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by Bonneville Power Administration

U.S. Army Corps of Engineers
Portland District

Trestle Bay Restoration Project

Final Feasibility Study and Environmental Assessment

July 2015

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Executive Summary

The U.S. Army Corps of Engineers, Portland District (Corps) proposes to construct an ecosystem restoration project at Trestle Bay. This project is addressed through the Corps' Section 536 Authority to conduct studies and implement ecosystem restoration projects in the lower Columbia River and Tillamook Bay estuaries. This proposed ecosystem restoration project requires review under the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321, et seq. and implementing regulations at 40 Code of Federal Regulations [CFR] 1500 and 33 CFR Part 230). This document serves as both a Feasibility Study and an environmental assessment (EA) meeting the requirements of NEPA. The Columbia River Estuary Study Taskforce is the non-Federal cost share sponsor for this study. The Bonneville Power Administration is a cooperating agency under NEPA.

Trestle Bay is a 628 acre bay located in Clatsop County, Oregon approximately 6 miles upstream of the Mouth of Columbia River (MCR). The area is separated from the Lower Columbia River estuary by the South Jetty Root. The root is an 8,800-foot (ft) structure comprised of large rocks that rise through, and extend 25 ft above, the water column from the riverbed; preventing unfettered salmonid access to and from Trestle Bay. There is a 500-ft gap (the gap does not extend fully down through the water column) within the South Jetty Root that provides limited salmonid access to and from the bay. This report describes and evaluates the benefits of fully removing several sections within the South Jetty Root to improve salmonid access to the bay and improve tidal connection to the Lower Columbia River (LCR) estuary.

Alternatives were developed to increase habitat access by providing additional passage opportunities within the jetty root. During alternatives development, it is assumed that the creation of additional openings would be designed in such a way as to not increase the water surface elevations in Trestle Bay. The intent of the project design is to improve tidal flushing of the bay and would provide improved salmonid access to fringe habitat within the bay.

Developed alternatives include:

Alternative 1: Construct 900 ft of opening along the South Jetty Root
Alternative 2: Construct 450 ft of opening along the South Jetty Root
Alternative 3: Construct 225 ft of opening along the South Jetty Root

The project will use the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) Programmatic Conference and Biological Opinion (BiOp) entitled, *Revisions to Standard Local Operating Procedures for Endangered Species to Administer Stream Restoration and Fish Passage Improvement Actions Authorized or Carried Out by the U.S. Army Corps of Engineers in Oregon* (SLOPES V Restoration) to meet Section 7 Consultation requirements. The project and application for coverage has been coordinated with the appropriate office of NMFS.

A cost effectiveness and incremental cost analysis (CE/ICA) was conducted to select and identify the National Ecosystem Restoration (NER) plan. The NER plan reasonably maximizes benefits over costs. For this project, benefits were calculated as Survival Benefit Units (SBU).

Based on the evaluation of alternatives, the Tentatively Selected Plan for this feasibility study is the construction of a number of openings with a cumulative total of 900 lineal feet along the South Jetty Root in a manner that provides adequate access to salmon across the full range of the Trestle Bay habitat.

Table of Contents

List of Figures

List of Tables

List of Appendices

ACRONYMN LIST

AA	Action Agencies
ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effect
BiOp	Biological Opinion
CAA	Clean Air Act
CAP	Continuing Authorities Program
CE/ICA	Cost Effectiveness and Incremental Cost Analysis
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CREEC	Columbia River Estuary Ecosystem Classification
CWA	Clean Water Act
CY	Cubic Yard
dB	decibels
DDT	Dichlorodiphenyltrichloroethane
DEQ	Oregon Department of Environmental Quality
DPS	Distinct Population Segment
EDC	Engineering During Construction
EFH	Essential Fish Habitat
EHW	Extreme High Water
EPA	U.S. Environmental Protection Agency
EQ	Environmental Quality
ER	Engineering Regulation
ERTG	Expert Regional Technical Group
ESA	Endangered Species Act
ESU	Evolutionarily Significant Units
FCRPS	Federal Columbia River Power System
FNC	Federal Navigation Channel
FR	Federal Register
FWOP	Future Without Project
GQAR	Government Quality Assurance Representatives
HCP	Habitat Conservation Plan
HTRW	Hazardous Toxic and Radioactive Waste
IWR Plan	Institute for Water Resources Planning Suite
LCR	Lower Columbia River
LCREP	Lower Columbia River Estuary Partnership
LERRD	Lands, Easements, Right-of-Way, Relocations, and Disposal
LUST	Leaking Underground Storage Tanks
MCR	Mouth of Columbia River
MCY	Million Cubic Yards
MHHW	Mean Higher High Water
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
MSL	Mean Sea Level
MSA	Magnuson-Stevens Fishery Conservation and Management Act

MTL	Mean Tide Level
NAAQS	National Ambient Air Quality Standards
NED	National Economic Development
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OPRD	Oregon Parks and Recreation Department
ORBIC	Oregon Biodiversity Information Center
OSE	Other Social Effects
P&G	Principles and Guidelines
PCB	Polychlorinated biphenyl
PCE	Primary Constituent Elements
PDT	Project Delivery Team
PED	Preconstruction Engineering and Design
PNNL	Pacific Northwest National Laboratory
PPA	Project Partnership Agreement
ppm	parts per million
ppt	parts per thousand
QA	Quality Assurance
QAP	Quality Assurance Plan
RCRA	Resource Conservation and Recovery Act
RED	Regional Economic Development
RM	River Mile
S&A	Supervision and Administration
SAAQS	State Ambient Air Quality Standards
SBU	Survival Benefit Unit
SEF	Sediment Evaluation Framework
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SL	Screening Levels
USFWS	United States Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
UST	Underground Storage Tank
TOC	Total Organic Carbon
WQC	Water Quality Certification

1. Introduction

The U.S. Army Corps of Engineers, Portland District (Corps) proposes to construct an ecosystem restoration project at Trestle Bay. This proposed ecosystem project requires review under the National Environmental Policy Act (NEPA), and this report supports that review and documentation (42 United States Code [USC] 4321, et seq. and implementing regulations at 40 Code of Federal Regulations [CFR] 1500 and 33 CFR Part 230). This document furthers the requirements of NEPA by serving as an environmental assessment (EA) in addition to a feasibility study. The Corps is the lead Federal agency for the proposed Trestle Bay Restoration project.

1.1. Study Authority

The Section 536 Lower Columbia River and Tillamook Bay Ecosystem Restoration Program (Section 536) authorizes the Corps to conduct studies and implement ecosystem restoration projects on the lower Columbia River and Estuary necessary to protect, monitor, and restore fish and wildlife habitat. Section 536 was authorized by Water Resources Development Act of (WRDA) 2000, Public Law number 106-541. Efforts under this authority have been cooperative and include development of the National Estuary Program, and various project partnerships with six state agencies from the states of Oregon and Washington; four federal agencies; interest groups from the recreation, agriculture, labor, and commercial fishing industries; and private citizens.

1.2. Study Guidance and Overview

1.2.1. Section 536 Program

The Trestle Bay study and proposed project concept complies with all the requirements of Section 536. The project would provide opportunity within the Lower Columbia River estuary for protecting and improving fish and wildlife habitat. In so doing, pursuant to Section 536(c)(2), it would neither affect the water related needs of the estuary (navigation, recreation, water supply), nor would it adversely affect private property rights. This document describes the process of developing this ecosystem restoration plan under the requirements of Engineering Regulation (ER) 1105-2-100, dated 22 April 2000. Also, the Principles and Guidelines (P&G) adopted by the Water Resources Council guide the formulation and evaluation of alternatives developed in this study. Integrated into this report is an EA which documents the information required per the requirements of NEPA.

The Study has followed the Corps six-step planning projects as described in ER 1105-2-100. The steps are as follows:

1. Specify water resources problems and opportunities;
2. Inventory, forecast, and analyze the water related land resource conditions within the study area;
3. Formulate alternative plans that address the identified problems and take advantage of the opportunities;

4. Evaluate the effect of alternative plans;
5. Compare the alternative plans; and
6. Select the recommended plan.

Trestle Bay is located on the Columbia River, Clatsop County, Oregon. This Section 536 Feasibility Study (Study) investigates relevant environmental issues at Trestle Bay, identified opportunities for ecosystem restoration, and formulates and recommends an ecosystem restoration plan that maximizes habitat benefits while ensuring cost effectiveness.

1.2.2. 2008 Biological Opinion

In 2008, in response to a court order, the Bonneville Power Administration (BPA) entered into an agreement with the Corps, several tribes, and other government agencies to implement projects that would benefit the Columbia River Basin salmon over a ten year period. The 2008 Federal Columbia River Power System Biological Opinion[1] (FCRPS BiOp) includes an implementation plan that outlines a comprehensive program of habitat improvements, hatchery reforms, and hydrosystem operations and improvements to protect Columbia and Snake River fish. The plan outlines a broad array of projects to improve spawning and rearing habitat in order to boost the survival rates of fish listed under the Endangered Species Act (ESA). One of the key methods recommended in the FCPRS BiOp to improve estuarine rearing habitat for salmonids.

1.3. Lead Federal Agency, Non-Federal Sponsor, and Cooperating Agency

The study documented herein has been conducted jointly by the Corps (lead Federal agency) and the Columbia River Estuary Study Task Force (CREST). As the project sponsor, CREST will provide or obtain the necessary permits and rights-of-way for the proposed project. Part of the cost-share requirement may be provided through work-in-kind contributions.

Bonneville Power Administration (BPA) is a cooperating agency under NEPA and is proposing to provide funds to implement the project.

1.4. Project Location and Study Area

Trestle Bay is located on the Oregon side (south side) of the Mouth of the Columbia River (MCR) near River Mile (RM) 7 immediately southeast of the functional MCR South Jetty. The bay is located in Clatsop County, Oregon, near the town of Hammond, and is surrounded by Fort Stevens State Park. Approximately 8,800 linear feet (ft) of the relic MCR South Jetty Root crosses through Trestle Bay. The jetty-enclosed portion of the bay is approximately 628 acres as defined by the Extreme High Water (EHW) elevation of 10.4 ft (North American Vertical Datum 1988 [NAVD 1988][2]). This area includes two abandoned trestle lines running parallel alongside

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[1] *Endangered Species Act Section 7(a)(2) Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation: Consultation on Remand for Operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin and ESA [sic] Section 10(a)(1)(A) Permit for Juvenile Fish Transportation Program (Revised and reissued pursuant to court order, NWF v. NMFS, Civ. No. CV 01-640-RE (D. Oregon))* FCRPS BiOp

[2] For this report, unless otherwise listed, all elevations use NAVD88 as the datum.

the south side of the jetty root. The trestles were used for hauling rock during the construction of and early rehabilitation of what is now the functional MCR South Jetty. The project location is shown in Figure 1.

Historical surveys illustrate the formation of Trestle Bay during initial jetty construction, which occurred from 1886 to 1896. The South Jetty was initially built on top of the submerged Clatsop sandbars off Point Adams. Then, during construction, sediment accreted along the ocean side of the Jetty, rapidly building up the submerged Clatsop sandbars into an emergent coastal landform. In this way, the South Jetty modified the Clatsop sandbars from an open-ocean environment with submerged shifting sandbars into an emergent ebb-tidal shoal, or jetty-connected spit feature.

The MCR South Jetty was extended in the early 1900s, creating what is now called the functional MCR South Jetty. Clatsop Spit became a permanently emerged jetty-connected landform prior to this extension. With this extension, the originally constructed jetty became the South Jetty Root. The relic South Jetty Root is at the location that crosses Trestle Bay. Jetty groins located on the channel side of the relic South Jetty Root, were originally constructed to provide navigational benefits for the Columbia River Federal Navigation Channel located to the north of the project area.

The emergence of Clatsop Spit effectively transitioned a naturally occurring shallow coastal open-water habitat into Trestle Bay, a tidally influenced, estuarine closed-water habitat. Up until 1995, Trestle Bay was considered closed-water habitat because of the relic South Jetty Root enclosure. However, in 1995 a 500-ft section of the relic South Jetty Root was lowered to elevation -1.16 ft to allow anadromous fish access into the previously enclosed bay. Project area features are shown in Figure 2.

