FINDING OF NO SIGNIFICANT IMPACT

LAKE BALLINGER AQUATIC ECOSYSTEM RESTORATION PROJECT
MOUNTLAKE TERRACE, WASHINGTON

The U.S. Army Corps of Engineers, Seattle District (Corps) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The final Integrated Feasibility Report and Environmental Assessment (FR/EA) dated July 2020 for the Lake Ballinger Aquatic Ecosystem Restoration Project addresses aquatic ecosystem development and restoration opportunities and feasibility in Lake Ballinger Park in Mountlake Terrace, Washington.

The final FR/EA, incorporated herein by reference, evaluated various alternatives that would address degraded floodplain connectivity, habitat for species of concern, and altered floodplain vegetation in the study area. The recommended plan is the National Ecosystem Restoration (NER) Plan and includes:

- Invasive Plant Removal – Acres are listed in FR/EA
- Riparian Planting – Area is detailed in FR/EA
- Overstory Planting
- Topographic modification (creation of hummocks)
- Physical Exclusion (including fencing and boardwalks)
- Removal of Impervious Surfaces (i.e., the tennis court, approximately 7,255 square feet
- Channel Diversity Improvements – Length is detailed in FR/E
- Armor removal– Volume is listed in FR/EA
- Off-Channel Connectivity—Side channels
- Channel Substrate Modification (gravel placement) – Depth specified in the FR/EA
- Instream Habitat Diversity-Large Woody Debris (LWD)
- Instream Habitat Diversity-Boulders
- Creation of Shallow Water Fringe Habitat
- Wetland Planting—Ponds
- Public Outreach and Education

In addition to a "no action" plan, four alternatives were evaluated. The alternatives included Alternative 2: riparian enhancement and lower channel armor removal. Alternative 3: constructing a meander in the lower channel and addition of LWD. Alternative 5: Upper and lower channel work with pond enhancement. Alternative 6: Upper and lower channel work with pond enhancement, off channel connectivity and topographic modifications. Alternatives are discussed in more detail in the FR/EA.

For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table 1:

Table 1: Summary of Potential Effects of the Recommended Plan

	Insignificant effects	Insignificant effects as a result of mitigation*	Resource unaffected by action
Aesthetics	☒	☐	☐
Air quality	☒	☐	☐
Aquatic resources/wetlands	☒	☐	☐
Invasive species	☒	☐	☐
Fish and wildlife habitat	☒	☐	☐
Threatened/Endangered species/critical habitat	☒	☐	☐
Historic properties	☐	☐	☒
Other cultural resources	☐	☐	☒
Floodplains	☐	☐	☒
Hazardous, toxic & radioactive waste	☐	☐	☒
Hydrology	☐	☐	☒
Land use	☐	☐	☒
Navigation	☐	☐	☒
Noise levels	☐	☐	☒
Recreational opportunities	☒	☐	☐
Socio-economics	☐	☐	☒
Environmental justice	☐	☐	☒
Soils	☐	☐	☒
Tribal trust resources	☐	☐	☒
Water quality	☒	☐	☐
Climate change	☐	☐	☒
Traffic	☒	☐	☐

** No compensatory mitigation is required as part of the recommended plan.*

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs) as detailed in the FR/EA will be implemented, if appropriate, to minimize impacts. Best management practices during and following project construction include:

- Work area will be restricted to the footprint delineated on the project drawings,
- no net loss of wetland or sensitive aquatic sites,
- stormwater runoff prevention to ensure that no unnecessary damage to the environment occurs,
- connecting the newly excavated restored reach with the existing Hall Creek during established in-water work windows (1 July through 15 September),
- appropriate turbidity control measures (temporary coffer dam, silt curtains, or similar) to isolate construction from Hall Creek and to minimize turbidity impacts during inlet/outlet construction and dewatering of the channel,
- fish rescue measures in areas where direct disturbance in confined areas is anticipated,
- utilization of marsh mats / swamp pads or temporary rock placement to minimize impacts to wetland soils, as needed,
- work will be done in the dry to the extent practicable,

- all required de-watering activities during construction would use appropriate devices (i.e. pumps, sandbags, sumps),
- all water removed from the site will be discharged in a vegetated upland location, a de-siltation basin, or location that would not incur damage due to water discharge,
- drive trains of equipment will not operate in the water,
- all equipment will be cleaned prior to in-water construction work,
- no refueling will occur near Hall Creek or Lake Ballinger,
- construction equipment will be regularly checked for drips or leaks, and
- all temporary access roads and staging areas will be returned to their natural condition upon completion of work.

Impacts from unavoidable and adverse effects will be minimized through the following measures:

- Noise disturbance to wildlife and homeowners in the vicinity due to operating heavy machinery during excavation and construction of the restoration site would be reduced by conducting work during daylight hours within local noise ordinances.
- Emissions from construction equipment would not exceed EPA's de minimis threshold levels and would be insignificant.
- Disruption of local traffic would be reduced by use of proper signage and flaggers would address safety concerns by moving traffic through the area as quickly as possible.
- Impacts to turbidity during the connection of the newly aligned stream to the upstream culvert and the downstream area would be minimized by implementing the aforementioned BMPs.

Temporary loss of recreation opportunities in the project area would likely occur but would only be temporary.

Given the temporary, localized, and minor nature of these effects, the Corps has determined that the proposed restoration project would not result in significant adverse environmental impacts.

Long-term there would be beneficial impacts to aesthetics, aquatic resources, fish and wildlife habitat, essential fish habitat, vegetation, and recreation.

No compensatory mitigation is required as part of the recommended plan.

Public review of the draft FR/EA and FONSI was completed on 26 May 2020. All comments submitted during the public review period were responded to in the final FR/EA and FONSI.

Pursuant to section 7 of the Endangered Species Act of 1973, as amended, the U.S. Army Corps of Engineers determined that the recommended plan will have no effect on federally listed species or their designated critical habitat.

HISTORIC PROPERTIES NOT ADVERSELY AFFECTED

Pursuant to section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that historic properties would not be adversely

affected by the recommended plan. This determination was transmitted to the Washington State Historic Preservation Officer (SHPO) for concurrence 27 March 2020. Concurrence was received from the SHPO on 13 April 2020.

NO EFFECT TO HISTORIC PROPERTIES

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that the recommended plan has no potential to cause adverse effects on historic properties.

CLEAN WATER ACT SECTION 404(b)(1) COMPLIANCE

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with section 404(b)(1) Guidelines (40 CFR 230). The Clean Water Act Section 404(b)(1) Guidelines evaluation is found in Appendix B of the FR/EA.

401 WQC PENDING

The Corps will be submitting a determination of functional analogy to Nationwide Permit (NWP) 27 for aquatic habitat restoration to WDOE for their concurrence when detailed plans and specifications are developed. To date, WDOE has indicated no objections to the proposed project.

CZMA CONSISTENCY PENDING

A determination of the consistency of this proposed action, to the maximum extent practicable, with the enforceable policies of the Washington State Coastal Zone Management program pursuant to the Coastal Zone Management Act of 1972 will be provided to Ecology prior to construction. Their concurrence in that determination will be sought.

CLEAN AIR ACT

The activity will generate an increase in direct emissions of a criteria pollutant or its precursors that would be de minimis, and would therefore be exempt by 40 CFR Section 93.153(c)(2)(iv) from the conformity determination requirements. Therefore, effects would be insignificant.

ENDANGERED SPECIES ACT

The Corps evaluated potential effects to threatened and endangered species, consulted informally with the National Marine Fisheries Service (NMFS) and the U. S. Fish and Wildlife Service, and made a determination of no effect for Chinook salmon, steelhead, bull trout, yellow-billed cuckoo, streaked horned lark, gray wolf, North American wolverine, Oregon spotted frog, southern resident killer whale, and marbled murrelet; and for their critical habitat. This determination was made due to these species sensitivities to human presence, lack of suitable habitat, or because their presence is so transitory that any temporal affects to these species from construction activities would not be perceived as unusual, cause disruption of

behavior or lead to measurable reduction in their prey base. To date the Corps has not received concurrence on this determination.

ESSENTIAL FISH HABITAT

Essential Fish Habitat (EFH) is designated for in the project area for chinook and coho salmon. However, after informal consultation with NMFS, the Corps has determined that there will be no effect on EFH for these species and no EFH assessment is necessary. To date the Corps has not received concurrence on this determination.

MIGRATORY BIRD TREATY ACT

There would be no adverse effect on migratory bird habitat and the project would only have minor and temporary effects to a small number of individual birds that may be present in the project area. No permit application for "take" of migratory birds is thus required.

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed for this stage of the project.

FINDING

Technical, environmental, and cost effectiveness criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on the attached FR/EA, the reviews by other Federal, State and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the Recommended Plan/preferred alternative would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

17 Sept 2020
Date

Alexander "Xander" L. Bullock
Colonel, Corps of Engineers
District Commander

US Army Corps of Engineers®
Seattle District

City of Mountlake Terrace

Lake Ballinger Aquatic Ecosystem Restoration Project, Mountlake Terrace, Washington

Continuing Authorities Program, Section 206

Feasibility Report and Environmental Assessment

Prepared by:
U.S. Army Corps of Engineers
Seattle District

In Coordination With: City of Mountlake Terrace, Washington

JULY 2020

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Executive Summary

This integrated feasibility report and environmental assessment (FR/EA) presents the results of a U.S. Army Corps of Engineers (Corps) feasibility study to identify and evaluate alternatives to restore degraded wetland, riparian and riverine ecosystems in Ballinger Park, Mountlake Terrace, Washington. The Corps is undertaking this effort in partnership with the City of Mountlake Terrace, WA, the non-Federal sponsor (Sponsor). The study is being conducted under the authority of Section 206 of the Water Resources Development Act of 1996.

Ballinger Park is located in the City of Mountlake Terrace, Washington, approximately 14 miles north of downtown Seattle. The specific area of focus for this study is Hall Creek and associated wetlands and floodplain within Ballinger Park, in the Lake Ballinger/McAleer Creek Watershed.

This feasibility study focuses on addressing degraded floodplain connectivity and degraded wetland and channel habitat for species of concern, including fish, amphibians and migrating birds. The proposed project would restore wetland functions and riparian habitat, and would improve Essential Fish Habitat for coho and Chinook salmon, as designated by the National Marine Fisheries Services in accordance with the Magnuson-Stevens Fishery Conservation and Management Act.

The proposed project would be consistent with the Sponsor's Ballinger Park Master Plan and the Lake Ballinger/McAleer Creek Watershed Forum's strategic action plan for flood reduction, and water quality, and habitat improvement in the watershed. The Lake Ballinger/McAleer Creek Watershed Forum is comprised of Snohomish County and the cities of Mountlake Terrace, Edmonds, Lake Forest Park, Lynnwood, and Shoreline.

The Recommended Plan is Alternative 5, Upper & Lower Channel Work with Pond Enhancement. This alternative would include wetland, stream channel and riparian zone restoration, benefiting fish and wildlife in and around Hall Creek and in Lake Ballinger. Based on October 2020 price levels, the estimated first cost of the Recommended Plan is $5,405,000.

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Contents

The sections of this FR/EA that are required for NEPA compliance are denoted with an asterisk (*) following the section heading.

List of Figures

List of Tables

List of Appendices

List of Abbreviations and Acronyms

AAHU Average Annual Habitat Unit

ACHP Advisory Council for Historic Preservation

APE Area of Potential Effect

BMP Best Management Practice

CAA Clean Air Act

CAP Continuing Authorities Program

CE/ICA Cost Effective/Incremental Cost Analysis

CEQ Council for Environmental Quality

CFS Cubic feet per second

cm Centimeter

Corps U.S. Army Corps of Engineers

CWA Clean Water Act

CY Cubic yards

CZMA Coastal Zone Management Act

DO Dissolved Oxygen

EA Environmental Assessment

EC Engineering Circular

EFH Essential Fish Habitat

ER Engineer Regulation

ESA Endangered Species Act

EPA U.S. Environmental Protection Agency

FR/EA Feasibility Report/Environmental Assessment

FONSI Finding of No Significant Impact

FWCA Fish and Wildlife Coordination Act

HWA HWA Geosciences Inc.

HSI Habitat Suitability Index

HU Habitat Unit

HTRW Hazardous Toxic Radioactive Waste

IWR Institute for Water Resources

LWD Large Woody Debris

LOS Level of service

MBTA Migratory Bird Treaty Act

MSA Magnuson-Stevens Fishery Conservation and Management Act

NAAQS National Ambient Air Quality Standards

NEPA National Environmental Policy Act

NHPA National Historic Preservation Act

NMFS National Marine Fisheries Service

NOAA National Oceanic and Atmospheric Administration

NPDES National Pollutant Discharge Elimination System

NRHP National Register of Historic Places

NWD Northwestern Division

O&M Operations and Maintenance

OMRR&R Operations, Maintenance, Repair, Rehabilitation & Replacement

PSD Prevention of Significant Deterioration

PSM pre-spawn mortality

RU Recovery Unit

SHPO State Historic Preservation Officer

SMA Shoreline Management Act

SWPPP Stormwater Pollution Prevention Plan

TSP Tentatively Selected Plan

USACE U.S. Army Corps of Engineers

USC United States Code

USFS U.S. Forest Service

USFWS U.S. Fish and Wildlife Service

WAC Washington Administrative Code

WDFW Washington Department of Fish and Wildlife

WDOE Washington Department of Ecology

WSDOT Washington State Department of Transportation

WISAARD Washington Information System for Architectural and Archaeological Recording Data

WRDA Water Resources Development Act

1. Introduction

This integrated feasibility report and environmental assessment (FR/EA) documents the planning process for the Lake Ballinger Aquatic Ecosystem Restoration Project at Ballinger Park in the City of Mountlake Terrace, Washington, and demonstrates consistency with U.S. Army Corps of Engineers (Corps) planning policy and with the National Environmental Policy Act (NEPA). The following sections provide background information regarding the basis for this study. The sections that are required for NEPA compliance are denoted with an asterisk (*).

1.1 Study Purpose and Scope

As part of the planning process for all Continuing Authorities Program (CAP) projects, a feasibility study must be completed. This feasibility study was conducted in accordance with the Corps' CAP engineering pamphlet (EP 1105-2-58), Planning Guidance Notebook (ER 1105-2-100), and Civil Works Ecosystem Restoration Policy (ER 1165-2-501), and with consideration given to the scope and scale of the recommended solution. This study also serves to meet the regulations that implement NEPA. USACE has conducted no prior studies regarding the study area. The City of Mountlake Terrace prepared the Ballinger Park Master Plan 2015. The Ballinger Park Master Plan presents a comprehensive vision for the future of the park that includes stream and wetland restoration elements.

The purpose of the Lake Ballinger Aquatic Ecosystem Restoration Project feasibility study is to evaluate significant aquatic ecosystem degradation in Ballinger Park; to formulate, evaluate, and screen potential solutions to these problems; and to recommend a series of actions and solutions that have a Federal interest and are supported by a non-Federal sponsor willing to provide the necessary items of local cooperation. Environmental degradation in Ballinger Park includes a loss of natural ecosystem structures, functions, and processes necessary to support critical fish and wildlife habitat.

See Section 2.1 for discussion of the historic and existing conditions that are the basis of the problem to be addressed and the objectives of this study.

1.2 Study Authority*

The study is being conducted under the authority of Section 206 of the Water Resources Development Act of 1996 [P.L. 104-303] as amended 33 USC § 2230 (Section 206) for aquatic ecosystem restoration. Under this authority, a project for aquatic ecosystem restoration should "improve the quality of the environment and be in the public interest … and cost effective." Per EP 1105-2-58, paragraph 35. a., the project should be "consistent with current policies and procedures governing projects of the same type which are specifically authorized by Congress."

1.3 Lead Federal Agency and Non-Federal Sponsor*

The Corps is the lead Federal agency. The City of Mountlake Terrace submitted letters of intent to sponsor a study on 15 January 2016 and 22 March 2016, formally requesting the Corps' assistance under Section 206. The Corps and the City of Mountlake Terrace signed a feasibility cost share agreement in October 2018. The City of Mountlake Terrace is the non-Federal sponsor for this study, and is hereinafter referred to as "the Sponsor".

1.4 Location of Study Area*

The study area is located within the City of Mountlake Terrace, in Snohomish County, Washington (Figure 1-1). The specific areas of focus for this study are Hall Creek, which runs from north to south, draining into Lake Ballinger; and Ballinger Park (Figure 1-2). The lake and the park are located in the Lake Ballinger/McAleer Creek Watershed. Ballinger Park was once a public golf course but is now a "passive" park used for low intensity recreation. A passive park is a term used for a park that offers passive recreation activities, such as walking and bird watching, which do not require extensive physical infrastructure and have minimal impacts on the environment. The Sponsor, which owns the now former golf course, allowed this park to return to a more natural condition starting in 2012. Hall Creek runs through Ballinger Park, entering the north end of Lake Ballinger via an outlet structure operated by the Sponsor (Figure 1-2). In this report, the "upper reach" is the portion of Hall Creek within the park that is upstream of the developed area (senior center and parking lots) and characterized by an incised and straight channel segment, and the "lower reach" is downstream of the developed area in the more open landscape of the old golf course.

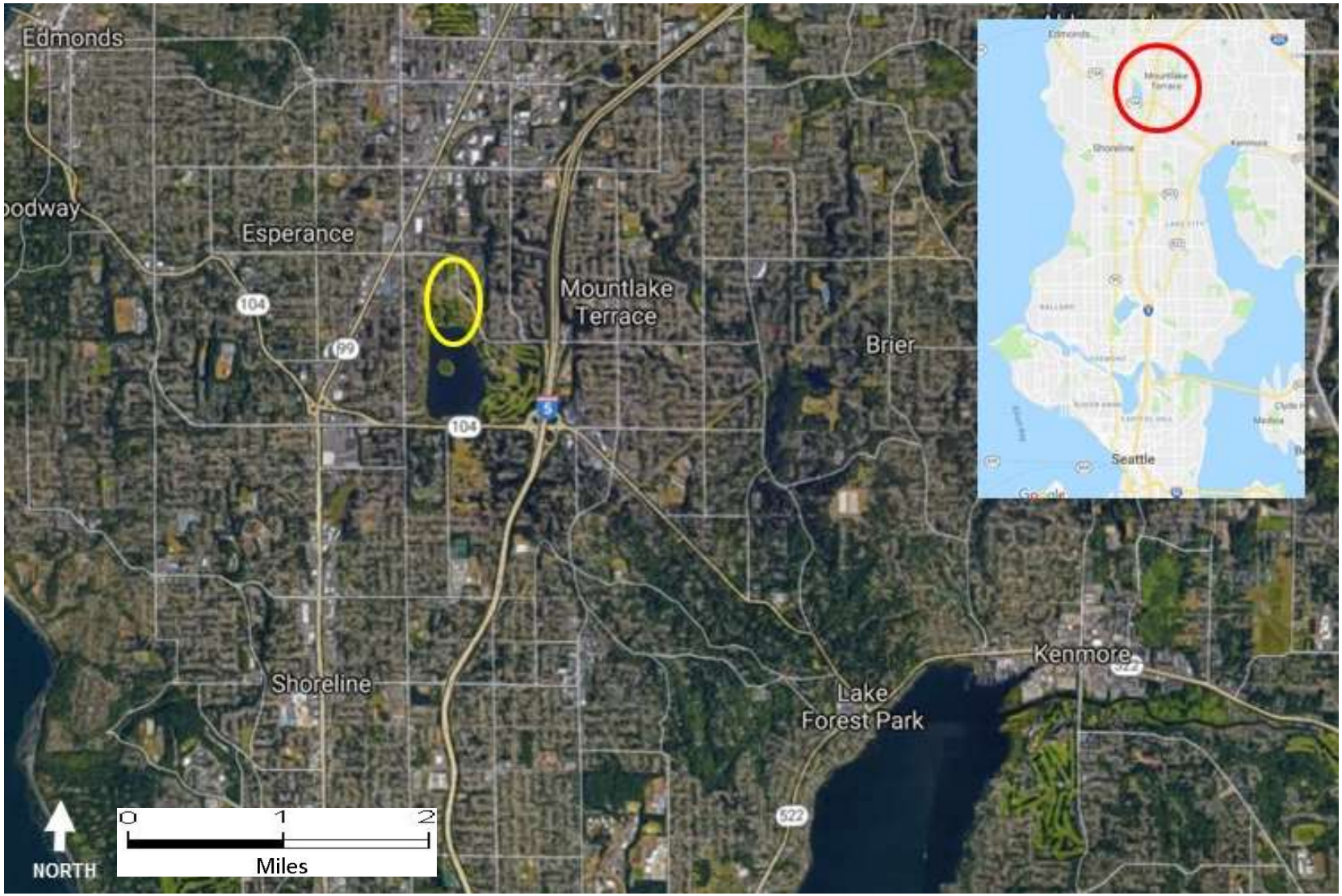

Figure 1-1. Project Location with Study Area Circled in Yellow (Source: Google Earth)
Red circle on inset indicates project vicinity.

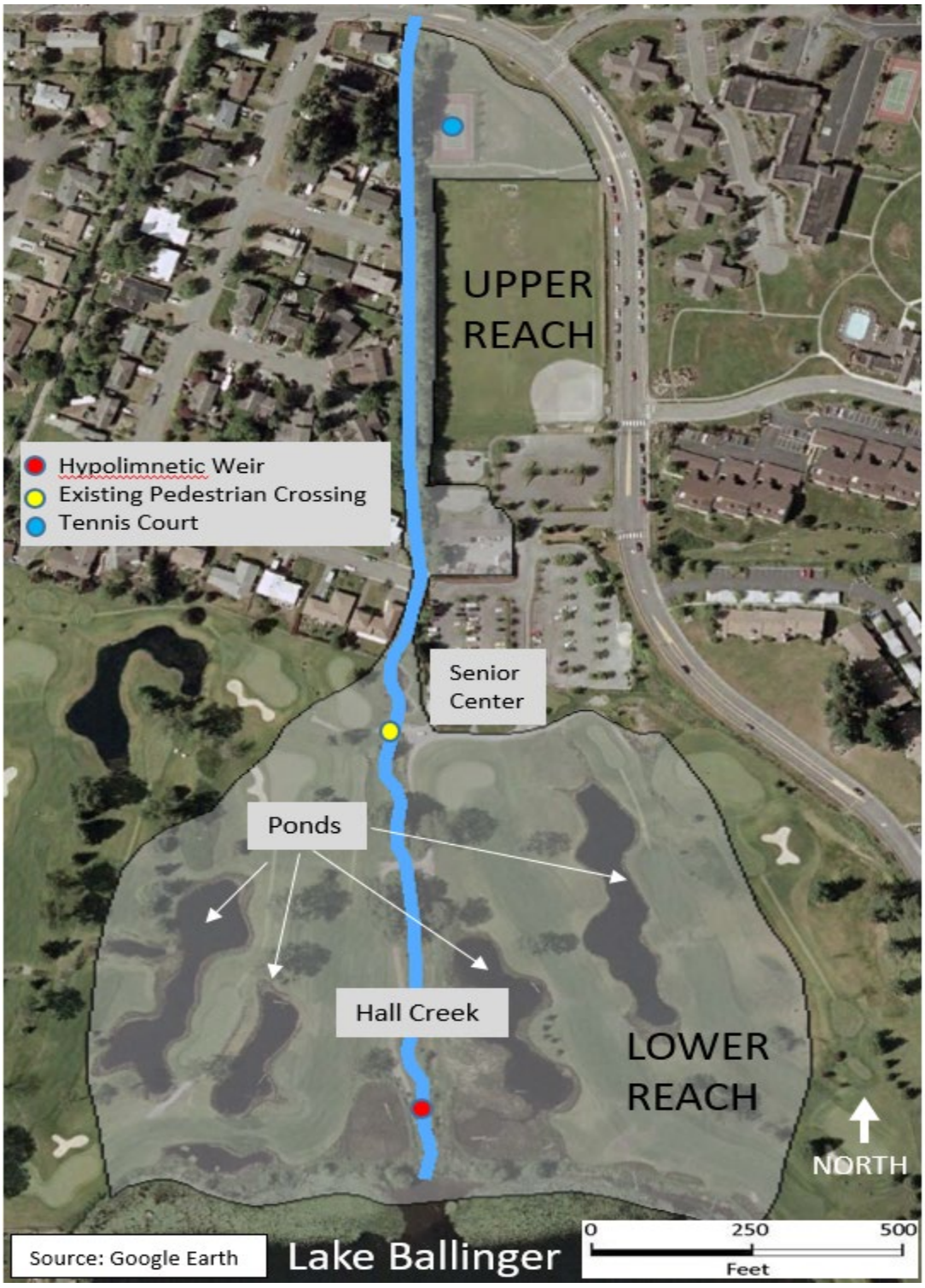

Figure 1-2. Vicinity Map: Shaded Areas = Boundary of Potential Ecosystem Improvements. All work areas within Ballinger Park.

1.5 Proposal for Federal Action*

The Corps proposes to implement aquatic ecosystem restoration of Hall Creek and associated habitats within Ballinger Park. The proposed Federal (Corps) action would be within Ballinger Park, consistent with the Sponsor's Master Plan. The Corps has a unique opportunity to address problems in the study area by restoring habitat in a rapidly developing urban area.

1.6 Overview of Integrated Feasibility Report / Environmental Assessment

This document is an integrated feasibility report/environmental assessment (FR/EA). The Corps planning process utilized herein is detailed in the Planning Guidance Notebook (ER 1105-2-100). The purpose of the FR/EA is to identify the plan that reasonably maximizes ecosystem restoration benefits, is technically feasible, and preserves environmental and cultural values consistent with NEPA. The purpose of the EA portion of this report is to identify and present information about potential environmental effects of the alternatives and to incorporate environmental considerations into the decision-making process. The six steps of the Corps planning process each align with a NEPA requirement. The list of the planning steps appears in Table 1-1. with the document chapter and NEPA element to which they relate:

Table 1-1. Overview of FR/EA

Corps Planning Step	Analogous NEPA Requirement	FR/EA Section
1. Specify Problems and Opportunities	Purpose and Need for Action	Chapter 2
2. Inventory and Forecast Conditions	Affected Environment	Chapter 4
3. Formulate Alternative Plans	Alternatives including Proposed Action	Chapter 3
4. Evaluate Effects of Alternative Plans	Environmental Consequences	Chapter 4
5. Compare Alternative Plans	Alternatives including Proposed Action	Chapter 3,4
6. Select Recommended Plan	Agency Preferred Alternative	Chapter 5

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2. Need for and Objectives of Action

This chapter presents results of the first step of the planning process, the specification of water and related land resources problems and opportunities in the study area. This chapter also establishes the planning objectives and constraints, which are the basis for formulation of alternative plans.

2.1 Existing and Historical Conditions

Historically, the Lake Ballinger/McAleer Creek Watershed was covered with lowland coniferous forest, with forested wetlands and bogs at the mouth of Hall Creek. The area was homesteaded in the late 1800s. The Great Western Lumber Company operated from the northwest shore of Lake Ballinger in the early 1900s. The lumber company floated logs across the lake to the mill which was located adjacent to the Interurban Railway that delivered supplies between Seattle and Everett. Subsequent to the logging operations, the area was utilized for agriculture.

The land north of Lake Ballinger opened as a golf course in 1959 (WSGA 2013). The City of Mountlake Terrace purchased the golf course in 1970, partially funded by a state grant through the Interagency for Outdoor Recreation. The golf course changed ownership several times in the form of lease agreements with the Sponsor starting in 1990. Hardy Golf LLC was the last golf course lessee and ceased operations in 2012 (Shaw 2014). A clubhouse was built in 1989. The golf course underwent major renovations in 1999, which included the construction of six ponds. When Hardy Golf LLC ceased operations, the Sponsor developed a master plan to create an ecologically restored park on the golf course site.

Water is at the heart of Ballinger Park's ecology. The interconnectedness of Hall Creek, the ponds, and lake create a unique opportunity for improving and restoring various ecological processes and habitats. The most ecologically under-performing element of the site is Hall Creek, which is heavily channelized and choked by non-native plants. The artificial ponds have developed into wetlands which are also home to non-native plants. Lake Ballinger is prone to algae blooms due to high levels of phosphorous and other nutrients.

The current baseline condition of the Lake Ballinger/McAleer Creek Watershed is typical of a suburban area, with widespread conversion of native vegetation, to residential and commercial tracks, with ornamental vegetation and increased impervious surface. There have been increases in invasive plant species in the area. Existing water courses have been greatly modified, via channelization and rerouting of drainage. There have been decreases in water quality due to increased runoff containing pollutants from point-sources and non-point sources. The diversity of native fish and wildlife has been reduced, favoring more generalist species and those that can survive in degraded environmental conditions.

2.2 Future Without Project Conditions

There are no known current plans to restore or further develop the project site. While the Sponsor's Ballinger Park Master Plan speaks generally about "enhancing ecology" at the site, there is no detailed design process or implementation strategy underway other than that being undertaken through this project. It is therefore reasonable to assume that if this project is not implemented, the Sponsor would continue to manage Ballinger Park in the manner that it is currently managed. In the future without project condition, flow conditions for Hall Creek, McAleer Creek and Lake Ballinger would remain the same as present. Hall Creek in the lower reach would continue to periodically overflow its banks during high flows and spread north downstream of the senior center onto park lands. The channel of Hall Creek would remain entrenched and stable. Pond levels would remain the same. Invasive species within the project site would continue to spread, with Himalayan blackberry, tansy ragwort and Scotch broom likely becoming more dominant unless actively managed or slowly outcompeted by trees if they are able to spread. The extent of wetlands would likely remain the same, but the quality would degrade. Future without project conditions are described by resource in Chapter 4, Affected Environment and Environmental Consequences.

2.3 Problems and Opportunities

The primary problem this study addresses is ecosystem degradation in Ballinger Park. Alteration of the environment and encroachment on the floodplain by human-made structures have degraded and continue to affect natural ecosystem structures, functions, and processes necessary to support fish and wildlife habitat throughout Ballinger Park. An ecosystem's structure includes its topography and physical features such as soils and hydrology and vegetation; ecosystem processes are the physical, chemical and biological actions or events that link organisms and their environment; and ecosystem function is the capacity of natural structure and processes to provide goods and services that satisfy human needs, either directly or indirectly, for example clean water or habitat for wildlife species valued by people. With the challenges of Hall Creek and the health of Lake Ballinger, this study recognizes an opportunity to enhance the creek's ecological functions, through restoring its structure and the ecological processes related to it. For example, increasing areas where water flows and is stored throughout the site would enhance ecosystem complexity and habitat value and increase the potential for improved water quality.

Since the arrival of European and American settlers in the 1800s, human activities have altered the watershed's hydraulic and geomorphic processes and reduced the area's ecological resources. Problems stemming from existing specific human impacts to the watershed that are the focus of this study include:

- Hall Creek has been channelized and, as a result, latitudinal connectivity between the creek and its floodplain has been lost.
- In-stream creek habitat for species of concern such as native fish, migratory birds, and amphibians has been simplified through straightening and removal of pool/riffle structure.
- The surrounding floodplain vegetation and wetland habitat has been heavily altered from natural conditions.

The impacts outlined above have led to the degradation of ecosystem processes, structures, and functions in the study area.

Opportunities to address problems for the study area include the following:

- Restore wetland and riparian habitat with native plants for fish and wildlife including native fish, migratory birds, and amphibians; such habitat is scarce in this highly urbanized area.
- Provide habitat for birds covered under the Migratory Bird Treaty Act (MBTA).
- Partner with the Sponsor on a project that is consistent with larger community-supported Ballinger Park Master Plan and regional recovery objectives.

This project has a rare opportunity to create and preserve critical habitat in a rapidly developing urban area. The project would create habitat for species of concern (e.g. amphibians) and provide habitat for migrating birds and many species of waterfowl on the Pacific Flyway. This project also represents an important opportunity to restore valuable wetlands in an area with tremendous visibility. The local community is actively engaged and motivated to move forward with this restoration opportunity. WSDOT has planned three downstream habitat restoration actions aimed at establishing safe, long-term connectivity for Endangered Species Act (ESA) listed fish species. These planned actions are not a part of this study, nor are they dependent upon it; they are mentioned for context because if this project is implemented, it would interact synergistically with those future actions, increasing their potential to benefit the environment.

