sand and gravel beach (Figure 26, Figure 27). Though typically underwater during high winter flows, this beach is currently an unofficial swimming site used by the public in the summer. This project will consider the feasibility of public beach development within the Project Area.

There are several site conditions that should be considered when planning for beach improvements. In general, this portion of the Project Area is the most suitable for a human-accessed beach. This is due to a lower bank height, more gentle bank slopes for accessing the beach, and a more gentle channel bed slope (see more discussion of site conditions in Section 3 Site Analysis). Site observations also suggest there may be a velocity break provided by the bank inflection point just upstream and possibly by the dock, which also serves as a debris catcher/deflector. These conditions promote more sediment deposition compared to the south end of the Eastbank Crescent site. Existing substrate conditions, however, are marginally conducive to use as a swimming beach. Although there is sand within the Project Area, there is also angular riprap material scattered throughout the site. Regardless, substrate and topographic conditions are expected to change as a result of the PGE RM 13.1 project, which is slated for construction in 2017. The PGE project will install a cap over contaminated sediments. The cap is described in greater detail in previous sections of this report, and will result in a raising of the bed and lower bank by 2 feet. The surface material is currently proposed to be small riprap overlain with gravels. It is possible that sand could be placed on top of the cap, but based on existing hydraulics and boat wake studies, it is likely the sand would need replenishment and management to remain in place. The City of Portland BES has requested additional analysis from PGE to describe how sediment dynamics might change after cap construction (Lisa Huntington, City of Portland BES, personal communication June 2016). This information will help further characterize the future sediment composition here and the implications it may have to use as a recreational beach.

Photo by Inter-Fluve, Inc.

Figure 26. Small Sand and Gravel Beach in Zone 1.

Photo by Inter-Fluve, Inc.

Figure 27. Small Sand and Gravel Beach in Zone 1.

4.2. Contamination

In 2011, PGE determined that sediments in the vicinity of RM 13.1 contain excessive levels of contaminants (URS 2014). Based on these results, a remedial action for RM 13.1 was determined to be the installation of an isolation cap, which would occur within the Project Area. The approximate extent of the proposed isolation cap (per the 60% design plans for the PGE project) is shown on Figure 5 and in Appendix A: Site Map and Constraints Map. The proposed sediment isolation cap will cover approximately 56,900 SF (1.3 acres) and consist of approximately 9,400 CY of permanent fill being placed within the isolation cap footprint in the river.

Clean sand and gravel will comprise the isolation cap. Cap construction will first place the toe armor along the perimeter of the cap, in order to contain and buttress the sand layer that will act as the isolation barrier for the contaminants. The isolation sand layer will be placed beginning at the lowest elevation (in deeper water) and working up the slope to design elevations. After placement of the sand layer across the entire cap footprint, the gravel (body armor) layer will be placed to cover the isolation and toe armor layers. Along the shoreline, specific armor will be placed above elevation +1 foot COP. Lastly, mixed sediment sizes for the "habitat layer" will be placed in the nearshore aquatic environment to facilitate nearshore habitat restoration activities. For a discussion of the effects these activities will have on the Project Area and shallow water fish habitat, please see Sections 3.2 Topography and Bathymetry and 3.9 Fisheries and Aquatic Resources.

A larger effort to study contaminants within the Project Area's bank has not been performed. Consequently, potential impacts and limitations posed by subsurface bank contamination are unknown. For the purposes of this project, it is assumed than any excavated materials during habitat restoration activities will be considered and disposed of as contaminated.

4.3. Habitat Enhancement Opportunities

Situated between two halves of the Portland metro area, the Willamette River is economically and ecologically significant. In an ecological context, the Willamette River supports a number of residential as well as migratory aquatic species, such as salmon, trout, and lamprey – many of which are federally listed under the Endangered Species Act. Within this broader context, the largely undeveloped character and unique shallow shoreline have made the Eastbank Crescent a priority target area for potential habitat restoration within the City of Portland (e.g. Central City 2035). Given this priority, conceptual habitat enhancement opportunities were investigated as part of this effort. Habitat enhancement opportunities were developed based upon project goals, site investigations, existing available data, understanding of potential constraints (e.g. existing infrastructure, permitting), analyses conducted as part of this effort, discussions with project stakeholders, and with reference to previous restoration recommendations (BPS 2015).

4.4. Potential Habitat Treatment Planning Zones

The Project Area has been broken down into three restoration planning zones (Figure 5). These three zones correspond with the existing habitat capacity zones outlined in Section 3.1. Zones have been delineated based on local hydraulics, bedform, infrastructure, topography, and bathymetry. While some of these characteristics can be modified to enhance potential habitat (e.g. topography), existing representative characteristics of these zones lend themselves to certain geomorphically and hydraulically-appropriate treatment types (Table 2).

Table 2. Opportunities and constraints associated with existing habitat zones.

	Biophysical habitat drivers	Alternative use potential constraints	Habitat Type
Zone 1	Shallowest bank slopes Lowest banks Lowest velocity area	Most geomorphically/hydraulically appropriate location for water access	Shallow water and low-flow rearing habitat Low to moderate flow cover
Zone 2	Mixture of steep and shallow sloped banks Some existing native vegetation Moderate velocity	Most geomorphically/hydraulically appropriate location for dock (at boundary of Zone 1/Zone 2)	Low to moderate flow habitat Velocity refuge Local deep pools Margin complexity
Zone 3	Steep banks Higher velocity Most constricted cross-section		High-flow velocity refuge Margin complexity

4.5. Habitat Treatment Type Opportunities

A total of four habitat enhancement treatment type opportunities (treatment types) were identified and deemed feasible for the Project Area including habitat complexity, alcove creation, bank regrading and riparian restoration, see Appendix C for a habitat matrix and pictorial illustrations of habitat treatments and precedent studies. Although these actions are framed as separate treatment types below, they are not necessarily mutually exclusive, and combinations of the restoration treatments could be constructed within the project area. The appropriateness of treatment type varies by planning zone. Further, many treatment types (e.g. large wood) can be scaled upwards or downwards depending upon funding and desired alternative uses of the project area.

4.5.1. Habitat Complexity Elements

This treatment type opportunity includes placement of habitat elements such as large wood, logjams, or boulders in order to achieve numerous habitat objectives. Broadly speaking, these treatments can span a wide range of structure, process-based, and function-based approaches. Within the Project Area, it is likely that form-based and function-based (mainly infrastructure protection) approaches are most feasible. Due to differences in topography, hydraulics, and existing infrastructure, these treatments vary by zones. The specific element type, their anticipated benefits for the Project Area, and applicable treatment zones are detailed below in Table 3.

Table 3. Habitat Complexity Elements.

Habitat Complexity Element	Anticipated Benefits	Applicable Zones	Potential constraints
Single logs and multiple piece complexity jams	Logs could be placed to provide low flow cover and complexity	Zone 1 Zone 2	Public damage to logs Encroachment in water for swim

Habitat Complexity Element	Anticipated Benefits	Applicable Zones	Potential constraints
		Zone 3	and boater safety Unknown contaminants in bank that could be encountered during construction
Large multi-river stage log jam.	Larger log jam built from low flow beach back up into the bank could provide cover at multiple river stages.	Zone 2 Zone 3	Public damage to logs Encroachment in water for swim and boater safety No-rise permitting feasibility Unknown contaminants in bank that could be encountered during construction
Log cribwall	Structural wall built out of logs that can provide infrastructure-related stability on steep slopes, but more habitat than riprap. Vegetation can also be incorporated into structure.	Zone 2 Zone 3	Public damage to logs Evaluation of sufficient stability to support upland uses required No-Rise permitting Unknown contaminants in bank that could be encountered during construction
Boulder clusters	Clusters of larger rocks that can create scour holes over time and provide areas of reduced velocity	Zone 1 Zone 2 Zone 3	No-Rise permitting Scour effects on PGE cap and/or any placed beach sediments could be an issue.

*Note that the potential impact of habitat structure on predator-prey dynamics of juvenile salmon should be considered further before moving forward with this treatment type

4.5.2. Alcove Creation

This treatment opportunity includes the potential to increase the quantity and quality of off-channel habitat in the form of alcoves along the river bank. This treatment would likely be created via excavation into the riverbank or construction of a bank around low-velocity backwater areas. Alcove construction could be paired with placement of habitat structural elements and excavation of deeper localized scour pools to provide increased habitat complexity. Due to differences in topography, hydraulics, and existing infrastructure, these treatments vary by zones and are detailed below in Table 4.

Table 4. Alcove Creation

Habitat Complexity Element	Anticipated Benefits	Applicable Zones	Potential constraints
Alcove construction	Velocity refuge and rearing areas	Zone 1 Zone 2 Zone 3	Slope stability (shear) Unknown contaminants in bank (applicable if alcove is excavated into bank)

			Cut/fill will need to be balanced in the cross-section for FEMA No-rise certification

4.5.3. Bank Re-grading

This treatment type involves the re-grading of the existing riverbank to create a more gradual slope. Benefits of re-grading a bank are primarily structural. A more gradual riverbank slope can increase available margin habitat at a wider range of velocities and flow depths and improve suitability for riparian revegetation. Feasibility of proposed slopes along the bank ranges from maintaining existing grade (in some places 1:1) to the most gradual feasible slope of 4:1 (based upon existing constraints and topography). In general, slopes will vary due to existing infrastructure constraints and can be pulled back to various degrees throughout the project area. Due to differences in topography, hydraulics, and existing infrastructure, these treatments vary in applicability by zones. A range of grades and their associated anticipated benefits are detailed below in Table 5. Bank Re-grading Treatment Opportunities.

Table 5. Bank Re-grading Treatment Opportunities.