1.5. Proposal for Federal Action

The proposal to implement ecosystem restoration in Trestle Bay triggered the National Environmental Policy Act (NEPA) process recorded in this document (40 CFR 1501.2). Based on study results, the Corps is proposing restoration by removing segments of the South Jetty structure that crosses Trestle Bay.

1.6. Overview of Integrated FR/EA

This document is a combined Feasibility Report and Environmental Assessment (EA). The purpose of the DPR is to identify the plan that reasonably maximizes ecosystem restoration benefits, is technically feasible, and preserves environmental and cultural values. The purpose of the EA portion of the report is to comply with the NEPA by identifying and presenting information about any potentially significant (significance as it relates to NEPA is defined in 40 Code of Federal Regulation 1508.27) environmental effects of the

Figure 1. Overview Map of Study Area

alternatives and incorporating environmental concerns into the decision-making process. The six steps of the Corps planning process each align with a NEPA requirement. The planning steps are listed below with the document chapter and NEPA element to which they relate:

Table 1. Overview of FR/EIS

Planning Step:	Document Chapter and Analogous NEPA Requirement:
Step One – Specify Problems and Opportunities	Appears in Chapter 2, as described in the purpose and need for action.
Step Two – Inventory and Forecast Conditions	Appears in Chapter 4, which describes the existing conditions of the study area and compares the action alternatives to the no-action alternative, also known as the future without-project condition.
Step Three – Formulate Alternative Plans	Appears in Chapter 3 in the description of the screening process and formulation of alternative plans.
Step Four – Evaluate Effects of Alternative Plans	Appears in Chapter 4 with the comparison of how each alternative affects the resources identified in Chapter 4.
Step Five – Compare Alternative Plans	Begins in Chapter 3 after the description of the alternatives and continues in Chapter 4 with the comparison of how each alternative may affect the resources.
Step Six – Select Recommended Plan	Appears in Chapter 6 and includes details of the Tentatively Selected Plan (agency preferred alternative).

1.7. Prior Reports, Projects, Initiatives, and Activities

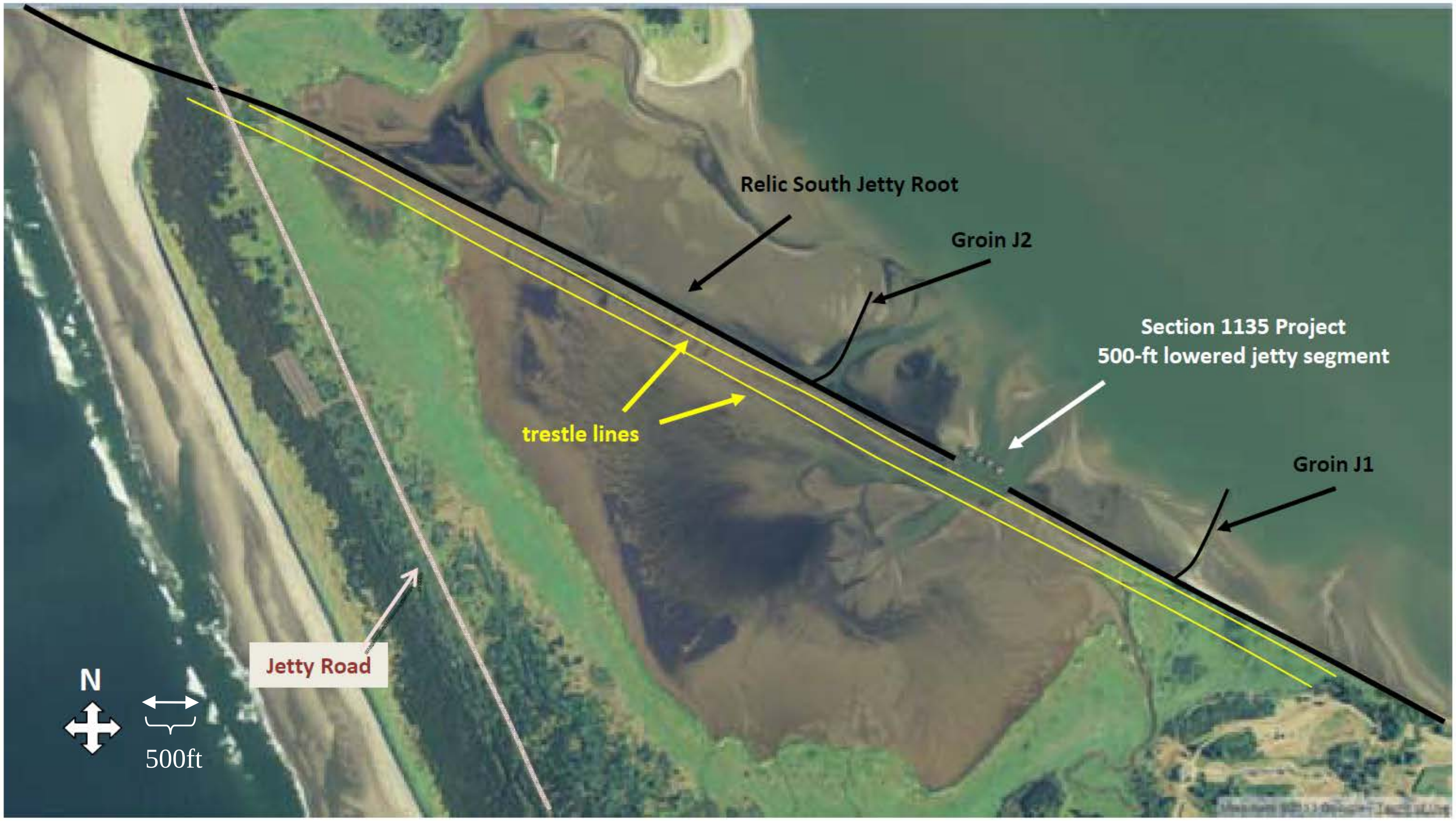
In 1995, the Corps constructed a Continuing Authority Program (CAP) Section 1135 (Section 1135) project at Trestle Bay. This project lowered a 500-ft segment between the jetty groins on the South Jetty Root to an approximate depth of -5.6 ft Mean Sea Level (MSL). This lowered jetty segment provides a solitary access/egress point to 628 acres of enclosed habitat. Lowering the jetty at Trestle Bay provided the juvenile fish with two approximately 6-hour windows per day to access the bay, forage, and exit before the ebb tide. Currently, fish access into the enclosed bay does not extend below the crest of the lowered jetty segment. As stated in the NOAA Technical Memorandum, NMFS-NWFSC-39, Biological Survey of the Trestle Bay Enhancement Project 1994, 1996-97, dated January 2000, pre- and post-project biological monitoring data for the Section 1135 project suggests that fish access could be further improved by opening up additional targeted segments of the South Jetty Root. Pre- and post-project sediment monitoring data also suggest that flushing of nutrients and detrital material from the enclosed bay could be further improved by such actions.

Two Mouth of the Columbia River (MCR)-related projects near Trestle Bay:

(1) The South Jetty dune stabilization project was completed in October 2013. It consists of a three-layer dynamic cobblestone revetment, approximately 35,000 CY of material, that prevents the Pacific from eroding and overtopping existing dunes, and reconnecting with Trestle Bay.

(2) Rehabilitation of the South Jetty, based on the June 2012 Major Rehab Report, will comprise of repairs and head stabilization estimated at $140M. Currently, the plan is for design to commence in FY 16, with rock procurement in FY 17 followed by placement from FY 18 to 21.

Figure 2. Project Area depicted on 2012 imagery at low tide



2. Need and Objectives

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 planning constraints, which are the basis for formulation of alternative plans.

2.1. Problems and Opportunities

The primary problem with Trestle Bay is the limited access/egress for salmonids. Additionally, the South Jetty Root limits the flushing, export, and exchange of nutrients and detrital material. The South Jetty Root is permeable enough to allow for full exchange of tidal water volume over the complete tidal cycle. The circuitous water pathways through the rubblemound jetty are not direct enough to allow for effective transport of nutrients and detritus material through the jetty thereby limiting exchange to and from the bay. There is speculation that some of the gaps between the rocks may provide openings large enough for fish passage; however, the juvenile salmon and steelhead are unlikely to swim through the long, dark, circuitous pathways. There is speculation that lack of light is a deterrent to fish attempting to navigate the dark circuitous pathways through the permeable rock jetty, but water velocities and length of pathways may also be contributing fish stressors that discourage the fish from passing back-and-forth.

The primary opportunity at Trestle Bay is to improve fish access to fringe estuarine habitat. Fish would be able to access the more remote parts of the bay at all times of the tidal cycle. The travel distance (or travel time) to remote dendritic channels and edge habitats would be reduced when compared to existing distance (or travel time) required from the present-day sole access point provided by the Section 1135 project. Creating openings in the South Jetty Root would provide, open access through the entire water column; and additional direct openings through the jetty would distribute tidal flows through these multiple larger openings, thereby reducing maximum entry and exit velocities during mid-tides. This reduction in velocity would reduce fish stressors within this system. Additionally, multiple openings within the South Jetty Root would provide more direct flow ways and transport through the jetty. These openings would increase the effectiveness of tidal exchange of nutrients and detrital material between Trestle Bay and the rest of the LCR estuary; tidal exchange of nutrients is an important contributor to the health of an estuarine food web.

2.2. Purpose and Need for Action

2.2.1. Purpose

The purpose of this project is to improve access and opportunity for juvenile salmonids and other estuarine fish species. The proposed project would provide improved foraging and rearing conditions and increase duration for juvenile salmonid access and egress to shallow-water habitat. These improvements are expected to benefit several threatened and endangered species including: fall and spring/summer Chinook salmon (*Oncorhynchus tshawytscha*), chum salmon (*Oncorhynchus keta*), Snake River sockeye salmon (*Oncorhynchus nerka*), steelhead trout (*Oncorhynchus mykiss*), coho salmon (*Oncorhynchus kisutch*) and coastal cutthroat trout

(*Oncorhynchus clarki*). Candidate species such as coho salmon *Oncorhynchus kisutch*) also are expected to benefit from improved access, opportunity and ecological function of the bay. Trestle Bay is comprised of habitat characteristics that would provide suitable salmonid rearing habitat.

2.2.2. Need

The need for this project is predicated upon the widespread wetland and tidal estuarine habitat losses that have occurred within the Lower Columbia River Estuary. Industrial, commercial, and residential development within the LCR estuary has led to the decline of available and suitable tidally influenced, estuarine habitat for aquatic species, particularly salmonids. Estimates from 1870 to 1970 indicate that 20,000 acres of tidal swamps (with woody vegetation; 78% of estuary littoral area), 10,000 acres of tidal marshes (with non-woody vegetation) and 3,000 acres of tidal flats have been lost. The original extent of tidal marsh and swamp in the estuary has been reduced by more than half (Lower Columbia River Estuary Partnership [LCREP] 1999). The LCREP identified habitat loss and modification as one of seven priority issues of concern to the estuary. Also, within the technical report *Wy-Kan-Ush-Mi Wa-Kish-Wit Spirit of the Salmon* (Nez Perce et al., 1995), one of the recommendations is to protect and restore critical estuary habitat. Estuary wetlands provide habitat for all Columbia Basin salmon stocks at some period in their life cycle. The Independent Scientific Advisory Board report, *The Columbia River Estuary and the Columbia River Basin Fish and Wildlife Program* (November 2000) hypothesized that the widespread loss of peripheral wetlands and tidal channels in the estuary has been detrimental to salmonids, driving a need for projects to create and restore habitat.