While this study would not address removal of a culvert at Interstate 5 that limits upstream fish migration to the study area, Washington State Department of Transportation (WSDOT) has indicated that these culverts would be replaced by 2024, to allow for improved fish passage.

This study represents an opportunity to identify a recommended plan that would restore habitat that would be beneficial to fish when the Washington State Department of Transportation (WSDOT) addresses this downstream constriction.

2.4 Purpose and Need for Action*

The need for the proposed Federal action arises from the significant degradation of natural structures and processes that sustain ecological functions of the watershed as described in section 2.2 of this report. The purpose for the proposed Federal action is to work within the defined study area to enact solutions within the Corps' authority to restore ecosystem process, structure and function in the aquatic environment by addressing the problems identified during the feasibility study. Restoration of ecosystem structures, functions, and processes will benefit nationally and regionally significant resources in the study area (see section 2.5).

2.5 Resource Significance—Technical, Institutional, Public

The goal of this ecosystem restoration project is to have a positive impact on significant ecosystem resources. The Lake Ballinger/McAleer Creek Watershed provides an opportunity to restore a natural ecological system within a highly urbanized area. Significant environmental resources have declined to a point that the ecosystem may not be self-sustaining without immediate intervention to curtail considerable ecological degradation. These resources are technically, institutionally, and publicly significant as described in the following sections.

2.5.1. Technical Significance

Technical significance of the resources proposed for restoration in the study area is supported by the fact that increasingly scarce species of native amphibians, fish and reptiles, riparian-dependent species, and migrating waterfowl and passerines would benefit from restoration of regionally rare wetland habitat (Azous, 2001). The degraded wetland habitats at the project site could support these ecological resources. Scarcity of such wetland resources is demonstrated by the fact that over 60 percent of Washington's wetlands have been lost to development, with most of that development occurring in King County (King County, 2017). (While this project is not proposed in King County, Ballinger Park borders King County; and the City of Mountlake Terrace is part of the greater Seattle metropolitan area.)

Wetlands and channel connectivity in the area provide ecological functions including rearing and resting sites for aquatic and land species, natural drainage, storage areas for floodwater, and water purification functions through natural filtration and sediment capture. The Lake Ballinger/McAleer Creek Watershed associated with Hall Creek would derive ancillary benefits from this project.

2.5.2. Institutional Significance

Institutional significance of the resources proposed for restoration in the study area is supported by recommendations within the action plan developed by the Water Resources

Inventory Area 8, the interagency regional ESA recovery entity responsible for the Lake Washington watershed, and by presence in the study area of Essential Fish Habitat (EFH) for coho and Chinook salmon, as designated by the National Marine Fisheries Service (NMFS) in accordance with the Magnuson-Stevens Fishery Conservation and Management Act.

Institutional significance is also demonstrated by the formation and activities of the Lake Ballinger/McAleer Creek Watershed Forum, comprised of Snohomish County and the cities of Mountlake Terrace, Edmonds, Lake Forest Park, Lynnwood, and Shoreline. The forum convened in 2007 to support of a joint watershed basin action plan which includes restoration in the study area.

WSDOT is an interested party because of existing downstream constrictions to fish passage which they could address per the requirements of the 2013 culverts case (U.S. v Washington, 20 F. Supp. 3d 986 (W.D. Wash. 2013). A culvert (Site 990273, I-5 on McAleer Creek) that limits upstream fish migration to the study area. WSDOT is proposing to replace this culvert before 2030 per its' FY21-23 culvert plan While this culvert replacement could in the future generate ancillary benefits for salmonids, for the purposes of analyzing the cost effectiveness of alternatives, the Corps has not assumed that the culvert will be replaced as there is no plan in place to do so currently.

The Ballinger Park Master Plan demonstrates institutional significance through outlining conceptual elements of site restoration. Restoration elements recommended in the master plan include removal of non-native vegetation, creation of stream channel meanders across the floodplain, creation of a diversity of wetland habitats in the floodplain, revegetation of the site with native species, and placement of large wood in Hall Creek.

2.5.3. Public Significance

Members of the public have recognized the significance of the Lake Ballinger/Hall Creek resources both formally and informally. Ecosystem restoration was a common theme in comments received during the NEPA scoping period as well as during public meetings held by the Sponsor throughout the course of the study. In addition, efforts contributed by volunteers to plan, raise funds for, and implement restoration at the site provide evidence of the public significance of the type of restoration described here.

Ballinger Park is already loved by the community and holds the potential to create a space with a natural ecosystem within a highly urbanized area, where natural systems and processes can be restored and valued by the people who would visit the park.

Table 2-1 summarizes the technical, institutional, and public significance of the resources proposed for restoration.

Table 2-1. Technical, Institutional and Public Significance

Technical Significance	Institutional Significance	Public Significance
Aquatic species, riparian-dependent species, and migrating waterfowl and passerines that depend on scarce wetland habitat	NMFS Essential Fish Habitat WSDOT Culvert Case Ballinger Park Master Plan Lake Ballinger/McAleer Creek Watershed Forum	NEPA Scoping — Public concern for ecosystem restoration

2.6 Objectives and Constraints

2.6.1. National Objective

The Federal objective of water and related land resources project planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. The objective of ecosystem restoration is to restore degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition (ER 1105-2-100, 3-5.b.(1)). Ecosystem restoration aims to reverse the adverse impacts of human activity and restore ecological resources, including fish and wildlife habitat, to as close to previous levels as feasible, but not a higher level than would have existed under natural conditions in the absence of human activity.

2.6.2. Planning Objectives and Constraints

Based on the problems identified in the study area, planning objectives include the following and consist of an effect, subject, location and timing per Engineer Regulation (ER) 1105-2-100:

1. Reconnect and restore the quantity, quality, and complexity of sustainable native riparian and floodplain habitats within Ballinger Park for the 50-year period of analysis.
2. Improve quality and complexity of Hall Creek within Ballinger Park for the 50-year period of analysis
3. Improve the quality and complexity of ponds and wetland function within Ballinger Park for the 50-year period of analysis.

4. Restore degraded ecosystem function and processes to a more natural condition within Ballinger Park for the 50-year period of analysis.
5. Decrease effects of urbanization and improve wetland function in the study area for the 50-year period of analysis.

Table 2-2 shows the identified problems in the study area and objectives that address them. The period of analysis for this study is the 50-year period from 2021 to 2071.

Table 2-2. Restoration Objectives and the Problems They Address

Objectives	Problems in the Study Area		
	Hall Creek has been channelized and, as a result, latitudinal connectivity between the creek and its floodplain has been lost.	In-stream creek habitat for species of concern such as native fish, migratory birds, and amphibians has been simplified through straightening and removal of pool/riffle structure.	The surrounding floodplain vegetation has been heavily altered from natural conditions and wetland habitat has been significantly altered
Reconnect and restore the quantity, quality, and complexity of native riparian and floodplain habitats.	X	X	X
Improve the quality, and complexity of Hall Creek within Ballinger Park.	X		
Improve the quality, and complexity of ponds and wetland function within Ballinger Park.			X
Restore degraded ecosystem function and processes to a more natural condition.	X	X	X
Decrease effects of urbanization.	X	X	X

Planning constraints are significant barriers or restrictions that limit the extent of the planning process. Study-specific planning constraints are statements of things unique to the specific planning study that alternative plans should avoid. The following constraints (i.e. limitations on

the range of measures and alternatives that can be proposed) have been identified for the study:

1. There cannot be modifications to the hypolimnetic[1] withdrawal system and associated weir. The weir was installed to help control phosphorus in the lake, which is at levels exceeding the TDML. Recent communication from WDFW and DOE affirms the need for the weir to remain.
2. No measure can lead to increased flood risks for critical public infrastructure or adjacent home owners.

2.7 Public Scoping Comments and Resources of Concern*

Community support for Lake Ballinger Aquatic Ecosystem Restoration Project continues to be evaluated as a function of the planning process by the Sponsor and the Corps. To date, the sponsor held a series of public meetings that included a representative cross section of the community. The following section summarizes the community and agency input as it pertains to the Section 206 project.

To date, the Sponsor held a public workshop on 27 April 2019 as part of its annual Arbor Day outreach that included materials on the Section 206 project. Drawings on the project were displayed and discussed, and were well-received. Public comments from the meeting demonstrate continued public support for the project and were archived as part of the project record.

The Sponsor has continued to involve the public as the project develops through the use of a quarterly newsletter and semi-annual meetings. The general view is that the restoration of Ballinger Park wetlands and riparian areas, and of Hall Creek, will provide many ecological and community benefits.

A NEPA public outreach effort has been undertaken for this feasibility report/environmental assessment. The results of this outreach are included in this final version of the report. More detail is provided Chapter 7.

[1] Via deep water aeration or hypolimnetic aeration, the oxygen demand of deep water is covered by oxygen from the atmosphere without destroying the lake's natural stratification. Thus the deep water becomes aerobic, the phosphate dissolution is reduced significantly and the mineralization of sediments improves.

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3. Plan Formulation

The guidance for conducting civil works planning studies (Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook and Principles and Guidelines, 1983) requires the systematic formulation of alternative plans that contribute to the Federal objective. To ensure that sound decisions are made with respect to development of alternatives and ultimately with respect to plan selection, the plan formulation process requires a systematic and repeatable approach. This chapter presents the results of the plan formulation process. Alternatives were developed in consideration of study area problems and opportunities as well as study objectives and constraints with respect to the four evaluation criteria described in the Principles and Guidelines (completeness, effectiveness, efficiency, and acceptability). Figure 3-1 presents a summary of the plan formulation process that will be presented throughout this chapter.

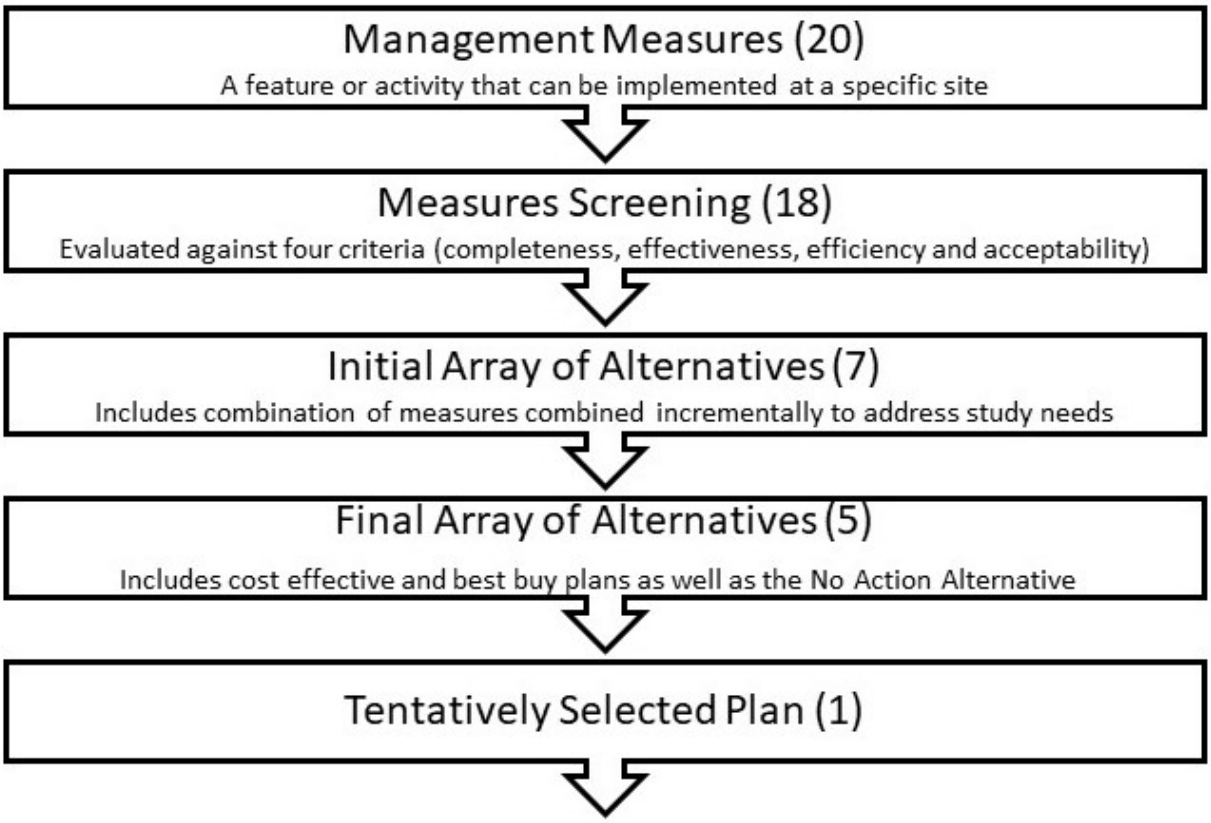

Figure 3-1. Plan Formulation Process

3.1 Management Measures

The Corps and Sponsor, along with input from interested stakeholders, developed a series of measures to be considered as potential elements of the project solution. A management measure is a feature or activity at a site that addresses one or more of the planning objectives and is a discrete element of a recommended project solution.

The management measures developed for this study were aimed at improving the aquatic ecosystem through addressing the lack of wetland connectivity, removal of invasive plants, side channel connections, increasing channel complexity, increasing large woody debris, enhancing ponds and restoring degraded riparian conditions. A total of 21 management measures were identified during preliminary planning stages and are described below. They are presented here in four groups based on the following measure types: Riparian Enhancement, Channel Diversity, Wetland Enhancement and Public Outreach and Education

Riparian Enhancement Measures

Measures associated with this functional grouping are intended to provide benefits to the ecosystem through improvements in the quality and quantity of riparian vegetation. Benefits are delivered through increases in nutrient delivery to Hall Creek (e.g. insect drop), sustaining diverse habitat for food sources for wildlife and resident fish and visual and thermal cover for migratory birds during all seasons.

1. Invasive Plant Removal—Riparian (non-structural measure): This measure consists of the physical removal of invasive plant species from within established riparian zones either mechanically or by hand. The measure provides benefit by reducing potential for continued expansion of vegetation considered to have little ecological value or is harmful to native wildlife. The expected benefits also include increased potential for native plant survival rate and expansion.

2. Invasive Plant Removal—Lake (non-structural measure): This measure consists of the physical removal of invasive plant species from in and around lakes either mechanically or by hand. The measure provides benefit by reducing potential for continued expansion of vegetation considered to have little ecological value or is harmful to native wildlife. The expected benefits also include increased potential for native plant survival rate and expansion.

3. Riparian Planting (non-structural measure): This measure consists of the installation of a diverse set of riparian plants along degraded riparian areas. Riparian Planting includes a diverse plant palette tailored to the specific needs of the site intended to provide both horizontal and vertical plant complexity. Common species employed in the northwest under this measure include low growing native plants (ferns, salal, grasses) and mid-level shrubs including salmonberry, snowberry, Oregon grape, dogwoods, vine maple and willows. Installation is generally conducted by hand either with potted plants or live stakes. The measure provides benefit by increasing the amount and diversity of riparian vegetation to facilitate high productivity riparian communities. It would improve shade, prey production, wildlife habitat,

fisheries habitat, and it would serve as a source of allochthonous input (i.e. provision of nutrients for valued native flora and fauna from external sources).

4. Overstory Planting (non-structural measure): This measure consists of the installation of a diverse set of riparian overstory plants along degraded riparian areas. Common species employed in the northwest under this measure include cottonwoods, native conifers, and bigleaf maples. Installation is generally conducted by hand either with potted plants or live stakes. The measure provides benefit by increasing the amount and diversity of riparian overstory vegetation to facilitate high productivity riparian communities. The measure provides benefit by improving shade, prey production, wildlife habitat, shade that benefits aquatic resources and native fishes, and would serve as a source of allochthonous input.

5. Topographic Modification (creation of hummocks): This measure consists of the creation of hummocks by increasing or decreasing elevations in existing uplands. In general, material is reused and reworked from channel excavations to create variability in elevations. The measure provides benefit by increasing plant diversity.

6. Physical Exclusion (including signage, fencing and boardwalks): This measure consists of the installation of signage, fencing, and boardwalks at sensitive riparian and wetland areas within the project site where the probability of human disturbance is high. The physical exclusion measure does not directly benefit the ecosystem, but rather prevents the degradation of, and accelerates the accrual of, benefits provided by other measures. Physical exclusion will reduce trampling and disturbance impacts from passive recreation use and increase habitat for migratory birds including waterfowl, and improve aquatic habitat. Signage provides benefit by directing visitors to stay on trails would reduce damage to sensitive ecological areas. Fencing provides benefit by excluding foot traffic in sensitive areas such as the riparian corridor or wetlands where sensitive plants and wildlife could be trampled. The boardwalk also serves as benefit by directing foot traffic to safely navigate through inundated areas and reducing the amount of disturbance to plants and wildlife. A less expensive soft trail through inundated areas was considered and ruled out for the following reasons: 1) a soft trail would have high operations and maintenance (O&M) costs driven by periodic need to replace trail material absorbed into the wetland; 2) a soft trail would reduce ecosystem benefits as it would not serve as habitat, whereas the area under a boardwalk would; 3) a soft trail would need to be combined with additional fencing to effectively exclude users from the surrounding natural areas, and fencing would disrupt connectivity across the site for wildlife, in addition to adding to both construction and O&M costs.

(This measure could have been grouped with Wetland Enhancement Measures as well; it is grouped here because riparian areas are more comprehensive, including wetlands, channel and uplands associated with rivers or streams.)

7. Removal of Impervious Surfaces (non-structural measure): This measure consists of demolishing and removing the tennis court located at the northernmost end of the project area. The measure provides benefit by creating additional riparian habitat for pollinators and wildlife. The increase of natural water infiltration into the ground can assist in preventing flooding in the surrounding area and help filter pollutants from the water before it enters Hall Creek.

Channel Diversity Measures

Measures associated with this functional grouping are intended to provide benefits to the ecosystem through improvements in the quality and quantity of the aquatic habitats (Hall Creek and side channels) including associated bankline and substrate. Benefits are delivered through increases in hydraulic diversity and structure (large woody debris/boulders) within Hall Creek, which improve delivery of food sources for wildlife and resident fish and conditions appropriate for invertebrate populations as well as resident and migratory birds. In-stream cover and refuge habitat for all organisms is provided. Future anadromous salmonid use in Hall Creek will also benefit from these improvements.

8. Channel Diversity Improvements: Through the reconfiguration of lower Hall Creek, this measure consists of creating variable channel habitat types in the lower section of Hall Creek. The measure is accomplished by use of excavator to create a new and more sinuous channel with varying side slopes west of the current channel. The measure provides benefit by increasing habitat complexity for plants, fish, and wildlife which in turn promotes increased species abundance and diversity.

9. Armor Removal (non-structural measure): This measure consists of the physical removal of armor stone from the banks of Hall Creek where possible. This measure provides benefit by increasing in-stream habitat productivity by promoting more natural bank conditions and increases in overhanging riparian vegetation.

10. Off-Channel Connectivity—Side Channels: This measure consists of creating blind dendritic channels off the new Hall Creek alignment by means of excavation. These channels dead-end at their upstream end (hence are “blind”), and are branching, as branches on a tree (hence “dendritic”). The measure provides benefit by increasing the amount of shallow backwater habitat for juvenile fish and wildlife.

11. Channel Substrate Modification (gravel placement): This measure consists of the placement of gravel and cobble in the realigned channel at the lower reach of Hall Creek (see Measure 8). Added gravel and cobble is generally the same size range as what is found in the upper reach of the project area. The measure provides benefit by reducing the possibility of channel incision from occurring. Additional expected benefits include fish spawning, and aquatic macro invertebrate habitat.

12. Instream Habitat Diversity—Large Woody Debris (LWD): This measure consists of the physical placement of individual logs in the channels of both the upper and lower reaches of the Hall Creek project area. Logs are typically fastened perpendicularly or angled downstream with cable or rope and anchored deep into the ground as a stabilizing method. The measure provides benefit by creating habitat complexity, promotes a medium for aquatic invertebrate production. Additional expected benefits are channel stabilization, energy dissipation, and gravel/cobble retention.

13. Instream Habitat Diversity—Boulders: This measure consists of the physical installation of appropriately sized boulders in the channel throughout the upper and lower reach of Hall Creek. Placement mimics the natural accumulation of boulders by means of random placement or cluster placement that would not impede fish movement. The measure provides benefit by restoring and maintaining a stable channel and provides improved habitat complexity. Another expected benefit is the creation of overhead cover for fish.

14. Reconnect Dendritic Channels: This measure consists of reconnecting dendritic channels off the new channel alignment. Dendritic channels are channels, connected in this case to Hall Creek at their downstream end, that branch and get progressively smaller going upstream (like branches on a tree extending from the trunk). The measure provides benefit by providing shallow backwater habitat for juvenile fish and wildlife.

Wetland Enhancement Measures

Measures associated with this functional grouping are intended to provide benefits to the ecosystem through improvements in the quality and quantity of wetland vegetative conditions focused largely around pond habitats. Benefits are delivered through increases in nutrient uptake, water quality and organic delivery to wetland communities within the footprint. Wetlands will ensure diverse habitat for food sources for amphibians, resident wildlife and food for reptiles and migratory birds during all seasons.

15. Creation of Shallow Water Fringe Habitat: This measure consists of the physical placement of fill material in select areas in each of the ponds. In general, ponds will have two to three areas where fill is placed to create a 10:1 slope where possible or by decreasing water depths to

less than one foot. The measure provides benefit by providing shallow water fringe habitat where a variety of native emergent vegetation take hold. Another benefit provided by this measure is the creation of habitat for amphibian use.

16. Wetland Planting—Ponds (non-structural measure): This measure consists of the improvement of the existing wetland buffer around the ponds by planting a variety of native emergent vegetation to support species dependent upon pond habitats. The measure provides benefit by creating important habitat and food sources for insects and wildlife. Emergent vegetation can also provide benefit filtering excess nutrients from runoff.

17. Wetland Planting—Creek (non-structural measure): This measure consists of the establishment or improvement of existing wetland emergent plant communities along the Hall Creek corridor. Plant palette would emphasize species tolerant of extended inundation. This measure provides benefit by improving wetland habitat and function.

18. Off-Channel Connectivity—Pond Habitat: This measure consists of the installation of off-channel connectivity from the new channel to the pond habitats. Connections are preferably subsurface while channels are installed where subsurface connections are not feasible. The measure provides benefit by restoring the natural water table up to its historic level. The restored water table results in re-watering soils and vegetation which in turn provide wildlife habitat. Another benefit of this measure is a more stable channel, especially when subjected to floods. Flow accesses the flood plain and spreads over a more broad area that is less erosive to the stream bank and streamside vegetation.

19. Removal of Fill and Creation of Wetland (non-structural measure): This measure consists of the removal and disposal of the of the fill layer at specific locations within the project site and expose native soils. This measure provides natural contours and microrelief, or subtle variations in elevation (associated habitat), conducive to the creation of wetlands. The creation of new wetlands provides habitat for fish, wildlife, and plants and would also provide an increase in overall biodiversity. This measure also provides benefit to the project by biogeochemical cycling excess nutrients such as nitrogen and phosphorus, nutrients known to cause water quality problems such as algal blooms at the project site.

Public Outreach/Education Measures

Measures associated with this functional grouping are intended to ensure sustainability and long-term benefits to the restoration project. Measures focus on maximizing connectivity between the natural environment and humans within the footprint to enhance interpersonal connections and stewardship. Physical measures are intended to ensure sustainability of

restoration features in light of on-going human presence, particularly for sensitive wetland and riparian plant communities.

20. Public Outreach and Education (non-structural measure): This measure consists of the installation of educational signage in select areas to provide public awareness and education of the restoration site. The measure provides benefit by educating the public of the ecological, wildlife, and cultural values of the area, and it could increase potential for custodial care.

Management measures for this study are listed in Table 3-1, along with the related objective(s) that each measure addresses.

Table 3-1. Management Measures and Relationship to Planning Objectives

Management Measures	Objectives				
	Reconnect and restore the quantity, quality, and complexity of native riparian and floodplain habitats	Improve the quality, and complexity of Hall Creek within Ballinger Park	Improve the quality, and complexity of ponds and provide wetland restoration	Restore degraded ecosystem function and processes to a more natural condition	Decrease effects of urbanization
1. Invasive Plant Removal—Riparian		X	X	X	X
2. Invasive plant removal—Lake			X	X	X
3. Riparian Planting	X	X		X	X
4. Overstory Planting	X	X		X	X
5. Topographic modification (creation of hummocks)	X			X	
6. Physical Exclusion (including signage, fencing and boardwalks)		X		X	X
7. Removal of Impervious Surfaces	X		X	X	X
8. Channel Diversity Improvements	X	X		X	X
9. Armor Removal	X	X		X	X
10. Off-Channel Connectivity—Side channels	X	X		X	X
11. Channel Substrate Modification (gravel placement)	X	X		X	X
12. Instream Habitat Diversity—LWD	X	X		X	X
13. Instream Habitat Diversity—Boulders	X	X		X	X

14. Reconnect Dendritic Channels	X	X		X	X
15. Creation of Shallow Water Fringe Habitat			X	X	X
16. Wetland Planting—Ponds			X	X	X
17. Wetland Planting—Creek		X		X	X
18. Off-Channel Connectivity—Pond Habitat	X		X	X	X
19. Removal of Fill and Creation of Wetland			X	X	X
20. Public Outreach and Education	X	X	X	X	X

3.2 Screening of Measures

Screening is the process of eliminating, based on planning criteria, those measures that will not be carried forward for consideration. Criteria are derived for the specific planning study, based on the planning objectives, constraints, and the opportunities of the study/project area. The following criteria were used to screen the measures:

1. Each measure must meet at least one planning objective.
    - Measure must contribute towards addressing to at least one of the planning objectives described in Section 2.6.2.
2. Each measure must avoid planning constraints.
    - Measure must not violate any of the constraints described in Section 2.6.2.
3. Each measure must be feasible in consideration of access/land ownership considerations.
    - Real estate needed for measure must available to the project.
4. The size or scale of each measure must be appropriate for the Continuing Authorities Program and the Sponsor's capabilities.
    - Measure must not exceed scope of project authority.
    - Measure must not require operations and maintenance costs that would exceed the anticipated benefits.

Measures were considered in light of the listed criteria; those that did not meet the criteria were screened out. Measures not carried forward included the following:

Measure 2: Invasive Plant Removal—Lake

This measure was not carried forward as it failed to adequately meet screening criterion #4. The lake is large and much of its shoreline is outside the jurisdiction of Mountlake Terrace, making long term sustainability of aquatic invasive plant removal unlikely. Large sources of invasive plants located beyond the Sponsor's jurisdiction would result in sustainability and maintenance concerns regarding this measure.

Measure 17: Wetland Planting—Creek

This measure was not carried forward as no location along the creek could be identified as a sustainable site for this type of community. This measure requires adequate shallow water fringe habitat along the creek, and such a site was not found in the reach. Therefore such wetland plantings would not meet any of the planning objectives and is screened out per screening criterion #1.

3.3 Measures Carried Forward for Further Evaluation and Alternative Formulation

After initial screening of measures was completed, remaining measures were analyzed for additional considerations including: combinability, dependability, mutual exclusion, and site identification for project implementation. The Corps, Sponsor, and local and regional stakeholders identified specific sites within Ballinger Park where one or more measures could address specific problems and opportunities. Preliminary measures were assigned to the proposed project footprint using best professional judgment of those features that will best function at the site for the intended benefits. Qualitative considerations of sustainability, O&M lifecycle costs, construction costs, real estate, scale, risk and reliability of performance, and benefit type needed were considered when applying measures to the proposed project. After screening out Measures #2 and #17, the following 18 measures are carried forward to alternatives formulation.

Riparian Enhancement Measures

1 - Invasive Plant Removal—Riparian
3 - Riparian Planting
4 - Overstory Planting
5 - Topographic Modification (creation of hummocks)
6 - Physical Exclusion (including signage, fencing and boardwalks)
7 - Removal of Impervious Surfaces

Channel Diversity Measures

8 - Channel Diversity Improvements

9 - Armor Removal & Bank Geometry
10 - Off-Channel Connectivity—Side channels
11 - Channel Substrate Modification (gravel placement)
12 - Instream Habitat Diversity—Large Woody Debris (LWD)
13 - Instream Habitat Diversity—Boulders
14 - Reconnect Dendritic Channels

Wetland Enhancement Measures
15 - Creation of Shallow Water Fringe Habitat
16 - Wetland Planting—Ponds
18 - Off-Channel Connectivity—Pond Habitat
19 - Removal of Fill and Creation of Wetland

Public Outreach/Education
20 - Public Outreach and Education

3.4 Formulation of Alternatives

The Corps formulated an initial array of seven alternatives by assembling various combinations of management measures into a range of alternatives plans informed by site conditions, field data collection external outreach, experience gained from similar projects within the District and best professional judgment. Each alternative was comprised of several measures, each determined to provide benefits given the footprint of the respective alternative. Alternatives were formulated using an additive methodology starting with measures predicted to have the largest improvement to the project location. Additional measures were added to the previous (smaller) alternative in order to increase the benefits relative to the previous alternative. After a series of meetings, the team identified which measures would best address the planning objectives and at what scale. The team selected a consistent size/scale for each measure based on the site conditions in order to maintain consistency between alternatives. This was done so that adjustments to any of the measures' footprints or locations during the feasibility level design, would impact cost proportionally among all alternatives that contain that measure.

Action alternatives were developed by first adding measures that the team concluded had the largest potential to address the restoration needs at the project site. The first action (smallest) alternative (#2) includes planting of understory and overstory vegetation to increase environmental benefits without the need for significant ground disturbance. To address the Hall Creek improvement objective, Alternative 2 also includes invasive plant removal and minor modification of the lower Hall Creek channel. Alternative 3 builds on the Hall Creek improvement objective by creating a new enhanced channel for lower Hall Creek. Alterative 4

adds channel improvements to upper Hall Creek. Alternative 5 includes enhancement of the four existing ponds. Alternative 6 would create additional wetland acreage. When Hall Creek rises, it would inundate the wetland area, create more off-channel habitat, and increase floodplain connectivity. Alternative 7 would add variable channel habitat types in the lower section of Hall Creek by creating more sinuous channel sections with varying side slopes west of the current channel.

No measures are mutually exclusive; however several are dependent on other measures. For example, Channel Diversity Improvements cannot occur without the Armor Removal. Similarly, Riparian Planting could not occur successfully without Invasive Plant Removal—Riparian. These dependencies were all considered during the development of each combination of measures that resulted in the array of alternatives. Table 3-2. shows which measures are included in each alternative.

Table 3-2. Management Measures and Relationship to Alternatives

Measure	Alternatives						
	Alt 1: No Action	Alt 2: Riparian Enhancement / Lower Channel Armor Removal	Alt 3: Lower Channel Meander / LWD	Alt 4: Upper & Lower Channel Work	Alt 5: Upper & Lower Channel Work with Pond Enhancement	Alt 6: Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications	Alt 7: All Measures
1. Invasive Plant Removal—Riparian		X	X	X	X	X	X
3. Riparian Community Enhancement		X	X	X	X	X	X
4. Overstory Planting		X	X	X	X	X	X
5. Topographic modification (creation of hummocks)			X	X	X	X	X
6. Physical Exclusion (including signage, fencing and boardwalks)				X	X	X	X
7. Removal of Impervious Surfaces		X	X	X	X	X	X
8. Channel Diversity Improvements			X	X	X	X	X
9. Armor Removal		X	X	X	X	X	X

10. Off-Channel Connectivity—Side channels			X	X	X	X	X
11. Channel Substrate Modification (gravel placement)			X	X	X	X	X
12. Instream Habitat Diversity—LWD			X	X	X	X	X
13. Instream Habitat Diversity—Boulders				X	X	X	X
14. Reconnect Dendritic Channels						X	X
15. Creation of Shallow Water Fringe Habitat					X	X	X
16. Wetland Planting—Ponds					X	X	X
18. Off-Channel Connectivity—Pond Habitat							X
19. Removal of Fill and Creation of Wetland						X	X
20. Public Outreach and Education		X	X	X	X	X	X

3.5 Alternatives to be Evaluated

This section describes the alternatives to be evaluated and compared to determine which alternative will comprise the National Ecosystem Restoration (NER) Plan and tentatively selected plan (TSP). The tentatively selected plan is the alternative identified by the Corps as most consistent with policy, prior to public review and incorporation of resulting comments into the planning process. The NER Plan is the alternative that maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objective. For Corps ecosystem restoration projects, the TSP is generally the NER Plan (or in some cases a locally preferred plan). These alternatives were formulated as complete and acceptable plans regardless of which would ultimately be found to be most cost effective. The alternative plans are not combinable. Each plan includes most, if not all, of the elements of the previous plan, with additional measures added. The 35% design set for the preferred alternative can be found in Appendix A.