Habitat Complexity Element	Anticipated Benefits	Applicable Zones	Potential constraints
1:1 or maintain existing	Maintain existing condition	Zone 3	Stability of upland slope Likely needs to be paired with log cribwall for stability
3:1	Moderate slope associated with a moderate increase in available habitat area and increased surface for riparian revegetation	Zone 1 Zone 2 Zone 3	Buried utilities Unknown contaminants in bank that could be encountered during construction Excavation limits are imposed by existing infrastructure including buildings and highway supports
4:1	The largest feasible increase in habitat area (based upon existing constraints), associated with largest increased surface for riparian revegetation	Zone 1 Zone 2	Buried utilities Unknown contaminants in bank that could be encountered during construction Excavation limits are imposed by existing infrastructure including buildings and highway supports

4.5.4. Riparian Restoration

For the Project Area, riparian restoration treatment types are primarily focused on restoring native vegetation communities in order to reestablish stream shading, nutrient exchange, and to provide moderate to high flow refuge. Riparian revegetation efforts would be designed to be appropriate for the site's flow duration, intensity, and frequency of inundation as well as to mimic historical species compositions. Given the topography and hydraulic conditions of the project area, shrub and tree

communities, as opposed to emergent communities, will likely be most appropriate. Riparian revegetation treatments can be paired with all other treatment types described above.

Table 6. Riparian Revegetation Project Elements

Habitat Complexity Element	Anticipated Benefits	Applicable Zones	Potential constraints
Shrub & Tree Enhancement	Future riparian shading and nutrient exchange	Zone 1 Zone 2 Areas above top of bank	Public removal or desctruction of plants Viewshed encroachment
Pole cuttings	Pole cuttings of cottonwood or dogwood can be interspersed with log jam features and log cribwalls to improve future riparian shading and nutrient exchange	Zone 1 Zone 2 Zone 3	Public removal or destruction of plants Viewshed encroachment

5. PRELIMINARY PROJECT EVALUATION

Development of habitat treatment options will be driven by design criteria, outreach to the public, and input from a technical review team, as well as regional and City restoration objectives. Potential habitat treatments will be evaluated based upon weighing potential project benefits against challenges and relative costs. An initial list of evaluation factors is presented below and a matrix for evaluating treatment types is presented in Appendix C.

Once habitat treatment types are selected, conceptual designs will be developed with consideration given to the site goals, restoration objectives, other beneficial uses, constraints, regulations, safety, and feasibility. Design criteria will be developed to guide the design process, including providing measurable design objectives and ensure project constraints understood and explicitly addressed.

5.1. Project Benefits

Project benefits will be evaluated based upon if, and to what extent, proposed actions achieve project goals.

5.2. Project Constraints and Challenges

Project constraints and challenges will be evaluated and will include those challenges described in previous sections including, but not limited to, infrastructure, competing uses, property ownership, and permitting.

5.3. Project Costs

For the conceptual phase, projects will be evaluated based upon relative cost.

5.4. Impacts to Property Owners, Lease Holders, and other Stakeholders

As part of the potential project evaluation, impacts to property owners, lease holders, and other stakeholders will be evaluated and considered. This will include evaluation of impacts both during construction, after construction, and impacts potential maintenance actions may impose.

5.5. Permitting

There are multiple permits that may be required due to impacts the Project may have below the ordinary high water mark and near-shore activities of the Willamette River. The scope and the selected design alternative will ultimately determine which permits are required. All regulatory agencies should be consulted early and often throughout the design process to streamline permitting. Below are list of some of the permits typical to habitat restoration projects.

5.5.1. Federal

Section 404, Section 10, Section 7 and Section 106

The United States Army Corps of Engineers (USACE) requires a Section 404 of the Clean Water Act permit and Section 10 of the River and Harbors Act of 1899 permit. Requirements of this permit include

DEQ Section 401 Water Quality Certification and Endangered Species Act (ESA) Section 7 Consultation with National Oceanic and Atmospheric Administration (NOAA) Fisheries for work in the Willamette River due to the presence of endangered fish species. In addition, consultation is required under Section 106 of the National Historic Preservation Act with the State Historic Preservation Office and an evaluation conducted by the Sediment Review Group to ensure projects are not releasing contamination into the Portland Harbor.

FEMA No-rise

FEMA has jurisdiction over the regulatory 100-year flood plain and flood way. Project impacts to the 100-year water surface elevation must be modeled and documented. For project conditions that do not create an increase in the 100-year water surface elevation (0.00-ft), a report must be prepared including model results indicating a no-rise condition.

5.5.2. State

Removal/Fill Permit

The DSL requires a Removal/Fill Permit. The review is coordinated through a Joint Permit Application (JPA) with the USACE Section 404. The JPA must be submitted to both DSL and USACE, including an alternatives analysis.

DEQ Water Quality Certification and 1200 C

If the project does not fall under pre-certified Nationwide Permit issued by the USACE, DEQ water quality certification will be required. The USACE will determine if the project meets pre-certified nationwide permit or regional general permit. If the project does not, the application materials and water quality information must be submitted to DEQ separately. Construction will also require a 1200 C for Stormwater management.

5.5.3. Local

Land Use Review and Site Development Permit

City of Portland Land Use Review will be required by Bureau of Development Services due to the Project Area being in the Greenway overlay as well as how utilities will be affected by the Project. In addition, a Site Development Permit will be required for grading and erosion control.

5.6. Maintenance

5.6.1. Short and long term Maintenance

Potential and foreseeable short and long term maintenance requirements will be considered as part of the project evaluation process.

5.7. Public Safety

Given the high public use of and traffic within the Project Area, both sanctioned and unsanctioned, public safety will be a major consideration of project designs. This includes safety for public access to the Project Area via land and water.

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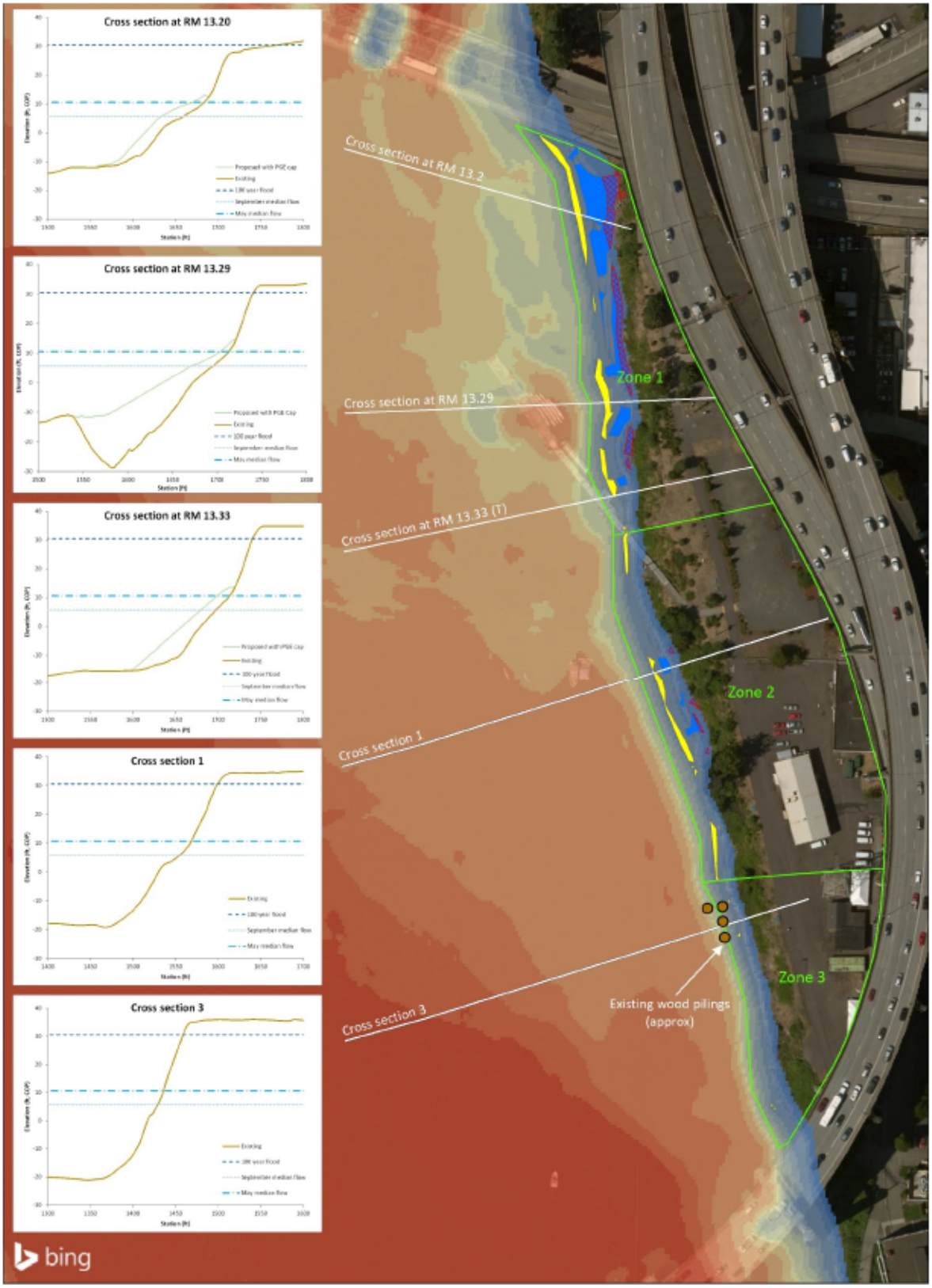
APPENDIX