2.3. Objectives and Constraints

2.3.1. Objectives

The main objectives of the Trestle Bay project are as follows:

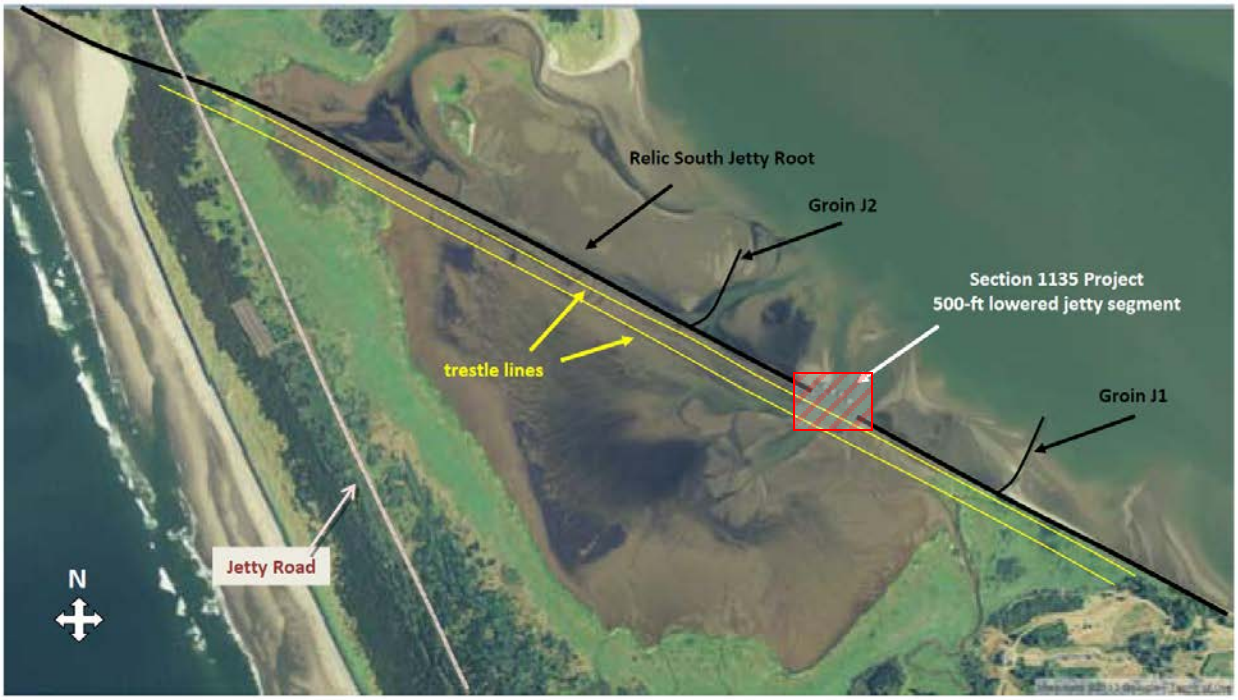
1. Provide improved access by juvenile salmonids and other species into existing fish rearing habitat in Trestle Bay by reducing fish travel from the main Columbia River to more distant reaches in the bay. (Spatial access)

2. Provide fish access into the Trestle Bay throughout the entire tidal cycle. (Temporal access)

2.3.2. Constraints

The primary project constraints are to optimize the Trestle Bay project benefits without impacting previous projects, specifically the Section 1135 Project, the operational MCR South Jetty navigation structure and its connections to the Clatsop Spit, and the Federal Navigation Channel. The project is required to avoid impacts to the previous Section 1135 project and to ensure distribution of restoration benefit across the entire project area. A buffer was identified around the original Section 1135 project (Figure 3) and any additional openings are not to be included in this buffer area.

Figure 3. Buffer around Section 1135 Project



3. Plan Formulation/Alternatives

3.1. Screening and Formulation of Measures

During the previous phase, the Trestle Bay Study Report proposed a project with 450 ft of total opening distributed across the jetty root structure. This alternative was developed by using an assumed minimum opening of 50 ft distributed in nine sections of the jetty. Fifty ft was assumed to be the minimum width necessary to provide suitable habitat conditions. Using this assumption, aerial photographs and bathymetry were examined to determine a quantity of openings that would be possible while minimizing risk to the intended function of the South Jetty. It was determined there are at least nine locations fitting this criteria. The actual width and distribution will be determined during later phases of the project and designed such that all of the assumptions are satisfied. As the quantity of material removed is small relative to the project area, removed material will be side cast and/or placed atop the jetty root to minimize disturbances to the environment and keep costs low. Placement will be more clearly defined during the design phase.

The concept of openings less than 50 ft was screened out, anticipating that velocities created will not achieve viable salmon habitat. The 50 foot minimum was developed from best professional judgment. The primary factors that went into the decision were (1) allowing access to a wide array of locations as possible for access/opportunity, while (2) not developing velocity gradients during strong tidal cycles that could impact juvenile salmon and other aquatic species behavior in a negative manner. Additional input into this width came from knowledge of the hydraulics of the existing opening from staff for the Columbia River Estuary Taskforce (CREST) (personal communications Matt Van Ess, CREST) and observational data obtained from site visits in small boats and in kayaks in the Monitoring of Completed Environmental Projects.

Three different size openings where considered as alternative measures to achieve a spectrum for consideration in regards to cost benefit evaluations, therefore alternatives formulated were to remove 225 ft, 450 ft and 900 ft of length. Quantities were estimated using 2010 LiDar imaging.

900 feet was determined to be the maximum opening size to be considered for several reasons:

- Based on 20 years of knowledge from the 1995 project.
- Dimishing ecological benefit for openings greater than 900 feet.
- Concerns that opening more than 900 feet could lead to changing the existing habitat type in the embayment due to increase the volume of flow into the embayment.
- Potential to promote shoreline erosion.

3.2. Alternative Development

This section discusses the process used to develop measures and formulate alternatives. Also included are descriptions of each alternative, environmental benefits evaluation, comparisons of alternatives using cost effectiveness and incremental cost analysis, and plan selection. The goal of the Trestle Bay project is to improve access and ecological function for the benefit of juvenile salmonids and other estuarine species.

3.3. Period of Analysis

Each study requires a period of analysis for the lifecycle of the project. A period of analysis typically extends for a predetermined range of time beyond the initial year of project operation (the expected year when the proposed project would be operational). The period of analysis is a time frame used when forecasting Future Without and With conditions of a project. Multiple with conditions may be analyzed during the alternative analysis. For this study, a 50-year period of analysis was assumed. The expected base operating year is 2015, from which the first year of potential benefits may be achieved. The period of analysis for this study is from 2015 to 2065.

3.4. Planning Assumptions

There are many assumptions that would impact the planning process and analysis. These assumptions are listed below for both the Future Without and With project condition assumptions:

- During the Design and Implementation phase 2-dimensional hydrodynamic modeling will be conducted to verify the specific numbers, sizes and locations of openings in the jetty root. Benefits are calculated based on the cumulative opening amount rather than the size of individual openingsOpenings would be designed to be sustainable, with little to no operations or maintenance required, and would be suitable for passage of fish and other aquatic species.
- Openings would be distributed and designed to allow for the greatest amount of access for aquatic species during the full range of tidal cycles.
- Openings would be designed to enable sufficient flows into and out of the site to reduce the potential for substantial sediment accretion in Trestle Bay, while also reducing the potential for erosion in the bay or breaching of the Clatsop Spit land connection to the operational MCR South Jetty.
- The project would not adversely affect the Columbia River Federal Navigation Channel.
- Effects to any aquatic or terrestrial habitat due to climate change would be immeasurable when compared to the No Action.

3.5. Evaluation of Alternatives

Alternatives for the study are formulated to achieve a spectrum of benefits at varied costs. The purpose of this process is to inform the teams of what projects are (a) cost effective and (b) provide the greatest benefit for the funds spent to plan, design, construct and maintain a project.

3.5.1. Survival Benefit Units

Survival Benefit Units (SBU) were used to determine benefit performance of each of the alternatives considered during preliminary feasibility study. The SBU calculation model was developed by the Expert Regional Technical Group (ERTG). ERTG is a group comprised of independent scientists with extensive education, research, and functional knowledge of the estuarine ecosystem and the processes involved in ecosystem restoration. This project utililized this same model and technique to evaluate the alternatives. . The process used to assign SBU for ecosystem restoration projects in the lower Columbia River and estuary involves scoring for three factors, (1) certainty of success, (2) potential benefits for habitat access/opportunity, and (3) potential benefits for habitat capacity/quality. Scoring Criteria has been developed for each of these three metrics ranging in a score of 1 being the lowest to 5 being the highest score. The Scoring Criteria for each of the three factors evaluated is as follows:

Certainty of Success

5 -- Restoring a natural process or landforms; proven restoration method; highly likely to be self-maintaining; little to no risk of detrimental effects; highly manageable *project complexity*; minimal to no uncertainties regarding benefit to fish, minimal to no exotic/invasive species expected.

4 – Largely restoring a natural process or landforms; proven restoration method; likely to be self-maintaining; minimal risk of detrimental effects; manageable project complexity; minimal uncertainties regarding benefit to fish; minimal exotic/invasive species expected.

3 – Partially restoring a natural process or landforms; proven restoration method; potentially self-maintaining; minimal risk of detrimental effects; manageable project complexity; moderate uncertainties regarding benefit to fish; exotic/invasive species expected.

2 – Partially restoring a natural process or landforms; poorly proven restoration method; unlikely to be self-maintaining; risk of detrimental effects; moderate project complexity; moderate uncertainties regarding benefit to fish; exotic/invasive species expected.

1 -- Unlikely to restore natural processes and landforms; unproven or risky restoration method; will likely require intervention to maintain; some risk of detrimental effects; excessive project complexity; excessive uncertainties regarding benefit to fish; exotic/invasive species expected.

Potential Benefit for Habitat Access/Opportunity

5 -- High *connectivity* of site for most species, populations and life history types coming down river at most water level stages; located in a mainstem area or a priority (TBD) reach; unencumbered access to site.

4 – Intermediate connectivity of site for most species, populations and life history types coming down river at most water level stages; located in a mainstem area or a priority (TBD) reach; unencumbered access to site.

3 – Intermediate connectivity; only accessible to a few life history types or species coming down river at most water level stages; located in a mainstem area, lower end of tributary or a priority (TBD) reach; moderate site access.

2 -- Intermediate to low connectivity; only accessible to specific life history types or one species coming down river at most water level stages; located in a mainstem area, lower end of tributary or a priority (TBD) reach; moderate site access.

1 – Low to no connectivity for any species, populations or life history types coming down river at most water level stages; located in areas far from main stem or lower ends of tributaries; poor site access.

Potential Benefit for Habitat Capacity/Quality (C/Q)

5 -- Maximum natural habitat *complexity*; well-developed natural disturbance regime and ecosystem functions; extensive channel and edge network and large wood; much prey resource production and export; no invasive species or nuisance predators; water quality/temperature quality excellent; site relatively large (> 100 acres).

4 – Very good natural habitat *complexity*; natural disturbance regime and ecosystem functions; very good channel and edge network and large wood; much prey resource production and export; minimal invasive species or nuisance predators; water quality/temperature quality very good; site moderate to large in size (30-100 ac)

3 -- Moderate habitat complexity; moderately-developed natural disturbance regime and ecosystem functions; some channel and edge network and large wood; moderate prey resource production and export; moderate potential invasive species or predators; water quality/temperature quality moderate; site intermediate in size (~30 to 100 acres).

2 – Moderate to low habitat complexity; moderately-developed natural disturbance regime and ecosystem functions; some channel and edge network and large wood; moderate to low prey resource production and export; moderate potential invasive species or predators; water quality/temperature quality moderate to low; site intermediate to small in size (≥30 acres).

1 – Low habitat complexity; poorly developed natural disturbance regime and ecosystem functions; poor channel and edge network and large wood; moderate to poor prey resource production and export; moderate to high potential invasive species or predators; water quality/temperature poor; site small in size (<30 acres).

These criteria are used to score the specific Columbia River Estuary Actions (CRE) actions involved in ecosystem restoration in the lower Columbia river and estuary, specifically actions described in the Estuary Module the ESA Recovery Plan developed by the National Marine Fisheries Service. The actions include (but are not limited to) CRE-1.4 restore and maintain ecological benefits in riparian areas; CRE-9.4 restore degraded off-channel habitats, CRE-10.1/2/3 restore hydrological connections to floodplain habitats; and CRE-15.3 remove invasive species.