Alternative 1: No Action

The No-Action alternative is synonymous with the "Future Without-Project Condition". No project would be implemented by the Corps to achieve the planning objectives. Evaluation of the No Action Alternative is required by Corps Planning guidance and by NEPA. As described throughout Chapter 4, Hall Creek will remain degraded under the No-Action Alternative. Habitat availability, quality, complexity, and connectivity will continue to deteriorate. The overall condition of the channel is anticipated to remain severely degraded.

Alternative 2: Riparian Enhancement / Lower Channel Armor Removal

Alternative 2 (Figure 3-2) is focused on improving habitat along the upper and lower reaches of Hall Creek through invasive removal and planting of native vegetation, and through removal of armor rock known to constrain channel productivity. These measures were identified as having the potential to provide high ecological lift in the proposed footprint without significant site alterations or structural components. Alternative 2 also includes public educational signage to help protect newly restored sensitive areas.

Alternative 2 includes the following measures:

- Invasive Plant Removal—Riparian
- Riparian Planting
- Overstory Planting
- Removal of Impervious Surfaces
- Armor Removal
- Education and Outreach

Alternative 3: Lower Channel Meander / LWD

Alternative 3 (Figure 3-3) includes all measures from Alternative 2 focused on upper and lower reach restoration of Hall Creek to a more natural condition. In addition, this alternative includes site alteration measures including a meandering new channel complete with LWD and substrate. Armor removal for this alternative and all that follow is limited to the upper reach to avoid disruption to the existing channel vegetation along the remnant channel that would become a side channel; the newly configured main channel would have no armor. The new channel would serve as the primary source of water flow and would be isolated from the old Hall Creek channel through use of a soil plug. A new channel crossing is included to maintain access to the park. Excavation material from the new channel will be added with imported soil to create hummocks to support diverse vegetation and direct surface water where needed. The existing Hall Creek channel would remain connected to the new channel at the lower end

serving as a long vegetated off channel habitat. These measures were the primary features needed to completely address lost productivity in Hall Creek.

Alternative 3 includes the following measures:

- Invasive Plant Removal—Riparian
- Riparian Planting
- Overstory Planting
- Topographic modification (creation of hummocks)
- Removal of Impervious Surfaces
- Channel Diversity Improvements
- Armor Removal
- Off-Channel Connectivity—Side channels
- Channel Substrate Modification (gravel placement)
- Instream Habitat Diversity—LWD
- Public Outreach and Education

KEY MEASURES ADDED: Lower Channel Meander

Alternative 4: Upper & Lower Channel Work

Alternative 4 (Figure 3-4) includes all measures from earlier alternatives focused on upper and lower reach restoration of Hall Creek to a more natural condition. In addition, this alternative includes a measure intended to control physical disturbance at the site as well as additional features within the channel. Physical exclusion including boardwalks and fencing are effective means for protecting long term sustainability of sensitive riparian plantings.

Alternative 4 includes:

- Invasive Plant Removal—Riparian
- Riparian Planting
- Overstory Planting
- Topographic modification (creation of hummocks)
- Physical Exclusion (including signage, fencing and boardwalks)
- Removal of Impervious Surfaces
- Channel Diversity Improvements
- Armor Removal
- Off-Channel Connectivity—Side channels
- Channel Substrate Modification (gravel placement)

- Instream Habitat Diversity—LWD
- Instream Habitat Diversity—Boulders
- Public Outreach and Education

KEY MEASURES ADDED: Physical Exclusion, Instream Habitat Diversity—Boulders

Alternative 5: Upper & Lower Channel Work with Pond Enhancement

Alternative 5 (Figure 3-5) includes all measures from earlier alternatives focused on upper and lower reach restoration of Hall Creek to a more natural condition. In addition, this alternative includes an emphasis on important pond habitat contributions to the overall site restoration. Addition of pond productivity improvements and associated wetland community establishment provides a full suite of main restorative function at the site.

Alternative 5 includes:

- Invasive Plant Removal—Riparian
- Riparian Planting
- Overstory Planting
- Topographic modification (creation of hummocks)
- Physical Exclusion (including signage, fencing and boardwalks)
- Removal of Impervious Surfaces
- Channel Diversity Improvements
- Armor Removal
- Off-Channel Connectivity—Side channels
- Channel Substrate Modification (gravel placement)
- Instream Habitat Diversity—LWD
- Instream Habitat Diversity—Boulders
- Creation of Shallow Water Fringe Habitat
- Wetland Planting—Ponds
- Public Outreach and Education

KEY MEASURES ADDED: Pond Enhancement and Wetland Vegetation

Alternative 6: Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications

Alternative 6 (Figure 3-6) includes all measures from earlier alternatives focused on upper and lower reach restoration of Hall Creek to a more natural condition. In addition Alternative 6 would create and emphasis wetland habitats in the upper and lower reaches. This alternative

includes construction of a wetland complex in the upper reach near the tennis court location to maximize wetland benefits. The constructed wetland includes physical exclusion measures like fencing to protect the vegetation. The alternative also includes construction of dendritic channel(s) in the lower reach to emphasis wetland production and off channel habitat.

Alternative 6 includes:

- Invasive Plant Removal—Riparian
- Riparian Planting
- Overstory Planting
- Topographic modification (creation of hummocks)
- Physical Exclusion (including signage, fencing and boardwalks)
- Removal of Impervious Surfaces
- Channel Diversity Improvements
- Armor Removal
- Off-Channel Connectivity—Side channels
- Channel Substrate Modification (gravel placement)
- Instream Habitat Diversity—LWD
- Instream Habitat Diversity—Boulders
- Reconnect Dendritic Channels
- Creation of Shallow Water Fringe Habitat
- Wetland Planting—Ponds
- Removal of Fill and Creation of Wetland
- Public Outreach and Education

KEY MEASURES ADDED: Increased wetland habitat and off-channel connectivity

Alternative 7: All Measures

Alternative 7 (Figure 3-7) includes all measures from earlier alternatives focused on upper and lower reach restoration of Hall Creek to a more natural condition. In addition Alternative 7 includes connective channels between the ponds and Hall Creek to allow access between the two features.

Alternative 7 includes:

- Invasive Plant Removal—Riparian
- Riparian Planting
- Overstory Planting

- Topographic Modification (creation of hummocks)
- Physical Exclusion (including signage, fencing and boardwalks)
- Removal of Impervious Surfaces
- Channel Diversity Improvements
- Armor Removal
- Off-Channel Connectivity—Side channels
- Channel Substrate Modification (gravel placement)
- Instream Habitat Diversity—LWD
- Instream Habitat Diversity—Boulders
- Reconnect Dendritic Channels
- Creation of Shallow Water Fringe Habitat
- Wetland Planting—Ponds
- Off-Channel Connectivity—Pond Habitat
- Removal of Fill and Creation of Wetland
- Public Outreach and Education

KEY MEASURES ADDED: Connectivity of ponds to channel

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LAKE BALLINGER SECTION 206
ALT 2: Riparian Enhancement/Lower Channel Armor Removal

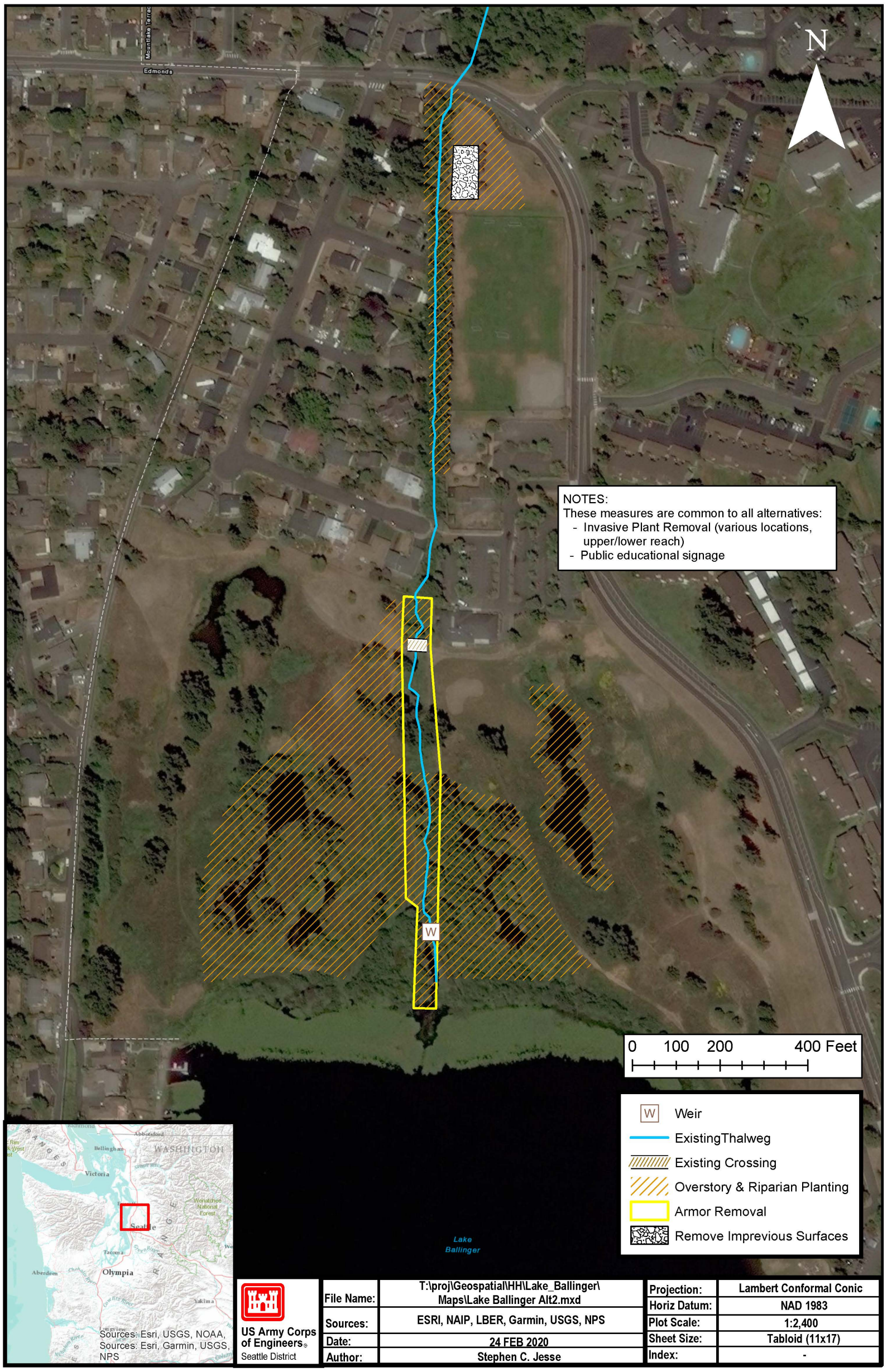

Figure 3-2. Alternative 2: Riparian Enhancement/Lower Channel Armor Removal

LAKE BALLINGER SECTION 206
ALT 3: Lower Channel Meander/LWD

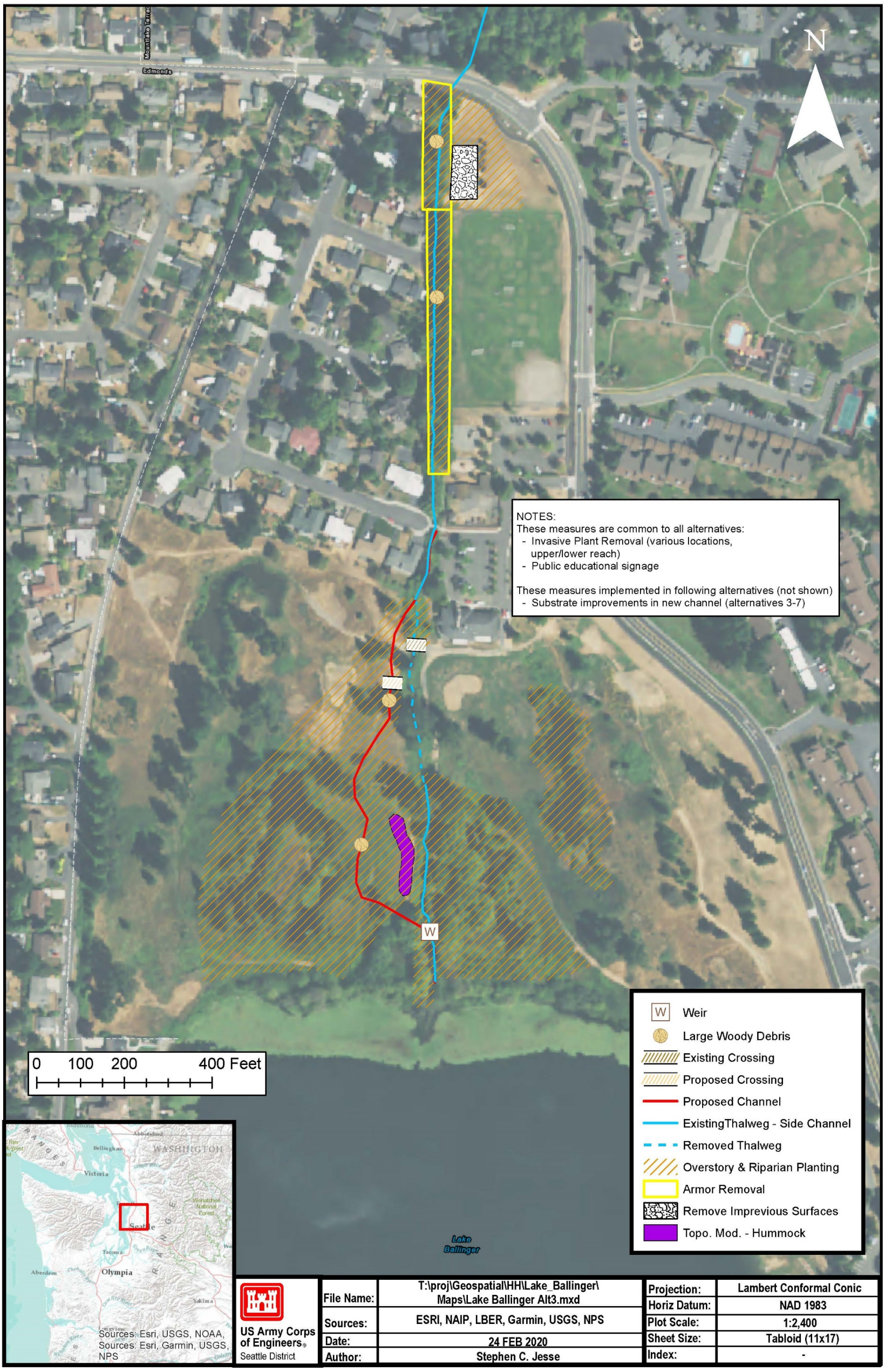

Figure 3-3. Alternative 3: Lower Channel Meander/LWD

LAKE BALLINGER SECTION 206
ALT 4: Upper & Lower Channel Work

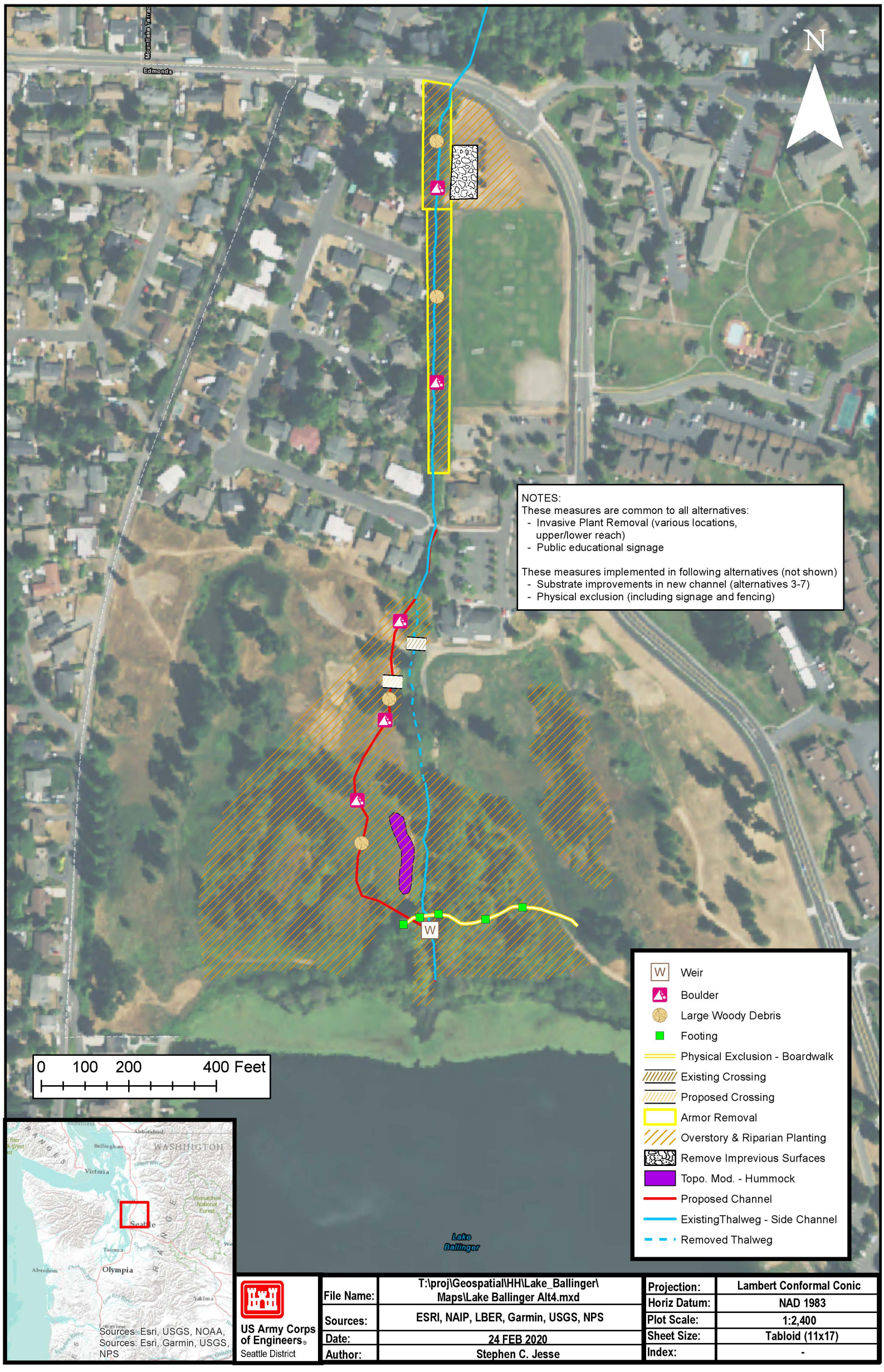

Figure 3-4. Alternative 4: Upper & Lower Channel Work

LAKE BALLINGER SECTION 206
ALT 5: Upper & Lower Channel Work With Pond Enhancement

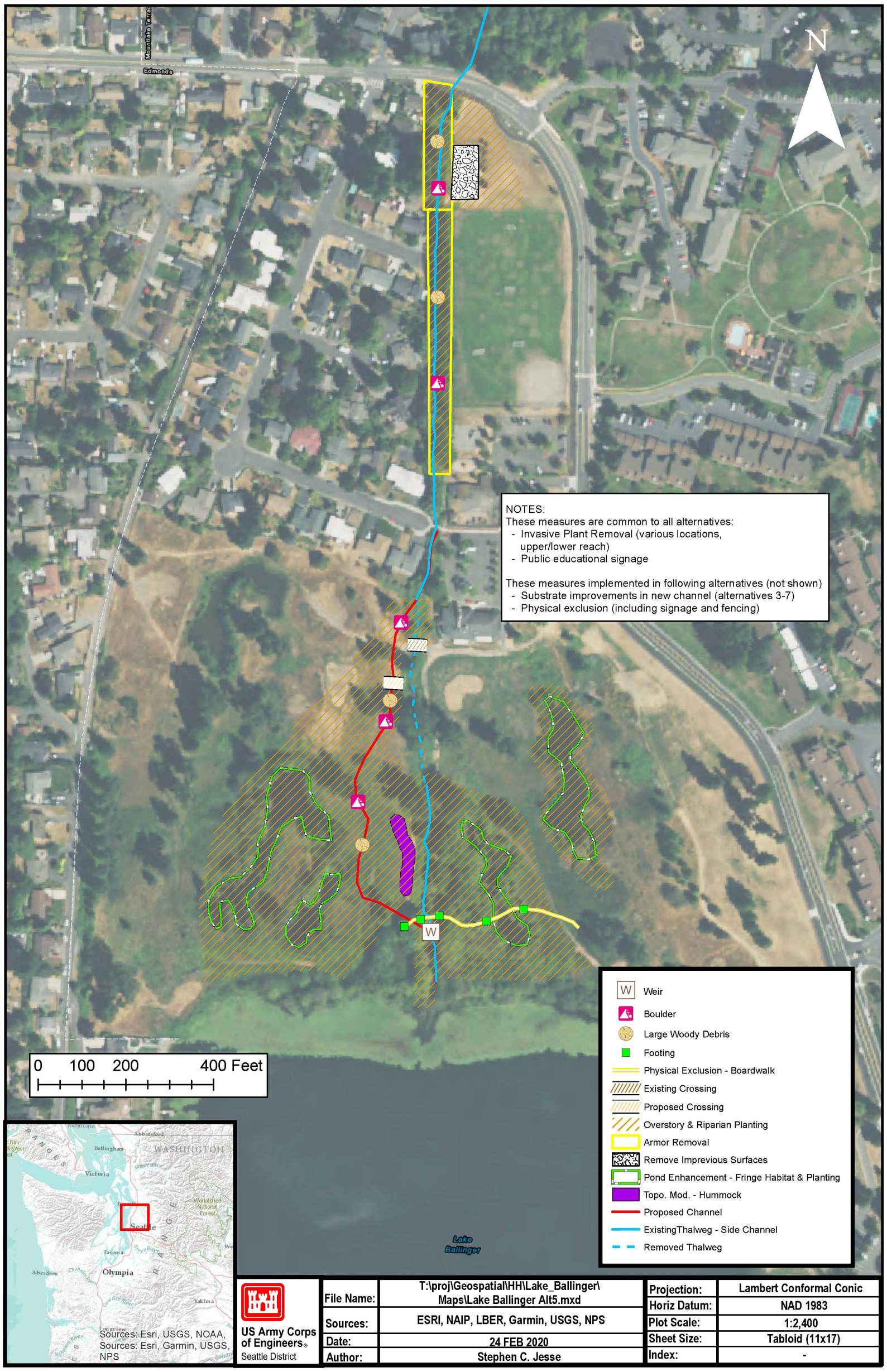

Figure 3-5. Alternative 5: Upper & Lower Channel Work With Pond Enhancement

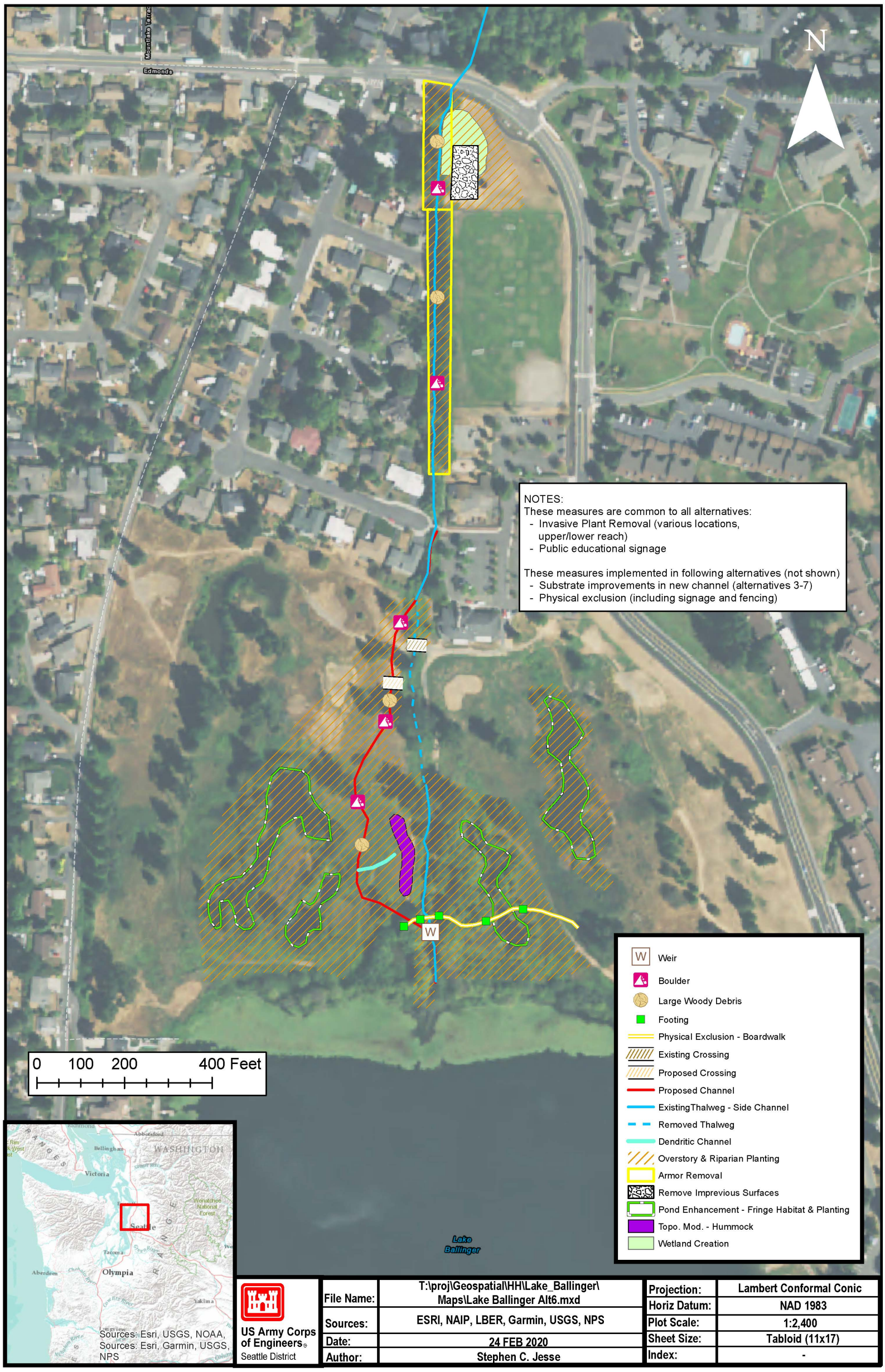

Figure 3-6. Alternative 6: Upper & Lower Channel Work with Pond Enhancement, Off-Channel Connectivity, and Topographic Modifications

LAKE BALLINGER SECTION 206
ALT 7: All Measures

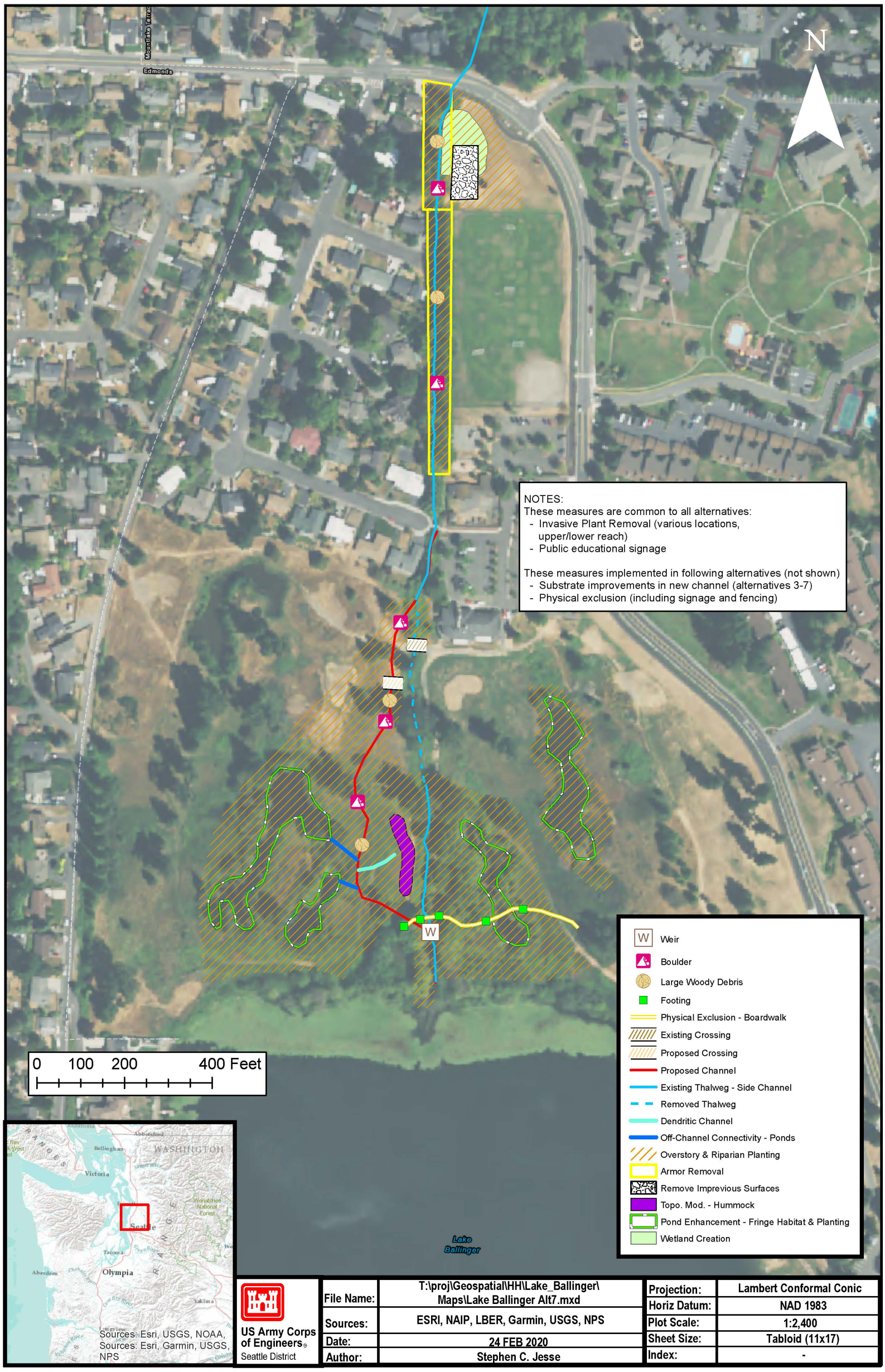

Figure 3-7. Alternative 7: All Measures

3.6 Evaluation of Alternatives

To evaluate the alternatives, the Corps developed parametric costs and estimated environmental outputs to evaluate alternatives in a cost effectiveness and incremental cost analysis (CE/ICA). The environmental outputs and costs are described in the following sections.

3.6.1. Environmental Outputs

The Corps estimated potential benefits for each alternative using three Habitat Suitability Index (HSI) models (marsh wren, yellow warbler and cutthroat trout). Each of these models is certified by the Corps for use in aquatic ecosystem restoration feasibility studies to calculate habitat units for each species being evaluated. The basic methodology compares the environmental quality of the existing environment over a fifty-year period versus the environmental quality projected over a fifty year period if each alternative were to be implemented. The models contain a series of variables with response curves, such that the inputs generate outputs that will always fall between 0.0 and 1.0 in order to create indexes.