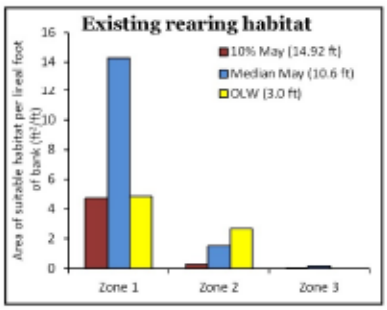
A Maps

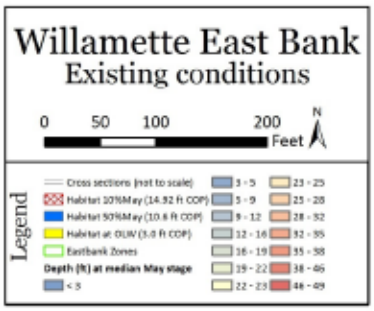
Existing Conditions

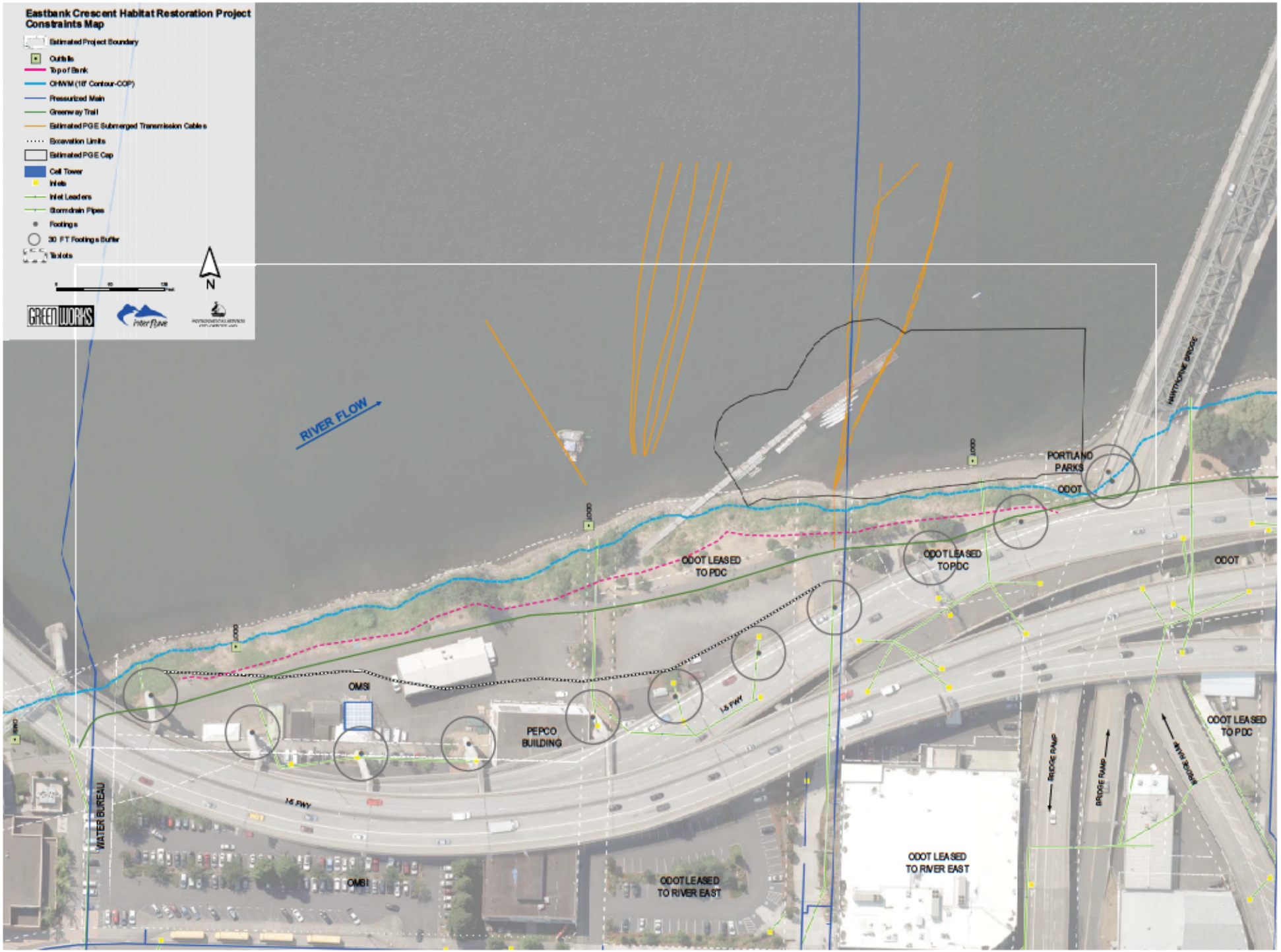
Site Map

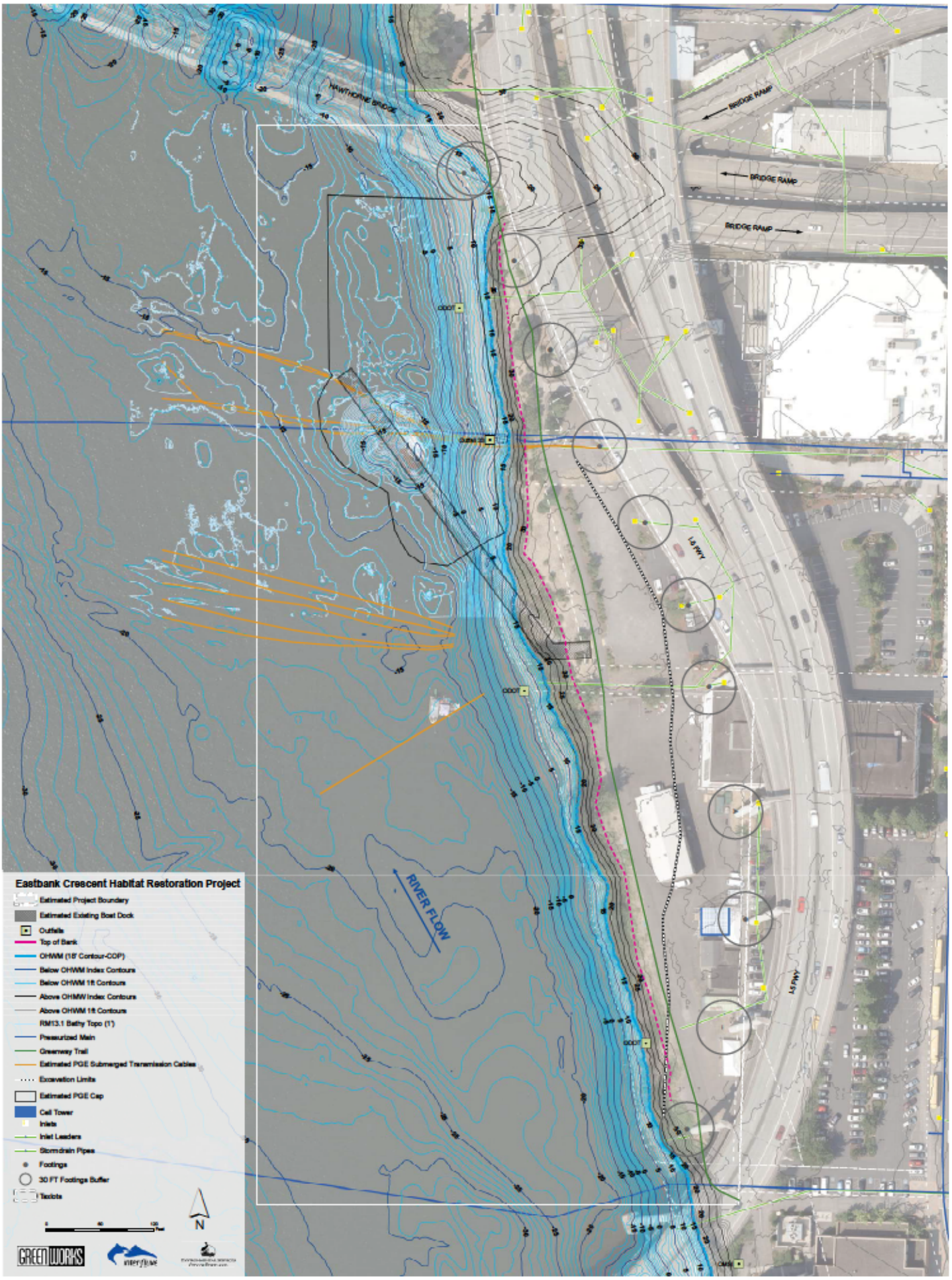
Constraints Map








Eastbank Crescent Habitat Restoration Project
Constraints Map
Estimated Project Boundary
Outfalls
Top of Bank
OHWM (10' Contour-COP)
Pressurized Main
Greenway Trail
Estimated PGE Submerged Transmission Cables
Excavation Limits
Estimated PGE Cap
Cell Tower
Inlets
Inlet Leaders
Storm drain Pipes
Footings
30 FT Footings Buffer
Toilets
N
GREENWORKS
interfluve
RIVER FLOW
HAWTHORNE BRIDGE
PORTLAND PARKS
ODOT
ODOT LEASED TO PDC
ODOT LEASED TO PDC
ODOT
OMSI
PEPCO BUILDING
I-5 FWY
WATER BUREAU
I-5 FWY
OMSI
ODOT LEASED TO RIVER EAST
ODOT LEASED TO RIVER EAST
BRIDGE RAMP
BRIDGE RAMP
BRIDGE RAMP
ODOT LEASED TO PDC


HAWTHORNE BRIDGE
BRIDGE RAMP
BRIDGE RAMP
BRIDGE RAMP
ODOT
ODOT
ODOT
ODOT
OUTFALL 22
OUTFALL 23
I-5 FWY
I-5 FWY
RIVER FLOW
Eastbank Crescent Habitat Restoration Project
Estimated Project Boundary
Estimated Existing Boat Dock
Outfalls
Top of Bank
OHWM (18' Contour-COP)
Below OHWM Index Contours
Below OHWM 1ft Contours
Above OHWM Index Contours
Above OHWM 1ft Contours
RM13.1 Bathy Topo (1')
Pressurized Main
Greenway Trail
Estimated PGE Submerged Transmission Cables
Excavation Limits
Estimated PGE Cap
Cell Tower
Inlets
Inlet Leaders
Storm drain Pipes
Footings
30 FT Footings Buffer
Taxlots
N
GREEN WORKS
river flows