The three scoring factors are multiplied by the percent of habitat restored (CRE category) resulting in the SBU value for the alternative. This technique allows for comparing different alternatives performance of habitat access and diversity for salmonids to the costs associated with each alternative.

The above stated criteria are used to evaluate the ecological benefit, measured in SBUs. Specifically for this project the CRE is 10.1 breach or lower the elevation of dikes and levees to restore natural hydrological functions and restore degraded habitat. These habitat types are particularly scarce in the Columbia River due to development over time by levees. This CRE is important to the out-migration for juvenile salmon and provides critical resting rearing and feeding habitat. Additionally, these habitats provide a significant food source for stream type salmonids that reside in the main stem by the export of detritus developed within the floodplain wetland and prey sources associated with this exported detritus. This project will benefit 13 ESUs listed salmonids. Juvenile salmon are broken into two specific life history types, stream-type and ocean-type. Stream-type salmonids primarily use the river as a migration corridor from their natal streams to the estuary and ocean spending days to weeks of their life-cycle in the river before going out into the ocean, where they will spend 2 to 5 years prior to returning to their natal stream to spawn. The ocean-type salmonids move through the river system more slowly and can spend up to several months using floodplain wetland habitats as refugia from predators and for feeding and growth prior to ocean entry where they also can spend 2 to 5 years before returning to their natal streams to spawn.

The evaluation for Trestle Bay focused primarily on the hydrological reconnection. Alternatives were evaluated for both spatial and temporal access into 628 acres of resting, rearing, and feeding habitat for juvenile salmon while on their out-migration.

This methodology was developed specifically for the Columbia River ESA listed stocks, ESA stock are being used as a surrogate as the "Best and Most Important" needs for aquatic species in the Lower Columbia River. The work done by the ERTG has been and continues to be peered reviewed. Their work and expertise in the estuary is highly respected by the Science Advisory Board and their work is annually disseminated.

The SBU model developed by ERTG assesses habitat metrics of potential project areas for the determination of change in survival benefits gained from implemented restoration projects. The alternatives developed during the Trestle Bay feasibility study were assessed using the SBU calculation model developed by ERTG. Project acres may be influenced by water levels elevations and are taken into consideration when applying the SBU model. For this project, the available acreage of habitat at Trestle Bay is defined by the Extreme High Water (EHW) elevation of 10.4 ft.[3] The type of salmonids that may benefit from this action are ocean-type and stream-type[4] juveniles; this report presents SBU scores for ocean-type juvenile salmonids unless otherwise noted.

[3] EHW is defined as the “highest elevation reached by the sea as recorded by a water level gauge during a given period. The National Ocean Service routinely documents monthly and yearly extreme high waters for its control stations.” (NOAA 2000)

[4] There is a difference between ocean- and stream type juvenile salmonids. Stream-type juveniles are much more dependent on freshwater stream ecosystems. A stream-type life history may be adapted to areas that are more consistently productive and less susceptible to dramatic changes in water flow. Ocean-type salmon typically migrate to sea within the first three months of life, but they may spend up to a year in freshwater prior to emigration to the sea. Ocean-type Chinook salmon tend to use estuaries and coastal areas more extensively than other pacific salmonids for juvenile rearing.

The Trestle Bay product delivery team (PDT) examined the SBU calculation model to identify which variables may affect the SBU outputs. In general, four variables affect the overall SBU score for any given measure:

- Acreage: An increase in the wetted area increases a SBU score.
- Certainty of Success: An increase in the likelihood that actions taken under a certain measure increases the SBU score. For example, project with a low risk of not performing as expected would generate a higher SBU score.
- Potential for Access/Opportunity: The greater opportunity for salmonids to access the site and utilize the habitat would result in an increased SBU score.
- Potential Habitat Capacity: Greater quantities of habitat to support higher population capacities would result in a higher SBU score.

As outlined above, certain actions undertaken during a restoration project may increase or decrease SBU scores. In order to achieve the objectives of this project, focus was given to alternatives that increase Certainty of Success and Potential for Access/Opportunities scores. It was not anticipated that a project that achieved the objectives of this study would result in measurable changes to Acreage or Potential Habitat Capacity.

3.5.2. Cost Effectiveness and Incremental Cost Analysis

A cost effectiveness and incremental cost analysis (CE/ICA) was conducted to select and identify the National Ecosystem Restoration (NER) plan. The NER plan is the alternative plan that reasonably maximizes benefits over costs. The NER plan is utilized as the Federal interest plan and is set for cost sharing purposes of the Corps.

This analysis was performed using the Institute for Water Resources Planning Suite (IWR-Plan). Cost effectiveness (CE) analysis was used to identify the subset of plans which are implementable. Then incremental cost analysis (ICA) was used on all cost effective plans to identify the best plans. IWR-Plan involves the following steps:

- Identification of cost effective plans (CE). Cost effective plans are those defined as those that for a given level of benefit, no other plan costs less or yields more benefit for a lesser cost.
- Identification of best buy plans (ICA), which are a subset of cost effective plans. Best buy plans are defined as those which have the lowest incremental costs per unit of benefit.
- Best buy plans are then evaluated to identity the National Ecosystem Restoration (NER) plan, which is the plan that reasonably maximizes benefit compared to the cost.

3.5.3. Development of Alternatives

In order to meet the objectives of the study, alternatives were developed with a focus on increasing the total amount of openings in the jetty root. Factors that do not measure increases in SBU scores include:

- Number of individual openings.
- Discrete size of individual openings.
- Specific locations of openings.

During the development of alternatives, the PDT determined that the creation of additional openings beyond the initial Section 1135 opening in the South Jetty Root would not increase the water surface elevations in Trestle Bay. The overall habitat acreage within Trestle Bay would not increase as a result of modifications to the South Jetty Root. Because there is no change to the water level, there would be no created or lost salmon habitat within the LCR estuary. The SBU variable related to water level is not relevant for this analysis.

Screened alternative: An alternative of removing the entire South Jetty Root was considered during the plan formulation process. However, removing the entire South Jetty Root poses high risk of impact to the nearby Columbia River Federal Navigation Channel, provides diminishing rate of economic return for salmon access to habitat, potentially impacts existing wetland habitat in Trestle Bay, and would be a high-costs construction project. Therefore, this alternative was removed from further consideration.

A suite of feasible alternatives were developed that would register a measurable change in benefit production. These alternatives are as follows:

Alternative 1: Construct 900 ft of opening along the South Jetty Root
Alternative 2: Construct 450 ft of opening along the South Jetty Root
Alternative 3: Construct 225 ft of opening along the South Jetty Root

3.5.4. Salmon Survival Benefit Calculations

ERTG was presented with the project proposed in the Trestle Bay Study Report and an official SBU score was given. In order to accurately quantify the change in SBU scores that can be anticipated with increases or decreases in total quantities of openings, the PDT presented a proposed 900 ft of opening to the ERTG and was given an unofficial score. As a result of these two scores, the PDT then developed a third alternative of lower total opening quantity and extrapolated an SBU score based on the two original ERTG scores. Only Ocean Type SBUs were used for the purposes of this alternatives evaluation.

Table 2. SBU performance based score for each restoration alternative

Restoration Alternative	Ocean Type SBUs
Alternative 1: 900 ft	1.6031
Alternative 2: 450 ft	0.9945
Alternative 3: 225 ft	0.5608

3.5.5. Economic Costs for Alternatives

The economic cost estimate was prepared using the concept designs for each alternative described above. The evaluation of alternatives used rough costs to determine the NER plan and then the costs were refined for the NER alternative. This refinement of costs did not change the selection of the NER alternative. The project first costs (the construction costs, preconstruction engineering and design (PED) costs, Lands, Easements, Right-of-Way, Relocations, and Disposal (LERRD) valuations, and contingencies) were provided for cost benefit analysis for each alternative using a 40% contingency on unit costs, 10% for supervision and administration (S&A), and 20% for PED. Sources of information for the unit prices from prior quotes, past project bid tables, and professional judgment of experienced engineers. Quantities were measured off of LiDAR (2010 data) and using field observations. Some of the assumptions used in developing the construction cost estimate include construction using a barge mounted crane floated into the project area. The crane will lift the jetty stones creating ingress and egress into the embayment. The crane will rotate and deposit the jetty stones approximately 50 feet riverward of the jetty. Material will be mounded up and the end result will extend above the water column Similar to the prior Section 1135 project, see Figure 7. Estimated rock removal quantity is approximately 3,445 tons.

Each rock removal alternative assumes a rock density of 180 lbs/cubic foot, and a void ratio consistent throughout the jetty. Mobilization costs assume point of departure being Longview Washington, 80 miles each way, with an average speed of 8 knots, a 2 hour contingency, for a total of 10 hours to the point of destination. The same assumptions were used for estimating demobilization costs. Assumptions are that mobilization and demobilization would only occur one time during the duration of the project. In addition to these first costs, the economic cost estimate also considered the anticipated operation and maintenance expenses, monitoring costs, and interest during construction. It was assumed no operations and maintenance of the project would be required. Monitoring expenses were based on 1% of the construction cost. Although the Real Estate instrument required to side cast the jetty stone is anticipated to be provided at no cost, the economic costs to cover administrative expenses is anticipated to be $30,000. Interest during construction was calculated based on a 2 month construction window, at a 3.375% Federal interest rate. Table 3 outlines the total expected costs for each alternative.

Table 3. Alternative Plan Costs

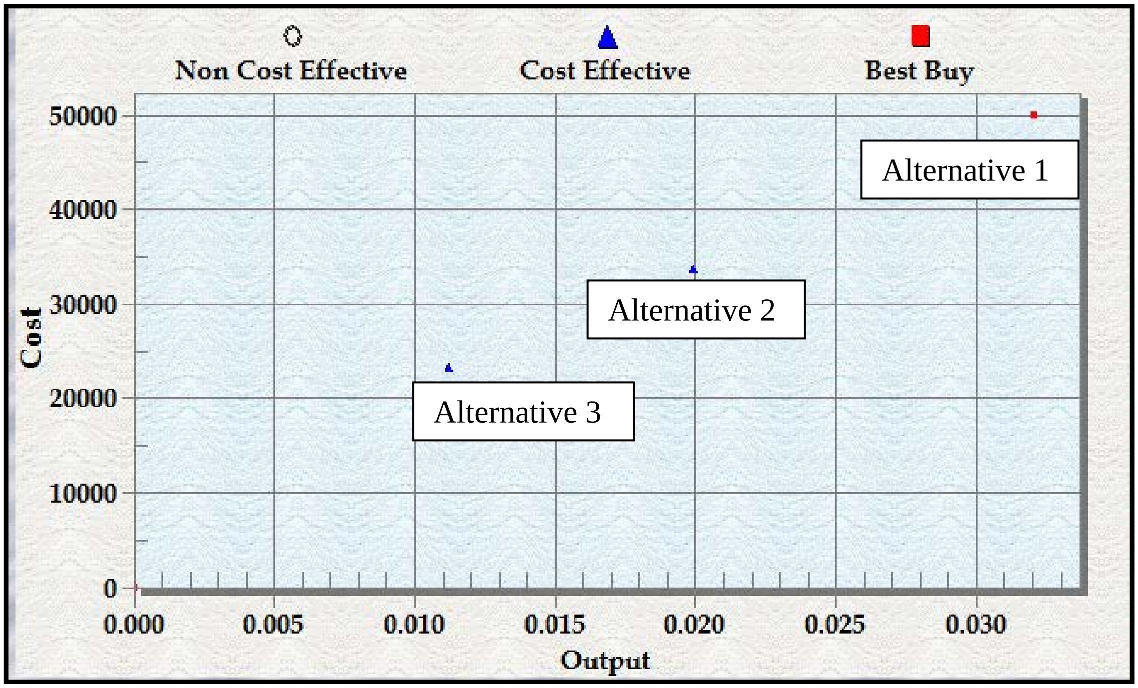
Alt Number	Plan Description	Construction Cost *	Monitoring Costs	RE Costs	O&M Costs	IDC**	Total Investment Costs (PV)	Avg Annual Costs***
1	900 ft of Breaches	$1,126,980	$11,270	$30,000	$ 0	$1,618	$1,169,868	$48,758
2	450 ft of Breaches	$754,902	$7,549	$30,000	$ 0	$1,084	$793,535	$33,073
3	225 ft of Breaches	$509,967	$5,100	$30,000	$ 0	$732	$545,799	$2,748

* includes 40% Contingency, 10% S&A, 20% PED, in FY 14 dollars
**Interest During Construction
*** Average Annual Costs were calculated based on a 3.375% Federal discount rate over a 50 year project planning horizon and are in FY 14 dollars.