The marsh wren model was used to characterize the quality of the pond habitats. Yellow warbler was used for the riparian areas. The cutthroat trout was use to characterize stream habitat. Each model generates a habitat suitability index (HSI) value (a normalized quality score) which is then multiplied by the number of acres (quantity) being evaluated to generate habitat units. Habitat units represent the value of the acreage in question as habitat for the species in question. Habitat that is of value to the three species used for alternative evaluation and comparison purposes here is expected by extension to be of value to other similar native species that inhabit the site currently or could inhabit the site in the future. More information on environmental outputs, including scoring of variables and habitat units, is available in Appendix B-3.

The benefits associated with connectivity are not explicitly captured in the habitat models and are not reflected in the habitat output tables. Benefits to terrestrial species such as birds, small mammals and amphibians dependent upon having upland habitats that are adjacent to aquatic breeding habitats are captured partially by the three HSI models in the riparian cover variables for each model. However, benefits of connectivity for fish are not captured in the cutthroat model. Therefore, no ecological uplift is shown for Alternative 7 as compared to Alternative 6 because the feature added, pond connectivity, is not measured by the model. While in general, reconnecting floodplains to streams is considered to be beneficial for rearing and flood flow refuge, in the case of Ballinger Park restoration, WDFW has recommended not making those connections. WDFW recommended against making direct connections between the existing or

realigned stream channel and the existing ponds due to concerns regarding potential fish stranding, temperature, and related sedimentation issues (City of Mountlake Terrace. 2015. P 98). Therefore, it was assumed that benefits from implementing this measure would be negligible.

The future without project condition was evaluated in the existing condition and assumed to have similar habitat quality over the period of analysis. While this may slightly undercount the estimates of benefits provided by the alternatives, predicting and quantifying the expected degradation in the future without project condition as compared to the existing condition would be imprecise at best; as this factor would equally impact benefit scores for all action alternatives, the Corps chose not to invest the additional resources necessary to predict and quantify that difference in ecosystem benefit. With project alternatives were evaluated in years 1, 5, 10, 25, and 50 and IWR Planning Suite was used to annualize habitat units over the period of analysis assuming linear interpolation between years analyzed. Table 3-3 displays the affected area in acres, without project and with project average HSI scores and net HSI scores. The net HSI score is multiplied by the acreage to estimate average annual habitat units (AAHUs), or the benefits of each alternative. Because HSIs are indexed from 0-1, the maximum AAHU score for any alternative is equal to the acreage of the site, and the minimum AAHU score is zero. The AAHUs are carried forward in the CE/ICA. Additional information on the methodology to estimate AAHUs is available in Appendix G, Economics.

Table 3-3. Alternative Affected Area and AAHUs

Alternative	Affected Area (Acres)	Future Without Project Average HSI	Future With Project Average HSI	Net HSI	AAHUs (Outputs or Benefits)
Alternative 1	13.19	0.189	0.189	0.00	0.00
Alternative 2	13.19	0.189	0.432	0.243	3.21
Alternative 3	13.19	0.189	0.498	0.309	4.08
Alternative 4	13.19	0.189	0.512	0.323	4.26
Alternative 5	13.19	0.189	0.525	0.336	4.43
Alternative 6	13.19	0.189	0.531	0.342	4.51
Alternative 7	13.19	0.189	0.531	0.342	4.51

3.6.2. Alternative Cost Estimates

Parametric costs were developed for each of the alternatives at October 2019 price levels. These costs include real estate, monitoring, adaptive management, and annual operations and

maintenance costs. Interest during construction is an economic opportunity cost that was computed assuming a four month construction duration. Costs were annualized by taking into account the full economic cost, or the costs to realize the environmental benefits. Costs are annualized over the 50-year period of analysis using the current discount rate of 2.75% as summarized in Table 3-4. The total average annual cost is carried forward in the CE/ICA.

Table 3-4. Estimated Alternative Costs

Alternative	Design & Implementation (1,000s)	Real Estate Cost ($1,000s)	Interest During Construction ($1,000s)	Total Investment Cost ($1,000s)	Cost for periodic O&M / Frequency ($1,000s)	Total Average Annual Cost * ($1,000s)
Alternative 2	$2,626	$136	$13	$2,775	$17.5 / $32.5 Alternating years (5x)	$112
Alternative 3	$3,453	$136	$16	$3,605	$17.5 / $32.5 Alternating years (5x)	$144
Alternative 4	$3,772	$136	$18	$3,926	$17.5 / $32.5 Alternating years (5x)	$156
Alternative 5	$3,925	$136	$18	$4,079	$17.5 / $32.5 Alternating years (5x)	$162
Alternative 6	$4,264	$136	$20	$4,420	$17.5 / $32.5 Alternating years (5x)	$174
Alternative 7	$4,487	$136	$21	$4,644	$17.5 / $32.5 Alternating years (5x)	$183

*Costs are based on October 2019 price levels, 2.75% discount rate, and 4 month construction duration

3.7 Cost Effectiveness and Incremental Cost Analysis (CE/ICA)

A cost effectiveness and incremental cost analysis (CE/ICA) was conducted in Institute for Water Resources (IWR) Planning Suite, version 2.0.9.1 (Corps certified model), using AAHUs and average annual costs presented in Section 3.6. Plans are then compared in IWR Planning Suite

by conducting CE/ICA, identifying the plans that are the best financial investments, and displaying the effects of each on a range of decision variables. The development of the complete alternative plans was completed with input from the entire team outside of this tool. Figure 3-8 displays a plot of alternative average annual costs and outputs (AAHUs).

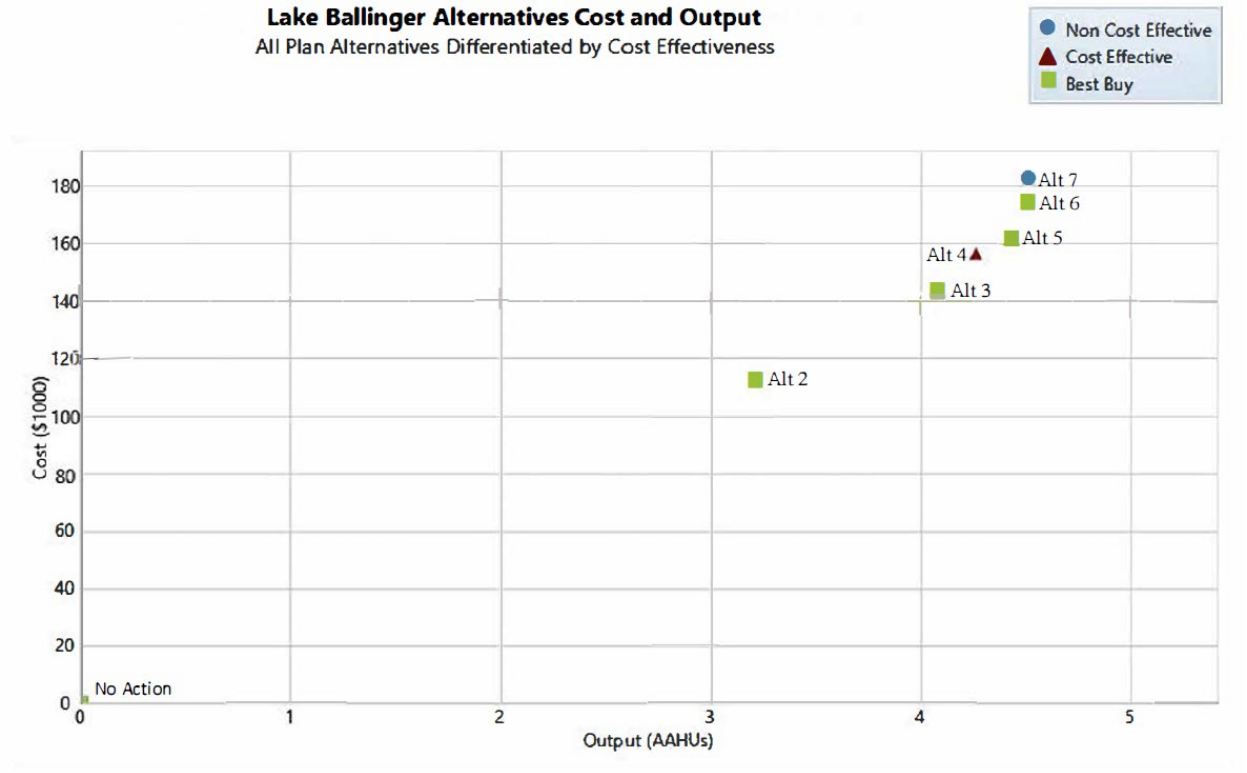

Figure 3-8. Alternative Cost and Output Plot

The results of the cost effectiveness analysis are displayed in Figure 3-8. Cost effective plans are plans that provide a level of environmental output at the least cost. All alternatives were cost effective except for Alternative 7, since Alternative 6 provides the same AAHUs at less cost than Alternative 7. Alternative 7 does not show a measurable change in AAHUs due to the lack of available models which can quantify the impacts from the added measure of connectivity to ponds. Although there will be marginal benefits provided by the addition of the pond connectivity, the Corps biologists determined that the lift from such measures would not be significantly more than those provided by the measures already implemented in Alternative 6.

Table 3-5. Cost Effectiveness Analysis

Alternative	Average Annual Habitat Units (AAHUs)	Average Annual Cost* ($1,000s)	Average Annual Cost / AAHU ($1,000s)	Cost Effective (Y/N)
Alternative 1	0	$0	--	Y
Alternative 2	3.21	$112	$35.0	Y
Alternative 3	4.08	$144	$35.2	Y
Alternative 4	4.26	$156	$36.7	Y
Alternative 5	4.43	$162	$36.6	Y
Alternative 6	4.51	$174	$38.7	Y
Alternative 7	4.51	$183	$40.6	N

*October 2019 prices, 2.75% discount rate

An incremental cost analysis identified five of the above plans as "Best Buy" plans, defined as those cost effective plans that provide the greatest incremental increase in output (benefits) for the lowest incremental increase in cost. These best buy plans are listed in Table 3-6 and displayed as a bar graph in Figure 3-9 and include Alternatives 1 (No Action), 2, 3, 5, and 6. As Alternative 4 is the first alternative to include Measure 13 and, while cost-effective, is not a Best Buy, the Corps considered the incremental cost per habitat unit of that measure relative to that of the other increments. The Corps considers the habitat value added by inclusion of Measure 13 (Instream Habitat Diversity—Boulders) worth the relatively low incremental average annual cost per habitat unit ($41,779), and therefore retains the boulders for subsequent alternatives.

Table 3-6. Incremental Cost Analysis

Best Buy Alternative	AAHUs	Average Annual Cost ($1,000s)	Incremental AAHU	Incremental Cost ($1,000s)	Incremental Cost / AAHU ($1,000s)
Alternative 1	0.00	$0	--	--	--
Alternative 2	3.21	$112	3.21	$112	$35
Alternative 3	4.08	$144	0.87	$32	$37
Alternative 5	4.43	$162	0.35	$18	$51
Alternative 6	4.51	$174	0.08	$12	$150

*Costs are based on October 2019 price levels and 2.75% discount rate

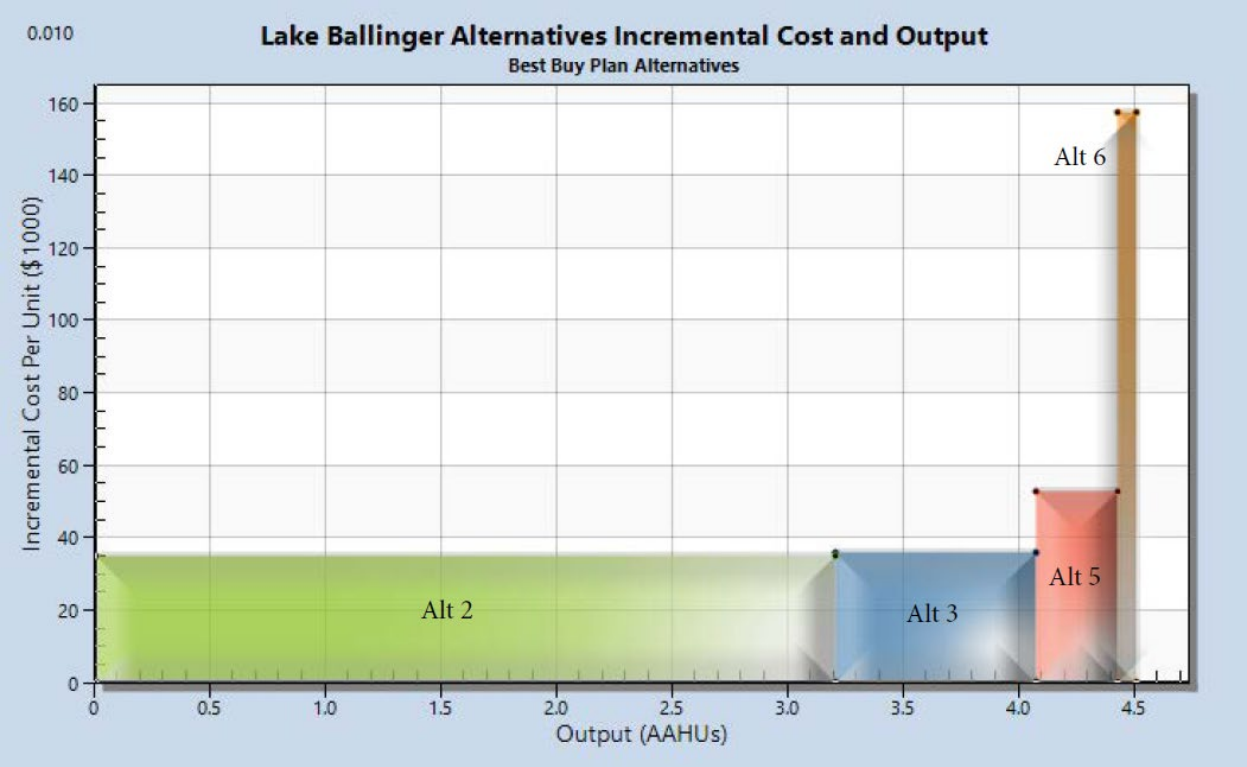

Figure 3-9. Increments of Benefits Provided by Each Best Buy Alternative

Additional information on the CE/ICA analysis and sensitivity analysis is presented in 3.10 through discussion of the "best buy" plans and can be found in Appendix G, Economics.

3.8 Final Array of Alternatives

Based on the results of the CE/ICA, the Corps carried forward best buy alternatives 1, 2, 3, 5, and 6 as the final array. A summary of the benefits, average annual cost, average annual cost per AAHU, and incremental cost per AAHU are displayed in Table 3-7.

Table 3-7. Costs and Benefits of the Final Array of Alternatives

Alternative	Acres Affected	AAHUs	Average Annual Cost*	Average Annual Cost per AAHU	Incremental Cost per AAHU
Alternative 1	0	0	$0	$0	--
Alternative 2	13.19	3.21	$112,000	$35,000	$35,000
Alternative 3	13.19	4.08	$144,000	$35,200	$37,000
Alternative 5	13.19	4.43	$162,000	$36,600	$51,000
Alternative 6	13.19	4.51	$174,000	$38,700	$150,000
*Costs are based on October 2019 price levels and 2.75% discount rate					

3.9 Completeness, Effectiveness, Efficiency, and Acceptability

Completeness, effectiveness, efficiency, and acceptability are the four evaluation criteria specified in the Council for Environmental Quality (CEQ) Principles and Guidelines (P&G) for the evaluation and screening of alternative plans. Alternatives considered in any planning study should meet minimum subjective standards of these criteria in order to qualify for further consideration and comparison with other plans. A summary of how the final array of alternatives meets these criteria is presented in Table 3-8.

Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects.

Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.

Efficiency is the extent to which an alternative plan is the most cost effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the nation‘s environment.

Acceptability is the extent to which the alternative plans are acceptable in terms of applicable laws, regulations and public policies.

Table 3-8. Comparison of Completeness, Effectiveness, Efficiency, and Acceptability

	Completeness	Effectiveness	Efficiency	Acceptability
Alternative 1	Complete	Not Effective	Most Efficient	Acceptable
Alternative 2	Complete	Minimally Effective	Most Efficient	Acceptable

	Completeness	Effectiveness	Efficiency	Acceptability
Alternative 3	Complete	More Effective	Somewhat Efficient	Acceptable
Alternative 5	Complete	More Effective	Somewhat Efficient	Acceptable
Alternative 6	Complete	Most Effective	Least Efficient	Acceptable

Alternative 1—No-Action Alternative*

Completeness: The No-Action Alternative is a complete plan because it is not dependent on the actions of others and it includes the necessary elements to achieve the subset of elements it is designed to deliver.

Effectiveness: The No-Action Alternative does not meet the effectiveness criterion because it does not achieve any of the planning objectives.

Efficiency: The No-Action Alternative is the most efficient alternative because it is does not require a financial investment by NWS or the Sponsor.

Acceptability: The No-Action Alternative is acceptable in terms of applicable laws, regulations and public policies. Of all the alternatives this plan would provide a minimal degree of satisfaction to government entities and the public. Generating no benefits, it would likely provide no satisfaction to most; however some sectors may consider federal funding to improve the environment to be an unwise investment and therefore prefer this alternative.

Alternative 2— Riparian Enhancement / Lower Channel Armor Removal

Completeness: Alternative 2 is a complete plan because it is not dependent on the actions of others and it includes the necessary elements to ensure the realization of the planned effects.

Effectiveness: Alternative 2 is effective because it alleviates the specified problems and achieves the specified opportunities, generating 3.21 net AAHUs. As measured by the model used to estimate the amount of ecological benefit provided, Alternative 3 is less effective than the other action alternatives.

Efficiency: Alternative 2 is the most efficient action alternative. It has the lowest incremental costs per habitat unit of all the action alternatives at $35,000 per habitat unit (HU), and is the lowest-cost Best Buy plan, as classified by IWR Planning Suite.

Acceptability: Alternative 2 is acceptable in terms of applicable laws, regulations and public policies. This plan would provide a considerable degree of satisfaction to government entities and the public, as it would provide considerable benefits at low cost through replacing invasive plants with native plants and removing armor rock along the lower reach of hall Creek, allowing the creek to naturally create and sustain more region-typical wetland habitat.

Alternative 3—Lower Channel Meander/ LWD

Completeness: Alternative 3 is a complete plan because it is not dependent on the actions of others and it includes the necessary elements to ensure the realization of the planned effects.

Effectiveness: As measured by the model used to estimate the amount of ecological benefit provided, Alternative 3 is more effective than Alternative 2 due to the construction of a channel meander in the lower reach of the creek, which increases the quantity and quality of channel habitat. Alternative 3 generates 4.08 net AAHUs. It is less effective than Alternatives 5 and 6, which include additional measures.

Efficiency: Alternative 3 is a moderately efficient plan. At $37,000 per HU it has a higher cost per habitat unit than Alterative 2 for the incremental benefits provided, and a lower cost per habitat unit for incremental benefits provided as compared to Alternatives 5 and 6. It is a Best Buy plan.

Acceptability: Alternative 3 is acceptable in terms of applicable laws, regulations and public policies. This plan would provide more satisfaction to government entities and the public than Alternative 2, as it further improves conditions for fish and wildlife.

Alternative 5—Upper and Lower Channel Work with Pond Enhancement

Completeness: Alternative #5 is a complete plan because it is not dependent on the actions of others and it includes the necessary elements to ensure the realization of the planned effects.

Effectiveness: As measured by the model used to estimate the amount of ecological benefit provided, Alternative 5 is more effective than Alternatives 2 and 3, generating 4.43 net AAHUs. In addition to the measure included in Alternative 3, Alternative 5 includes physical exclusion elements, pond enhancement and wetland vegetation. Those additions protect the restored habitat from anthropomorphic impacts, and create or improve habitat for amphibians and other species. It is less effective than Alternative 6, which includes additional measures.

Efficiency: Alternative #5 is a moderately efficient plan. At $51,000 per HU, it has a higher cost per habitat unit than Alternatives 2 and 3 for the incremental benefits provided, and a lower

cost per habitat unit for incremental benefits provided as compared to Alternatives 6. It is a Best Buy plan.

Acceptability: Alternative #5 is acceptable in terms of applicable laws, regulations and public policies. This plan would provide more satisfaction to government entities and the public than Alternative 3, as it protects the restored habitat with exclusionary measures that also provide safe access through the site for the public.

Alternative 6—Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications

Completeness: Alternative #6 is a complete plan because it is not dependent on the actions of others and it includes the necessary elements to ensure the realization of the planned effects.

Effectiveness: Alternative #6 is the most effective plan, generating 4.51 net AAHUs. In addition to the elements included in Alternative 5, it includes increased wetland habitat and off-channel pond connectivity. These add-ons would provide rearing or refuge habitat for fish species and increased habitat for amphibians and other fish prey species.

Efficiency: Alternative #6 is the least efficient plan, as the cost per habitat unit of the incremental benefits provided by this plan, $150,000 per HU, is much greater than for the other plans. It is somewhat efficient, as it is a Best Buy plan.

Acceptability: Alternative #6 is acceptable in terms of applicable laws, regulations and public policies. This plan would provide more satisfaction to government entities and the public than Alternative 5, as it further improves conditions for fish and wildlife.

3.10 Tentatively Selected Plan (TSP)

All four action alternatives would implement process-based restoration in this aquatic ecosystem by removing human-made stressors from the channel and landscape to allow natural ecosystem processes to influence the structure of the aquatic environment longitudinally in the channel, laterally across Ballinger Park, and vertically through the riparian zone, enhancing the site's value as habitat. All four action alternatives in the final array meet the four P&G evaluation criteria. Alternative 1 (No Action) does not meet the Effectiveness criterion. The implementation costs for all four action alternatives are well within the per project limit for Federal expenditure for a CAP Section 206 project. All five alternatives are Best Buy plans. Alternative 1 (No Action) does not meet the purpose and need, nor does it address any of the planning objectives. Alternative 3 does not address all the objectives as thoroughly as Alternatives 5 and 6, because it does not include the pond enhancement measures that

contribute to addressing Objective 3. Alternative 6 introduces uncertainty with regards to achievement of benefits by creating a wetland at the upper reach (northern) of the site. Alternative 5 generates 0.35 additional AAHU as compared to Alternative 3 at an average annual incremental cost of $51,000 per AAHU. This increase in habitat units is justified by the relative small increase in incremental cost because this alternative contains all the key measures required to address the full set of restoration objectives while maintaining a high degree of long term sustainability. Alternative 6 generates an additional 0.08 AAHU than Alternative 5 at an average annual incremental cost of $150,000 per AAHU. This increase in habitat units is not justified by the large increase in incremental cost because both added measures were found to have a high level of risk for long term sustainability. Alternative 5 generates more benefits than Alternatives 2 and 3, is more efficient than Alternative 6, and introduces less uncertainty than Alternative 6. Alternative 5 generates 4.43 AAHU at an estimated implementation cost of $4,079,000, an average annual cost of $162,000, and an average cost per acre of $309,000. (When comparing cost per acre to restore different sites, value should be informed by the type and quality of the restored habitat and the magnitude in change of quality resulting from the projects being compared.) Alternative 5 efficiently restores ecosystem structure, function, and dynamic ecosystem processes historically provided by now-scarce wetlands in the study area. The restored wetlands would support migrating waterfowl and passerines among other wildlife. Both the wetland restoration and the channel restoration would improve Essential Fish Habitat for coho and Chinook salmon. Alternative 5 reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objective; therefore it is the NER Plan and the Agency Preferred Alternative[2]. There is not a different locally preferred plan. Alternative 5 is the TSP. Specific features of the TSP are described in Section 5.

[2] The “Agency Preferred Alternative" is the alternative which the action agency (in this case the Corps) believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors. NEPA requires disclosure of the Agency Preferred Alternative.

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4. Affected Environment and Environmental Consequences*

This chapter describes the existing conditions and future without-project conditions used for analysis during the study, as well as the probable environmental outcomes of implementing each proposed alternative. Existing conditions are the physical, chemical, biological, and sociological characteristics of the study area. Characterizing resource conditions is critical for understanding the probable future condition of those resources (i.e., the future without-project condition) and for defining problems and opportunities. The assessment of environmental effects is based on a comparison of conditions with and without implementation of the proposed plan and a reasonable range of alternatives; in this case, three action alternatives formulated through the screening process are compared to the No-Action Alternative. The following four action alternatives being analyzed:

- Alternative 2: Riparian Enhancement / Lower Channel Armor Removal
- Alternative 3 - Lower Channel Meander/ LWD
- Alternative 5 - Upper and Lower Channel Work with Pond Enhancement
- Alternative 6 - Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications

The analysis focuses only on resources that are potentially affected by the alternatives and have a material bearing on the decision-making process. The spatial scale of analysis focuses on the locations of the proposed sites to provide a comparison between the No-Action Alternative and the three action alternatives. All action alternatives are within the same spatial footprint comprising 13.19 acres plus staging areas. The time scale for analysis is a 50-year period beginning in 2021 and extending to 2071.

The current baseline condition of the Lake Ballinger/McAleer Creek Watershed is typical of a suburban area, with widespread conversion of native vegetation, to residential and commercial tracks, with ornamental vegetation and increased impervious surface. There have been increases in invasive plant species in the area. Existing water courses have been greatly modified, via channelization and rerouting of drainage. There have been decreases in water quality due to increased runoff containing pollutants from point-sources and non-point sources. The diversity of native fish and wildlife has been reduced, favoring more generalist species and those that can survive in degraded environmental conditions. Over time, it is assumed the baseline will remain relatively stable, since in-filling has occurred and no major land-use changes are anticipated over the lifetime of the proposed project.

4.1 Hydraulics and Hydrology

Hall Creek: Within the project footprint, Hall Creek flows from north to south, where it enters into Lake Ballinger. Hall Creek drains a highly urbanized watershed and serves as the only major surface inflow to Lake Ballinger. Hall Creek is a year round perennial stream characteristic of urban streams located within flat upland plateaus of the Lake Washington watershed.

A 1947 aerial photograph indicates the site had been modified. The photograph includes man-made access roads, a very straight stream channel for Hall Creek, and an absence of trees. It is possible the area was utilized for logging or agriculture prior to extensive development.

Figure 4-1. 1947 Aerial Photograph - South Portion of Project Site

Hall creek runs through the middle of the property before emptying in Lake Ballinger. It has been channelized and runs almost perfectly straight with no meanders and high banks that prevent lateral movement.

In 1999, six ponds were created during a major renovation of the golf course. Three ponds are located in the western section, west of Hall Creek, two ponds are located in the eastern section, east of Hall Creek, and one pond is just east of the north end of Lake Ballinger. They are shallow

and none are fed by any established source of surface water. All flow into the ponds are presumed to be by surface runoff or historic subsurface drainage tiles and outfalls.

Current condition surveys of Hall Creek throughout the project site reveals there is very little woody debris in the stream. To be considered suitable habitat by Snohomish County standards, a stream should have more than two pieces of LWD per channel width.

With respect to fine sediment deposition, Snohomish County states that a stream should have less than ten percent surface fines in spawning areas to be considered suitable habitat (SCPW, 2002). In all reaches visually surveyed, surface fines far exceeded ten percent. There is also a lack of alternating riffle and pool habitat. This suggests that historically the area was a wetland. This is also confirmed by cadastral survey records from the Bureau of Land Management.

The watershed is highly urbanized with land use including commercial, retail, residential, schools, golf courses and a cemetery. As reported by Clear Creek Solution, approximately 38 percent of the watershed is covered by impervious surfaces.

Flood risk in the Hall Creek project area would not be expected to increase due to the any of the alternatives. Project elements will be designed to not increase any flood risk to structures. The recommended alternative will be designed such that water surface elevations at large floods do not increase above the existing condition.

McAleer Creek: Although not part of the project footprint, the characteristics of McAleer Creek are important to understanding the overall Lake Ballinger/McAleer Creek. McAleer flows southwest from Lake Ballinger to Lake Washington. A flood frequency analysis was performed for the McAleer Creek and Lyon Creek using current land use. The 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year flood flows for each limiting culvert on Lyon Creek and McAleer Creek are presented in Table 4-1. (Lyon Creek drains the neighboring watershed, to the east of the Lake Ballinger/McAleer Creek, into Lake Washington.)

Table 4-1. Flood Frequency Analysis Results at Culverts M585 and L30

Flood Frequency Return Period (years)	McAleer Creek at M585 Culvert (cfs)	Lyon Creek at L30 Culvert (cfs)
2	166	140
5	205	180
10	232	209
25	268	247
50	296	276
100	325	307

Hall Creek, Lake Ballinger, and the lower reaches of McAleer Creek are discharge points for shallow groundwater within the watershed. Lake Ballinger receives approximately 25 percent of its annual volume from groundwater discharges.

Lake Ballinger: Lake Ballinger has a history of flow control that goes back to at least 1942 when a weir was installed near the confluence with McAleer Creek to set lake levels. In an attempt to address continued flooding, the State of Washington issued an order in 1982 mandating operation of the lake to maintain lake levels between a maximum of 277.8 feet and a minimum of 276.8 feet. The order also specified that the maximum lake level could only be exceeded once every five years to a maximum of 278.5 feet.

Lake Ballinger is a shallow 104-acre lake shared by the cities of Edmonds and Mountlake Terrace. The depth of Lake Ballinger is 20 to 35 feet. Contributing drainage basins include Hall Creek (66 percent of total drainage area), Echo Lake and Aurora Village (16 percent of total drainage area), and non-specific areas adjacent to Lake Ballinger (18 percent of total drainage area). Portions of five jurisdictions drain to the lake including the cities of Edmonds, Lynnwood, Mountlake Terrace, and Shoreline, and Snohomish County.

The 1942 Superior Court order set the minimum level of Lake Ballinger at 276.5 feet, with a maximum of 278.5 feet. The Director of Hydraulics for the State of Washington was identified to control and maintain the weir. The 1982 adjudication changed this level slightly and approved a new weir structure to replace the failing structure installed in the 1940s in McAleer Creek the 1940's (Mountlake Terrace, 2008).

Significance Threshold Criteria

Based on the existing conditions discussed above, impacts to hydrology, hydraulics, and public safety would be considered significant if the alternative results in:

- Substantial change to base flow characteristics such as flow velocity, channel capacity, or channel configuration, in a manner that would result in substantial erosion or sediment deposition on or off-site.
- Increase in flood risk to surrounding property

4.1.1. Climate Change

Climate change is an important consideration in evaluating the array of project alternatives. Information presented in Appendix D-4 (Climate Change) informs how the relevant climate factors would influence the alternatives. The effects of climate change are addressed, consistent with ECB 2018-14 (USACE 2018), through discussion of literature findings and projections of future conditions developed for watersheds in the Puget Sound Lowlands.

Ecosystem restoration and hydraulic features described in the tentatively selected plan take into consideration potential future climate change scenarios by ensuring channel parameters and biological features are based on conservative assumptions of both high and low flow volumes in order to maintain resiliency. Specifically, resiliency is ensured through planned floodplain access for high flows and incorporation of low flow specific channels and groundwater connections for low flow periods. Biological components are predicted to survive in sufficiently flexible soils and hydrologic conditions. Site conditions are adequately flexible to allow stream design criteria to accommodate future climate change scenarios with little to no additional cost. Specifically, through planned floodplain access for high flows and incorporation of low flow specific channels and groundwater connections for low flow periods. Future design details will be developed in the Design and Implementation phase where climate change will be revisited to ensure resiliency for all elements of the design.

4.1.2. No-Action Alternative/Future Without Project Conditions

Under the No Action alternative, flow conditions for Hall Creek, McAleer Creek and Lake Ballinger would remain the same as present. Hall Creek in the lower reach would continue to periodically overflow its banks during high flows and spread north downstream of the senior center onto Ballinger Park proper. The channel of Hall Creek will remain entrenched and stable. Pond levels will remain the same.

4.1.3. Action Alternatives/Future With-Project Conditions

Alternative 2 - Riparian Enhancement / Lower Channel Armor Removal

Implementation of this alternative is not anticipated to have short-term or long term impacts related to hydraulics or hydrology. The channel geometry will remain the same. There might be slight changes in flow along the bankline due to the increase in bank vegetation and armor removal along 700 feet of existing channel, but this effect will be localized. No increase in flood risk is anticipated due to this alternative.