B Data Sources

Eastbank Crescent Habitat Restoration Project - Data Sources		
REPORT		
Data	**Use of Data**	**Source**
Final Feasibility Study Report River Miles 13.1 and 13.5 (URS, 2014 – Prepared for PGE).	Information in report relates to the north end of the site for existing conditions and future condition.	BES
PGE 60% drawings - PDF REPORT	Information in report relates to the north end of the site. Maps were used for base map and opportunities and constraints map to exhibit extend of PGE Cap, PGE Utility Lines and existing pilings.	BES
No-rise Study - Fires Station	Information used for Section 4.2	BES
No-rise study PGE project, Cap Protection from Propeller and Wave and Wake Effects	Information used for Section 4.2	BES
Hydrologic Modeling – PGE data from Remediation Project	Information used for Base Map	BES
HEC RAS data for RM 13.1 No Rise	Information used for Base Map	BES
Contamination Reports	Information used for Section 5.1	BES
Fish Use and Genetic Study Report	YES – 4 reports, 11FEB2016	BES
Ownership Data	Information used for Base Map and Section 5	BDS
Eastbank Crescent Riverfront Project Regulatory Agencies' Charrette – "What We Heard" (BPS 2015)	Information used throughout report	BES
DATA		
Topographic and bathymetric Autocad files (PGE data - 30%)	Information used for Base Map	BES
USACE 2003 – 2005 bathymetry data GIS Shapefiles	Information used for Base Map	BES
2009 Bathymetry data for NOAA for the Lower Willamette Group GIS Shapefiles	Interfluve obtained data to create 1' contours and top of bank.	INTERFLUVE
OHWM line GIS shapefile	Information used for Base Map and opportunity and constraints map	GreenWorks
1' Contours GIS shapefile	Information used for Base Map	INTERFLUVE

Top of Bank GIS shapefile	Information used for Base Map and opportunity and constraints map	INTERFLUVE
Topographic and bathymetric BES GIS river depth contour data 2,5, 10' contours GIS shapefile	Information used for Base Map	BES
DEM/Hillshade GIS shapefile	Information used for Base Map	BES
Hydrology – USGS Gage Data from usgs.gov	Information used to develop stage duration exceedance curve in Section 3	usgs.gov
GIS shapefile utility data (water, sewer, storm [streets, buildings, streams, waterbodies, combined sewer, zoning, diversions freeways, inlets, inverts, LIDAR 2' and 10', limes, outfalls, section)	Information used for Base Map and opportunity and constraints map	BES
Non city outfall data GIS shapefile	Information used for Base Map and opportunity and constraints map	BES
Water Mains GIS shapefile	Information used for Base Map and opportunity and constraints map	BES
Tax lots boundaries GIS shapefile	Information used for Base Map and Section 5	BES
Current Aerial Raster Image	Information used for Base Map	BES
Outfall 33 AUTCAD FILES	Information used for Base Map and Section 5	BES

C Habitat Treatment Types Matrix and Precedent Study

HABITAT TYPES PROGRAM MATRIX

HABITAT TREATMENT TYPES	KEY	Primary Project Habitat Restoration Goals			Central City 2035 Goals											
		GOAL 1: Provide habitat complexity at the river's edge to allow for rearing and refugia for resident and anadromous fish species.	GOAL 2: Improve riparian area conditions to improve the microclimate, enhance the food web and improve the riverine processes necessary for improved water quality, hydrology, habitat and biological communities.	GOAL 3: Provide educational opportunities for restoration strategies and showcase/demonstrate how other river uses and habitat restoration	GOAL 4: Enhance the riverfront as a destination (CC2035 1.1;1.5; 4.CE-1)	GOAL 5: Create pockets of refuge and habitat for Special Status Species and other species (CC2035 6.3)							GOAL 6: Provide upland habitat connections (CC2035 6.6)	GOAL 7: Link stormwater management with urban habitat (CC2035 6.4)	GOAL 8: Enhance in-water and riparian habitat (CC2035 4.ce-3)	GOAL 9: Create a relationship of physical form, orientation, activities and access between Central Eastside Development and the River (CC2035 1.CE-3b; 4.1; 4.ce-2)
						Steelhead (Winter & Summer)		Chinook (Summer & Fall)		Coho		Other species - Dabbling ducks, waterfowl, shorebirds, bats				
						Holding	Rearing	Holding	Rearing	Holding	Rearing					
Instream Complexity (Large Wood)		X		X		X	X	X	X	X	X				X	
Alcoves		X		X		X	X	X	X	X	X				X	
Riverbank Complexity (Large Wood)		X	X	X		X	X	X	X	X	X				X	
Boulder placement			X												X	
Increase right bank length															X	
Terraced banks		X	X	X	X									X	X	X
Sloped banks			X	X											X	X
Sandy shore				X	X	X	X	X	X	X	X	X				
Emergent vegetation		X	X	X	X							X		X	X	
Riparian thicket (shrubs)		X	X		X	X	X	X	X	X	X			X	X	
Riparian forest (trees)		X	X		X	X	X	X	X	X	X	X			X	
Standing floodplain snags				X	X							X	X			
Upland boulder placement				X									X			
Upland forest													X			


Instream complexity (large wood)


Alcoves


Riverbank complexity (large wood)


Boulder placement


Increase right bank length


Terraced banks


Sloped banks


Sandy shores


Emergent vegetation


Riparian thickets (shrubs)


Riparian forest (trees)