3.6. Plan Selection Process

All alternatives analyzed were identified as cost effective plans. Only one alternative, Alternative 1, was identified as a best buy plan. This is due to the fact that this plan results in substantially higher SBUs. Though the cost is greater than Alternatives 2 and 3, this cost is not so high as to reduce the overall impact of the additional SBUs that would be realized. Environmental impacts of implementing Alternative 1 would not be substantially different than impacts from Alternative 2 or 3. Further, Alternative 1 is not deemed to have issues with constructability, risk or other factors considered by the PDT in plan selection. Alternative 1 is the best buy plan, does not result in greater environmental impacts, and does not pose greater construction risk than the other alternatives. Figure 4 below illustrates the outcome of CE/ICA using ocean-type SBUs as habitat outputs.

Figure 4. Cost Effectiveness/Incremental Cost Analysis for ocean-type SBUs



*Costs are Average Annual Costs based on 3.5% Federal discount interest rate over a 50 year planning horizon, and are in FY 14 dollars. Outputs are Average Annual SBU's over a 50 year planning horizon.
**Assumes SBU scores are fully achieved within the first year of construction and are maintained over the 50 year period of analysis.

3.7. Principles and Guidelines

3.7.1. P&G Evaluation Criteria

The Corps planning Principles and Guidelines establish criteria for use in evaluating planning alternatives considered for selection. These criteria are:

1. Acceptability: The workability and viability of the alternative plan with respect to acceptance by Federal and non-Federal entities and the public and compatibility with existing laws, regulations, and public policies. Two primary dimensions to acceptability are implementability and satisfaction. Implementability means that the alternative is feasible from technical, environmental, economic, financial, political, legal, institutional, and social perspectives. The second dimension is the satisfaction that a particular plan brings to government entities and the public.

   - Early coordination activities with resource agencies and interested parties have lacked opposition to the project, with greater support for an alternative that provides more opening. As the project development continues, the compliance process with environmental and land use laws would be completed, however, no regulatory fatal flaw has been identified for any of the evaluated alternatives. Though a complete design has not been completed for the project, insurmountable or highly costly obstacles have not been identified that have not been taken into account. As such, the three alternatives perform equally with regard to implementability.

- In addition to impacts to NED Corps authorized missions, plan selection has been based on NED costs to implement the project, capturing the negative change in value of goods and services. The NED impacts (economic costs) along with the non-monetary benefits were used to derive the NER plan.

- As mentioned above, there is a general preference amongst the stakeholders that have been involved in the project for alternatives that involve more opening versus less. Public involvement has not been completed; however the PDT does not anticipate general preference of one alternative over another. As such, Alternative 1 performs slightly better with regard to satisfaction.

2. Completeness: 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.
   - Actions by others are not required to implement any of the evaluated alternatives. As such, the three alternatives perform equally with regard to completeness.

3. Effectiveness: The extent to which an alternative plan alleviates the specified problems and achieves the specific opportunities. An effective plan is responsive to the identified needs and makes an important contribution to the solution of some problems or to the realization of some opportunity.
   - The primary goal of this study is to identify ways to improve direct access to Trestle Bay for aquatic species. Each alternative accomplishes this goal; however, Alternative 1 can be considered more effective in accomplishing this goal because it proposes to provide a greater quantity of opening.

4. Efficiency: 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.
   - Only Alternative 1 was identified during the cost effectiveness evaluation as a "best buy" plan. This designation indicates it is the most cost effective alternative.

3.7.2. P&G Four Accounts

Four accounts are established in the P&G to facilitate the evaluation and display of effects of alternative plans.

1. National Economic Development (NED): Displays changes in the economic value of the national output of goods and services.

   - In general, the evaluated alternatives are small scale in nature and are not anticipated to make measurable changes to economic values of national outputs of goods and services. It should be noted; however, that the close proximity of the project to the Columbia River Navigation Channel, and the identification the channel as a constraint prohibits a proposed plan from having an adverse impact to the NED account.

2 Environmental Quality (EQ): Displays non-monetary effects on ecological, cultural, and aesthetic resources including positive and adverse effects of ecosystem restoration plans.

- The evaluated plans all have the same general anticipated environmental effects; however Alternative 1 has been recognized to have markedly higher benefit production.

3 Regional Economic Development (RED): Displays changes in the distribution of regional economic activity.
   - In general, other than temporary beneficial impacts to employment during construction, none of the evaluated alternatives are anticipated to have an measureable impact to the RED account.

4 Other Social Effects (OSE): Displays plan effects from perspectives that are relevant to the planning process, but are not reflected in the other three accounts (e.g. community impacts, health and safety, displacement, and energy conservation).
   - Because of the localized nature of the project, impacts that fall under the OSE account are negligible, if occurring at all. In general, all of the evaluated alternatives perform in this regard for the OSE account.

3.8. Tentatively Selected Plan (Proposed Action)

Based on the evaluation of the three alternatives, the Tentatively Selected Plan involves the removal of 900 total linear ft of the South Jetty Root stone. The construction would occur in a manner that provides improved salmon access to the full range of habitat at Trestle Bay. The Tentatively Selected Plan is henceforth referred to as the Proposed Project Alternative.

3.8.1. Design Considerations

The exact location and number of openings, optimal location and configuration of the piles of removed rock, and construction sequencing will be confirmed after analysis and assessment of 2-dimensional hydrodynamic modeling of various specific alternatives. Potential opening locations identified by existing prominent drainage/flow paths through the jetty are depicted in Figure 5. Openings at existing prominent drainage/flow paths would be expected to continue to support the present day functioning of the existing system while maximizing access opportunities.

Design considerations also include an effort to distribute openings strategically across the 8,800 ft structure in order to provide equidistance access for salmon to fringe habitat within Trestle Bay. Each opening would be no less than 50 ft wide in order to provide adequate access for salmon use. No openings would be placed in or immediately adjacent to the Section 1135 project area. Openings would be placed in locations that avoid excessive substrate erosion and negative impact to wetlands within Trestle Bay. Openings would be placed in locations that would avoid impacts to the Columbia River Federal Navigation Channel. Openings would be designed to avoid destabilization of adjacent jetty side slopes at the openings.

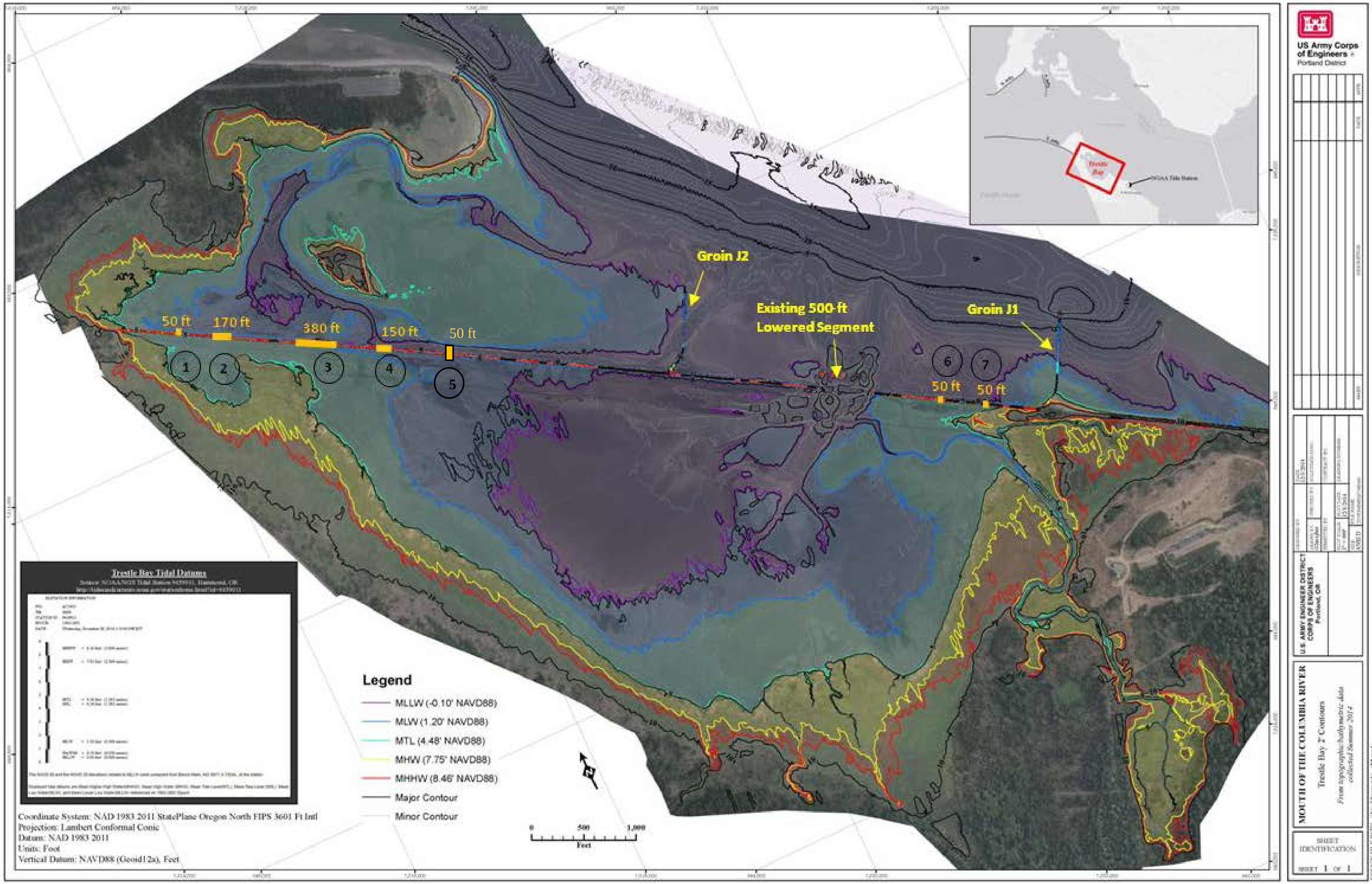


Figure 5. Location of initial proposed openings to be modeled: numbered 1 through 7 identifying the length of each opening.

The removal of the rocky substrate down to the existing adjacent riverbed allows for access throughout the complete tidal cycle increasing access opportunities and reducing the risk of entrapment at low tides. Going deeper than riverbed level would result in unnecessary disturbance of the river bottom sediments and unnecessary removal of the historic fascine material (a mat-like material that was placed on the channel bottom during the original construction of the south jetty in 1895, which is expected to be buried beneath the present-day riverbed) and therefore it was not considered further. As stated above, the maximum cumulative opening size was limited to 900 feet. Optimization will occur in the Design and Implementation (D&I) phase of the study. This phase will take the selected length of openings and determine through modeling if a number of disperse openings, or fewer larger openings, would provide better flow conditions for ingress and egress into the embayment while also satisfying the required planning assumptions. If several dispersed openings are preferred to a single large opening, the modeling will also optimize the number, size and locations of openings up to the selected total length.