Alternative 3 — Lower Channel Meander/ LWD

During construction of the project there will be some short term impacts. Water will be diverted from the upper channel to allow construction of the upper channel features. When construction is complete, flow will be returned to the channel. The project will include several best management practices (BMPs) to minimize these impacts including:

- Connecting the newly excavated restored reach with the existing Hall Creek will occur during established in-water work windows (1 July through 30 September).
- All required de-watering activities during construction would use appropriate devices (i.e. pumps, sand bags, sumps). All water removed from the site would be discharged in a vegetated location away from the current and proposed channel alignment, or location that would not incur damage due to water discharge.

As a result of the placement of instream structures and the change in change geometry, localized pockets of lower velocities will be created in the upper channel. In the lower channel, the change in channel geometry will result in a slight reduction in channel velocities. More modeling will be accomplished in the Design and Implementation (D&I) Phase to quantify this change and adjust channel geometry. As with the upper channel, localized pockets of lower velocity will be created by instream structures. The proposed changes will not result in negative impacts to flow characteristics (i.e. increased velocities in the Hall Creek Channel). Flood risk is not anticipated to increase due to the proposed restoration measures.

No change in water surface elevations in the ponds is anticipated post-construction.

Alternative 5 — Upper and Lower Channel Work with Pond Enhancement

If this alternative is implemented, there would be similar benefits and impacts as if the other alternatives were implemented.

Alternative 6 — Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications

If this alternative is implemented, there would be similar benefits and impacts as if the other alternatives were implemented. Additional backwater area will be created in the area where the tennis courts are removed due to further excavation of the area as compared to alternatives 3 and 5. So there will be a small improvement in low velocity refuge.

No significant impact to the areas hydraulics or hydrology are anticipated since none of the action alternatives will change flow conditions, erosion or flood risk.

4.2 Water Quality

Pervasive water quality issues (nutrients, DO, metals) are documented in the basin. In response to the flooding and chronic water quality problems in Lake Ballinger the jurisdictions in the basin entered into an interlocal agreement to develop a strategic action plan to identify strategies to address flood and water quality issues in the basin.

Lake Ballinger has a total maximum daily load for total phosphorous (WDOE 1993). A Total Maximum Daily Load (TMDL) for phosphorous was established in 1993 by EPA. A 1977 joint study by METRO and the University of Washington (METRO, 1977) estimated 67% of the external nutrient loading to Lake Ballinger was via Hall Creek; this inflow also was low in dissolved oxygen (DO) and high in ammonia concentrations. The sediment loading to the creek was determined to be excessive due to erosion in the watershed. The extensive development of the watershed coincided with the decline in lake water quality. The 1977 study recommended a two-phase project to improve Lake Ballinger water quality. Phase I, completed in 1980, consisted of the rehabilitation of Hall Creek and construction of two sedimentation basins to control phosphorus-rich sediments from reaching the lake. The Phase II project, started in 1982, constructed a hypolimnetic injection/withdrawal system which injected water with a higher DO content from Hall Creek into the lake. The project also removed nutrient-laden water from the lower level of the lake into McAleer Creek. After the construction of the sedimentation ponds in Hall Creek and the installation of the hypolimnetic injection/withdrawal system, internal phosphorus loading was reduced from 227 kg in 1979 to 17 kg in 1984 (KCM, 1985). It is currently estimated that Hall Creek currently inputs 44 percent of the daily phosphorous load into Lake Ballinger

Since the mid-1980s, better erosion control methods implemented on construction sites has led to a significant reduction in fine sediment deposition to Hall Creek and ultimately Lake Ballinger. Nutrient levels have stabilized and average summer levels have started to trend to lower levels (Shaw 2014). Sampling occurred at the mouth of Hall Creek from November 2005

to October 2006. Turbidity measurements ranged between 1.5 and 7.6 NTUs. Temperature measurements ranged from 6.18°C in February to 16.5°C in August. DO measurements ranged from 1.11 mg/L to 11.39 mg/L (WDOE 2008).

In the upper portion of the project area, there is a narrow but established buffer along Hall Creek which has good canopy cover, providing shade to the creek. On the lower section of Hall Creek below the senior center, the vegetation buffer is less well developed with several open areas with less canopy cover.

Significance Threshold Criteria
Impacts to water quality would be considered significant if an action resulted in:

1) An increase in sediment loading that exceeded state or federal water quality standards;
2) Long-term water quality degradation from pollutants; or
3) Degradation of water quantity or quality to below state standards.

4.2.1. No-Action Alternative/Future Without Project Conditions

Under the No Action Alternative, it is anticipated the current water quality problems in Lake Ballinger will persist with no change.

4.2.2. Action Alternatives/Future With-Project Conditions

Alternative 2 - Riparian Enhancement / Lower Channel Armor Removal
During construction there will be some short term impacts. It can be expected that temporary increases in turbidity may result from construction activities, such as removal of armor rock along approximately 700 feet of the existing channel.

In order to reduce the temporary increases in turbidity and potential related effects on juvenile salmonids, all “in-water” construction work would take place during the established fish window (1 July through 30 September), which is the driest time of the year. Construction techniques, sequencing, and timing would minimize soil disturbance to the extent practical.

A Stormwater Pollution Prevention Plan (SWPPP) will be developed prior to construction and would incorporate BMPs.

The following BMPs will be implemented during construction to help minimize water quality impacts;

- Work area is restricted to the footprint delineated on the project drawings.

- No net loss of wetland or sensitive aquatic sites.
- BMPs such as stormwater runoff prevention will be used to ensure that no unnecessary damage to the environment occurs.
- In-water work will occur during established in-water work windows (1 July through 30 September).
- Utilization of marsh mats / swamp pads or temporary rock placement will be used to minimize impacts to wetland soils, as needed.
- Work will be done in the dry, to the extent practicable.
- All required de-watering activities during construction would use appropriate devices (i.e. pumps, sand bags, sumps). All water removed from the site would be discharged in a vegetated upland location, a de-siltation basin, or location that would not incur damage due to water discharge.
- Drive trains of equipment would not operate in the water.
- All equipment would be cleaned prior to in-water construction work.
- No refueling would occur near Hall Creek.
- Construction equipment shall be regularly checked for drips or leaks.

All temporary access roads and staging areas will be returned to their natural condition upon completion of work.

Turbidity monitoring would be conducted during construction to ensure that the project does not exceed state standards. If samples indicate that water quality standards for turbidity are not achieved, project work will be halted and modified so that standards can be met. Any turbidity effects would be temporary and limited to areas within a short distance downstream of the project site. Section 402 of the Act requires a National Pollutant Discharge Elimination System (NPDES) permit and the associated implementing regulations for General Permit for Discharges from large and small construction activities for construction disturbance over one acre. This project would have land disturbance of approximately 13 acres; therefore, a NPDES permit will need to be obtained prior to construction.

Increasing native vegetation and meandering Hall Creek would improve lake water quality by allowing for biofiltration and infiltration of runoff before entering lake. There might be minor improvements in water temperature levels due to increased shading. Since the project will not change the inputs to the area from the upper watershed, any improvements in water quality, such as phosphorous input, will be limited.

Alternative 3 — Lower Channel Meander/ LWD

During construction there will be some short term impacts. While the new stream channel will be constructed prior to connecting to the existing stream, it can be expected that temporary increases in turbidity may result from construction activities, such as placement of LWD and boulders in the upper section of Hall Creek. There would be a pulse of sedimentation following the diversion of the stream into the restored streambed, resulting in short-term turbidity increases as the streambed adjusts to the new flow. Localized shifting of sediments would continue sporadically as the new stream heals and adjusts. High flows during the winter and spring following construction would continue to mobilize sediments in the project area, potentially contributing to small increases in turbidity than what is normally seen during high flow events.

In order to reduce the temporary increases in turbidity and potential related effects on juvenile salmonids, all "in-water" construction work would take place during the established fish window (1 July through 30 September), which is the driest time of the year. Construction techniques, sequencing, and timing would minimize soil disturbance to the extent practical to reduce the generation of turbidity during construction of the new channel. To facilitate construction of restoration features in the upper section of Hall Creek, a temporary by-pass might be utilized.

A Stormwater Pollution Prevention Plan (SWPPP) will be developed prior to construction and would incorporate BMPs.

The following BMPs will be implemented during construction to help minimize water quality impacts;

- Work area is restricted to the footprint delineated on the project drawings.
- No net loss of wetland or sensitive aquatic sites.
- BMPs such as stormwater runoff prevention will be used to ensure that no unnecessary damage to the environment occurs.
- In-water work will occur during established in-water work windows (1 July through 30 September).
- Connecting the newly excavated restored reach with the existing Hall Creek will occur during established in-water work windows (1 July through 30 September).
- During inlet/outlet construction and watering of the new channel, appropriate turbidity control measures (temporary coffer dam, silt curtains, or similar) would be used to isolate construction from Hall Creek and to minimize turbidity impacts.

- Utilization of marsh mats / swamp pads or temporary rock placement will be used to minimize impacts to wetland soils, as needed.
- Work will be done in the dry, to the extent practicable.
- All required de-watering activities during construction would use appropriate devices (i.e. pumps, sand bags, sumps). All water removed from the site would be discharged in a vegetated upland location, a de-siltation basin, or location that would not incur damage due to water discharge.
- Drive trains of equipment would not operate in the water.
- All equipment would be cleaned prior to in-water construction work.
- No refueling would occur near Hall Creek.
- Construction equipment shall be regularly checked for drips or leaks.

All temporary access roads and staging areas will be returned to their natural condition upon completion of work.

Turbidity monitoring would be conducted during construction to ensure that the project does not exceed state standards. If samples indicate that water quality standards for turbidity are not achieved, project work will be halted and modified so that standards can be met. Any turbidity effects would be temporary and limited to areas within a short distance downstream of the project site. Section 402 of the Act requires a National Pollutant Discharge Elimination System (NPDES) permit and the associated implementing regulations for General Permit for Discharges from large and small construction activities for construction disturbance over one acre. This project would have land disturbance of approximately 13 acres; therefore, a NPDES permit will need to be obtained prior to construction.

Increasing native vegetation and meandering Hall Creek would improve lake water quality by allowing for biofiltration and infiltration of runoff before entering lake. There might be minor improvements in water temperature levels due to increased shading. Since the project will not change the inputs to the area from the upper watershed, any improvements in water quality will be limited.

Alternative 5 — Upper and Lower Channel Work with Pond Enhancement
If this alternative is implemented, there would be similar benefits and impacts as if Alternative 3 were implemented.

Alternative 6 — Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications
If this alternative is implemented, there would be similar benefits and impacts as if Alternative 3 were implemented.

No significant impacts to water quality are anticipated from each of the action alternatives since BMPs will be employed to minimize short-term exceedances of state water quality standards, and the implementation of the measures will not contribute to long-term degradation existing water quality.

4.3 Geotechnical

The following sections discuss the existing geologic conditions that are present at the Lake Ballinger Ecosystem Restoration project are based upon existing geotechnical data provided by the Sponsor as well as a geotechnical exploration that was conducted during October 2019.

4.3.1. Topography

The site is mostly flat at less than 1% slope except along the fence lines on both the eastern and western sides of the property. Within the areas that are mostly flat, there are areas where fairways have been slightly elevated and there are a few mounds and depressions in the western section. The western section along the fence line is about 5(H): 1(V), which is about 11.3% slope for roughly about first 900 feet from the southwest corner of the property. From 900 feet to about 1,200 feet from the SW corner, the slope is roughly 18% or 8(H): 25(V). This is the steepest area on the site. Beyond this point along the western section of the fence line, the terrain becomes much flatter. The eastern section ranges from 2(H): 75(V) or 1.5% slope to 25(H): 1(V) or about 2.3% slope along the fence line.

4.3.2. Geology

A cursory review of the region using the United States Geologic Survey interactive web tool and Hart Crowser's Geotechnical Data Report indicates that:

"…Quaternary Younger Alluvium (Qyal) generally underlies the project site. This geologic unit is made up of fluvial sediments in and around streams, Lake Ballinger, and Lake Washington. The unit generally consists mostly of sand and gravel with some organic-rich layers. Adjacent to the project site and underlying the alluvium are the glacial drift soils consisting of: Recessional Outwash (Qvr), Till (Qvt), and Advance Outwash (Qva) (Figure 4-2). These soils generally consist of sands and gravels with varying amounts of clay and silt, and occasional seams of clay or silt. The Recessional Outwash is the youngest of the glacial soils and was deposited as the glacier receded. The Till and Advance Outwash were deposited as the glacier advanced and are typically much denser than the Recessional Outwash soils."

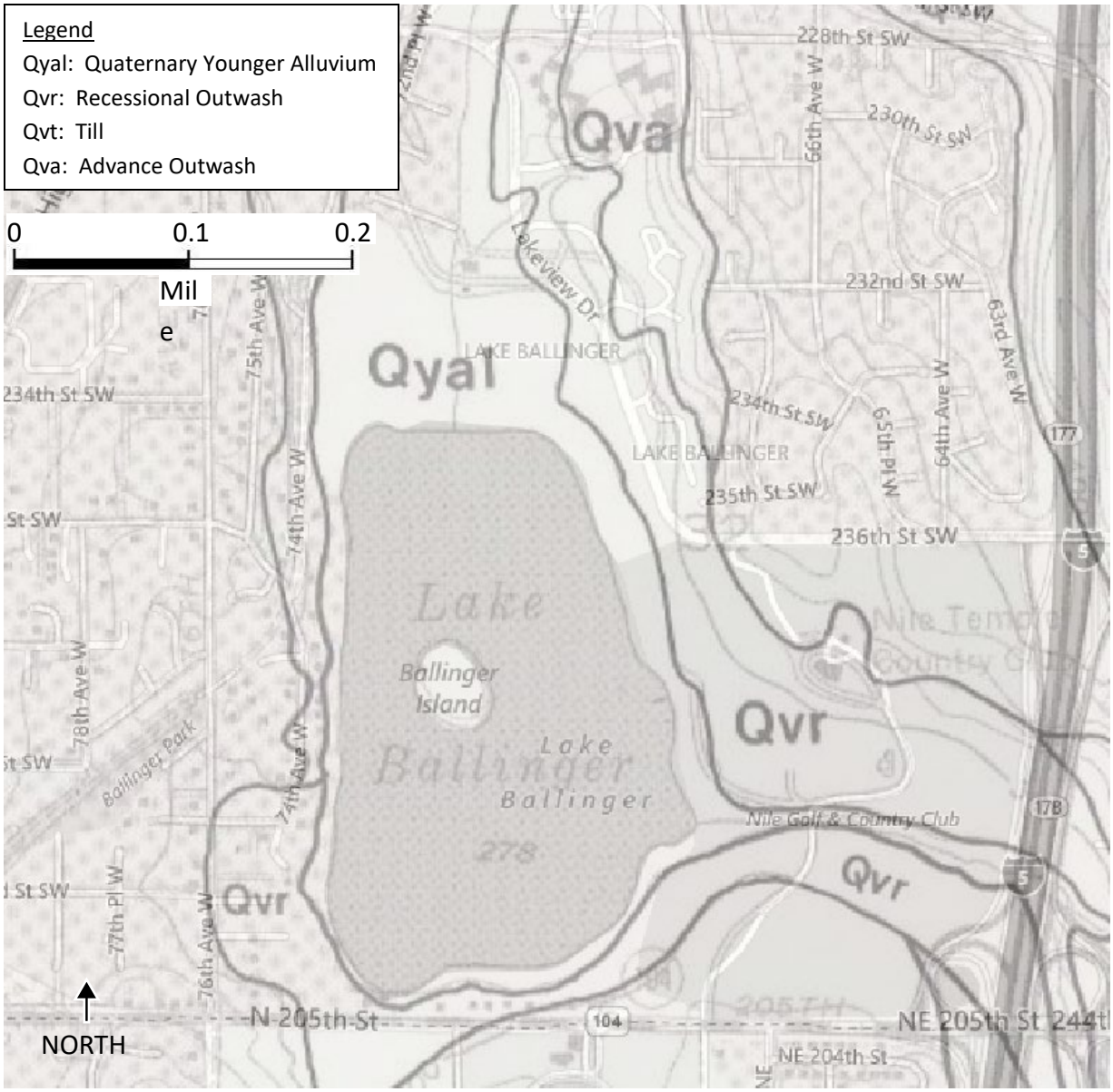

Figure 4-2. Soil Deposition at Project Site

Generally speaking the site around Hall Creek is overlain by loose to medium dense sands and gravels, with a compressible layer of peat or fine grain soils underlaying that deposit and dense glacial deposits at greater depths. The surficial alluvial soils will have a greater hydraulic conductivity than the underlying soils and groundwater may become perched on fine grained or very dense less permeable deposits. For a more in depth discussion of the soil types and characteristics see the attached Geotechnical Data Report in Engineering Appendix D-2.

4.3.3. Subsurface Explorations

To aid the Corps in design planning and development the Sponsor in collaboration with the Corps performed a geotechnical exploration during the week of 21 October 2019. The exploration was comprised of five hollow-stem auger borings that included four monitoring wells to provide groundwater monitoring across the extents of the project, where needed. The data collected will provide support in design analysis and decisions for channel alignment, creek flow structures, pedestrian and vehicle access bridge, and pedestrian boardwalk at the north end of Lake Ballinger. Supplemental to the planned exploration, the Sponsor provided existing geotechnical data associated with the culvert replacement located to the northwest of the Senior Center. The boring logs and test data associated with the explorations are included in Appendix A. The Geotechnical Data Report, dated January 2020, provides existing geotechnical information and is included as part of Engineering Appendix D-2.

4.3.4. Groundwater

HWA Geosciences Inc. (HWA) conducted investigations at the site. HWA encountered groundwater near an elevation of 274 feet while advancing borings across the site in July of 2010. HWA installed a 2-inch diameter PVC pipe and collected ground water level measurements periodically from September 2010 through April 2011 and indicating groundwater elevations of 282 to 284 feet, corresponding to water levels observed at the sewer and bridge crossing. It was HWA's opinion that groundwater during the wet season was likely to be within 2 to 5 feet of the ground surface and perhaps as deep as 10 feet during the dry season.

During the October 2019 exploration, the groundwater at the time of drilling varied across the site. At the north end of the project site the water elevation was recorded at 284 to 286 feet; near the pedestrian access bridge the water elevations was recorded 269 feet; near the north shore of Lake Ballinger the water elevation was 277 to 280 feet. It should be noted that at the time of the exploration there had been significant precipitation from the previous few days. Four monitoring wells installed as part of the geotechnical exploration with pressure transducers to collect water levels. Readings will be collected four times over a period of one year.

4.3.5. Seismic

Included in HWA's report is recommendations for the design of the bridge abutments in support of the existing culvert removal. Based on HWA's analysis, the granular soils above and below the compressible soils are susceptible to liquefy if they are below the water table at the time of the earthquake. The peat is probably not liquefiable but may settle during shaking.

Induced liquefaction may cause settlement to the ground surface, potentially damaging any supported shallow structures, and adds additional loading (downdrag) to deep foundation elements such as piles.

Significance Threshold Criteria
Impacts would be considered significant if an action resulted in changes to the topography and geology that would significantly alter the region or if it resulted in soils being prone to long-term erosion or mass movement.

4.3.6. No-Action Alternative/Future Without Project Conditions

Under the No Action Alternative the site would remain the same, requiring no site development or analysis.

4.3.7. Action Alternatives/Future With-Project Conditions

Alternative 2 - Riparian Enhancement / Lower Channel Armor Removal
No alteration of the topography or soils of the project area will occur due to implementation of this alternative. BMPs would be employed to minimize erosion of soils (see Section 4.2.2)

Alternative 3 — Lower Channel Meander/ LWD
As part of feature alternatives, design and construction will be based upon the existing conditions indicated above. These considerations will account for weak surficial soils that will likely require shallow slopes for the Hall Creek channel and deep foundation elements for the access bridge and pedestrian boardwalk. Deep foundations will mitigate risk and loading conditions associated with the site conditions as well as potential seismic loading and induced settlement; Engineering Appendix D-2 presents typical foundation types that would be suitable for the project. A preliminary analysis of realignment portion of Hall Creek was completed in support of the feasibility phase and is discussed in Engineering Appendix D-2. Topographic changes to the site are limited to those necessary to support design features and not expected to change public usage. The general slopes in the project area will remain similar with localized changes where the new channel is constructed, with in some locations a wider channel width.

Alternative 5 — Upper and Lower Channel Work with Pond Enhancement
If this alternative is implemented, there would be similar benefits and impacts as if Alternative 3 were implemented. There will be a minor alteration of pond bathymetry, creating shallow water in the four ponds. However, this small topographic alteration (less than 0.31 acres) is considered to be a minor topographic alteration.

Alternative 6 — Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications

If this alternative is implemented, there would be similar benefits and impacts as if Alternative 3 were implemented. In the area where the tennis courts are removed there will be further excavation of the area as compared to alternatives 3 and 5. However, this small topographic alteration (less than 0.8 acres) is considered to be a minor topographic alteration.

No significant impact to the regions topography, geology, and soils is expected under the action alternatives since no significant long-term erosion is expected and the topography and geology of the region since there would only be minor grading. BMPs will be employed to minimize construction impacts. Affects would be localized to the project site, specifically to those areas cleared, grubbed, excavated, and graded.

4.4 Vegetation/Wetlands

4.4.1. Vegetation

Before the arrival of European and American settlers the project area was a mixture of forest and wetland. The forest overstory was dominated by western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), and Douglas fir (*Pseudotsuga menziesii*) with an understory of salal (*Gaultheria shallon*), huckleberry (*Vaccinium sp.*), and variety of ferns (Halvorson and Khan 2013). Historic wetlands were likely dominated by emergent vegetation like sedges and rushes which overtime developed into the organic soils as vegetation piled up and decomposed with subsequent generations growing overtop. When settlers arrived these forests and wetlands were cleared for lumber and agricultural purposes.

Today, the project area is no longer heavily forested but retains wetland features in a highly modified state. Much of the native vegetation has been removed and replaced with ornamental plants and grasses when the site was developed into a golf course. Forested areas are restricted to thin bands along Hall Creek and portions of the ponds, with the greatest canopy cover present along Hall Creek where it enters Ballinger Park and at the confluence of the creek and Lake Ballinger. These forested areas consist primarily of early successional, fast growing and shade intolerant species such as red alder (*Alnus rubra*) and black cottonwood (*Populus tricocarpa*). However, western red cedar and Douglas fir are present in small numbers. None of these trees are old-growth specimens due to historical logging practices, but these two species are usually the dominant ones in mid- to late-successional forest species.

The shrub layer is dominated by willow (*Salix sp.*) and Douglas spirea (*Spiraea douglasii*) in most areas. Other shrubs present, but not as widespread, include Indian plum (*Oemleria*

cerasiformis), vine maple (*Acer circinatum*), snowberry (*Rubus spectabilis*), and Nootka Rose (*Rosa nutkana*), among others. Most common herbaceous plants observed in the project area are non-native species including reed canarygrass (*Phalaris arundinacea*), creeping bentgrass (*Agrostis stolonifera*), Canada thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*), creeping buttercup (*Ranunculus repens*); and native species including Douglas aster (*Symphyotrichum subspicatum*) and spotted touch-me-not (*Impatiens capensis*).

Invasive species are found throughout the site, having become established where dispersal is made easier through natural and human influenced processes. Common terrestrial invasive species found in wetlands and uplands include creeping buttercup, Canada thistle, English ivy (*Hedera helix*), Scotch broom (*Cytisus scoparius*), reed canarygrass, tansy ragwort (*Senecio jacobaea*), yellow flag iris (*Iris pseudacorus*), Himalayan blackberry (*Rubus armeniacus*) and an unknown species of bamboo. Additionally, aquatic invasive species are found within the stream, ponds, and lakes. These include the Eurasian watermilfoil (*Myriophyllum spicatum*), fragrant waterlily (*Nymphae odorata*), and curly leaf pondweed (*Potamogeton crispus*). Figure 4-3 shows the location of invasive plant species in the park area.

In 2018, 80-90% of the near shore area of Lake Ballinger was covered with a mixture of these aquatic invasive plants which spurred the Sponsor and Washington Department of Ecology (WDOE) to develop a Lake Ballinger Integrated Aquatic Vegetation Management Plan (Tetra Tech 2019; available upon request). The plan reviewed various options to address the invasive aquatic plant problem, which included selective herbicide treatment. The first application of aquatic herbicide was completed in July of 2019 (City of Mountlake Terrace 2019).

Figure 4-3. Location of Invasive Species at Ballinger Park (Halvorson and Khan. 2013)

Significance Threshold Criteria

Impacts would be considered significant if an action resulted in:

1) Direct or indirect disturbance to unique or high quality plant communities;
2) An unacceptable increase in distribution and abundance of noxious/invasive weeds; or
3) Substantial reduction to the existing native riparian habitat or substantial changes to the existing native habitat structure.

4.4.2. Wetlands and Ponds

Historically, much of the project area was likely wetland or marginal wetland as evident from the extent of hydric soils (a hydric soil is a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part.). The majority of the site has been altered to support recreational use (i.e. golf). This has drastically influenced the three characteristics that define a wetland: vegetation, soils and hydrology. Wetland reconnaissance conducted by the Corps in April and July 2019 found wetland characteristics across much of Ballinger Park intermixed with upland. Areas along the lake, ponds, and stream are definitively wetlands. However, away from these water features, the influence of sand traps, grading and filling activities that created the golf course result in a wetland mosaic across a majority of the lower end of Ballinger Park.

At this stage in the study, a wetland delineation has not been conducted in the study area. For the purposes of project planning, the entire project area is considered to be wetland (13.19 acres). However, a detailed wetland delineation conducted during the D&I Phase, might identify fewer wetlands present.

In the 1990s six ponds were constructed as part of the golf course renovation. These ponds are connected to each other and Hall Creek by a series of pipes and underground swales. The status of this system is uncertain. The ponds have fairly stable water surface elevations being between 4 to 5 feet in depth. These ponds are fringed by both emergent wetlands composed of both native and non-native species, as well as forested wetland features on part of the fringe.

Significance Threshold Criteria

Impacts to wetlands would be considered significant if restoration measures resulted in a net loss of wetland area or wetland habitat value.

4.4.3. No-Action Alternative/Future Without Project Conditions

Under the No Action Alternative the site would remain the same. Invasive species within the project site would continue to spread, with Himalayan blackberry, tansy ragwort and Scotch broom likely becoming more dominant unless actively managed or slowly outcompeted by trees if they are able to spread. The extent of wetlands would likely remain the same, but the quality would degrade.

4.4.4. Action Alternatives/Future With-Project Conditions

Alternative 2 - Riparian Enhancement / Lower Channel Armor Removal

The 13 acre project area will be planted with native species to improve overstory and understory cover. Invasive species will be removed improving wildlife habitat. The quality of bank vegetation will be improved improving the quality of stream habitat. Increasing density of bank vegetation will provide overhanging cover in the creek, increase insect drop and detrital input. Pond buffer vegetation will be enhanced. No fill in wetland areas would occur in this alternative. There will be no net loss of wetlands due to the proposed project.

Possible changes in the vegetation plantings due to climate change will be assessed through the adaptive management process. If dryer conditions develop, there could be a replanting of several more drought tolerant species. However, the projected plant palette will include several drought tolerant species such as Oregon grape and snowberry.

Alternative 3 — Lower Channel Meander/ LWD

If this alternative is implemented, there would be similar benefits and vegetation impacts as if Alternative 2 were implemented. The existing channel would be partially filled in to form a plug to divert water into the newly constructed channel. The characteristics of this part of the existing channel would change from stream bed to swale (emergent vegetation). The maximum extent of this conversion would be 0.45 acres. In addition, on the left bank of the new channel, a low hummock will be built to impede the channel from migrating towards the old channel. This feature will be further refined in the D&I Phase and might modified to incorporate the natural levee that exists on the right bank of the existing channel. The hummock would be to a maximum height of 18 inches above the existing ground surface. With capillary rise, the hummock is expected to maintain wetland hydrology as demonstrated by a water table 12 inches or less below the soil surface during the growing season at a minimum frequency of five years in ten. There will be no net loss of wetlands due to the proposed project.

Alternative 5 — Upper and Lower Channel Work with Pond Enhancement

In addition to the improvements associated with Alternatives 2 and 3, the quality of wetland vegetation in the ponds will be improved through the removal of invasive species and enhancement of the emergent community. Approximately 0.31 acres of the pond will be altered by placing fill in specified areas to reduce the water depth to enhance the emergent fringe and provide improved habitat for amphibians. There would be no net loss of wetlands due to Alternative 5.

Alternative 6 — Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications

In addition to the improvements associated with alternatives 2, 3 and 5, the riparian community in upper Hall Creek will further be enhanced by creating riparian forested wetland habitat in the area where the tennis courts have been removed.

No significant impacts are anticipated from the implementation of the four action alternatives since there will be no reduction in high quality plant communities and riparian habitat. Riparian habitat will increase. Invasive plant species will be removed and managed over the long-term. Wetland functions for the area will be enhanced.

4.5 Aquatic Resources

The upper Lake Ballinger/McAleer Creek Watershed was likely home to significant runs of anadromous salmon including Chinook (*Oncorhynchus tshawytscha*) and coho (*Oncorhynchus kisutch*) (Shaw, 2014). Eyewitness accounts certainly indicate that this was the case (Simmons, 2006). Residents report that downstream of Lake Ballinger in the City of Lake Forest Park, salmon spawned in the thousands in the 1930s and 1940s. In the decades leading up to the present day, loss of viable habitat through general development pressures, in-stream barriers to migration, and high flow levels that wash away spawning sites or deposit silt in egg nests has led to the decline and near elimination of most Chinook and coho salmon runs in the central Puget Sound region.

Historically the Lake Ballinger/McAleer Creek Watershed had habitats suitable for salmonids such as coho, Chinook, sockeye (*Oncorhynchus nerka)*, steelhead (*Oncorhynchus mykiss)*, and resident trout. Due to extensive urbanization and habitat fragmentation that occurred in the 20th century salmonids are absent from most of their historic range. Where salmon are found, they are predominately along the lower reaches of McAleer creek in the City of Lake Forest Park, and along the shoreline of Lake Washington (WDFW Salmonscape). Installation of culverts for the Interstate 5 project in the mid-1960s severely limited access to Lake Ballinger and Hall Creek for these migratory salmonid species. Urbanization in the upper watershed and corresponding stream flow increases over the years has further degraded any existing habitat. Upper McAleer Creek, Lake Ballinger, and Hall Creek no longer support natural Chinook or coho populations.

In recent decades, urban stream surveys in the Puget Sound region have suggested that spawning coho salmon experience high rates of pre-spawn mortality (PSM), a phenomena where coho die before they're able to spawn. Evidence suggests there is a direct correlation between increased PSM and urban stormwater runoff (Spromberg et al 2016). PSM at these

high rates could pose significant extinction risk for wild coho populations (Spromberg & Scholz 2011). Although coho salmon do not currently occur in Hall Creek, PSM is an important topic of management consideration for when the reintroduction of anadromous salmonids occurs in the future.

Little information is available regarding the existing fish assemblage in Hall Creek. Currently, WDFW stocks rainbow trout in Lake Ballinger to support a sport fishery and also reports a presence of resident cutthroat trout, largemouth bass, yellow perch, black crappie, and bullhead catfish. It can be reasonable assumed that some of these species could occur above the weir that separates Hall Creek from Lake Ballinger. Unidentified juvenile salmonids were observed in Hall Creek during site visits for habitat modeling. Other observed aquatic species within the project vicinity include turtles, frogs, and number of various aquatic invertebrates such as mayflies.

Significance Threshold Criteria
Impacts would be considered significant if the alternative results in a substantial loss in the population or habitat of any native fish

4.5.1. No-Action Alternative/Future Without Project Conditions

Under the No Action Alternative, aquatic habitat for fish would continue to be degraded and would likely result in a decline in both diversity and abundance of aquatic species. Habitat would continue to be inadequate for the future reintroduction of anadromous fishes.