Standing floodplain snags


Upland boulder placement


Upland forest

PRECEDENT IMAGERY | HABITAT TREATMENT TYPES and LEGEND

EASTBANK CRESCENT HABITAT RESTORATION PROJECT April 2016

ENVIRONMENTAL SERVICES CITY OF PORTLAND
GREENWORKS interfluve

WILMINGTON WATERFRONT PARK: Wilmington, Delaware

WEST HARLEM PIER PARK: New York, New York

SCULPTURE PARK: Seattle, Washington

SOUTH FALSE CREEK PARK: Vancouver, BC, Canada

Pittsburgh, Pennsylvania

MILWAUKEE GREENWAY GATEWAY PARK: Milwaukee, Wisconsin

ELLIOT BAY SEAWALL: Seattle, Washington

CRYSTAL SPRINGS CREEK: Portland, Oregon

BROOKLYN BRIDGE PARK: Brooklyn, New York

PRECEDENT IMAGERY | WATERFRONT PARKS

EASTBANK CRESCENT HABITAT RESTORATION PROJECT April 2016

ENVIRONMENTAL SERVICES CITY OF PORTLAND

GREENWORKS interfluve

ALCOVE

TERRACING

TERRACING - WOOD CRIB WALL

WOOD JAM

LARGE WOOD

LARGE WOOD BANK STABILIZATION

OVERLOOK

OVERLOOK

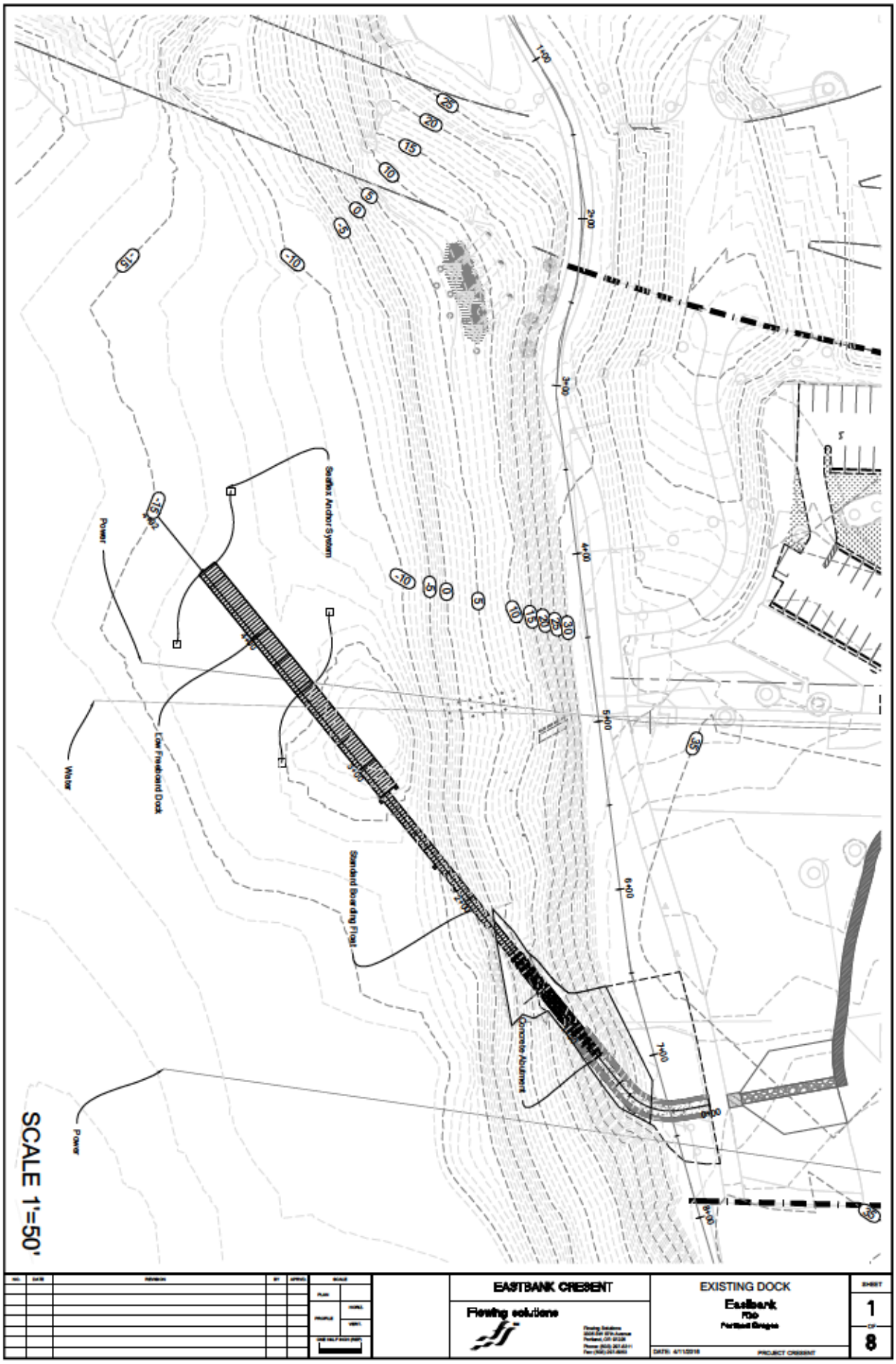
OVERLOOK

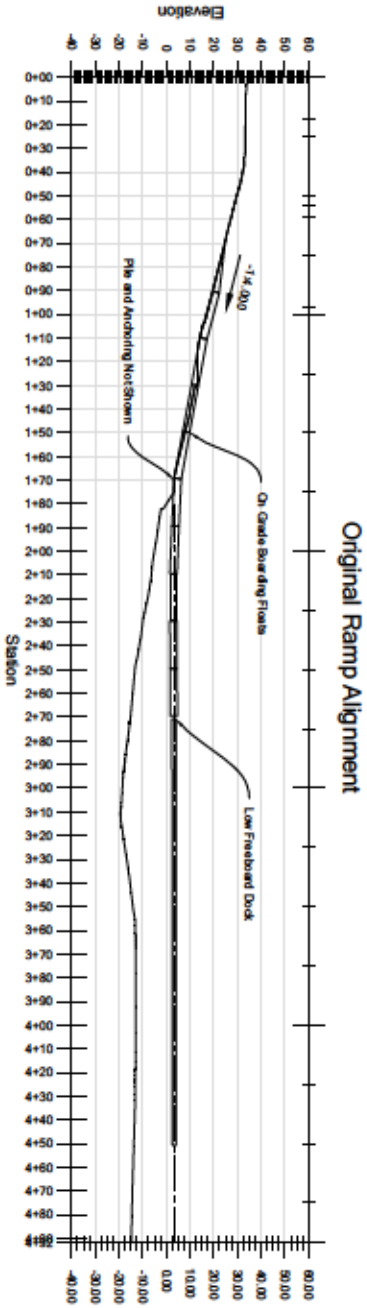
PRECEDENT IMAGERY | HABITAT RESTORATION TECHNIQUES and OVERLOOKS

EASTBANK CRESCENT HABITAT RESTORATION PROJECT April 2016

ENVIRONMENTAL SERVICES
CITY OF PORTLAND
GREENWORKS
interfluve

APPENDIX C: DOCK DESIGN OPTIONS





SCALE 1'=50'

NO.	DATE	REVISION	BY	APPRD.

SCALE
PLAN
PROFILE
HORIZ.
VERT.
ONE HALF INCH (thick)

EASTBANK CRESCENT

Flowing solutions

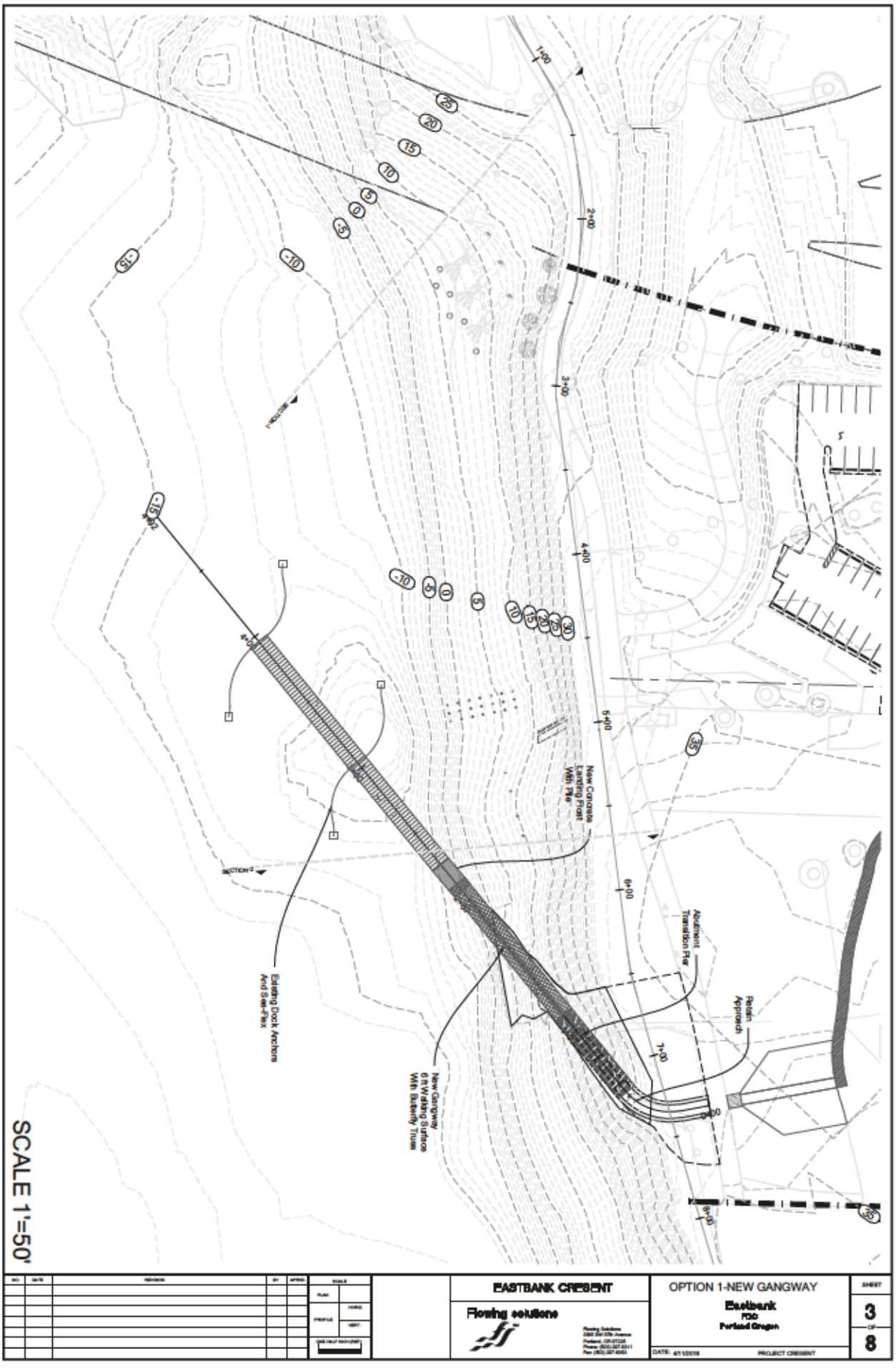
Flowing Solutions
3304 SW 97th Avenue
Portland, OR 97225
Phone: (503) 297-4311
Fax: (503) 297-4063

Existing Launch Profile

Eastbank
PDC
Portland Oregon

DATE: 4/11/2016 PROJECT CRESENT

SHEET 2 OF 8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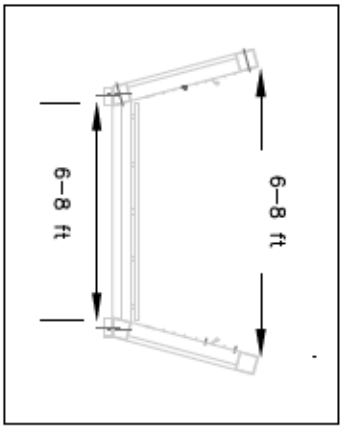
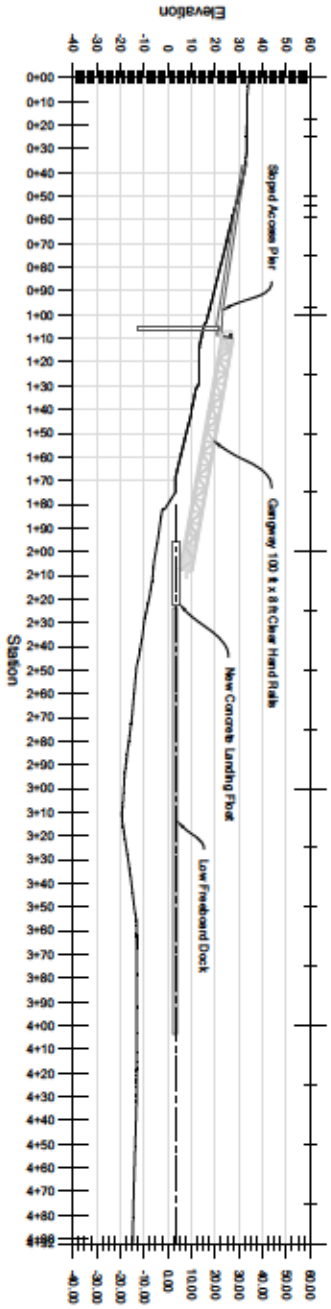
EASTBANK CRESCENT
Flowing solutions
OPTION 1-NEW GANGWAY
Eastbank
PDC
Portland Oregon
DATE: 4/1/2016
PROJECT CRESSENT
SHEET
3
OF
8
New Concrete Landing Float With Pier
Existing Dock Anchors And Steel Pilex
New Gangway 6'R Walking Surface With Butterfly Trusses
Abutment Transition Pier
Retain Approach
SECTION 2
SECTION 1



GANGWAY SECTION



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NO.	DATE	REVISION	BY	APPVD

SCALE: PLAN, PROFILE, HORIZ., VERT.