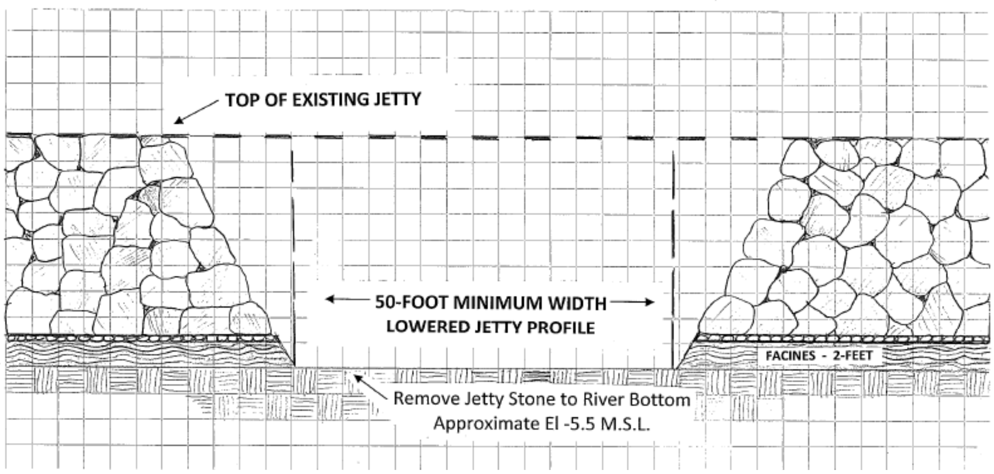


Figure 6. General Cross-Section Profile of a Jetty Opening.

Figure 6 depicts the typical features of a jetty opening in cross section view. The project would be completed by a barge mounted crane and excavator floated out to the project area. Much of the jetty stone removal would need to be completed during high tide; however, the barge would be expected to ground at low tides and remain operational. Mats would be placed on the adjacent sandy substrate for cases where construction operations could benefit from a ground-level approach at low tides. Jetty stone will be picked up from the jetty and piled adjacent to the existing jetty on the Columbia River side of the Jetty or placed on top of the relic jetty structure. Piling the stone next to the jetty would be similar to the 1135 project completed in 1995, see Figure 7 for an aerial photograph of this placement. The approximate volume of jetty stone to be removed is 3445 tons which converts to approximately 2,024 cubic yards. No staging area would be required on this project.

The jetty structure is comprised of large stones throughout its cross-section. Therefore the jetty structure is not expected to unravel with exposure to the environment. The new openings would not require additional armoring.

Figure 7 –Stone Piles Created from the 500-feet of Jetty Opening in 1995

3.8.2. Construction Considerations

This section presents the basic construction considerations, restrictions, and coordination of the major feature construction for Trestle Bay Restoration Project. A Product Development and Construction Schedule are located at the end of this Section.

3.8.2.1. Schedule

- General Information. Construction will occur during November 1, 2015 to February 28, 2016. The construction contract is estimated to take 2 months from award to demobilization. Onsite construction is estimated to take 3 weeks to complete. The contract closeout process would begin at the conclusion of construction and is estimated to take 1 month.

- In-Water Work. All work is assumed to be in-water work. The in-water work window for this reach of the Columbia River, as determined by the Oregon Department of Fish Wildlife, is 1 November to 28 February.

3.8.2.2. Contractor Operations

- Contractor Work, Office, Staging, and Parking Areas. No staging would be required on this project. Contractors would get to and from the barge from a skiff at the boat launch in Astoria. Jetty stone removal will be coordinated with the tides in the area. This work would not require dredging for construction access.

- Environmental Controls. All Federal, State, and local laws and regulations would be complied with concerning this work. All runoff from construction site activities would be controlled with Best Management Practices provided by the contractor and approved by the Government along with controls implemented under the National Pollutant Discharge Elimination System (NPDES) permit for small vessels. Turbidity monitoring is required due to the in-water activities.

3.8.2.3. Restricted Access

- Access Road. Contractor would access their barge with a mounted crane from the river. It is assumed the contractor would work the tide cycle and coordinate barge access only during high tides.

- Public Access. The public does not have direct, easy access to the jetty; anecdotal knowledge indicates that the public rarely access Trestle Bay. During construction, access would be managed by the Oregon Parks and Recreation Department.

3.8.2.4. Quality Assurance and Contractor Quality Control

- Quality Assurance. Quality Assurance would be accomplished by a well programmed policy as covered in the Resident Office Quality Assurance Plan (QAP). The QAP would be augmented by a site-specific Quality Assurance (QA) Plan Supplement prepared by the Construction Project Engineer. Staffing of the QA surveillance would be by assigning one Project Engineer and a suitable number of Government Quality Assurance representatives (GQAR) to perform the day to-day surveillance, which purpose is to assure adherence to specification requirements for quality and safety. The product development team would periodically travel to the site to participate in partnering meetings, periodic scheduling meetings, and to observe the work as part of required Engineering During Construction (EDC) protocols.

- Contractor Quality Control. Contractor Quality Control would be monitored by the QA team, Project Engineer and GQAR(s), as part of the QAP and QA Supplement requirements. The Contractor would be required to follow the guidelines of Division 1 specifications, particularly Quality Control System, Submittal Procedures, and Contractor Quality Control. These Sections specify criteria for outlining the work to be performed and for communicating the quality to the workers performing the work. A Quality Manager is required to be on the Contractor Staff with the responsibility for executing all quality related matters which include preparing submittals and conducting the three phases of control for each definable feature of work.

3.8.3. Operations and Maintenance

To date, the previously conducted Section 1135 project (constructed in 1995) has not required operation or maintenance activity. Based on the performance of the Section 1135 project, the proposed Section 536 project is expected to be a self-sustaining and require no additional operations and maintenance beyond construction. The Section 536 project openings would be constructed in a manner that avoids destabilization of adjacent jetty side slopes at the new openings.

3.8.4. Real Estate

The non-Federal Sponsor would be required to support the project by obtaining any easements required for actions within aquatic lands owned/controlled by the State of Oregon, Department of State Lands under their Fill/Removal Program for the removal and rock placement.

3.8.5. Estimated Project Cost and Assumptions

Costs were developed using 2014 price indices. Additional detail can be found in Appendix A.

Constant dollar amount:

Activity	Phase	Fiscal Year	Cost
Planning, Engineering and Design	Design and Implementation	FY14	$121,000
Construction	Design and Implementation	FY14	$444,000
Construction Management	Design and Implementation	FY14	$70,000
Lands and Damages	Design and Implementation	FY14	$39,000
Estimated Total Project Cost			**$674,000**

Inflated dollar amount:

Activity	Phase	Fiscal Year	Cost
Planning, Engineering and Design	Design and Implementation	FY15	$124,000
Construction	Design and Implementation	FY15	$454,000
Construction Management	Design and Implementation	FY15	$73,000
Lands and Damages	Design and Implementation	FY15	$40,000
Estimated Total Project Cost			**$692,000**

In order to enter the Design and Implementation Phase, a Project Partnership Agreement (PPA) would be executed.

Basis of Design and Estimate: The estimate for this project was developed using information provided by the designer, including plans and quantities. The estimate is a detailed MCACES MII Version 4.2, using labor and equipment crews, quantities and production rates. The barge and accompanying tug would access Trestle Bay only at high tide, precluding dredging of an access and work channel.

Construction Schedule: Due to the tidal restrictions and nature of the work, overtime is assumed of 10 hour work hour days, 5 days a week. This project solicitation is for open competition, seal bid, with award to the low bidder.

Subcontracting Plan: This cost estimate assumes the prime contractor be experience in dredging or heavy civil construction including cranes and marine work.

Project Construction.

a. Site AccessConstruction access to the project footprint will be via barge and boat. Construction is to be accomplished by removing the jetty stones with a barge mounted crane which allows ingress and egress to the project location at high tide. No Temporary Work Area lands will be required

b. Quantities: Quantities were determined from quantity take-offs provided by the design team. The assumption at this level of design was that excavation would be taken down to grade. The elevation of grade varies throughout the length of the Jetty.

c. Construction Methodology: Much of the work will need to be completed during high tide. Rock will be excavated and piled adjacent to the existing Jetty in a single lift. Existing Jetty stone is assumed to be an average of 7 tons.

d. Unusual Conditions: Work in the bay is subjected to tidal influence, wave action, salinity, and harsh weather.

e. Equipment/Labor Availability and Distance Traveled. Equipment and Labor is available in the Keslo/Longview area 80 miles away by Highway 30 or the Columbia River.

f. Overhead, Profit and Bond: Prime Contractor Markups are assumed as: Profit 8.6% (PWG) , Bond 1.58% (Bond Table), JOOH 25.19% (Calculated), and HOOH 15% which is the average rate from historical projects.

g. Contingency, E&D, S&A and Productivity: Contingency, E&D, S&A were not included in the MII Report, these cost will be reflected on the TPCS (see appendix A). A productivity factor of 50% has been applied to the breach. Work will have to be performed during high tide due to the amount of water need to draft a barge into the area. Assume each tide last 6 hours, 1 hour will be needed to draft in and out of the area leaving just 5 hours for construction per tide.

h. Effective Dates for Labor, Equipment, Material Pricing: Effective date for all pricing is November 2014. The Davis Bacon Labor Rates from OR140063 10/17/2014 OR63 was used, the 2014 EP Region 8 Equipment Library database and the 2012 English Cost Book Database of MII, which are the most current available, were also used.

3.8.6. Schedule

The following is the anticipated schedule for design and implementation of the Feasibility Report:

Begin Design Phase (including hydraulic modeling)	May 2015
NEPA Complete	July 2015
Plans and Specifications Complete	August 2015
Real Estate Certifications	August 2015
Issue Request for Proposal	August 2015
Award Contract	September 2015
Begin Construction	Nov-1 2015 (in-water work window)
Construction Complete	28 February 2016
Closeout Contract	April 2016

4. Environmental Conditions

Describing baseline conditions help establish a current description of the environmental condition of a project area.Baseline conditions also referred to as the “affected environment” section of a NEPA document should “succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration. The descriptions shall be no longer than is necessary to understand the effects of the alternatives. Data and analyses shall be commensurate with the importance of the impact, with less important material summarized, consolidated, or simply referenced” (40 C.F.R. § 1502.15). Alternative assessments conducted against baseline conditions/affected environment provide a comparison of anticipated effects of a selected action.

The Future Without Project (FWOP) Condition is the state of the project area if no action is implemented and consists of the current state of the project area and the conditions that are likely to develop over the next 50 years.

4.1. Baseline (Existing) Condition

4.1.1. Physical Environment

4.1.1.1. Tides and Water Levels

Tidal energy influences the hydraulic, physiographic, biologic, and chemical processes within Trestle Bay. These elements are discussed in this section as well as the biologic and sediment section.

Trestle Bay is a partially enclosed, 628-acre, tidally influenced, riverine embayment, as defined by the acreage expected to be inundated at Extreme High Water (EHW) estimated at elevation 10.4-ft (NAVD88) shown in Figure 8. This includes a tidally influenced marsh (called Swash Lake) located at the southeast end of Trestle Bay. Clatsop Spit shelters Trestle Bay from ocean waves and storm events from the north, west, and south. The Columbia River along this reach is primarily influenced by tidal cycles and natural riverine flows but may be affected in a small part by upstream reservoir regulation (regulation of reservoirs can increase or decrease the volume of water moving through the Columbia River system) and storm events. The project area is adjacent to the MCR and any additional increase or decrease in water volume moving through the system is dispersed across the wide opening where the MCR spills into the Pacific Ocean.

Regarding the tidal hydraulics of the bay, the permeable jetty structure provides full exchange of tidal water volume into, and out of, the bay through relatively large circuitous pathways between the individual jetty rocks. In this way the jetty acts as a flow diffuser, providing numerous individual outlets for the tidal currents to flow through the jetty; and as a screen, causing the sediment, nutrients and detritus to tend to fall out of the water column before flowing through the jetty. Astronomical tides at Trestle Bay are mixed semi-diurnal with two high waters and two low waters per day. The mean tidal range (difference in height between mean high water, MHW, and mean low water, MLW) is 6.6 ft. The approximate volume of water within the partially enclosed bay between MHW and MLW is 800 acre-ft. Consequently, on average, this volume of water is pumped through the permeable rock jetty four times per day (i.e., approximately every 6 hours). This is the primary driver of present-day circulation within the bay. Figure 8 shows the contours (i.e., the inundation areas) for MHW and MLW.