4.5.2. Action Alternatives/Future With-Project Conditions

Alternative 2 - Riparian Enhancement / Lower Channel Armor Removal
Armor removal along 700 feet of the lower channel combined with planting of native vegetation on the bank will improve prey abundance and shading for aquatic species. Likewise, planting of the upper channel will improve prey abundance and shading for aquatic species.

Alternative 3: Lower Channel Meander and LWD.
Addition of Boulders and LWD increases channel complexity, provides low velocity refuge areas, provides habitat for juvenile fish, and provides nutrients and substrate for aquatic invertebrates. Additional increase of prey item availability due to invasive removal and new plantings along the 925 of the new lower channel and the 900 feet of the existing upper channel. Improvement to aquatic habitat complexity in lower channel due to meanders would increase diversity and abundance of aquatic organisms in the lower section of Hall Creek.

A portion of the existing Hall Creek channel will be filled in to provide a plug to divert Hall Creek to the new channel. The conversion of part of the existing Hall Creek channel will be compensated for by the creation of the new channel.

Alternative 5: Upper & Lower Channel Work with Pond Enhancement.
If this alternative is implemented, there would be similar benefits and impacts as if Alternative 3 were implemented.

Alternative 6: Upper and Lower Channel Work with Pond Enhancement, Off-Channel Connectivity and Topographic Modifications.
If this alternative is implemented, there would be similar benefits and impacts as if Alternative 3 and 5 were implemented.

In addition, additional backwater area will be created in the area where the tennis courts are removed due to further excavation of the area as compared to alternatives 3 and 5. So there will be a small improvement in low velocity refuge and available habitat to aquatic organisms.

No significant impacts are anticipated from any of the action alternatives since stream improvement activities will improve fish habitat and not cause declines in fish populations. Short-term construction impacts will be minimized through the use of BMPs.

4.6 Wildlife

Wildlife present in the study area is typical of that found in urban forested and wetland areas with modified vegetation communities and frequent noise and disturbance. Small rodents and raccoons utilize the area. Coyote, beaver and river otter are also in the system. The ponds and lake serve as habitat for migratory and wintering waterfowl. In addition, there is evidence of breeding waterfowl also utilizing the area. Migratory birds are present in the forested and pond areas of project area. A review of eBird sightings document at least 125 bird species utilizing the site. The two species used in the HSI models, yellow warbler and marsh wren have been observed onsite.

The Ballinger Park ponds serve as habitat for amphibians and reptiles. Pacific chorus frogs were noted on one site visit. Non-native turtles (most likely red sliders) are present in park ponds.

Query of the WDFW PHS mapper indicates that no bald eagle nests or roost sites are currently recorded as being in or near the project area (WDFW 2019). Bald eagle have been observed in the area during site visits.

Significance Threshold Criteria

Impacts to wildlife would be considered significant if the restoration actions resulted in a substantial, long-term (>2 years) reduction in the quantity of habitat critical to the survival of local populations of common wildlife species.

4.6.1. No-Action Alternative/Future Without Project Conditions

Under the No Action Alternative, the project area will continue to provide habitat for species typically found in urban areas.

4.6.2. Action Alternatives/Future With-Project Conditions

Alternative 2 - Riparian Enhancement / Lower Channel Armor Removal

Restoration of Ballinger Park area would enlarge areas for wildlife rearing, refuge, and forage opportunities. Increases in canopy cover would benefit migratory songbirds. The increase in wooded habitat will possibly result in greater numbers of species dependent upon larger contiguous forested areas utilizing the habitat.

Under the restoration alternative, minor short term impacts are expected from the work occurring in the area. Disturbance will likely occur to wildlife during construction but these impacts are temporary in nature.

Vegetation clearing will result in some disruption to nesting birds. Impacts to nesting will be minimized by conducting clearing before nesting season (1 April to 1 August). In the case where vegetation has to be cleared during nesting season, a nest survey will be conducted by Corps biologists and possible disruption of nesting will be coordinated with U.S. Fish and Wildlife Service.

Long term benefits to wildlife from the preferred alternative can be expected as vegetation that is planted matures and invasive species are reduced over time. The improvement of understory cover should also benefit wildlife at it provides enhanced forest floor complexity and provides for additional refuge opportunity.

Long term benefits to wildlife from this alternative can be expected as vegetation that is planted matures and invasive species are reduced over time. The improvement of understory cover should also benefit wildlife at it provides enhanced forest floor complexity and provides for additional refuge opportunity.

Alternative 3 — Lower Channel Meander/ LWD

In addition to the benefits described for Alternative 2, the enhanced wetland and stream would be more attractive to, and more heavily utilized by wildlife such as river otter, beaver, muskrat, coyote, as well as raptors, migratory passerines, amphibians and reptiles. In addition, the plantings would provide stream cover, bank erosion protection, a future source of woody debris, nutrients for aquatic insects and wildlife, and provide shade to reduce the density of reed canarygrass and other invasive non-native plants.

Several logs and wood debris will be placed in the stream channel; they will serve to trap sediments and gravel, slow flood flows, improve pool habitat, provide shelter to fish and wildlife, provide nutrients to aquatic insects, and over time provide a more natural and complex floodplain environment.

Due to the presence of soft soils, there is potential that pilings will be required to ensure structural stability of the stream crossing which may temporarily impact local wildlife activity. Methods will be used consistent with the presence of residential homes in the nearby vicinity in order to minimize any noise from this activity. Typical pile driving equipment produces sound levels at between 100 and 110 dBA at 50 feet. The closest residence is approximately 725 feet from any pile driving activity. At that point noise levels will attenuate to approximately 80 dBA.

Long term benefits to wildlife from the preferred alternative can be expected as vegetation that is planted matures and invasive species are reduced over time. The improvement of understory cover should also benefit wildlife at it provides enhanced forest floor complexity and provides for additional refuge opportunity.

No significant impacts are anticipated from any of the action alternatives since riparian enhancement measures will improve wildlife habitat and not cause declines in wildlife populations. Short-term construction impacts will be minimized through the use of BMPs.

Alternative 5 — Upper and Lower Channel Work with Pond Enhancement

In addition to the benefits described for Alternative 3, native amphibians, and migratory waterfowl would benefit from enhancement of pond habitats. The improved buffer will enhance nesting opportunities waterfowl such as wood duck and marsh dependent passerines such as marsh wren. By placing material and regrading some of the pond shoreline to create a gentler slope (approximately 10:1) will enhance habitat for amphibians, providing shallow water with emergent stems suitable for attachment of egg masses.

Alternative 6 — Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications

In addition to the benefits described above, floodplain habitat in the upper part of Hall Creek will be improved in the area where the tennis courts are removed.

4.7 Threatened and Endangered Species

In accordance with Section 7(a)(2) of the Endangered Species Act, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed and proposed threatened or endangered species. A species list was obtained from U.S. Fish and Wildlife Service (USFWS) for species that might be present in the project area. The relevant threatened and endangered species under the jurisdiction of USFWS are gray wolf, North American wolverine, streaked horned lark, marbled murrelet, yellow-billed cuckoo, and Puget Sound Recovery Unit (RU) bull trout. In addition, a search of the National Oceanic and Atmospheric Administration (NOAA) database determined that the project areas was in the range of Puget Sound Chinook salmon and steelhead. However, no critical habitat is present in the project area (NMFS 2018). Protected species potentially occurring in the project area are listed in Table 4-2.

Under ESA, the action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for the proposed project includes terrestrial areas 500 feet from the construction to encompass all areas that would experience temporary elevation in air noise levels generated by the use of heavy equipment. The action area includes all aquatic habitats extending one half mile upstream and Lake Ballinger, which is immediately downstream of the proposed project. This area includes sufficient area to encompass all reasonably likely effects to ESA-listed species and designated critical habitat, and extends to the point where any far field effects would be lost.

The project area is defined as the area where work will be completed. This includes construction, staging, and access to/from the construction site.

Table 4-2. Protected Species Potentially Occurring in the Project Vicinity

Species in Snohomish County	Federal Status	Critical Habitat	Presence in Action Area
Canada lynx (*Lynx canadensis*)	Threatened	Designated, not in action area	Unlikely present due to habitat requirements
Gray Wolf (*Canis lupus*)	Endangered	Designated, not in action area	Unlikely present due to habitat requirements

Species in Snohomish County	Federal Status	Critical Habitat	Presence in Action Area
North American wolverine (*Gulo gulo luscus*)	Proposed Threatened	None designated	Unlikely present due to habitat requirements
Yellow-billed cuckoo (*Coccyzus americanus*)	Threatened	Proposed, not in action area	Unlikely present due to habitat requirements
Puget Sound RU Bull trout (*Salvelinus confluentus*)	Threatened	Designated, not in action area	Unlikely present due to habitat requirements
steelhead (*Oncorhynchus mykiss*)	Endangered	Designated, not in action area	Unlikely present due to habitat requirements
Puget Sound ESU Chinook salmon (*O. tshawytscha*)	Endangered	Designated, not in action area	Unlikely present due to habitat requirements
Marbled Murrelet Brachyramphus marmoratus	Threatened	Designated, not in action area	Unlikely present due to habitat requirements
Streaked Horned Lark Eremophila alpestris strigata	Threatened	Designated, not in action area	Unlikely present due to habitat requirements

No critical habitat for any of the species was present.

The Corps evaluated potential effects to threatened and endangered species and made a determination of no effect for Chinook salmon, steelhead, bull trout, yellow-billed cuckoo, streaked horned lark, gray wolf, North American wolverine, Oregon spotted frog, southern resident killer whale, and marbled murrelet. This determination was made due to these species sensitivities to human presence, lack of suitable habitat, or because their presence is so transitory that any temporal affects to these species from construction activities would not be perceived as unusual, cause disruption of behavior or lead to measureable reduction in their prey base. Chinook and steelhead were previously in the system, but continued habitat degradation and blockage of access to the watershed have resulted in no naturally sustaining populations being present in Hall Creek.

The consultation requirement of section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) directs Federal agencies to consult with NMFS on all actions, or proposed actions that may adversely affect Essential Fish Habitat (EFH). Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and

loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that may be taken by the action agency to conserve EFH.

Section 4.5 of this FR/EA provides an analysis of effects to the habitat elements that make up EFH for anadromous salmonids. Coho spawning occurs downstream of the action area and juvenile coho rear in the action area in Hall Lake and Creek and in Lake Ballinger. At this time juvenile coho salmon are stocked in Hall Lake and they rear in the lake, Hall Creek and Lake Ballinger. The project vicinity includes EFH for coho salmon and Chinook salmon below Lake Ballinger, and EFH in Hall Lake, Hall Creek and Lake Ballinger which is in the action area. The Corps determines that the proposed project has short term effects that may adversely affect EFH designated for this species and the juvenile life-stage found in the action area. The Corps believes that through a combination of the habitat restoration, conservation and impact avoidance measures provided there will be no effect on EFH.

Significance Threshold Criteria
Impacts would be considered significant if the alternative results in:

Substantial loss of individuals of a Federally-listed or special status species or unmitigated adverse modification of designated critical habitat.

4.7.1. No-Action Alternative/Future Without Project Conditions

With the No-Action alternative there will be no change in conditions for ESA listed species.

4.7.2. Action Alternatives/Future With-Project Conditions

Alternative 2 - Riparian Enhancement / Lower Channel Armor Removal
Habitat restoration in this alternative could potentially improve conditions for several ESA listed species. The increase in cover provided by deciduous trees could improve migratory stop-over habitat for yellow-billed cuckoo. The stream improvements to Hall Creek would provide improved habitat for Chinook and steelhead. However, the return of these species to the Lake Ballinger system is dependent upon other improvements in downstream connectivity, as well as improving stream conditions and runoff upstream of the project area. There will be temporary short-term impacts to habitat as restoration measures are constructed consistent with aquatic and wildlife impacts described earlier in this document.

There will be temporary short-term impacts to EFH as restoration measures are constructed consistent with aquatic and wildlife impacts described earlier in this document. However, through the implementation of BMPs and avoidance, there will be no adverse effect to EFH, and long-term improvements to EFH.

Alternative — 3 Lower Channel Meander/ LWD

Habitat restoration in this alternative could potentially improve conditions for several ESA listed species. The increase in cover provided by deciduous trees could improve migratory stop-over habitat for yellow-billed cuckoo. The stream improvements to Hall Creek would provide improved habitat for Chinook and steelhead. However, the return of these species to the Lake Ballinger system is dependent upon other improvements in downstream connectivity, as well as improving stream conditions and runoff upstream of the project area. There will be temporary short-term impacts to habitat as restoration measures are constructed consistent with aquatic and wildlife impacts described earlier in this document.

There will be temporary short-term impacts to EFH as restoration measures are constructed consistent with aquatic and wildlife impacts described earlier in this document. However, through the implementation of BMPs and avoidance, there will be no adverse effect to EFH, and long-term improvements to EFH.

Alternative 5 — Upper and Lower Channel Work with Pond Enhancement
If this alternative is implemented, there would be similar benefits and impacts as if Alternative 3 were implemented.

Alternative 6 — Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications
If this alternative is implemented, there would be similar benefits and impacts as if Alternative 3 were implemented.

No significant impacts threatened or endangered species are anticipated to occur for each of the four action alternatives because habitat will be improved in the area which could potentially benefit ESA listed species that might use the area.

4.8 Air Quality and Noise

The Clean Air Act (CAA) requires U.S. Environmental Protection Agency (EPA) to set standards for air quality, regulating pollutants that are considered harmful. Areas of the country where air pollution levels persistently exceed the National Ambient Air Quality Standards (NAAQS) are designated as “non-attainment” areas. The EPA sets de minimis threshold levels for six common

air pollutant: ozone, carbon monoxide, nitrogen dioxide, particulate matter (solid and liquid particles suspended in the air), sulfur dioxide, and lead. Areas that do not meet the minimum threshold levels are designated non-attainment areas. Washington meets the NAAQS across the state but 12 communities are at risk of violating standards (WDOE 2018). The areas at risk are shown below in Figure 4-4. The location of the proposed project is in an attainment area.

The CAA also designates noise as a pollutant. Noise becomes a pollutant when it either interferes with normal activities such as sleeping, conversation, or disrupts or diminishes the quality of life. While noise is generated from a variety of sources, the largest source at the proposed project site is expected to be related to traffic and vehicle noises.

Noise is defined as unwanted sound (LaMuth 2008). A number of factors affect how humans perceive sound. These include the loudness, frequencies involved, period of exposure to the noise, and changes or fluctuations in noise levels during exposure. The human ear cannot perceive all pitches or frequencies equally well. Reflecting this fact, measures can be weighted to compensate for the human range of sensitivity. The most common of the weighted measurement units used for assessing construction activities is the A-weighted decibel, or dBA. Zero on the dBA scale is based on the lowest sound that the healthy human ear can detect. Ambient sounds generally range from 30 dBA (very quiet) to 100 dBA (very loud).

Noise levels in the project area are at levels typically found in residential areas with overlying traffic noise (around 60 dBA).

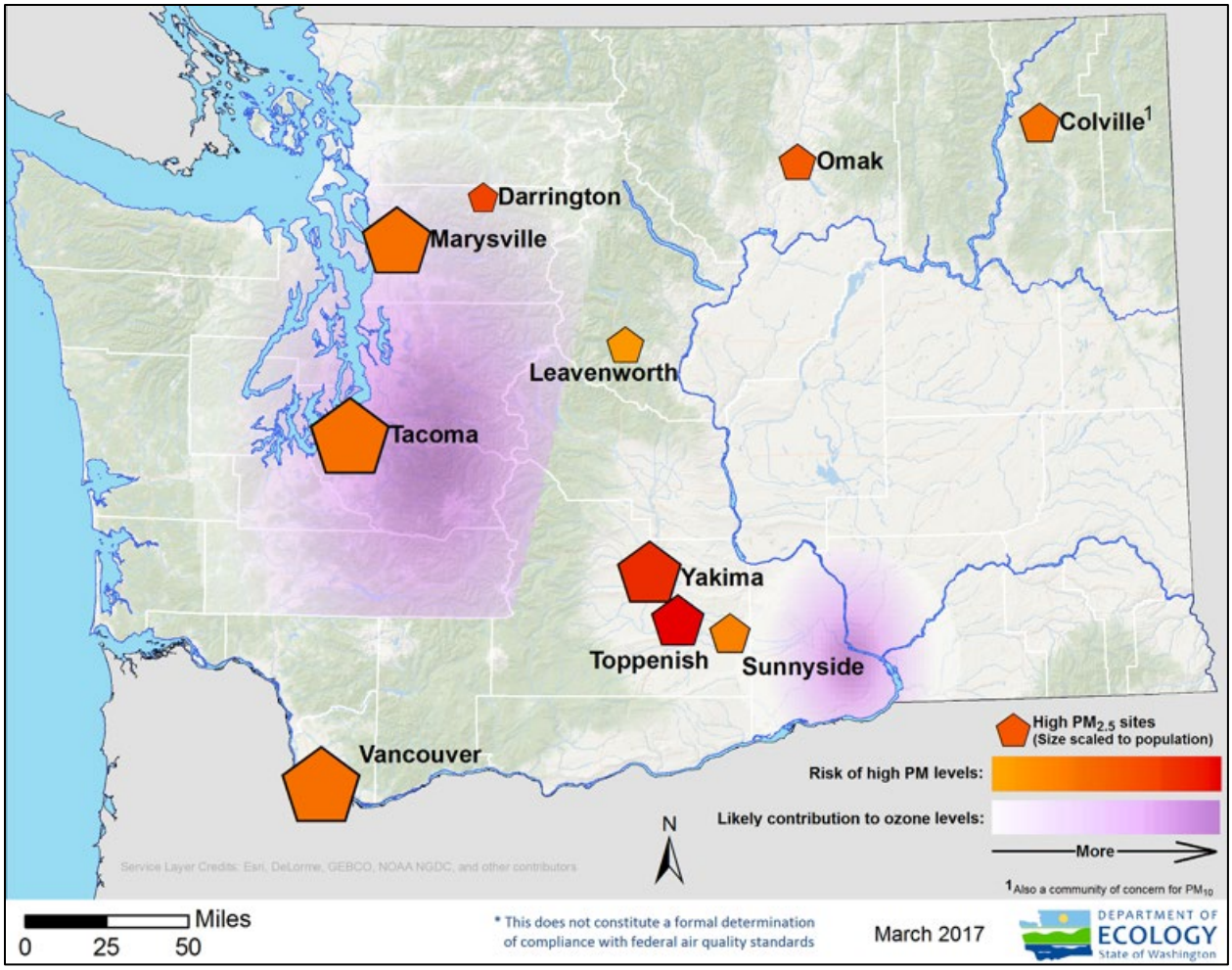

Figure 4-4. Areas at Risk for Air Quality — Particulate Matter and Ozone (WDOE 2018)

Significance Threshold Criteria

Impacts to air quality would be considered significant if actions resulted in a violation of NAAQS or production of hazardous air pollutants exceeding state or federal emission levels.

Impacts to noise would be considered significant if actions result in a long-term or permanent elevation of noise levels above ambient noise levels or results in exceedance of established noise ordinances.

4.8.1. No-Action Alternative/Future Without Project Conditions

Under this alternative there would be no work proposed. The current condition in regards to air, and noise would remain the same.

4.8.2. Action Alternatives/Future With-Project Conditions

Alternative 2 - Riparian Enhancement / Lower Channel Armor Removal

The project area is located in an attainment area. Additionally, since no stationary sources associated with the proposed action would generate more than 250 tons per year of emissions, the EPA Prevention of Significant Deterioration (PSD) program analysis is not applicable to the proposed action. Construction vehicles may temporarily increase air emissions impacts. Emissions from construction equipment would not exceed EPA's de minimis threshold levels (100 tons/year for carbon monoxide and 50 tons/year for ozone) or affect the implementation of Washington's Clean Air Act implementation plan. Best management practices to minimize impacts to the air such as standard practices used to control fugitive dust during the construction phase and during daily O&M of the proposed project will occur.

Although the proposed action increases greenhouse gas emissions, the increase is negligible in the context of all anthropogenic sources of greenhouse gases, and does not constitute a significant contribution of greenhouse gases and is not anticipated to generate substantial amounts of hazardous air pollutants or generate emissions that would result in NAAQS exceedances.

Construction of this alternative would temporarily increase ambient noise levels. Construction would be limited to daylight hours as much as possible to minimize the impact to nearby noise sensitive receptors such as residences, schools, day care facilities, etc. Noise-related effects to fish and wildlife are analyzed in Section 4.6.

There will be short term impacts to noise from construction related activities that will temporarily increase noise in the immediate project vicinity. Typical equipment to be used would include excavators, dump trucks, compactors, water trucks, and pickup trucks. Average maximum noise levels at 50 feet from heavy equipment range from 73 to 101 dBA (WSDOT 2013). Noise levels will generally be within normal background for the areas where construction is occurring with temporary elevation of noise levels over background at various times during construction. Noise associated with the use of heavy machinery may disturb local homeowners; however, these impacts would be temporary and highly localized, and would not result in significant impacts.

Alternative 3 — Lower Channel Meander/ LWD

If this alternative is implemented, there would be similar benefits and impacts as if Alternative 2 were implemented.

In addition, due to the presence of soft soils, there is potential that piling will be required to ensure structural stability of the stream crossing. Methods will be used consistent with the presence of residential homes in the nearby vicinity in order to minimize any noise from this activity. Typical pile driving equipment produces sound levels at between 100 and 110 dBA at 50 feet. The closest residence is approximately 725 feet from any pile driving activity. At that point noise levels will attenuate to approximately 80 dBA.

No long-term increases in ambient noise are anticipated due to the construction of the project features.

Alternative 5 — Upper and Lower Channel Work with Pond Enhancement
If this alternative is implemented, there would be similar benefits and impacts as if Alternative 3 were implemented.

Alternative 6 — Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications
If this alternative is implemented, there would be similar benefits and impacts as if Alternative 5 were implemented.

None of the four action alternatives are anticipated to result in significant impacts to air quality or noise levels. NAAQS will not be exceeded. Noise levels from construction will remain at or below 80 dBA. No long-term increases in noise levels will result from implementation of the proposed restoration measures.

4.9 Socioeconomics

Mountlake Terrace, WA has a population of 21,590 (2019). The population density is 5,091 per square mile which is 52% higher than the Washington average and 55% higher than the national average. The median age in Mountlake Terrace is 37 which is approximately 2% lower than the Washington average of 38. In Mountlake Terrace, 52% of the population over 15 years of age are married, 77% speak English and 6% speak Spanish. These figures are similar to the averages for the Seattle Metropolitan area. The racial makeup of Mountlake Terrace in 2010 was 71.7% White, 4.3% African American, 1.1% Native American, 11.2% Asian, 0.8% Pacific Islander, 4.9% from other races, and 6.1% from two or more races. Hispanic or Latino of any race were 10.5% of the population.

The watershed is highly urbanized with land use including commercial, retail, residential, schools, golf courses and a cemetery. Ballinger Park represents an opportunity for Mountlake Terrace residents to experience passive recreation opportunities. The entire park is zoned as a

Recreation and Park District. The area surrounding the park contained a mixture of multi-family and single family residences. To the southeast is the Nile Golf Course.

Executive Order 12898 requires that impacts on minority or low income populations be accounted for when preparing environmental and socioeconomic analyses of projects or programs that are proposed, funded, or licensed by Federal agencies (59 Fed. Reg. 7629 (1994)). The policy defines a minority population as a group of individuals that are identified or recognized as African American, Asian American/Pacific Islander, American Indian, or Hispanic. In accordance with Council on Environmental Quality (CEQ) guidance, a minority community exists where a census block group, or multiple census block groups, has a minority population equal to or greater than 51.1 percent in urban areas or 33.8 percent in rural areas, or where the minority population percentage is meaningfully greater than the minority population in the general population or other appropriate geographic unit (CEQ, 1997).

The small number of minorities residing within the study area are not at levels equal to or greater than the percentages required to be classified as minority communities.

A low income population is defined as a group of individuals having an annual income that is less than the poverty threshold established by the U.S. Census Bureau. As of 2010, the Census Bureau defined the poverty level as $11,139 of annual income or less. A low-income community is a census block group, or area with multiple census block groups having a low income population equal to or greater than 23.6 percent of the total population. The study area does not meet the definition of a low-income community.

Significance Threshold Criteria

Based on the existing conditions discussed above, impacts would be considered significant if the alternative:

1) The creation of substantial incompatibilities with existing or planned uses.
2) A substantial shift in population, housing, or employment.
3) A disproportionately high and adverse human health or environmental effect on minority or low-income populations.
4) A permanent or significant limitation of the use of or access to a recreational area or facility.

4.9.1. No-Action Alternative/Future Without Project Conditions

Under the No Action Alternative, land-use in the area will remain the same, with Ballinger Park being dedicated to passive recreation activities. The Sponsor may elect to carry out other park improvements at a smaller scale to improve recreation opportunities in the park. It is likely that with increasing populations in the Seattle metro area, passive recreational users will impact natural areas to a greater degree than occurs presently through trampling vegetated areas and introducing non-native species. This would lead to increased maintenance costs related to replanting trampled areas and removing invasive species.

4.9.2. Action Alternatives/Future With-Project Conditions

Alternative 2 - Riparian Enhancement / Lower Channel Armor Removal

Under this alternative, there is anticipated to be no changes in land use in Ballinger Park as well as the surrounding area.

Impacts to the restored area from use of the park by the public will be minimized through physical inclusion measures to include signage, and fencing. Passive recreation opportunities in the park will be enhanced. Public access will be maintained through the rebuilding of the trail system. By having a well-defined trail system wildlife viewing opportunities will be enhanced. There will be some short-term disruption of local traffic patterns as materials are delivered to the site during construction. However, the traffic flow impacts will be minimized by the use of signage, and flaggers. The Corps will work with the city to develop a traffic control plan.

Alternative 3 — Lower Channel Meander/ LWD

Under this alternative, there is anticipated to be no changes in land use in Ballinger Park as well as the surrounding area.

Impacts to the restored area from use of the park by the public will be minimized through physical inclusion measures to include signage, fencing and a boardwalk. Passive recreation opportunities in the park will be enhanced. Public access will be maintained through the rebuilding of the trail system including the new boardwalk. By having a well-defined trail system wildlife viewing opportunities will be enhanced.

Alternative 5 — Upper and Lower Channel Work with Pond Enhancement

The future with-project condition is the same as Alternative 3 with the addition that the inclusion of fencing will direct the public away from sensitive wildlife areas.

Alternative 6 — Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications

The future with-project condition is the same as Alternative 5.

None of the four actions alternatives are anticipated to have significant impacts to socioeconomic resources. Land use will remain the same, with recreational opportunities being enhanced. The makeup of the surrounding population will not change. There will be no disproportionate impacts to minority or low-income populations.

4.10 Cultural and Historic Properties

The Corps has coordinated its review of impacts on cultural resources for NEPA with its responsibilities to take into account effects on historic properties[3] as required by Section 106 of the National Historic Preservation Act (NHPA). The Corps has determined and documented the area of potential effect (APE) as required at 36 CFR 800.4 of the regulations implementing Section 106. The APE includes the entire construction footprint including all staging and access areas. The Washington State Historic Preservation Officer (SHPO) agreed with our determination of the APE on 11 June 2019. Subsequently, the Corps expanded the APE to include additional staging an access west of Hall Creek. The SHPO agreed with the revision to the APE on 21 January 2020.

The Corps conducted a records search and literature review of the Washington Information System for Architectural and Archaeological Records Data (WISAARD). The literature review and records search revealed that there are no properties listed in the National Register of Historic Places (NRHP) or the Washington State Historic Site Register in the project area, and no cultural resources have been recorded within the APE. The Corps completed inventory of the original APE in July 2019, conducting pedestrian survey, and 31 shovel probes and one auger probe. One archaeological site (LB-1) was identified within shovel probe 27. Site LB-1 remains unevaluated for listing on the NRHP and will be avoided by all proposed work. Due to the presence of cultural materials Corps archaeologists monitored geotechnical boring within the APE in October 2019 and no cultural materials were observed. The Corps completed inventory of the revised APE in the form of pedestrian survey on 12 February 2020 and no cultural resources were observed.

[3] *Historic Properties* are those cultural resources that are eligible for inclusion or listed on the National Register of Historic Places.

The Corps notified the Muckleshoot Indian Tribe, The Tulalip Tribes, Suquamish Tribe, Snoqualmie Indian Tribe, Sauk-Suiattle Indian Tribe, Swinomish Indian Tribal Community, Stillaguamish Tribe of Indians, and the Confederated Tribes and Bands of the Yakama Nation about the project on 11 June 2019 to identify properties to which they may attach religious or cultural significance or other concerns with historic properties that may be affected. The Tribes did not comment on the project.

The Corps has made a reasonable and good faith effort to identify historic properties that may be affected by the proposed project. Although there is one archaeological site within the APE, it will be avoided by all proposed work. Based on the results of the cultural resources inventory and the fact the archaeological site will be avoided by all proposed work, the Corps has found there would be no historic properties affected by the proposed project. The Corps notified the SHPO of our finding of No Historic Properties Affected on 27 March 2020. The SHPO concurred on 13 April 2020.

Significance Threshold Criteria

Under the NHPA, impacts to cultural resources are typically examined in terms of how the project would affect the characteristics that make the property eligible for the National Register. For instance archaeological sites that are eligible under Criterion D may be impacted by ground disturbance. Meanwhile, a property that is eligible under Criterion A, such as a farmhouse or TCP, may be impacted by the introduction of audible or visual intrusions because these intrusions would affect its integrity of location, setting, and feeling. Such impacts are referred to as adverse effects in the NHPA's implementing regulations (36 CFR 800.5).

For the purposes of this analysis, an adverse effect to an eligible cultural resource would be considered a significant impact under NEPA.

4.10.1. No-Action Alternative/Future Without Project Conditions

Under this alternative, there would be no work proposed. The current condition in regards to cultural resources would remain the same.

4.10.2. Action Alternatives/Future With-Project Conditions

Alternative 2 - Riparian Enhancement / Lower Channel Armor Removal

Alternative 2 includes alterations to the upper and lower reaches of Hall Creek as well as invasive plant species removal, and replanting of native species. All ground disturbing work is concentrated on and around Hall Creek with further excavations in the northern extent of the

APE. All four alternatives would have no adverse impact on cultural resources as ground disturbing work would avoid site LB-1, further, there are no historic properties eligible for listing on the NRHP within the project APE.

Alternative 3 — Lower Channel Meander/ LWD
Alternative 3 includes alterations to the upper and lower reaches of Hall Creek as well as placement of LWD, invasive plant species removal, and replanting of native species. All ground disturbing work is concentrated on and around Hall Creek with further excavations in the northern extent of the APE. All four alternatives would have no adverse impact on cultural resources as ground disturbing work would avoid site LB-1, further, there are no historic properties eligible for listing on the NRHP within the project APE.

Alternative 5 — Upper and Lower Channel Work with Pond Enhancement
If this alternative is implemented, there would be similar benefits and impacts as if Alternative 3 were implemented.

Alternative 6 — Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications
If this alternative is implemented, there would be similar benefits and impacts as if Alternative 3 were implemented. Alternative 6 includes further excavation of material at the northern extent of the project boundary to improve wetland habitat. All ground disturbing work is concentrated on and around Hall Creek with further excavations in the northern extent of the APE. All four alternatives would have no adverse impact on cultural resources as ground disturbing work would avoid site LB-1, further, there are no historic properties eligible for listing on the NRHP within the project APE.

No significant impacts to cultural resources are anticipated to occur due to implementation of the four action alternatives. All four alternatives would have no adverse impact on cultural resources as ground disturbing work would avoid site LB-1, further, there are no historic properties eligible for listing on the NRHP within the project APE.

4.11 Hazardous, Toxic and Radioactive Waste

A Phase 1 Environmental Baseline Survey (also known as an Environmental Site Assessment or Preliminary Site Assessment) was conducted at the project area in January 2019. The objective of this study was to identify the potential presence of hazardous, toxic, or radioactive waste (HTRW) at the project area that may affect plan formulation. A records search, an interview of site personnel familiar with the site, and a site visit was conducted for analysis of potential HTRW concerns. Based on the influx from tributaries of contaminated stormwater onto the site,

deposition of hazardous substances has occurred, but at concentrations that do not require a removal or remedial action. Therefore, all proposed alternatives in this feasibility study are highly unlikely to have any effect on HTRW materials. The full Phase 1 report can be found in Appendix F.