EASTBANK CRESCENT

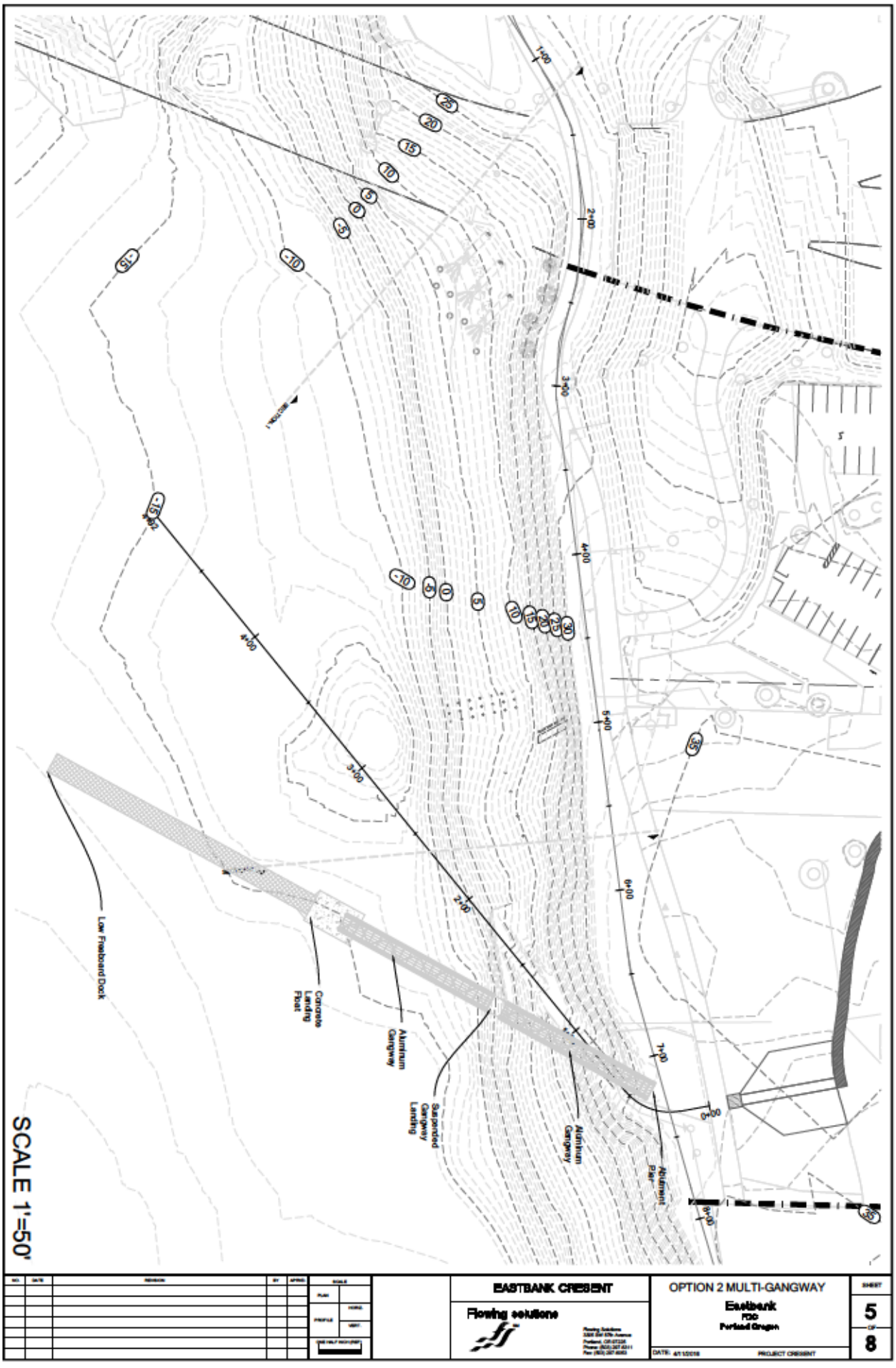
Flowing solutions

OPTION 1 SECTION

Eastbank
FDC
Portland Oregon

DATE: 4/11/2016 PROJECT CRESENT

SHEET 4 OF 8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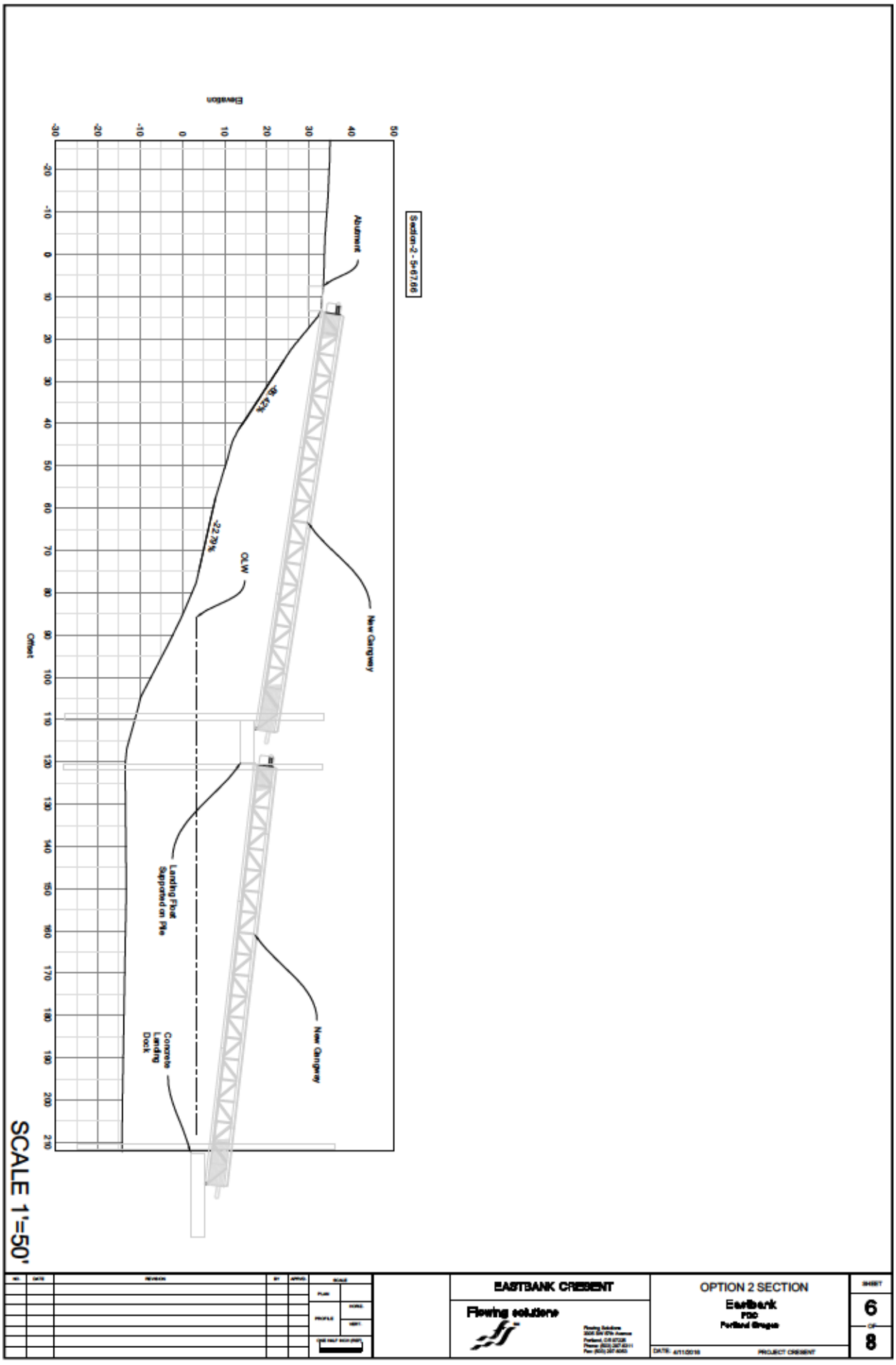
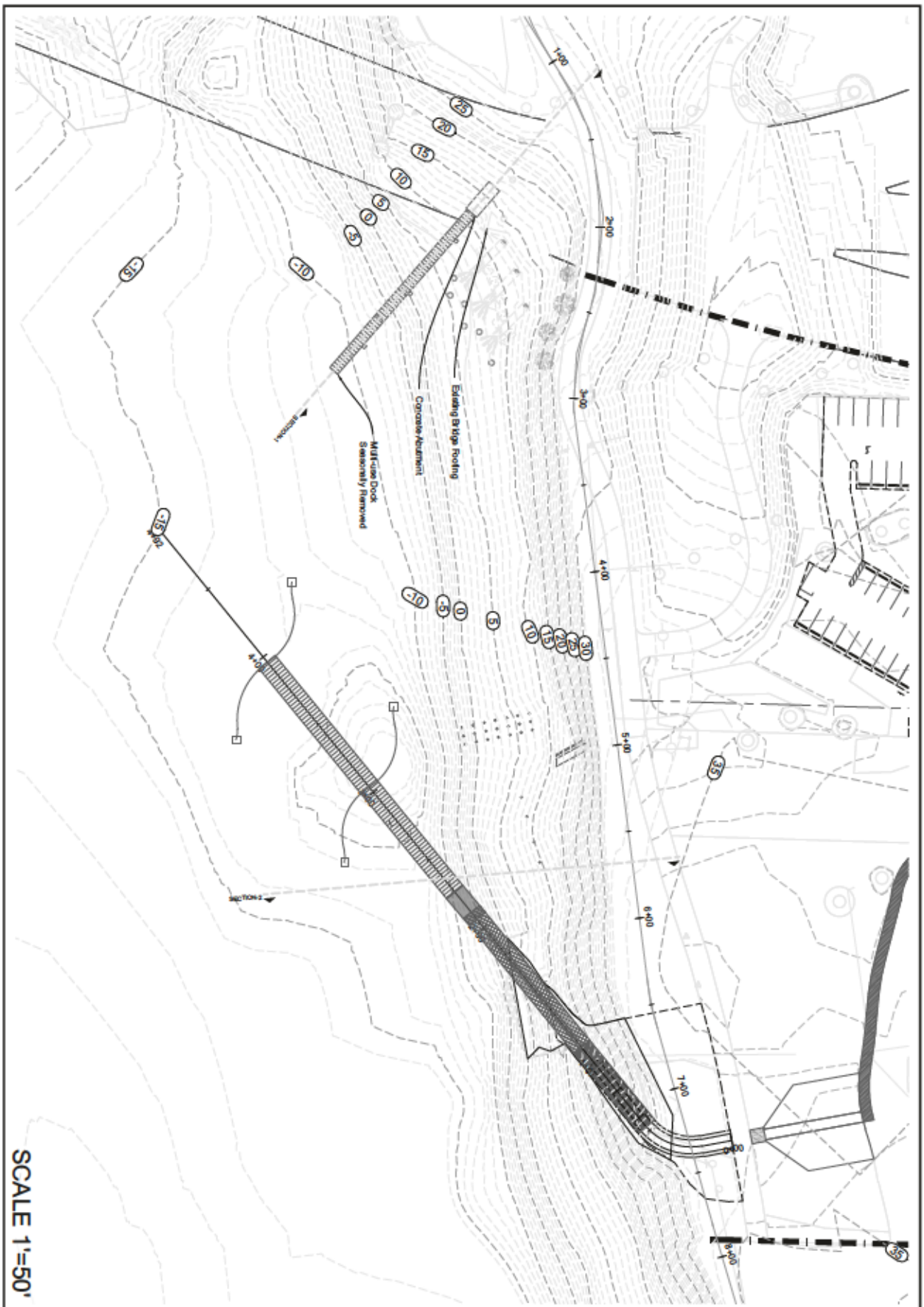
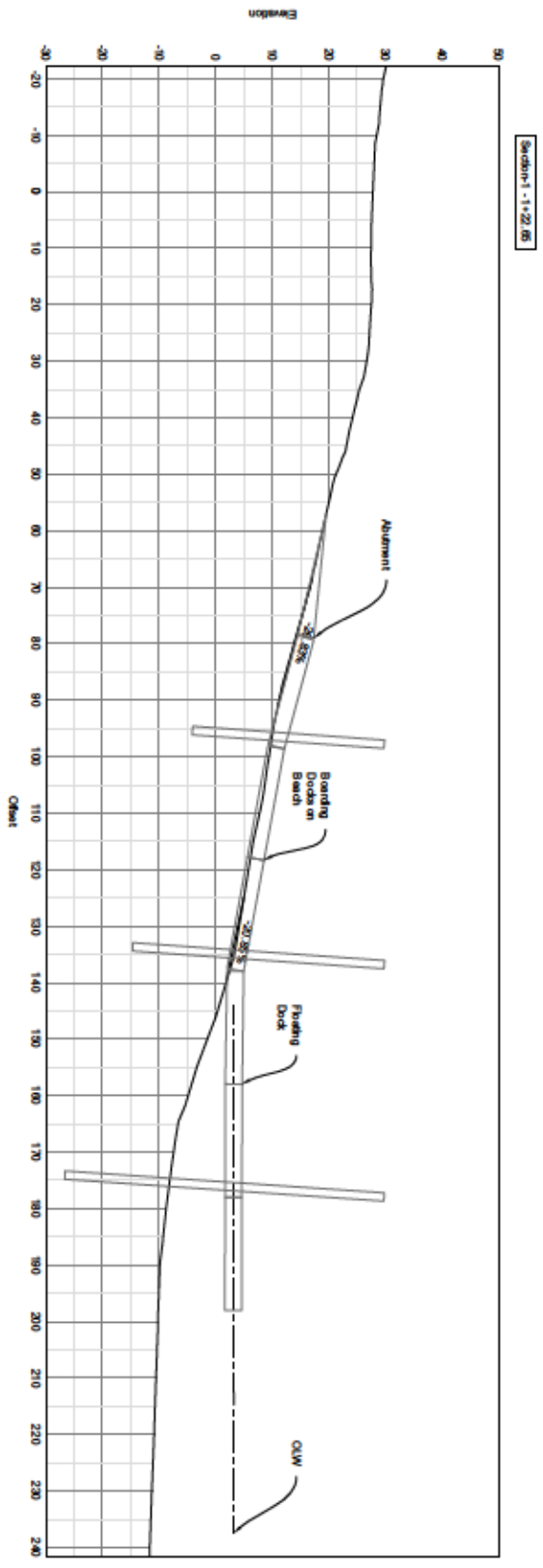
Low Freeboard Dock
Concrete Landing Float
Aluminum Gangway
Suspended Gangway Landing
Aluminum Gangway
Abutment Pier
EASTBANK CRESCENT
Flowing solutions
OPTION 2 MULTI-GANGWAY
Eastbank
PDX
Portland Oregon
DATE: 4/1/2016
PROJECT CRESSENT
SHEET
5
OF
8