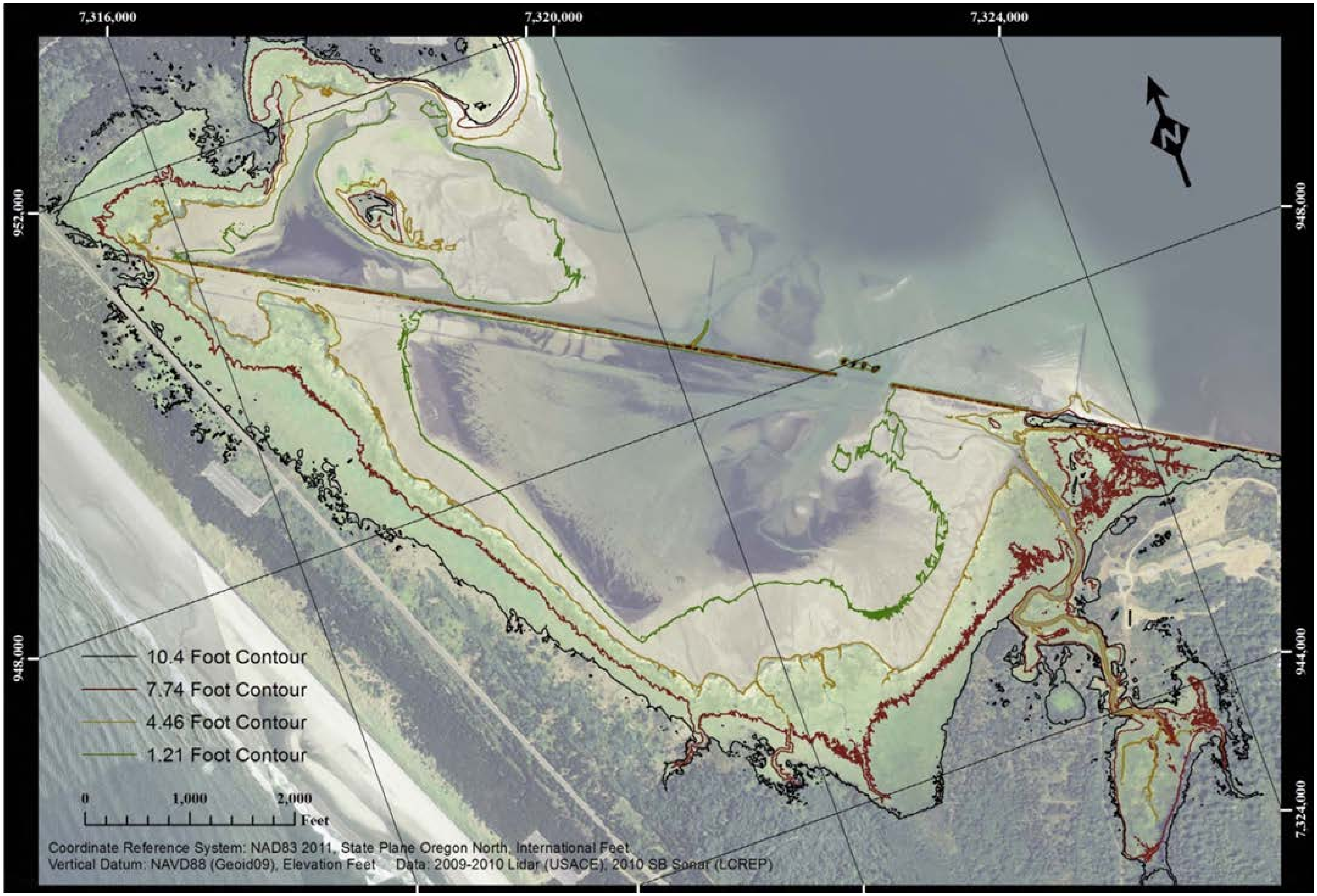


Figure 8. Inundation Areas for Extreme High Water in black (10.4 ft), Mean High Water in Red (7.8 ft), Mean Tide Level in Orange (4.5 ft), and Mean Low Water in Green (1.2 ft).

Figure 9 shows an example of a tidal cycle for Hammond, OR. The National Oceanic and Atmospheric Administration (NOAA), National Ocean Service gage at Hammond, OR, (Station 9439011) is located immediately southeast of Trestle Bay. A summary of the tidal information from the Hammond gage is listed in

Table 4. High and low tides are also referred to as slack tides because they are associated with a zero velocity as currents reverse direction from flood to ebb and ebb to flood. After each slack tide velocities begin to accelerate and reach peak velocities around mid tide. Velocities begin to decelerate after peak velocity is reached at mid tide level. These changing water levels and corresponding variations in velocity acceleration, magnitude and direction governs the nature of the physiographic, biologic and chemical prcesses that form the resulting habitat of the enclosed bay. Figure 8 includes the elevation contours for MHW (red), MTL (orange), MLW (green) and EHW (black) and shows the distinct changes in physiographic features in the proximity of these water levels as would be expected.

Figure 9. Typical Semi-diurnal Tides at Hammond, OR.

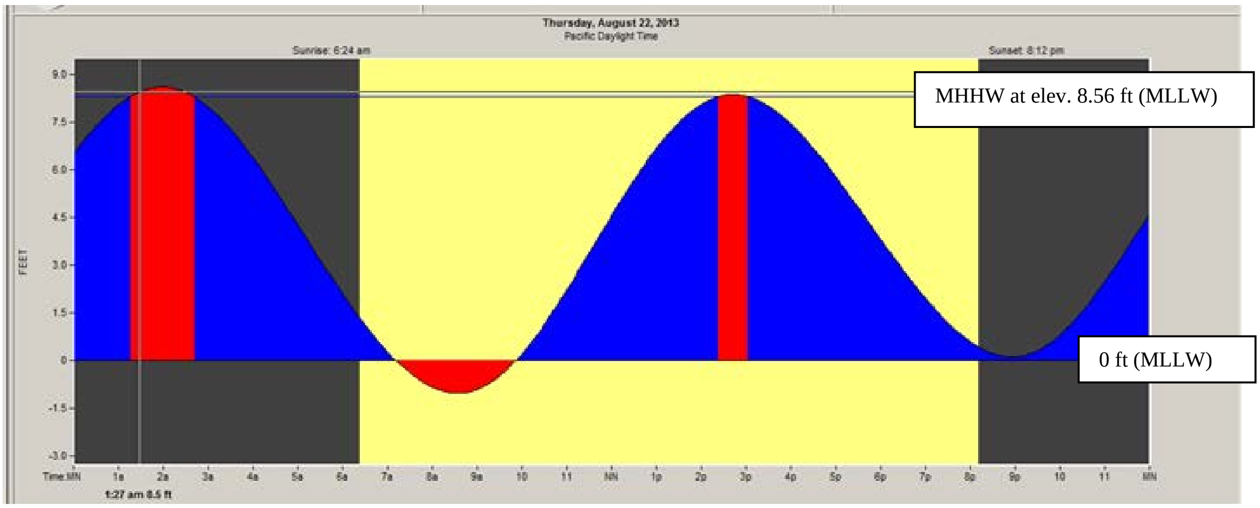


Table 4. Tide Data at Hammond, OR, referenced to NAVD88.

Mean Higher High Water (MHHW)	8.46 ft
Mean High Water (MHW)	7.75 ft
Mean Tide Level (MTL)	4.48 ft
Mean Sea Level (MSL)	4.44 ft
Mean Low Water (MLW)	1.2 ft
Mean Lower Low Water (MLLW)	-0.1 ft
Highest Observed Water Level (22 Nov 1988)	11.35 ft
Lowest Observed Water Level (23 June 1986)	-2.92 ft
Greatest Diurnal Range (difference in height between MHHW and MLLW)	8.55 ft
Mean Tidal Range	6.56 ft

The perimeter shoreline of Trestle Bay gently slopes towards several dendritic channels incised throughout the marsh and mudflat (Figure 10). The deeper end of Trestle Bay remains wetted throughout the full tidal cycle. The Trestle Bay area remains shallow and gradually slopes northward beyond the jetty structure for approximately ¼ of a mile before steeply dropping off into the Columbia River. The 500-ft section of the South Jetty Root that is lowered to -1.16 ft (NAVD88) acts to accommodate a portion of the tidal flow through the jetty.

Figure 10. Left: Typical Dendritic Channels at Trestle Bay. Right: Photograph Location.

4.1.1.2. Sediment and Water Quality

In 2000, the National Marine Fisheries Service (NMFS) published the results of a study sponsored by the Corps that examined the effects of the Section 1135 Project on the benthic and epibenthic invertebrate populations. Sediment samples were collected with the biological samples at 12 locations within and 3 locations just outside of Trestle Bay (Figure 11), both before and after modification of the jetty. Sediment characteristics, including grain size distribution and percent volatile solids, which estimates plant and organic matter in the sediments, are listed below in Tables 2 and 3. There was no evidence that any of the samples underwent chemical analysis. Samples collected in April, June, and August of 1994 (prior to the 1995 modification of the jetty) were compared to those collected in April, June, and August of 1997 (following modification). (Hinton and Emmett, 2000)

The NMFS study concluded that, with few exceptions, sediment characteristics remained fairly constant at each station between the pre-and post-breach studies (NMFS 2000). However, the data show that median percent of fines declined at 13 of 15 stations sampled. This decline may be attributed to the increased circulation within Trestle Bay as a result of the jetty modification; however, the decline may also be a result of the sustained high water within the Columbia Basin (thereby leading to a possible increased level of water circulation within Trestle Bay) beginning in February 1996 and continuing into 1997.

Trestle Bay is a moderate-energy[5] environment, with naturally occurring fluctuations of turbidity (particularly in the winter) on the riverside of the South Jetty Root. Trestle Bay and the adjacent mainstem of the Columbia River is sheltered from incoming ocean waves by Clatsop Spit, but is still impacted by wind energy[6] in the estuary. A comparison of aerial photography of the pre- and post construction of the Section 1135 project show a distinct scour of sediment at the breach site. Current aerial photographs show the formation of dendritic channels leading through the Section 1135 opening. Tidal actions continue to erode/deposit sedimentary material within Trestle Bay.

[5] Moderate-energy areas typically exhibit variable velocity and are protected from storm events and extreme changes in water flow.
[6] Wind energy creates waves. Waves in turn cause turbulence through the water column, suspending particles. An increase in suspended particles may lead to higher instances of turbidity.

Figure 11. Location of sediment sampling stations at Trestle Bay.