Significance Threshold Criteria

Based on the existing conditions discussed above, impacts regarding hazards materials would be considered significant if the alternatives results in:

1) Long-term exposure of humans, wildlife, wildlife habitat or the general environment to hazardous materials; and

2) An acute or adverse public health hazard through the release of hazardous materials into the environment.

4.11.1. No-Action Alternative/Future Without Project Conditions

Under this alternative, no work is proposed. There would be no effect on HTRW at the proposed site. The current condition in regards to HTRW would remain the same.

4.11.2. Action Alternatives/Future With-Project Conditions

Alternative 2 - Riparian Enhancement / Lower Channel Armor Removal

There will be no effect on HTRW as a result of Alternative 2. The alternative does not require disturbance of any areas with potential to release HTRW. The Phase 1 Environmental Baseline Survey for this project did not identify any HTRW concerns in the project area.

The proposed measures do not require disturbance of any areas with potential to release HTRW. BMPs will be employed to reduce the risk of releases of HTRW material from construction activities. To ensure the alternative does not generate new HTRW concerns, measures will be taken during construction and installation activities, fuels, oils, lubricants, and other hazardous materials would be used to avoid potential new sources of contamination. An accidental release or spill of any of these substances could occur, resulting in potential adverse impacts to on-site soils and water. However, the amounts of fuels, other lubricants, and oils would be limited, and the equipment needed to limit any contamination quickly would be located on site. To minimize these risks, a spill prevention control and containment plan designed to reduce impacts form spills would be in place prior to the start of construction. During the pre-construction meeting, the contractor will review and implement the plan making sure equipment operators understand what is expected. Beside the implementation of the spill

prevention control and containment plan, several BMPs will be employed to reduce risk of spills or leaks, and they include:

- Drive trains of equipment would not operate in the water.
- All equipment would be cleaned prior to in-water construction work.
- No refueling would occur near Hall Creek.
- Construction equipment shall be regularly checked for drips or leaks.

Alternative 3 — Lower Channel Meander/ LWD

No impacts to HTRW are anticipated in association with this alternative. If this alternative is implemented, there would be similar benefits and impacts as if Alternative 2 were implemented.

Alternative 5 — Upper and Lower Channel Work with Pond Enhancement

No impacts to HTRW are anticipated in association with this alternative. If this alternative is implemented, there would be similar benefits and impacts as if Alternative 2 were implemented.

Alternative 6 — Upper and Lower Channel Work with Pond Enhancement, Off-channel Connectivity and Topographic Modifications

No impacts to HTRW are anticipated in association with this alternative. If this alternative is implemented, there would be similar benefits and impacts as if Alternative 2 were implemented.

5. Recommended Plan / Agency Preferred Alternative*

This section describes the Recommended Plan advanced for design and implementation (Figure 5-1). As described in Chapter 3, Alternative 5 is the TSP; upon conclusion of the NEPA process, the TSP becomes the Recommended Plan. This comprehensive description of the Recommended Plan is intended to support a common vision of the final project and a defendable feasibility level cost estimate, to document feasibility level risks and for uncertainties to be investigated further and resolved during the Design and Implementation phase.

The Recommended Plan was selected according to plan formulation processes described in Chapter 3 of this report. In short, management measures were identified that had potential to address known ecosystem degradation at the project site and then evaluated for potential implementation. The identified measures were incrementally added according to potential to affect positive ecological lift and sustained delivery of benefits. Measure combinations were scoped similarly for the purpose of evaluation based on professional judgment and then conceptual designs were used to evaluate both cost and benefit outputs using CE-ICA and several habitat models. The results were discussed as a joint District and Sponsor team and after balancing the cost, sustainability of the outcomes and public input, the Recommended Plan described below was selected. The 35% design sheets are found in Appendix A.

5.1 Plan Components

The components of the Recommended Plan are generally described earlier in this document. This section separates the specific actions into demolition activities and construction activities to better characterize those actions that correct existing issues and those that implement new or improved features. Together these actions work together to deliver a full suite of restoration benefits within the project footprint and include adequate actions to ensure long term sustainability of the results in an urban site with constant public access. The project site is characterized as having an upper reach above the Senior Center and lower reach in the area of the former golf course. This identification of reach is useful as the character of Hall Creek is observably different and measures applicable to each reach are implemented at different scales and have different constraints. No new recreation features are included in the Recommended Plan. Existing trails that would be disturbed through implementation of the Recommended Plan will be replaced in kind, and exclusion measures designed to protect the restored area, such as the boardwalk and signage, may have incidental recreation benefits.

LAKE BALLINGER SECTION 206
Recommended Plan

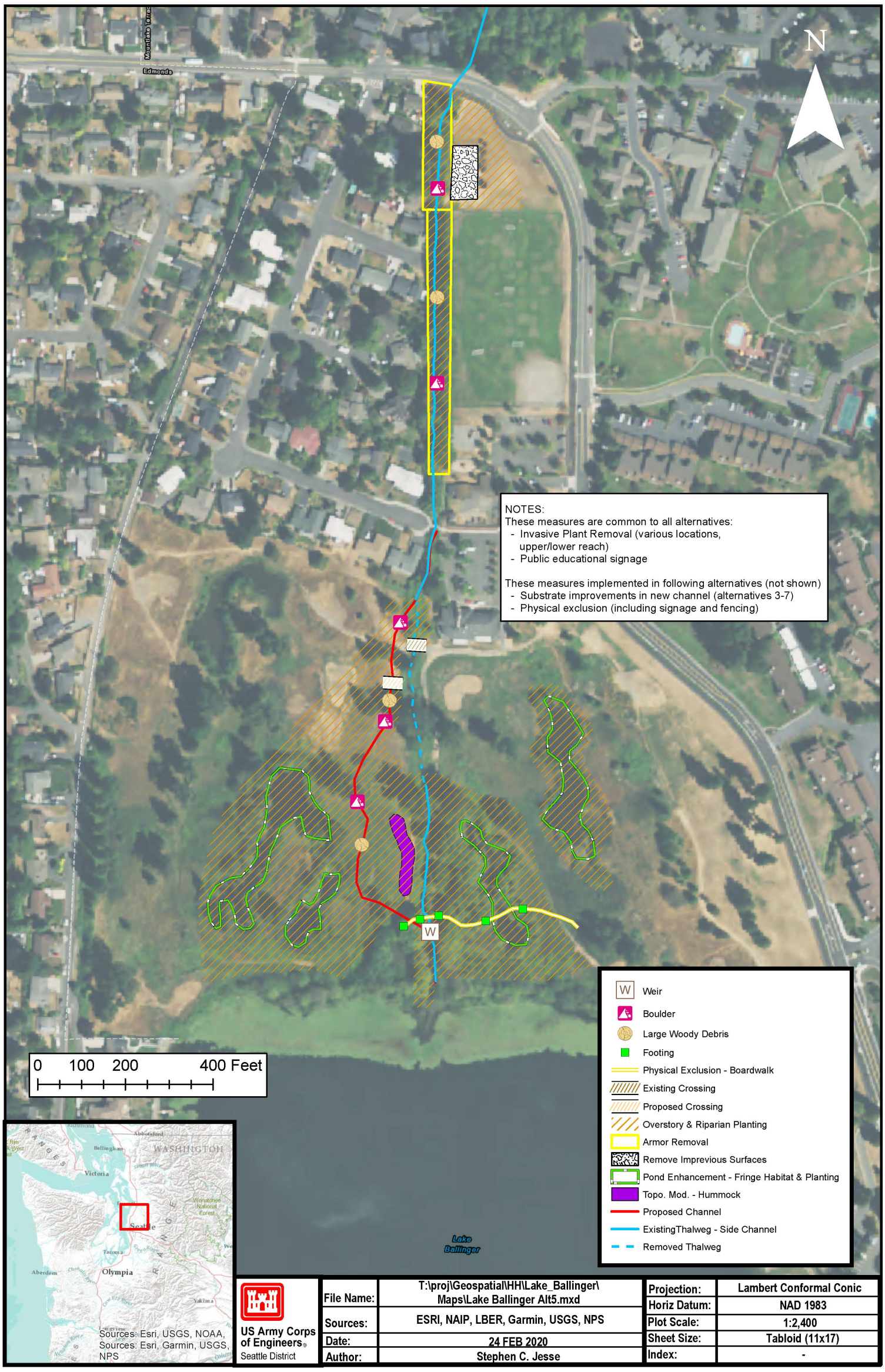

Figure 5-1. Recommended Plan — Conceptual Design

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5.1.1. Demolition and Site Prep Activities

Invasive Plant Removal: Invasive plant species including, tansy ragwort, scotch broom and blackberry are common throughout the project footprint. Most notably in the area associated with the banks of Hall Creek. The Recommended Plan calls for removal of these communities at both the upper reach where Hall Creek is channelized and lower reach within the former golf course. In the upper project reach, the Recommended Plan would propose a mix of mechanical and hand removal of invasive plants. In some cases, herbicide treatment for specific species may be prescribed. The right bank may also require some plant removal but the proximity of residential homes will require more careful removal to ensure avoidance of any potential impacts to fences or retaining walls. In the lower reaches, the areas around Hall Creek and where construction related measures may be employed will be targeted. There is approximately 27,200 square feet (.62 acre) of removal planned at this stage in the upper reach and 211,300 square feet (4.85 acre) anticipated in the lower reach that could receive treatment.

Removal of invasive plants is a difficult but key action necessary to ensure long term growth and expansion of native riparian and shrub/tree plantings within the project footprint. Without this action, the invasive species are likely to overrun the newly planted areas and prevent establishment. Species such as blackberry, knotweed and canary-grass are particularly well suited to impeding establishment of new plants.

Invasive plants in riparian environments can be difficult to successfully remove and control. In addition to physical removal of plants, a course of herbicide application is anticipated at the start of construction with the targeted second application occurring in areas where topography and density of invasive plants make it necessary. The first application will likely occur immediately after mechanical removal of invasive plants and treat most all areas expected to receive native plantings. It is expected that not all invasive plants will be eradicated even after construction is completed; so, post-construction monitoring by the City will be required. The site appears to be well suited to establishment of native plants so native plant survival is expected to be high (approx. 90%-95%) and quickly establish densities adequate to prevent recurrence of invasive plant impacts.

Removal of Impervious Surfaces: Functional wetland habitats, once occupying the low lying areas adjacent to Hall Creek, have been converted to impervious surfaces. This is common in areas of human development. While this prevents establishment of a healthy plant community, impervious surfaces also serves to prevent runoff absorption and, if large enough, can alter the hydrology of small streams. In extreme cases of impervious surface coverage, runoff can be

contaminated with vehicle and household compounds. In the area of the project footprint there are several areas of impervious surface most of which are associated with ongoing community and city activities by the Senior Center. The Recommended Plan does not address all impervious surfaces associated with the upper reach but does propose removing that surface associated with the tennis court adjacent to Hall creek. The removal of 7,255 square feet (.16 acre), as part of the Recommended Plan will allow this area to be gently sloped down toward the creek channel and restored with plantings.

By removing impervious surface an immediate habitat lift will occur once paired with the riparian plantings measure. There is an expectation that minor excavation will occur to remove anticipated minor fill under the tennis court surface and match surface elevations with the surrounding low lying areas.

Armor Removal: Natural stream systems located in close proximity to human development are often altered with large angular rock placed along the banks and sometimes bottom of the channel. This action is generally done to reduce channel movement and erosion that could affect upland values. The effect of this action is to reduce in-stream habitat productivity by reducing potential for establishing healthy benthic communities, invertebrate prey resources for native fish and wildlife and degrades the ability to establish a healthy riparian plant development and necessary diversity. The banks of Hall Creek, in the vicinity of the project footprint, have received extensive treatment of armor rock through the years in order to maintain channel location, particularly in the upper reach. In the lower reach, there also are areas of armor rock negatively affecting the channel. Armor in the lower reach is intermittent and will not be removed as part of the Recommended Plan in order to avoid excessive disruption to existing creek. The Recommended Plan will address habitat degradation caused by armoring by identifying the key locations of impactful rock and seek to remove it by mechanical means, likely in conjunction with invasive plant removal. The rock will be re used on site if appropriate, stockpiled for use elsewhere by the Sponsor if available or hauled off to disposal. The Recommended Plan includes approximately 600 cubic yards (CY) of armor rock being removed from the footprint.

Removal of the armor rock is a key feature to establish productive channel conditions and riparian and shrub/tree plantings. This feature will be used in the upper reach primarily and focused on the left bank and stream bottom. Presence of private property along the right bank will restrict armor removal in order to sustain the existing level of erosion protection. The right bank in the upper reach will see invasive plant removal and replanting only. In the lower reach this action will occur on both banks as needed to improve channel productivity for that portion

of the existing channel that remains. Without this action, the footprint will not be capable of establishing the proper channel and vegetation characteristics.

Structural Components: There are several existing structural features on the site that will need to be removed or were considered under the Recommended Plan. In all cases, actions taken on structural components are done so to sustain function of existing features, improve construction efficiency or reduce overall project costs. Features known to require ongoing functionality within the project site include several minor stormwater outfalls located in the upper reach of Hall Creek. These outfalls serve to drain areas of Ballinger Park outside the project footprint into Hall Creek. The outfalls vary in size but are roughly 12 inches in diameter and it is not anticipated that these outfalls will be replaced during construction. If any outfalls are inadvertently damaged at their connection to Hall Creek they will require replacement. None of these features generate environmental output but are notable Recommended Plan features with cost implications that need to be identified and managed.

The hypolimnetic weir and wing walls located at the confluence of Hall Creek and Lake Ballinger in the lower reach will not be impacted as part of the Recommended Plan. The new channel alignment is planned to tie back into the old channel above this point. Not only will this ensure its continued functionality but avoid any potential issues that may arise (erosion, sedimentation, increased backwater) by tying in too close to the lake shoreline.

Structural components scheduled for removal as part of the Recommended Plan include the existing stream crossing at Hall Creek in the lower reach. This feature is roughly 10 feet wide by 20 feet long wooden stream crossing installed to ensure access by the public to the western side of the previous golf course. It currently serves as access for pedestrians using Ballinger Park and light vehicle traffic for City of Mountlake Terrace maintenance vehicles. This structure is in poor condition and will be removed as part of the project. A new crossing is included in the Recommended Plan to cross the new channel at Hall Creek which is wider and further downstream from the current structure. The replacement vehicular bridge to span the new channel may be up to a length of 50 feet with 10 feet minimum width, and consist of a 26000 gross vehicle weight rating. Due to the soils in the area, the stream crossing may require driven piles for support. The bridge is currently being considered to consist of structural steel and wood for the decking and substructure, with reinforced concrete for its foundations. There is a tall light duty chain link fence located in the upper reach of Hall Creek adjacent to the stream. The purpose of this fence is associated with a ball field and will be removed to facilitate movement of equipment and materials during construction. The existing fence is approximately 420 feet long and between 6 and 20 feet tall. It is anticipated to be a small cost and will be replaced with a new 6-foot high chain link fence as part of the project. The narrow walking trail

constructed of crushed gravel that exists parallel to Hall Creek will be impacted during construction to facilitate construction in the upper reach. This trail will be restored in-kind as part of the project. Pedestrian trails exist in multiple locations in the lower reach. Most of these trails are informal with little investment made to sustain them. During construction, consideration will be made when planning access routes to be consistent with existing trails so they are sustained or even improved slightly as part of normal demobilization efforts when the project is complete.

5.1.2. Construction Activities

Riparian Planting: The long history of degradation at the project site from past land usage has dramatically reduced the presence of function riparian communities. There are examples of native riparian plants along the existing Hall Creek channel in the lower reach however, these examples are limited in their growth as the areas outside the Hall Creek corridor are both dominated by invasive species and received years of human disturbance and compaction. The conditions to restore native riparian plantings are available if the current shallow ground vegetation and soils are improved. Following the removal of invasive plants in the lower reach there is adequate area available on either side of the new channel alignment and along areas of the existing Hall Creek channel. In the upper reach there is area available following removal of the impervious surface and in low lying areas at the northern terminus to establish riparian communities that have direct connection to Hall Creek.

The Recommended Plan proposes riparian planting in large areas on either side of the new channel, areas near the existing Hall Creek channel and grassy areas within the upper reach Focus will be on both sides of the newly constructed channel, in limited areas in the upper reach adjacent to Hall Creek and along grassy upland areas disturbed by construction. In areas designated as open understory a modified plant palette will be used to provide sight lines for public safety. Total riparian plantings in the upper reach are estimated at 35,500 square feet (.82 acre) and 434,250 square feet (10.0 acre) in the lower reach. The plant palette will vary somewhat depending on the conditions of the site but will consist of a variety of native understory plants with species selection compatible with areas of high groundwater and expressing a variety of full height capability to provide appropriate vertical diversity and tolerant to disturbance. Plants will be installed largely by hand from pots ranging from 4” to 12” depending on variety, on roughly 6-foot centers. Live stakes may also be incorporated where technically appropriate.

Overstory Planting: As with other measures intended to restore diverse native riparian communities, the overstory component is valuable companion measure to the riparian community measure and is often employed in upland areas where loss of shade and vertical

habitat has occurred. Overstory is limited in the project footprint outside the current Hall Creek alignment. This measure would act to expand that benefit along the new channel alignment and in other areas where shade would be considered valuable. The conditions to restore native overstory plantings are available primarily in the lower reaches along Hall Creek and in disturbed areas such as those used for construction laydown an access areas. Following the installation of native riparian plants in the lower reach it is expected that select overstory plants will be added to those areas as available on either side of the new channel alignment. In the upper reach there is some limited area for overstory plantings following removal of the impervious surface and select areas along the creek bank.

The Recommended Plan proposes overstory planting throughout the project footprint. Overstory plantings areas proposed for planting is 277,500 square feet (6.3 acre) within the greater project footprint. The plant palette consists of a variety of native trees including cottonwood, maple, and coniferous trees such as Douglas fir and Sitka spruce. Species selection will be compatible with areas of both riparian and upland characteristics and focused providing a high degree of vertical diversity and shade for wildlife and aquatic resources. Plants will be installed largely by hand from pots ranging from 24”-48” depending on variety on roughly 10 foot centers. Live stakes may also be incorporated where technically appropriate.

Topographic Modification: The lower reach of Hall Creek within the proposed footprint has been highly modified due to is past land usage. There are areas adjacent to the proposed project that have been altered causing the general area to be flat and compacted. There are a few areas of low lying area but there is need to deliver the diversity of topography necessary to facilitate robust growth of all native types of vegetation community including wetland, riparian and upland vegetation. Material removed from the creation of the new channel will be repurposed in areas around the lower reach footprint to create several hummocks to ensure a diversity in ground slope and elevation for this purpose. Doing so will provide a place for upland plants to thrive as well as help control movement of people around the site to protect sensitive vegetation. Height and length of the hummocks will vary depending on the specific location planned but are expected to be no greater than 18 inches in height.

Physical Exclusion: The project footprint is located within Ballinger Park which is a highly used community asset for the City of Mountlake Terrace. The majority of the footprint is located in an area currently used for passive recreation and receives daily visitation by residents. Because the project is anticipated to see consistent public usage, left uncontrolled such usage can damage the physical features and degrade full site performance and therefore environmental output. Areas receiving native riparian plantings are especially sensitive, particularly the southern areas adjacent to the lake where the water table is higher. It is important that

measures are in place to direct and focus human disturbances at the site (boardwalk) as well provide information about the site (signage) to facilitate local connection to the values produced by the project.

A pedestrian boardwalk is proposed at the southern end of the lower reach to allow controlled access from West to East by visitors. The boardwalk is estimated as 400 feet long and comprised of readily available materials (wood/plastic) and set on top of wood or concrete footings that may require deep foundation elements to ensure stability in the highly organic surficial soils. The boardwalk will be elevated in areas depending on local topography and for proper crossing of the existing creek. In areas where boardwalk requires fall protection, handrails will be included. The use of boardwalks to control access and protect native riparian communities is a common activity and will greatly enhance the survivability of the restoration site.

In areas particularly sensitive to human disturbance throughout the project site, modest fencing will be installed to restrict access to planting areas. There are areas of proposed riparian planting in the upper reach in areas adjacent to active recreation (soccer/softball fields) that would be expected to see higher use by visitors. Visual deterrent through use of fencing will reduce trampling and enhance sustainability of the plantings. The fencing is not intended to serve as a complete physical barrier so ongoing monitoring will be needed to ensure camping or other disturbances are prevented. Dog usage in Ballinger Park is a known issue for the Sponsor so there may be select locations where low fencing may be employed to keep dogs out of sensitive areas like pond fringe habitats.

Channel Diversity Improvements: The primary feature of the aquatic restoration of Hall Creek is the addition of a new stream channel proposed in the lower reach to the West of the existing channel. As a result of decades of degradation, Hall creek is incised and straightened such that almost all hydraulic diversity has been lost. The channel is excessively narrow and lacks in-stream structure currently and lacks overstory to generate such structure into the future and increase shading of the creek.

The Recommended Plan calls for a sinuous channel approximately 925 feet long that generally follows the natural lowland contours of Ballinger Park. The proposed channel diverts from the current alignment slightly south of the Senior Center located near the boundary of the lower and upper reaches. The channel dimensions will vary depending on topography but be generally 8 feet wide at the bottom with side slopes between 2:1 and 3:1 depending on soil condition and height of the surrounding ground. The top width of the channel also varies but

ranges between 17 feet and 47 feet wide. These are preliminary dimensions that will be revised in design phase to best accommodate observed high flow events.

The northern sections of the channel will have a wider top width to accommodate a higher surrounding topography. The slope of the channel is anticipated to be a consistent 0.5% to ensure adequate passage of flow at all conditions and move fine sediment. Given the site topography and the need for the new channel alignment to be a transport channel, a break in slope is currently planned in order to follow the site topography. The channel may also exhibit a low-flow channel or two-stage channel bottom depending on local hydraulic needs. The new channel will reengage with the current channel upstream of the hydraulic weir to ensure its continued operation. The alignment of the channel at the confluence with the existing channel will be graded to avoid erosional forces causing issues at that location. Some LWD or other features may be required to ensure erosion is managed properly.

At the upstream end of the channel, a soil plug consisting principally of suitable imported material is proposed along approximately 160 feet of the existing channel to serve as the diversion point between the old and new channel. This plug may include some amount of LWD and rock to ensure its long term stability and function as well as contribute to the ecology and productivity of the new channel. The elevation of the plug will be near the surrounding grade but may appear as a shallow swale to ensure any overbank flow from Hall Creek is properly directed along the project footprint and back into the restoration site. This will also serve to reduce potential impacts from flood waters on key trails or active recreation areas around the Senior Center.

With construction of the new channel, a new crossing will be required to allow access for visitor and small maintenance vehicles to the western end of Ballinger Park. There is a current crossing that will not be reused due to its current condition and inadequate length to span the projected channel. The location for the crossing in the Recommended Plan is currently proposed at the northern end of the lower reach where the top width of the channel is anticipated to be approximately 30 feet. The location is selected to ensure the crossing is elevated adequately above the stream survey elevations at high flow so that it does not adversely affect flows or become unusable. Ground surface elevations lower in the project footprint are closer to the high flow stream surface elevation making it unsuitable for an access crossing. The crossing in the Recommended Plan was developed after review of existing crossings that serve the same purpose. After review by the Corps and Sponsor, structural engineers developed a feasibility level design using existing designs from within the region. The crossing is shown to be a straight crossing approximately 10’ wide and 30’ long composed of steel runners with a wooden surface. The crossing will support a single emergency vehicle up to a maximum weight of 26000

pounds Gross Vehicle Weight Rating. The crossing will contain side railings for safety, likely comprised of wood or similar material and access and egress ramps to provide smooth transition onto and off the structure. The crossing will be laid on concrete abutments of approximately 13' in length. The abutments will be placed back from the stream channel to avoid adverse hydraulic conditions and maintain full channel productivity. Deep foundation elements are likely required to ensure stability under load due to highly compressible surficial soils present at Ballinger Park.

Off Channel Connectivity—Side Channels: The existing channel of Hall Creek within the lower reach will be disconnected at the point of diversion for the new channel, and will remain open at its downstream end. The newly disconnected channel will become a remnant feature serving as a vegetated side channel. This new side channel will maintain connection to the new main Hall Creek channel at the point of confluence at the lower end of the reach (above the hypolimnetic weir). The project footprint contains a high water table and the old channel is anticipated to function as a forested wetland for the approximately 600 feet of its remaining length downstream of the soil plug. The remnant channel will serve as a vegetated side channel able to serve as a source of backwater vegetated wetland and aquatic habitat for invertebrates, resident fish and amphibians. To encourage long term development of a native plant community, invasive plants will be removed as part of the site prep phase and remaining native vegetation and overstory will remain; the forested wetland will be planted where appropriate. The length of the side channel will be approximately 600 feet long depending on length of upper channel diversion plug and downstream reconnection point. The forested wetland will serve to provide particularly beneficial benefits to aquatic, fish and wildlife species and work in conjunction with the newly restored active channel.

Channel Substrate Modification: The bottom of the channel, in the lower channel portions, will be lined with gravels to facilitate invertebrate colonization and microbial prey resource colonies to improve diversity within the channel. Thickness of the gravels may vary slightly depending on ground condition but will generally be 2 feet. The gravels will be delivered from off-site approved sources and placed mechanically following the channel construction. These gravels are not intended to serve as long term spawning habitat for anadromous salmon as they do not currently spawn in the creek. Further, there is a lack of long-term source of gravels upstream so this measure is primarily intended to facilitate faster channel maturation and improved ecological diversity for wildlife and resident fish. Areas of gravel placement are anticipated to shift over time and would be expected to accumulate in areas of moderate velocity and adjacent to instream structures where hydraulic conditions serve to disrupt fine sediment accumulation.

Instream Habitat Diversity—Large Woody Debris (LWD): Because of the long history of active land use in the upper and lower reaches of the project footprint, there is very little LWD in Hall Creek currently. It is likely, that LWD was once plentiful in Hall Creek but actively removed from the system after recent human development in order to maximize water transport past the largest elements of infrastructure. In the lower reach, the history of being used as a golf course rather than concern over flooding likely prevented LWD from accumulating in the stream channel. Heavy vegetation management is common at such courses. Even today, it is important to consider that the presence of valuable infrastructure and private properties within the project footprint will affect the development of this element of the Recommended Plan.

While benefits can be achieved through placement of LWD in the stream channel it will likely not reflect historic conditions due to the modern day constraints of a developed environment. Still the placement of LWD in strategic locations and establishment of shrub/tree plantings to serve as sources of future LWD will deliver the key benefits anticipated. Among these include small scale complex hydraulic conditions along the channel, a substrate for microbial nutrient production and source of food for invertebrates.

LWD also provide perching habitat for native birds, and refuge for resident fish and possibly anadromous salmon in the future. The LWD will consist of coniferous trunks both with and without root structures to maximize surface area. They will be placed within the new channel alignment in a manner that avoids excessive erosion or flooding and compatible with the size of the creek. LWD may also be placed slightly outside the wetted channel for bird and invertebrate habitat purpose and substrate for future vegetation. To avoid LWD moving within the channel and causing issues, installation will be done at the time of channel construction. LWD will be anchored into the bankline and may require boulders or other devices to ensure proper anchorage. The Recommended Plan currently proposed 11 LWD structures distributed as appropriate between the upper and lower reaches.

Instream Habitat Diversity—Boulders: In stream diversity through placement of appropriately sized boulders and rock clusters are often used to provide small scale hydraulic diversity in stream conditions that allow refuge areas for small resident fish and invertebrates. This features allows for a variety of flow conditions in small streams that allow diversity in sediment accumulation and trap nutrients in the stream.

Hall Creek has been degraded such that few, if any natural, boulders capable of supplying these benefits were observed. Single armor rocks can supply some of this benefit but it is considered less productive than natural rounded structures common in rivers and streams.

In the Recommended Plan, several areas are identified with in the new channel corridor to provide some hydraulic diversity. Similar to the LWD measure, these elements will be placed only where they do not represent a potential for increasing flooding or unwanted erosion. They are often placed near LWD structures to provide hydraulic conditions that support those benefits while providing slower degrading structural presence in the stream. These features are installed mechanically at the time of construction.

Boulders and rock clusters provide perching habitat for native birds, and refuge for resident fish and possibly anadromous salmon in the future. Boulders do not generally require anchoring into the bankline to ensure proper anchorage. The Recommended Plan currently proposed 7 boulder clusters distributed as appropriate between the upper and lower reaches.

Creation of Shallow Water Fringe Habitat: Much of the benefit to be derived at this project location is to native wildlife species that have been significantly impacted by loss of this type of habitat in this part of the Lake Washington Watershed. A combination of human development and changes in water quality/quantity affects smaller and less mobile species especially hard. Amphibian species such as Pacific tree frog, and bird species such as marsh wren and Virginia rail require shallow water habitats commonly found around wetlands and ponds. Most of these habitats have been either lost to residential/industrial development, converted for landscaping and park purposes or taken over by exotic species such as cattail and reed canary grass. While the vegetative portion of these habitats are critical and covered elsewhere in the following section, this habitat relies on shallow ponds rather than deeper ponds dug for water retention or in this case golf course hazards. Having a shallow fringe habitat for native species to inhabit and serve to support emergent wetland plants is critical and very hard to find.

This measure is intended to modify the shallow fringes around the deeper portions of existing ponds by adding or reshaping the shoreline and deep water areas by mechanical means to enhance amphibian and bird habitat and facilitate emergent plant community development. Approximately 0.31 acres of shallow water habitat will be created in the 4 ponds in the project area. The degree that this measure will be employed is limited to areas likely to sustain any changes in pond bathymetry, and has low likelihood of human disturbance (as the shallow and plants are particularly sensitive). Soil condition and orientation to sun exposure are also considerations for employment of this measure.

Wetland Planting—Ponds: Presence of emergent plant communities associated with shallow ponds and wetlands are critical to many amphibian, reptile and bird species. This measure will be employed around the shoreline of existing ponds where conditions are appropriate to allow sustained plant growth and can be managed to reduce invasive plant establishment. The plants

communities will consist largely of native sedges, and rushes. Native wildlife species have been significantly impacted by loss of this type of habitat in this part of the Lake Washington Watershed. A combination of human development and changes in water quality/quantity affects the availability of emergent vegetation necessary for sensitive species. Amphibian species such as Western tree frogs, and bird species such as marsh wren and Virginia rail are particularly dependent on shallow water habitats and associated wetland plant communities found around wetlands and ponds.

Public Outreach and Education: Signage will be added in select areas to highlight the sensitive nature of the restoration site and provide context for visitors to help reduce unwanted disturbances. In additional to signs to prevent unwanted trespass, littering or damage to sensitive areas, placement of informational signage may be included to help engage local commitment to the site and generate visitor stewardship of the site. This signage would be limited in scope and location but is considered particularly valuable in areas such as Ballinger Park where sustained year-around human visitation is expected.

5.2 Design and Construction Considerations

The Engineering Appendix (Appendix D) provides detailed information on the technical context for project feature design, including investigations completed to date and to be completed in the project Design and Implementation phase. During the design phase, the existing design data, requirements, and constraints will be verified and finalized. This may result in revisions to project feature footprints and elevations. In recognition of the constraints of the project authorization, any changes will be minimized.

At this point in the design process, there are no specific design or construction considerations identified that could significantly alter the Recommended Plan. There will be however, additional technical surveys/data collection to validate and verify feasibility level assumptions regarding hydraulic modeling, geotechnical conditions and topographic data. Existing considerations also include monitoring for unexpected discoveries within the footprint relative to HTRW or Cultural Resources.

Technical considerations that warrant specific exploration in the D&I Phase are described in further detail in the technical appendices and include the following:

- Continued hydraulic modeling analysis is planned to include a wider array of flow events and conditions for the proposed channel flow conditions to ensure the project does not induce flooding to adjacent landowners and to ensure potential climate change scenarios are accounted for.