Section-2 - Sta 67.00
Abutment
-25.0%
-22.2%
OLW
New Gangway
Landing Float Supported on Pile
Concrete Landing Dock
New Gangway
Elevation
Offset
SCALE 1'=50'
EASTBANK CRESCENT
Flowing solutions
OPTION 2 SECTION
Eastbank
PDC
Portland Oregon
DATE: 4/11/2016
PROJECT CRESCENT
SHEET
6
OF
8


Existing Bridge Footing
Concrete Abutment
Multi-use Dock Seismically Removed
SECTION 2
SCALE 1"=50'
EASTBANK CRESCENT
Floating solutions
OPTION 3 MULTI-USE DOCK
Eastbank
Portland Oregon
7
8



SCALE 1'=50'

NO.	DATE	REVISION	BY	APPRD

SCALE
PLAN
PROFILE
HORIZ
VERT
ONE HALF INCH WIDE

EASTBANK CRESCENT

Flowing solutions

OPTION 3 SECTION

Eastbank
FDC
Portland Oregon

DATE: 4/11/2016 PROJECT CRESENT

SHEET 8 OF 8

APPENDIX D: OUTREACH AND ENGAGEMENT SUMMARY

June 15, 2015 Design Charrette

To initiate the planning process, a half-day design charrette was conducted to brainstorm overall themes for redevelopment of the Eastbank Crescent site, and designers sketched representations of ideas raised by participants. The charrette was attended by representatives of federal, state and local agencies responsible for permitting or expected to play a role in aspects of future development, owners of properties within the project site, and landscape design and engineering professionals. Participants discussed potential options, opportunities and constraints at the site, and begin to identify the permits necessary to implement such a project. The following overarching themes emerged and are detailed in the What We Heard Report, found on the project website at www.portlandoregon.gov/bps/71051:

Habitat

- Examine ways to regrade and lay back the riverbank to create more habitat; vegetate with native plants
- Create undulating shallow water area with alcoves or backchannels; enhance habitat
- Create viewpoints/access for education

Greenway Trail

- Separate pedestrians and bicyclists to degree possible
- Reconfigure to provide more space between trail and river
- Address potential conflicts at crossings to access the river

Holman Dock

- Separate boat and swimming floating docks/platforms
- Make universally accessible with limited switchbacks on approach
- Provide boat storage

Swimming Beach

- Improve beach and make universally accessible access path
- Demark swimming area
- Add restrooms, changing area

Stakeholder Interviews

Beginning in fall, 2015, interviews were conducted with representatives of swimming, boating and environmental organizations to learn how the Eastbank Crescent site is used now, ideas for how it could be improved, and to understand their goals for the future of the site. General comments and suggestions include:

Swimming Interests

- The Holman Dock is important; should be replaced and maintained
- Make public access into the river a priority; every neighborhood along the river should have access
- Need a master plan for the river's edge that addresses swimming, habitat, access, boating needs, docks
- No net loss of public access into the river in the Central City; as much access as possible should be provided
- Need river swimming guidelines for public to know how and where to swim safely
- Parks and Recreation should promote river swimming online and with public information

Boating Interests

- Eastbank Crescent is the best place for Portland Boathouse and Holman Dock: serves city clubs and residents all year; has easy access to parking and transit; provides safe access for paddlers with impairments
- Holman Dock provides the low-freeboard dock needed to launch and disembark small watercraft
- Low-freeboard docks are also conducive to sunbathing and swimming, causing conflicts between users: sunbathers can obstruct boat launching, and human-powered boats of limited maneuverability, such as racing shells and dragon boats, may not see swimmers in the water
- Removable, seasonal docks or floats just for swimmers and sunbathers may alleviate conflicts
- Buoys to demark swimming areas can reduce conflicts
- Heavy traffic on Greenway Trail can make it difficult to safely cross the trail carrying boats

Environmental Interests

- Prioritize uses best suited to the site, and don't assume public access to the river and habitat restoration should be accommodated at the same site; attempting to provide both, especially with limited space on a constrained site, could result in both being ineffective
- Provide a swimming beach and associated gathering space and amenities at one site in the Central Reach – Hawthorne Bowl makes the most sense - and forgo habitat restoration there, but prioritize habitat at other shallow water areas such as Eastbank Crescent
- Engineer habitat areas to be unattractive to access, using sharp rocks and vegetation, to avoid trampling and damage
- Design beach or dock access to be attractive and easy to use to keep people from attempting to access the river through restoration areas

City of Portland Technical Advisory Committee

Throughout the planning effort, a Technical Advisory Committee (TAC) comprised of representatives from bureaus throughout the city that would be involved in permitting, development and management of future activities at the site provided guidance and feedback. Using the ideas generated at the Design Charrette as a starting point and incorporating the findings of the Existing Conditions Report and the Central City Potential Swimming Beach Sites Study, the consultant team developed three initial draft design concepts for the Eastbank Crescent. The first design concept emphasized public access and activity, the second emphasized habitat restoration and the third provided a mix of both. On April 21, 2016, the TAC participated in a half-day facilitated review of the three initial draft design concepts and provided feedback and ideas:

Habitat

- Significant bank layback, increased habitat complexity and riparian improvements should be incorporated in any design
- Habitat areas need clear definition, physical demarcation to deter human encroachment
- Incorporating stormwater control features offers educational opportunities

Greenway Trail

- Splitting bike entry from eastbound Hawthorne Bridge bike lane helps reduce conflicts with north-south trail traffic and encourages bikes to use SE Water Ave southbound
- Separated grade of pedestrians and bikers from the dock access is desirable
- Multiple viewpoints/pull-outs help with trail traffic as well as provide river viewing and beach oversight
- Winding trail alignment not desirable as it reduces sightlines, pedestrian and biker safety
- Signage, bollards, striping and other features needed on shared trail areas, crossings

Holman Dock

- Boat dock needs to be easily accessible to other boaters than just Portland Boathouse members
- Dock needs to be straight to accommodate boaters

Swimming Beach

- While the site is not well suited to a family-friendly swimming beach, any access to enter into the river should be accompanied by restrooms and showers, concessions, life jacket rental, "swim at your own risk" signage
- Separate swim dock/float with separate access, best alleviates user conflicts
- Swim dock access from the north preferred for safety and security; universally accessible path to top of bank provides access for Fire department's 4-wheeler
- Swim dock allows Portland police to patrol while a floating platform would require sheriff patrol by water
- Any hardscaping at beach area will require mitigation

Other thoughts and considerations

- Investigate opportunity to site any new buildings (boathouse, restrooms) under freeway
- Investigate opportunity to site restrooms, showers north of Hawthorne Bridge
- Concessions could be seasonal and transportable
- Could boat dock be seasonal/removable?
- Is there space to completely separate pedestrians and bikers?

- Restroom/showers will require a new water main; siting needs to consider proximity to nearest trunk line

Review of Draft Design Concepts

Stakeholder Meetings

The main themes of the three initial draft design concepts were maintained but revisions were made to reflect TAC recommendations. The draft concepts were presented at two consecutive, facilitated stakeholder meetings on June 1st, 2016, hosted by adjacent property owner Portland Community College CLIMB Center (PCC CLIMB). Participants at the first meeting were representatives of owners and agencies responsible for properties within the site, including Oregon Museum of Science and Industry, Oregon Department of Transportation, Oregon Department of Environmental Quality, Oregon Department of State Lands, Portland General Electric, Lincoln Properties, Portland Bureau of Parks and Recreation, Portland Bureau of Transportation and Portland Fire Bureau. The second stakeholder meeting was attended by representatives of swimming, boating and environmental interests, neighboring property owners and businesses, the Central Eastside Industrial Council and the Oregon Marine Board. In both meetings, comments were more focused on specific components of the alternatives than on the individual concepts.

Meeting One, Property Owners

- Maximizing habitat restoration was favored by Oregon Departments of State Lands and Environmental Quality; ecological enhancements benefit the Central Reach and would be more readily permitted than hardscaping or excavation to create a beach
- Concern that laying back the bank could affect river currents and disturb contaminated sediment containment cap, scheduled to be completed in 2017
- Creating a boat-staging area with direct access to the Holman Dock and a separate swimming dock accessible from the Greenway Trail reduces user conflicts
- Expanding educational opportunities along the river while maintaining usability of Pepco Building is important for OMSI
- Some support for complete separation of cyclists and pedestrians on Greenway Trail for safety; others prefer multiuse trail with improved signage
- If there is a beach, all-terrain vehicle access needed for emergencies

Meeting Two, Interest Groups

- Habitat restoration is desirable to take advantage of shallow water area, to provide a natural experience for users of the site and to create a more interesting shoreline when viewed from the river
- Rustic beach is better, but with floating dock, buoys to demark swimming area
- Important to have separate docks for swimmers and boaters
- Boat dock must be straight to allow for carrying long boats
- Grade-separated dock entrance reduces conflicts crossing the Greenway Trail
- Restrooms are needed
- Changing ramp from eastbound Hawthorne Bridge to enter at Clay Street instead of directly onto the Greenway Trail could encourage some southbound bicyclists to take SE Water Ave, but SE Water Ave is becoming busier with freight traffic, backed up due to the Orange Line

Public Open House:

Modifications were made to the three draft design concepts to incorporate comments and suggestions from the stakeholder meetings. The new drafts were posted on the BPS website and presented at a public open house on June 29, 2016, also hosted by PCC CLIMB. Concept A emphasizes public access and activity, Concept B emphasizes habitat restoration and Concept C provides a mix of public activity and habitat restoration; all can be viewed on the project website, www.portlandoregon.gov/bps/71051. Forty-five members of the public attended the open house and provided written and verbal feedback, and approximately 30 comments were received via email. Comments are summarized for each concept:

Concept A

General:

- Great
- Love it
- Looks amazing - about time
- Priority should be fair and safe access to the river
- Prioritize public access – environmental stewardship best served through relatively intense human activity, and more people will be able to enjoy it all at once

- Favor design that encourages and accommodates public access
- This is prime real estate for active recreation - let's maximize it
- Manages human element best
- The easier and safer for regular folks to enjoy the river, the more citizens will actively protect it
- Like it but concerned about mixing/routing of so many people doing different things
- Need additional fingers of access back into eastside to reinforce public activity

Swimming:

- Like concept of swimming docks to help prevent boater/swimmer conflicts
- Likes designated swimming area (multiple likes)
- Love swimming dock; activates area for swimming
- Appears safest for water users
- Buoys make it great for families
- Even with swimming dock, may not be enough dock space to accommodate the crowds that do and will come
- Need bike parking for the beach
- Don't make beaches exclusive of kayakers - prefer beach launch
- Like the "active" beach
- Like the swim dock concept but it looks pretty far from the amenities (bathrooms)

Boating:

- Love separation of watercraft/swim area
- Resolves boater/swimmer conflict best (multiple likes)
- May not be enough separation between docks
- Boat staging area too small

Flow:

- Greenway overpass for boat ramp is excellent idea
- Greenway overpass for boat ramp not needed

Amenities:

- Love outdoor seating/classroom area
- Love platforms/plaza/concessions
- Like it, but needs more parking

Concept B

General:

- Need restoration at a macro-scale on the Willamette
- Given the lack of suitable habitat within the Portland Harbor, emphasizing fish and wildlife habitat is the only logical choice to make; support the city's efforts to elevate the river's importance and accessibility but question any concept that would elevate recreation above habitat needs for fish and wildlife.
- There are many other options the city could adopt that would allow public access to the river without taking a site that has good restoration potential and focusing recreational opportunities on that site; do not think the middle ground is where we should head.
- Maximize habitat restoration in this area - very few opportunities for ecological restoration involving shallow water and riparian habitat in the Central City, this stretch the most habitat deficient reach of the entire Willamette River System. Restoration along the entire 187-mile long river is undermined by the extreme habitat loss here.
- Young salmon need shallow water/ riparian habitat areas approximately every quarter mile as they migrate to the sea; sites like the East Bank Crescent are absolutely critical to achieving the City's goals for supporting salmon recovery.
- "Balancing" on what little intact habitat or habitat restoration opportunities still exist is a recipe for further ecological degradation, not restoring our river to health.
- Habitat restoration is not incompatible with recreational use; careful site design and management should allow for public access to the river, while also providing and protecting real habitat restoration objectives
- Engage the public with a site that reflects what a healthy river should look like—this includes trees and other vegetation, downed woody debris, etc.. We disagree with those who assert that the public wants beach areas with minimal habitat characteristics. We believe that the public wants to interact with a healthy, restored river.
- Set a high standard for resource protection and restoration at this site

- Prefer the highest level of restoration.
- Ample access provided to the river without significant new infrastructure.
- Need to better focus on ensuring that our investments meet past and ongoing aspirations for salmon recovery.
- Provides some good opportunities to educate the public about what healthy river's need.
- Responsible course of action
- Design resists campers
- Habitat will not survive recreational users
- Excludes folks who already use the site
- Concerned about lack of access
- Too much middle of the forest for the middle of the city
- All for habitat improvements, but doesn't do enough for public access
- Like the pools
- Love the large wood placement

Swimming:

- Have a swimming dock separate from boat dock to minimize current conflicts
- Love aspects of this plan and wonder if we could combine the swim dock from A
- Favorite, but wish it had a swim dock
- Needs swimming dock
- Need Option D - more habitat, separate docks, pools and plantings

Boating:

- Dock will be a problem for boaters; incompatible especially for rowing shells
- Love more habitat, but want more access for kayaks

Flow:

- 12' not enough for path - pinch point for pedestrians and bikes

Concept C

General:

- Favor design that encourages and accommodates public access
- Provides more structure/guidelines for human activities - balanced
- Like balanced approach
- More diversity of riverside edge needed - constant monocular design emphasis of look but don't touch is too much of a monoculture

Swimming:

- Most important to get the sunbathers/swimmers a dock of their own
- Add swimming dock and it would be great (multiple likes)

Boating:

- Lack of swimming dock will cause conflicting uses on rowing dock

Flow:

- Greenway overpass for boat ramp is an excellent idea
- Overpass/bridge idea to separate bikers/walkers from people wanting to launch boats is brilliant.
- As a person who uses this dock now this (overpass) seems unnecessary; no real problem now at bike/boat interface
- Like separate pedestrians and bikes

Amenities:

- Add restrooms, shower and swim platforms and this would be favorite

General Swimming Issues

- Beach is attractive nuisance, will attract children who may put themselves in peril
- Currents around Hawthorne Bridge can be dangerous; liability concerns
- Beach area at Eastbank Crescent is too shady
- Eastbank Crescent is one of the few areas to launch small boats; swimming should not be encouraged

- Unique pairing of Hawthorne Bowl and Eastbank Crescent as swimming areas should be given priority
- Too much goose poop at Hawthorne Bowl - relocate the geese
- Poetry at the Beach has needles and trash
- Not sure the idea of a "family swim area" makes sense - large, deep river with major flow volume, have trouble envisioning a way it would be safe for young kids.
- Duckworth Deck provides a perfect protected area to have a swimming area. Why not provide ladders and use a resource that is already in place?
- Poetry at the Beach seems like a good candidate for family swimming in terms of being more shallow, safer and out of the way.

General Dock Issues

- Need more dock space for swimmers; not sure seasonal dock helps
- Need debris boom

General Amenity Issues

- Restrooms important (multiple likes); plus regular maintenance
- Need foot wash/showers
- Need parking and bike storage
- Need rack of multi-sized life jackets as loaners
- Need lockers or "coat-check," use fees for beach maintenance
- Need kayak racks to lock boats while parking

Other

- Clean up the PCBs
- No wake zone, year round
- Maintain public access to the river for leisure and recreation