- Verify stream crossing is consistent with WDFW 2013 guidelines.
- Additional topographic survey data collection is anticipated to refine select areas of the project footprint critical to key infrastructure such as stream crossing elevations, channel elevations to ensure improved understanding of conditions necessary for successful streambank conditions and riparian plant establishment.
- Additional soil explorations and laboratory analysis may be required to further refine bearing pressures, lateral capacity, anticipated settlement and seismic vulnerabilities depending on final determination of foundation elements. Stability analysis for the creek channel and support for wood debris placement is also anticipated.
- Coordination is anticipated with the Sponsor to ensure human visitation to the site is directed to ensure sustainability of restoration features by directing and focusing user effort to areas of less sensitivity.
- Refinement of plant palette selection and sight lines to enhance park user safety.
- Cultural resources specialist review of the 65% plan set to ensure any known archaeological sites are avoided.
- Wetland delineation survey will be conducted during the D&I Phase to support documentation that there will be no net loss of wetlands.

Most construction work would need to be completed between mid-June and October when conditions are drier and the ground is less likely to be affected by high water tables. In-water work will need to occur during the in-water work window of 1 July – 30 September. Construction is expected to last one construction season.

5.3 Lands, Easements, Rights-of-Way, Relocations, and Disposal Areas (LERRD

The Real Estate Plan is in Appendix H. The report is tentative, for planning purposes only, and for use with this integrated FR/EA, pending any modifications to the plans during the design and implementation phase, following completion of the feasibility phase.

The Sponsor has fee ownership of the two parcels directly required to support construction and operation of the project. As a result, the Sponsor will be in position to certify standard Corps real estate interest (fee and temporary work area easement interests). No additional real estate interest acquisitions are anticipated. However, the Sponsor positively completed the Real Estate Acquisition Capability Assessment. A total of 28.32 fee acres and .35 temporary work area easement acres are available. Estimated LERRD Cost is $135,500 per the District's Land Cost Estimate dated 11 October 2019. The effective date is 6 October 2019. At October 2020 price levels (project first cost price level) the estimated LERRD cost is $139,000.

Project lands are classified Parks-General Recreation. There are wetlands throughout the project footprint, and a large portion of the lands are located within the 1% annual exceedance probability floodplain (i.e. the portion of the floodplain that has a one in one hundred chance of flooding any given year). Given those factors, future marketable usage is unlikely.

Suitable materials will be reintroduced to the new project; unsuitable materials (if any will be shipped to a commercial disposal facility.

5.4 Environmental Considerations

5.4.1. Best Management Practices

NEPA requires that agencies identify and include in the action all relevant and reasonable best management practices that could reduce negative construction effects of the Federal action.

Best management practices during and following project construction would include:

- Work area is restricted to the footprint delineated on the project drawings.
- No net loss of wetland or sensitive aquatic sites.
- BMPs such as stormwater runoff prevention will be used to ensure that no unnecessary damage to the environment occurs.
- Connecting the newly excavated restored reach with the existing Hall Creek will occur during established in-water work windows (1 July through 30 September).
- During inlet/outlet construction and watering of the new channel, appropriate turbidity control measures (temporary coffer dam, silt curtains, or similar) would be used to isolate construction from Hall Creek and to minimize turbidity impacts.
- Fish Rescue measures will be employed in areas where direct disturbance in confined areas is anticipated.
- Utilization of marsh mats / swamp pads or temporary rock placement will be used to minimize impacts to wetland soils, as needed.
- Work will be done in the dry, to the extent practicable.
- All required de-watering activities during construction would use appropriate devices (i.e. pumps, sand bags, sumps). All water removed from the site would be discharged in a vegetated upland location, a de-siltation basin, or location that would not incur damage due to water discharge.
- Drive trains of equipment would not operate in the water.
- All equipment would be cleaned prior to in-water construction work.
- No refueling would occur near Hall Creek or Lake Ballinger.
- Construction equipment shall be regularly checked for drips or leaks.

- All temporary access roads and staging areas will be return to their natural condition upon completion of work.

5.4.2. Unavoidable and Adverse Effects*

Unavoidable adverse effects of the proposed project include:

- Noise disturbance to wildlife and home owners in the vicinity due to operating heavy machinery during excavation and construction of the restoration site; most wildlife are anticipated to avoid the area while work is in progress. To reduce impacts, work would be conducted only during daylight hours in accordance with local noise ordinances.
- Disruption of local traffic in the project vicinity during construction. Proper signage and flagmen would be utilized to address safety concerns and move traffic through the area as quickly as possible.
- Impacts to turbidity during the connection of the newly aligned stream to the upstream culvert and the downstream existing channel. These temporary impacts would be minimized by the use of BMPs.
- Temporary loss of recreational opportunities as construction occurs.

Given the temporary, localized, and minor nature of these effects, the Corps has determined that the proposed restoration project would not result in significant adverse environmental impacts.

5.4.3. Cumulative Impacts*

The NEPA defines cumulative effects as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR §1508.7).

A review of ongoing and planned development proposals by City of Mountlake Terrace staff indicates that there are no significant new developments ongoing or planned for the Hall Creek Watershed. Land use is fairly stable in this area. There will be some in-filling of lots adjacent to Hall Creek; however developments meet WDOE stormwater requirements, so changes in flow into Hall Creek is not anticipated. Likewise, the amount of change in impervious surface in the watershed (0.77 acres), another measure of hydroperiod rates, will have an insignificant effect on the overall hydroperiod in the watershed.

Joint efforts to improve Lake Ballinger water quality are ongoing and the proposed project will contribute to the overall improvement of water quality in Lake Ballinger. Several barriers to fish

passage have already been removed on McAleer Creek and Hall Creek. Future fish passage improvements by WSDOT as related to fish passage barriers located downstream of the project footprint at Interstate 5 are being developed and WSDOT has indicated the fish passage barriers will be corrected by 2024.

Overall the proposed project will have a positive benefit to the overall ecological health of the Hall Creek and Lake Ballinger/McAleer watershed through the addition of migratory bird habitat in an area where that habitat is limited, improving water quality by providing more filtering of flood flows, and providing improved stream habitat for salmonids as other fish passage improvements are implemented. While more habitat will be created for aquatic and wildlife species, it will fall short of altering the overall urban nature of the watershed.

5.5 Cost Estimate

A detailed cost estimate for the Recommended Plan has been prepared as part of the study. Based on January 2020 price levels, the estimated project first cost is $5,405,000 as shown in Table 5-1. (The project first cost includes, team labor and traditional survey costs for preconstruction engineering and design, labor for construction oversight, construction costs, LERRD values, and contingencies.) Specific PED related costs are described in the Cost Engineering appendix. The total project cost estimate (fully funded with escalation to the estimated midpoint of construction, with actual feasibility costs) is $6,461,000. Please see Appendix C, Cost Estimate, for more details.

Table 5-1. Recommended Plan Project First Cost

Project Cost Component	Project First Cost ($1,000, Oct 2020 prices)
Construction and Real Estate	
Construction Costs	$4,278
Real Estate Costs	$139
Planning, Engineering and Design (PED)	$683
Construction Management (CM)	$305
Total Estimated Cost	**$5,405**

5.6 Cost Share

The Sponsor has proposed to provide its share of funds through a combination of cash and work in-kind to be completed during the design phase. As specified in the Section 206 authority, the cost share for design and implementation (construction) is 65 percent Federal and 35 percent non-Federal. These costs were updated after the CE/ICA was performed at October 2020 prices, and are not expected to impact the results of that analysis.

Table 5-2. Project Cost Share of the Recommended Plan

	Total Estimated Cost* ($1,000s)	Federal ($1,000)	Non-Federal† ($1,000)
Ecosystem Restoration			
Construction Costs	$4,446	$4,308	
Real Estate Costs	$146		$146
Planning, Engineering and Design (PED)	$730	$730	
Construction Management (CM)	$339	$339	
Cash Contribution/Reimbursement	$0	-$1,758	$1,835
Total Project Cost Share	**$5,661**	**$3,679**	**$1,981†**
		65%	**35%**

*Fully-funded to the midpoint of construction.
†Non-Federal Cost Share does not include OMRR&R costs. Those costs are detailed below.

5.7 Operations, Maintenance, Repair, Rehabilitation, & Replacement

After completion of construction, the Sponsor will assume operations and maintenance (O&M) responsibility for the entire project. The Sponsor is responsible for all long-term project operations, routine maintenance, repairs, replacements, and rehabilitation following completion of construction. At this time it is assumed that the recommended plan will require minimal maintenance for the restoration components of the project. If the project is approved, a detailed OMRR&R manual would be developed during the design and implementation phase and would be submitted to Sponsor upon completion of construction. The current working estimate includes $100,000 for typical grounds maintenance and removal of invasive vegetation over a five year post construction period. Invasive removal is assumed to be accomplished via mechanical means with minimal application of herbicides.

5.8 Monitoring and Adaptive Management

After completion of construction, a monitoring and adaptive management plan will be finalized to monitor success and maturation of the restoration project. The Monitoring and Adaptive Management Plan contains specific recommendations for monitoring key metrics of project success and outlines triggers and remedial actions if metrics are not reached. A draft of the plan

is included in Appendix B. Following a baseline conditions assessment after construction the following metrics will be monitoring in years 1, 3 and 5.

Key elements to be monitored will be:

a. Invasive plant distribution
b. Native plant survival and function based on percentage of plants that have survived and canopy cover and shrub cover.
c. Native emergent plant cover on pond fringe and pond shallow habitat
d. Pond shallow water coverage
e. Channel and in-stream structure condition and function

The primary concern is that plantings will not adequately cover the restoration area. In the case of plant coverage not meeting specified targets, the Corps and the local sponsor will evaluate the need to do additional plantings and /or invasive control. Please refer to Draft Monitoring and Adaptive Management Plan for more detail on possible adaptive management actions.

The project has budgeted $347,000 for monitoring and adaptive management to assist the project in meeting restoration targets in the first 10-years of the project life.

5.9 Risk and Uncertainty

Risks that have been identified by the Corps are listed in the table below, along with steps that will be taken to reduce those risks.

Risk or Uncertainty	Steps to Reduce Risk or Uncertainty
Ballinger Park receives a lot of visitors throughout the year, which if uncontrolled, could impact the habitat which the project would restore.	Trails will be designed to focus user impact and minimize damage to restored areas. Signage will be included to educate public on sensitive ecosystem features.

5.10 Sponsor Views

The Sponsor has completed a considerable amount of public outreach in support of this project. The Sponsor has concurred with the Recommended Plan and agreed to provide its share of funds through a combination of cash and work-in-kind to be completed during the design and implementation phase. The Sponsor understands the primary purpose and benefit of the project is to improve the ecological structure and function at Ballinger Park. The Sponsor understands the cost share for design and implementation of the recommended plan is 65 percent Federal and 35 percent non-Federal.

6. Compliance with Applicable Environmental Laws, Regulations & Executive Orders*

This FR/EA is prepared pursuant to Sec. 102(C) of the National Environmental Policy Act (NEPA), and includes compliance with other laws, regulations and Executive Orders as discussed below (Table 6-1.). Feasibility level consultation and coordination documents are found in Appendix B.

Table 6-1. Summary of Project Compliance with Environmental Laws, Policies, & Regulations

Law/Policy/Regulation – Federal Acts		Compliance Action
1	American Indian Religious Freedom Act	No effect
2	Bald and Gold Eagle Protection Act	Determination of no harm. See Section 4.6 of this document.
3	Clean Air Act (PL 91-404)	Once construction completed, project will not be a source of pollutants.
4	Clean Water Act – Federal Water Pollution Control Act (§401, 402, and 404)	The proposed restoration project will be functional analogous to Nation Wide Permit 27. The Corps will complete coordination with WDOE during the D&I Phase. An NPDES permit will be secured from EPA for construction.
	Coastal Zone Management Act (CZMA) of 1972 as amended (16 U.S.C. §1451-1464)	Concurrence of the consistency determination is pending based on WDOE review of the Coastal Consistency Determination during D&I.
5	Endangered Species Act (Section 7)	The proposed work will have No Effect on ESA listed species. The Corps has coordinated with NMFS and USFWS on this determination.
6	Magnuson-Stevens Fishery Conservation and Management Act (MSA)	The proposed work will have no adverse effect on EFH for Chinook and coho. The Corps has coordinated with NMFS on this determination.
7	Migratory Bird Treaty Act	No effect to MBTA, proposed clearing work will be outside of the prime nesting season.
8	National Environmental Policy Act	Finding of No Significant Impact (FONSI) would be signed following public review of this integrated feasibility report and environmental assessment, and after the final report is approved by the USACE Major Subordinate Command (Northwestern Division).

Law/Policy/Regulation – Federal Acts		Compliance Action
9	National Historic Preservation Act	No Effect: SHPO concurred with the amended APE and the Corps' finding of No Historic Properties Affected. No tribes identified any concerns within the amended APE.
10	Executive Order 11990 Protection of Wetlands	No net loss of jurisdictional wetlands anticipated.
11	Executive Order 11988 Floodplain Management	No additional damage within the floodplain will occur
12	ER 12989 Environmental Justice in Minority Populations	Coordination with local Tribes initiated and ongoing throughout project. Minority and low-income communities do not exist in the project area. Project not a permanent facility requiring a siting study.
13	Fish and Wildlife Coordination Act	Determination of concurrence received from USFWS on 11 October 2019.

6.1 American Indian Religious Freedom Act

The American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996) establishes protection and preservation of Native Americans' rights of freedom of belief, expression, and exercise of traditional religions. Courts have interpreted AIRFA to mean that public officials must consider Native Americans' interests before undertaking actions that might impact their religious practices, including impact on sacred sites.

No alternative is expected to have any effect upon Native Americans' rights of freedom of belief, expression, and exercise of traditional religions. There are no known sacred sites at the project location. On 10 June 2019, the Muckleshoot Indian Tribe, The Tulalip Tribes, Suquamish Tribe, Snoqualmie Indian Tribe, Sauk-Suiattle Indian Tribe, Swinomish Indian Tribal Community, Stillaguamish Tribe of Indians, and the Confederated Tribes and Bands of the Yakama Nation (Tribes) were contacted to identify properties to which they may attach religious or cultural significance or other concerns with historic properties that may be affected. The Tribes did not comment on the proposed project. The APE was later amended on 21 January 2020 to include areas west of Hall Creek for access and staging. The Tribes were notified of the amendment and no response has been received. The Notice of Preparation was sent to the aforementioned Tribes.

6.2 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d) prohibits the taking, possession or commerce of bald and golden eagles, except under certain circumstances. Amendments in 1972 added to penalties for violations of the act or related regulations.

No take of either bald or golden eagles is likely through any of the actions discussed in this FR/EA; since there are no known nests near any of the work locations.

6.3 Clean Air Act of 1972

The Clean Air Act as Amended (42 USC §7401, et seq.) prohibits Federal agencies from approving any action that does not conform to an approved State or Federal implementation plan. The operation of heavy equipment, removal and placement of material, and the operation of vehicles during construction would result in increased vehicle emissions and a slight increase in fugitive dust. These effects would be localized and temporary.

The Corps has determined that the proposed project will result in an increase in emissions that is clearly de minimis, and thus a conformity determination is not required, pursuant to 40 CFR 93.153 (c)(2)(iv). Therefore, effects would be insignificant.

6.4 Clean Water Act of 1972

The Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.) is more commonly referred to as the Clean Water Act (CWA). This act is the primary legislative vehicle for Federal water pollution control programs and the basic structure for regulating discharges of pollutants into waters of the United States. The CWA was established to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." The CWA sets goals to eliminate discharges of pollutants into navigable waters, protect fish and wildlife, and prohibit the discharge of toxic pollutants in quantities that could adversely affect the environment.

The Corps does not issue Section 404 permits to itself for its own civil works activities, but must comply with the substantive requirements of Section 404 and 401 under the CWA. The Corps has concluded the proposed project is functionally analogous to the General, Regional and State conditions for Nationwide Permit 27 (NWP 27 - Environmental Restoration) and complies with Sections 404 and 401 of the CWA. Coordination with WDOE on concurrence with the NWP 27 determination is ongoing, and will be completed during the D&I Phase when detailed construction plans are prepared. It is anticipated that an individual 401 Water Quality Certification will not be required from WDOE, since the regional conditions of NWP 27 will be met.

The Corps administers regulations under Section 404(b)(1) of the Clean Water Act, which establishes a program to regulate the discharge of dredged and fill material into waters of the U.S., including wetlands. The Corps has evaluated potential project-induced effects subject to these regulations during feasibility-level design and the draft 404(b)(1) evaluation is provided in Appendix B. No compensatory mitigation is required for this action. The final 404(b)(1) evaluation is included in appendix B-2.

The National Pollutant Discharge Elimination System (NPDES), controls discharges into waters of the United States. NPDES permits contain industry-specific, technology-based, and/or water-quality-based limits, and establish pollutant monitoring and reporting requirements. EPA has established a program to address stormwater discharges. These regulations require that facilities or construction sites with stormwater discharges from a site that is one acre or larger apply for an NPDES permit. Stormwater discharge permits will provide the relevant authority for discharges from restoration sites during construction. As part of the permit documentation, a Stormwater Pollution Protection Plan (SWPPP) will be developed for the care and management of stormwater flows coming from the construction site as part of the Design and Implementation Phase.

6.5 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) of 1972 as amended (16 U.S.C. §1451-1464) requires Federal agencies to conduct activities in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved State Coastal Zone Management Program.

Under Washington's program, Federal activities that affect land use, water use, or natural resource of the coastal zone must comply with the enforceable policies within the following four laws identified in the program document.

- State Shoreline Management Act (NOAA approval: February 2016)
    - Washington Administrative Code (WAC) 173-15: Oil and Natural Gas Exploration Permits
    - Washington Administrative Code (WAC) 173-18: Rivers within Shoreline jurisdiction
    - Washington Administrative Code (WAC) 173-20: Lakes within Shoreline jurisdiction
    - Washington Administrative Code (WAC) 173-22: Wetlands
    - Washington Administrative Code (WAC) 173-26: Master Program Guidelines (also includes ocean use guidelines)

    - Washington Administrative Code (WAC 173-27): Permit Enforcement
- State Water Pollution Control Act (NOAA approval: March 2017)
    - Washington Administrative Code (WAC)
- Washington State Clean Air Act (NOAA approval: November 2017)
    - Washington Administrative Code (WAC) (especially WAC 173.400 through 173.495)
- State Ocean Resources Management Act (NOAA approval 2018)
    - Washington Administrative Code (WAC) 173-26-360 Part IV: Ocean Use Guidelines

In evaluating compliance with CZMA, the Corps determined that the proposed work was consistent to the maximum extent practicable with the enforceable policies of the approved Washington Coastal Management Program. The Corps will submit a Coastal Consistency Determination (CCD) during the detailed design phase of the project. WDOE concurrence is pending, subject to their review of the CCD.

6.6 Endangered Species Act of 1973

In accordance with Section 7(a)(2) of the ESA of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species and their critical habitats.

The Corps evaluated potential effects to threatened and endangered species, consulted informally with NMFS and USFWS, and made a determination of **no effect** for Chinook salmon, steelhead, bull trout, yellow-billed cuckoo, streaked horned lark, gray wolf, North American wolverine, Oregon spotted frog, southern resident killer whale, and marbled murrelet, and associated critical habitat. This determination was made due to these species sensitivities to human presence, lack of suitable habitat, or because their presence is so transitory that any temporal affects to these species from construction activities would not be perceived as unusual, cause disruption of behavior or lead to measureable reduction in their prey base. To date the Corps has not received formal concurrence on this determination.

6.7 Magnuson-Stevens Fishery Conservation and Management Act

The MSA (16 U.S.C. 1801 et. seq.) requires Federal agencies to consult with the National Marine Fisheries Service (NMFS) on activities that may adversely affect EFH. The objective of an EFH assessment is to determine whether or not the proposed action(s) "may adversely affect" designated EFH for relevant commercial, Federally-managed fisheries species within the

proposed action area. The Corps has reviewed the current condition of the existing habitat, current distribution of listed species and overall potential effects of the proposed project, consulted informally with NMFS, and determined that there will be no adverse effect on EFH for Chinook salmon and coho salmon. To date the Corps has not received formal concurrence on this determination.

6.8 Migratory Bird Treaty Act

The MBTA (16 U.S.C. §703-712), as amended protects over 800 bird species and their habitat, and commits that the U.S. will take measures to protect identified ecosystems of special importance to migratory birds against pollution, detrimental alterations, and other environmental degradations. Executive Order 13186 directs Federal agencies to evaluate the effects of their actions on migratory birds, with emphasis on species of concern, and inform the USFWS of potential negative effects to migratory birds. The proposed restoration would not result in any direct and deliberate negative effects to migratory birds: There would be no adverse effect on habitat and the project would only have minor and temporary effects to a small number of individual birds that may be present in the project area. No permit application for "take" of migratory birds is thus required.

6.9 National Environmental Policy Act

The National Environmental Policy Act (NEPA) (42 U.S.C. §4321 et seq.) commits Federal agencies to considering, documenting, and publicly disclosing the environmental effects of their actions. This integrated FR/EA is intended to achieve NEPA compliance for the proposed project. As required by NEPA, this integrated FR/EA describes existing environmental conditions at the project site, the proposed action and alternatives, potential environmental impacts of the proposed project, and measures to minimize environmental impacts. The document determines if the project would create any significant environmental impacts that would warrant preparing an EIS, or whether it is appropriate to prepare a FONSI.

6.10 National Historic Preservation Act of 1966

Section 106 of the NHPA requires that a federally assisted or federally permitted project account for the potential effects on sites, districts, buildings, structures, or objects that are included in or eligible for inclusion in the National Register of Historic Places. All project areas have been surveyed, and a finding of No Historic Properties Affected was submitted to the SHPO on 27 March 2020. Concurrence was received from the SHPO on 13 April 2020. The proposed project has been analyzed with respect to its effects on the treaty rights described above. The Corps notified the Muckleshoot Indian Tribe, The Tulalip Tribes, Suquamish Tribe, Snoqualmie Indian Tribe, Sauk-Suiattle Indian Tribe, Swinomish Indian Tribal Community,

Stillaguamish Tribe of Indians, and the Confederated Tribes and Bands of the Yakama Nation and asked the Tribes to identify any concerns and sought information about properties of religious or cultural significance that might be affected by the project. The Tribes did not identify any resources within the APE.

6.11 Executive Order 11988, Floodplain Management

Executive Order 11988 requires Federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities" for the following actions:

- Acquiring, managing, and disposing of Federal lands and facilities.
- Providing federally undertaken, financed, or assisted construction and improvements.
- Conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities.

As explained above, Executive Order 11988 requires Federal agencies to consider how their activities may encourage future development in floodplains. The proposed action will not alter land-use in the floodplain found in the project area.

There are eight steps reflecting the decision making process required in this Executive Order. The eight steps and responses to them are summarized below.

1. **Determine if the proposed action is in the base floodplain.**
   The proposed actions are located within the base floodplain for Hall Creek and Lake Ballinger.

2. **If the action is in the floodplain, identify and evaluate practicable alternatives to locating in the base floodplain.**
   As the primary objective of the project is aquatic ecosystem restoration, there are no practicable alternatives completely outside of the base floodplain that would achieve this objective.

3. **Provide public review.**
   The Corps and the Sponsor coordinated the proposed project with the public, government agencies and interested stakeholders. The Corps released the draft FR/EA for public review

from April 24–May 26 2020. Responses to comments received are included in Appendix I of this final FR/EA.

4. **Identify the impacts of the proposed action and any expected losses of natural and beneficial floodplain values.**
   Chapter 4 of this document presents an analysis of alternatives. Practicable measures and alternatives were formulated and potential impacts and benefits were evaluated. The anticipated impacts associated with the recommended plan are summarized in Chapter 4 of this report. While construction of project features would result in mostly minor and temporary adverse impacts to the natural environment, the proposed restoration would result in a substantial and long-term increase in habitat values including an increase in the quantity and quality of riparian and aquatic habitat. For each resource analyzed in Chapter 4, wherever there is a potential for adverse impacts, appropriate best management practices or other environmental considerations were identified. As there is a net benefit to biological resources, no biological mitigation is required for the Recommended Plan.

5. **Minimize threats to life and property and to natural and beneficial floodplain values. Restore and preserve natural and beneficial floodplain values.**
   Implementing the recommended plan would have no significant flooding impacts on human health, safety, and welfare.

6. **Reevaluate alternatives.**
   Chapter 4 of this document presents an analysis of alternatives. There are no practicable alternatives completely outside of the base floodplain that would achieve study objectives.

7. **Issue findings and a public explanation.**
   The public will be advised that no practicable alternative to locating the proposed action in the floodplain exists, as indicated in Item 3 above.

8. **Implement the action.**
   The proposed project does not contribute to increased development in the floodplain and does not increase flood risk, but rather it restores “natural and beneficial values.” The recommended plan is consistent with the requirements of this Executive Order.

6.12 Executive Order 11990 on the Protection of Wetlands

Executive Order 11990 is an overall wetlands policy applicable to all agencies managing Federal lands, sponsoring Federal projects, or providing Federal funds to state or local projects. It requires affected Federal agencies to follow avoidance, mitigation, and preservation procedures and to obtain public input before proposing new construction in wetlands. Derived

from Executive Order 11990 is the Corps' "no net loss" policy for wetlands, which requires that any loss of wetlands be compensated for by creating wetlands with the same or similar value at a minimum one-to-one compensation-to-loss ratio.

Consistency with the overall wetlands policy contained in Executive Order 11990 is achieved through CWA Section 404 compliance requirements and the Corps' preparation of the 404(b)(1) evaluation.

The implementation of the proposed project will not result in a loss of wetlands in the project area.

6.13 Executive Order 12898, Environmental Justice

Executive Order 12898 directs Federal agencies to take the appropriate steps to identify and address any disproportionately high and adverse human health or environmental effects of Federal programs, policies, and activities on minority and low-income populations. Minority populations are those persons who identify themselves as Black, Hispanic, Asian American, American Indian/Alaskan Native, and Pacific Islander. A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population.

The proposed action will not disproportionately affect minority or low-income populations nor have any adverse human health impacts. No interaction with other projects will result in any such disproportionate impacts. No cumulative impacts to Environmental Justice will be expected from interaction of the proposed action with other past, present, and reasonably foreseeable projects. Further, tribal governments that are also environmental justice communities in the project area have been engaged and informed about the proposed action.

6.14 Fish and Wildlife Coordination Act.

Fish and Wildlife Coordination Act (FWCA) is a required Federal consultation between the US Army Corps of Engineers and the USFWS to ensure fish and wildlife resources are provided equal consideration during the planning/design phases. Project information was provided to the USFWS with request to provide determination on applicability of FWCA to the Lake Ballinger Section206 project. USFWS considered the scope and purpose of the project and determined through email on 11 October 2019, that "Since the purpose and need of the proposed action calls for restoration for the benefit of native habitats (including potentially 13.19 acres of enhanced habitat), fish, and wildlife, then we do not see a reason to develop additional conservation recommendations or measures in a Fish and Wildlife Coordination Act Report. Based on that information, the FWCA is considered satisfied.

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7. Public Involvement, Review and Consultation*

Public involvement activities and agency coordination are summarized in this chapter. Stakeholders, agencies, Tribes, and other interested parties are integral in providing input for defining problems, opportunities, objectives, constraints, and for developing strategies that support development of the range of alternatives to be analyzed for feasibility and environmental compliance.

In accordance with NEPA public involvement requirements (40 CFR 1506.6) and Corps Planning policy (ER 1105-2-100), opportunities are presented for the public to provide oral or written comments on potentially affected resources, environmental issues to be considered, and the agency's approach to the analysis.

7.1 Draft FR/EA Public Review

Corps Planning policy and NEPA require a public comment period, during which any person or organization may comment on the draft FR/EA. For this study, the public comment period formally ran for 30 days, from 24 April 2020 through 26 May 2020. The Corps considered all comments received during the comment period. Comments were received from private citizens, public agencies and one tribe. All comments received, and the Corps' responses, are included as Appendix I to this final FR/EA.

7.2 Agency and Tribal Government Consultation and Coordination Process

Preliminary Resource Agency and Tribal coordination was conducted during this phase of the study. ESA consultation, CWA compliance, NHPA coordination, and NEPA documentation will be prepared during the design and implementation phase and will be completed ahead of soliciting any contract action for construction of execution of the project.

Preparation of this FR/EA is being coordinated with appropriate Federal, state, and tribal interests. The following agencies and tribes were involved in coordination:

- Washington Department of Ecology
- Washington Department of Fish and Wildlife
- Washington State Historic Preservation Officer
- Muckleshoot Indian Tribe,
- The Tulalip Tribes,
- Suquamish Tribe,
- Snoqualmie Indian Tribe,

- Sauk-Suiattle Indian Tribe,
- Swinomish Indian Tribal Community
- Stillaguamish Tribe of Indians
- Confederated Tribes and Bands of the Yakama Nation.

The Corps invited Federal, state, and local resource agencies to a site visit during the feasibility phase. The purpose of the meeting was to solicit preliminary input on environmental and cultural topics to inform development of alternatives. Attendees to the 8 October 2019 meeting included the Corps, the City of Mountlake Terrace, WDFW, and WDOE. Input from the Muckleshoot Indian Tribe biologists has been requested.

On 10 June 2019, the Corps sent tribal coordination letters to the following Tribes to inform them of the project: Muckleshoot Indian Tribe, The Tulalip Tribes, Suquamish Tribes, Snoqualmie Indian Tribe, Sauk-Suiattle Indian Tribe, Swinomish Indian Tribal Community, Stillaguamish Tribe of Indians, and the Confederated Tribes and Bands of the Yakama Nation.

Washington Department of Fish and Wildlife and Washington Department of Ecology visited the site on 8 October 2019. Based on their observations, design suggestions were made which will be considered during this feasibility phase and detailed design.

Refer to Appendix B for environmental and cultural resources compliance documentation.

7.3 Peer Review Process

The Corps developed the Review Plan for this feasibility study, which the Corps' Northwestern Division (NWD) approved on 17 December 2019. Peer review for this study was designed to meet all pertinent Corps policies (e.g. Engineering Circulars [EC] including EC 1165-2-217). This plan requires internal and external technical review of the FR/EA and appendices. This study has adhered to this guidance and this document is undergoing District Quality Control review and will undergo Agency Technical Review.

8. Recommendation

The following language outlines the Corps' recommendations for project approval and authorization for implementation.

I recommend that Alternative 5, Upper & Lower Channel Work with Pond Enhancement, be implemented as the recommended plan for the Lake Ballinger Aquatic Ecosystem Restoration Project as generally described in this report be approved for implementation as a Federal project.

Based on October 2020 price levels, the estimated project first cost to design and implement the recommended plan is $5,405,000. The Federal portion of the project first cost is 65%, or $3,513,250. The non-Federal sponsor's required portion of project first cost is 35%, or $1,891,750. The non-Federal sponsor shall, prior to implementation, agree to perform the following items of local cooperation:

1. Provide 35% of total project costs for design and implementation as further specified below:

1. a. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the project;

1. b. Provide, during design and implementation, any additional funds necessary to make its total contribution equal to 35% of total project costs;

2. Shall be responsible for all costs related to project operations, maintenance, repair, rehabilitation, and replacement.

3. Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds are authorized to be used to carry out the project;

4. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments), such as any new developments on project lands, easements, and rights-of-way, or the addition of facilities which might

reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

5. Shall not use the project or lands, easements, and rights-of-way required for the project as a wetlands bank or mitigation credit for any other project;

6. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

7. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and state laws and regulations and any specific directions prescribed by the Federal Government, with the exception that the non-federal sponsors can cease O&M activities on the project's nonstructural and non-mechanical features 10 years after the Secretary of the Army determines success;

8. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;

9. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;

10. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of three years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

11. Comply with all applicable Federal and state laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c et seq.);

12. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

13. Assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project;

14. Agree, as between the Federal Government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA; and

15. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103(j) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable

element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.

Alexander "Xander" L. Bullock
Colonel, Corps of Engineers
District Commander

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