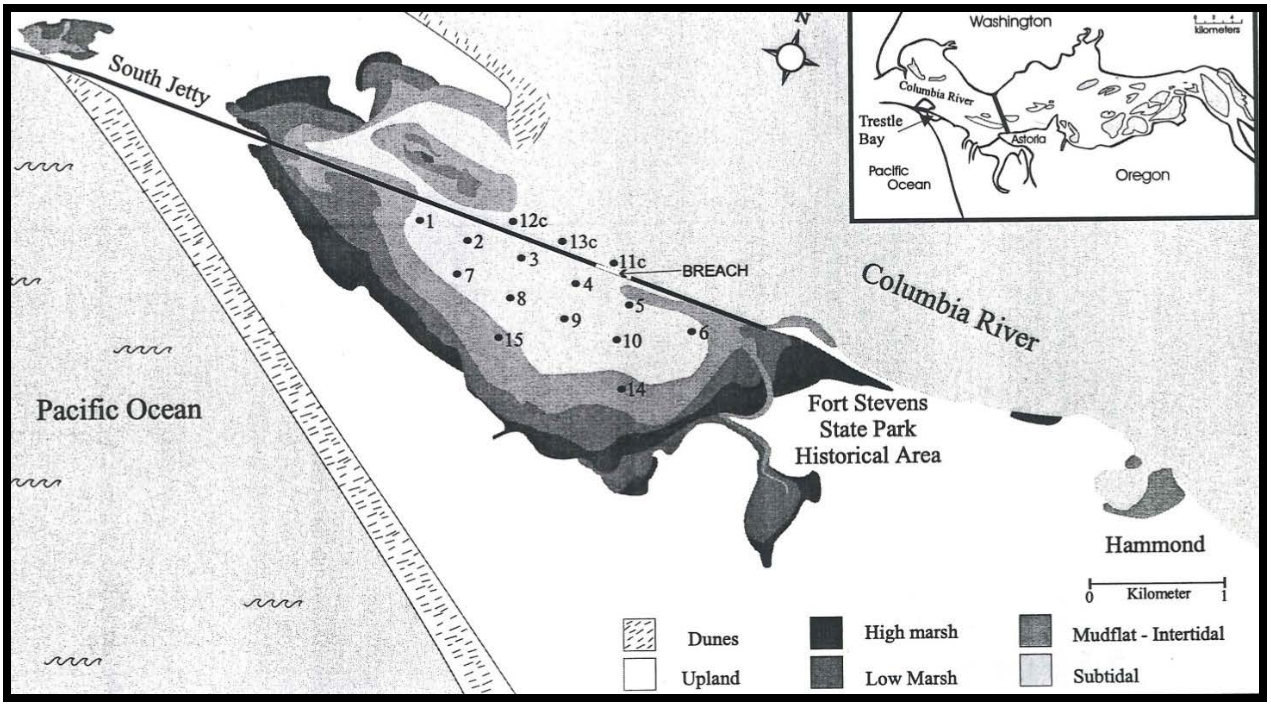


Table 5. Percent fines (silt and clay) at sediment sampling stations in and adjacent to Trestle Bay in the Columbia River estuary.

stations	Aug-93	Apr-94	Jun-94	Jun-97	Aug-97
	% fines (silt and clay)				
1	25.2	18	17.4	60	73
2	88.4	80.5	85.7	75	43.5
3	91.8	87.6	83.8	76	70
4	92	84.1	85.1	75	60
5	21.5	36.7	13.5	0.2	4.9
6	29.5	28.5	17	16.4	16
7	96.7	94.1	94.2	19.7	35.4
8	94.1	75.3	91.4	82	80
9	94.9	89.9	93.3	80	82
10	62.4	92.4	34.5	86	80
14	*	86.5	97.5	88	85
15	*	18.9	26.5	9.6	12.2
11C	0.4	39.5	5.3	1.8	7.9
12C	1.9	0.6	8.7	0.4	1.3
13C	*	0.7	5	3	2.1

Note: Stations 1-10, 14, and 15 were located in the bay; stations 11C-13C were located outside and adjacent to the bay.
*sites were not sampled in 1993.

Table 6. Percent volatile solids at sediment sampling stations in and adjacent to Trestle Bay in the Columbia River estuary

Stations	Aug-93	Apr-94	Jun-94	Jun-97	Aug-97
	% volatile solids				
1	12.0	1.0	1.1	5.7	6.3
2	5.6	4.7	4.1	5.6	6.0
3	6.5	4.9	4.2	6.4	6.4
4	7.1	5.4	5.6	6.5	6.5
5	2.1	2.1	0.8	1.6	4.9
6	2.4	2.1	1.2	2.5	1.8
7	5.8	4.7	4.5	3.2	2.5
8	5.9	3.4	3.8	6.0	5.5
9	5.9	4.9	4.9	6.2	6.4
10	3.7	5.0	2.1	5.8	6.0
14	*	5.1	2.0	5.7	4.7
15	*	1.5	1.5	2.1	1.4
11C	0.6	3.2	0.8	1.3	1.4
12C	0.7	0.6	0.8	1.2	0.8
13C	*	0.5	0.5	1.2	0.8

Note: Stations 1-10, 14, and 15 were located in the bay; stations 11C-13C were outside and adjacent to the bay.
*sites were not sampled in 1993.

The majority of individual sediment samples collected within Trestle Bay had percent fines measurements greater than 20 percent (%). The maximum fines percentage, 97.5%, was prior to breaching at station 14. Samples collected outside the jetty at Trestle Bay were usually 5% fines or less. As expected, overall percentages of silt, clay and volatile solids were lower outside of Trestle Bay due to higher riverine currents and increased water circulation outside of the bay. There are no known sources of contamination in the immediate area. No further sediment sampling has been conducted within Trestle Bay since 1997.

The Corps conducted sediment testing of the mainstem Columbia River Federal Navigation Channel in 2008. The sediment evaluation was conducted following procedures set forth in the Sediment Evaluation Framework (SEF) which is consistent with the federal guidance in the Ocean Testing Manual and Inland Testing Manual. The SEF was developed jointly with regional federal and state agencies to address environmental issues associated with dredging and sediment management. Sediment testing was conducted throughout approximately 103.5 miles of the Columbia River from the MCR (RM 3) upstream to Vancouver, Washington (RM 106.5). Approximately 6 million cubic yards (MCY) of sand is dredged from the Columbia mainstem annually; most material is placed back in-water at high-energy flow lane sites.

As part of the ongoing maintenance of the Columbia River deep-draft federal navigation channel (FNC), ninety-eight (98) boxcore (BC) surface-grab samples were collected August 26-27, 2008 from the Columbia River. Two of these samples, BC2 and BC3 are within one mile of Trestle Bay. Sample BC2 was from RM 6 at a depth of 44.5 ft. The sample consisted of 7.6% gravel, 85.4% sand, and 6.9% fines. Sample BC3 was from RM 7 at a depth of 42 ft. The sample consisted of 0.2% gravel, 98.8% sand, and 1.1% fines. No chemical analyses were conducted on these samples as they were less than 20% fines. (USACE, 2009)

Sediment was characterized within Hammond Boat Basin in 2005, approximately 1.3 miles upstream from Trestle Bay. The sediment evaluation determined the material was authorized for unconfined in-water disposal (Columbia River Estuary Study Taskforce [CREST], 2014). Sediment sampling is currently being conducted for Hammond Boat Basin dredging and in-water placement suitability determination in 2015. Previous sediment samples indicate a high percentage (>95%) of fine sediments in the boat basin.

Sources of potential contamination into Trestle Bay include discarded transformers and a gasoline underground storage tank (UST) on the Fort Stevens State Park (formerly the Fort Stevens Military Reservation). Soil sampling in the area of the transformers and gasoline UST indicated very low levels of polychlorinated biphenyl (PCBs) (< 1 part per million [ppm]) and 11ppm TPH, respectively. The transformers were removed in 1991 and disposed of at the Hillsboro Landfill. The gasoline UST was removed in 1992. The Oregon Department of Environmental Quality determined No Further Action (NFA) was required at the site of the transformers in 1992 and for the gasoline UST in 1992 and 1997.

In addition, the Oregon Department of Environmental Quality maintains information on leaking underground storage tanks (LUST). There are two known sites near Trestle Bay (UST Facility IDs 853 and 11444). Site 853 is located in Fort Stevens State Park and cleanup was initiated in 1992 and completed in 1997. Site 11444 is also located in the state park. Cleanup was initiated in 1995 and completed in 1997.

Documented water quality data collected at Trestle Bay is limited. NMFS measured salinity and water temperature during the pre-jetty modification sampling study conducted in 1994. Salinity of Trestle Bay waters (March-April 1994) ranged from 2.27 to 26.56 grams part per thousand (ppt) with an average of 11.3 ppt; water temperatures during this sampling period averaged 10.3 degrees Celsius (C) with a range between 7.1 and 16.0 degrees C. Although salinity was expected to increase following the jetty modification, there was a decrease in the average Trestle Bay salinity measured in the post project survey, likely as a result of the high freshwater flows in the Columbia River in 1996 into 1997 (Hinton et al. 2000). More recent water quality data for Trestle Bay is not available. The Columbia River from river mile 0 to 35 is 303(d) water quality-limited for PCB, arsenic, and dichlorodiphenyltrichloroethane (DDT). Trestle Bay is located at RM 7 of the Columbia River. No known contaminant sites are located within or adjacent to Trestle Bay.

4.1.1.3. Geology and Soils

The National Resources Conservation Service (NRCS) web soil survey resources provide soil classifications for Clatsop County and the soil within the Trestle Bay project area. The typical profile for the bay mud flat area is listed as open water. The intertidal salt marsh areas bordering the bay are classified as silt loams of a Coquille-Clatsop complex. The upland areas are classified as Heceta-Waldport fine sands in upland areas. NRCS soil survey data is considered surface soils and classify soil in this area of Clatsop County to a depth of less than 62 inches.

In 1993, ten soil samples were collected from the Trestle Bay side of the South Jetty Root and evaluated for soil classification. These samples describe the soils within the embayment area mudflats as non-plastic silts and some silty sands. The 1993 soil samples are considered surface grab samples and do not reflect conditions at depths of more than 6 to 12 inches.

Several wells have been drilled in the Clatsop plains area south of the South Jetty within a few miles of the study area (Frank 1970). Near the surface, these wells encountered a variety of unconsolidated dune, beach, and shallow marine sands interbedded with alluvium, all of Pleistocene and Holocene age. These young deposits extend to depths of between 250 and 300 ft below sea level and rest unconformably on a sandy unit that extends to depths of approximately 400 ft below sea level. This second unit was tentatively identified as the Astoria Formation (Frank 1970), but has subsequently been called Upper Miocene Sandstone by Schlicker and others (1972). This unit is typically buff-colored, medium- to coarse-grained, semi-consolidated sandstone of marine origin. The Oligo-Miocene beds that are part of the Astoria Formation underlie the Upper Miocene Sandstone. The project site occurs on accreted sand material that accumulated to form Trestle Bay after jetty construction commenced in 1885.

4.1.1.4. Air Quality and Noise

The Oregon Department of Environmental Quality (DEQ) and the U.S. Environmental Protection Agency (EPA) regulate air quality in the project area. The EPA has established the National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: carbon monoxide (CO), ozone, particulate matter, lead, sulfur dioxide, and nitrogen dioxide. DEQ, which is responsible for maintaining compliance with the NAAQS in Oregon, has established State Ambient Air Quality Standards (SAAQS) that are at least as stringent as the NAAQS.

For each of the six criteria pollutants, the NAAQS and SAAQS are defined as a maximum concentration above which adverse effects on human health may occur. Geographic areas in which the ambient concentrations of a criteria pollutant exceed the NAAQS are classified as nonattainment areas. Federal regulations require states prepare statewide air quality planning documents called State Implementation Plans (SIPs) that establish methods to bring air quality in nonattainment areas into compliance with the NAAQS and to maintain compliance. Nonattainment areas that return to compliance are called maintenance areas. No part of the Study Area is a designated as a nonattainment or maintenance area for criteria pollutants (DEQ 2013).

The lower Columbia River climate is characterized by wet winters, relatively dry summers, and mild temperatures throughout the year. Along the lower elevations of the immediate coast, normal annual precipitation is between 65 to 90 inches. Occasional strong winds strike the Oregon Coast, usually in advance of winter storms. Wind speeds can exceed hurricane force, and in rare cases have caused damage to structures or vegetation. Damage is most likely at exposed coastal locations, but it may extend into inland valleys as well. Such events are typically short-lived, lasting less than one day. The prevailing winds along the Lower Columbia River comes from the east out of the Columbia Gorge during the fall and winter months (from about October to March), and from the west off of the ocean during the spring and summer months (April to September).

Noise is generally defined as unwanted sound and is a fluctuating pressure wave. It is measured in terms of the sound pressure level expressed in decibels (dB). Existing sources of noise in the project area originate from vessel traffic in the Columbia River. Receptors of this noise include users of Fort Stevens State Park and aquatic species transiting through the area. Trestle Bay is not classified by Clatsop County as a “noise sensitive” property.

4.1.2. Biological Environment

4.1.2.1. Aquatic and Terrestrial Communities

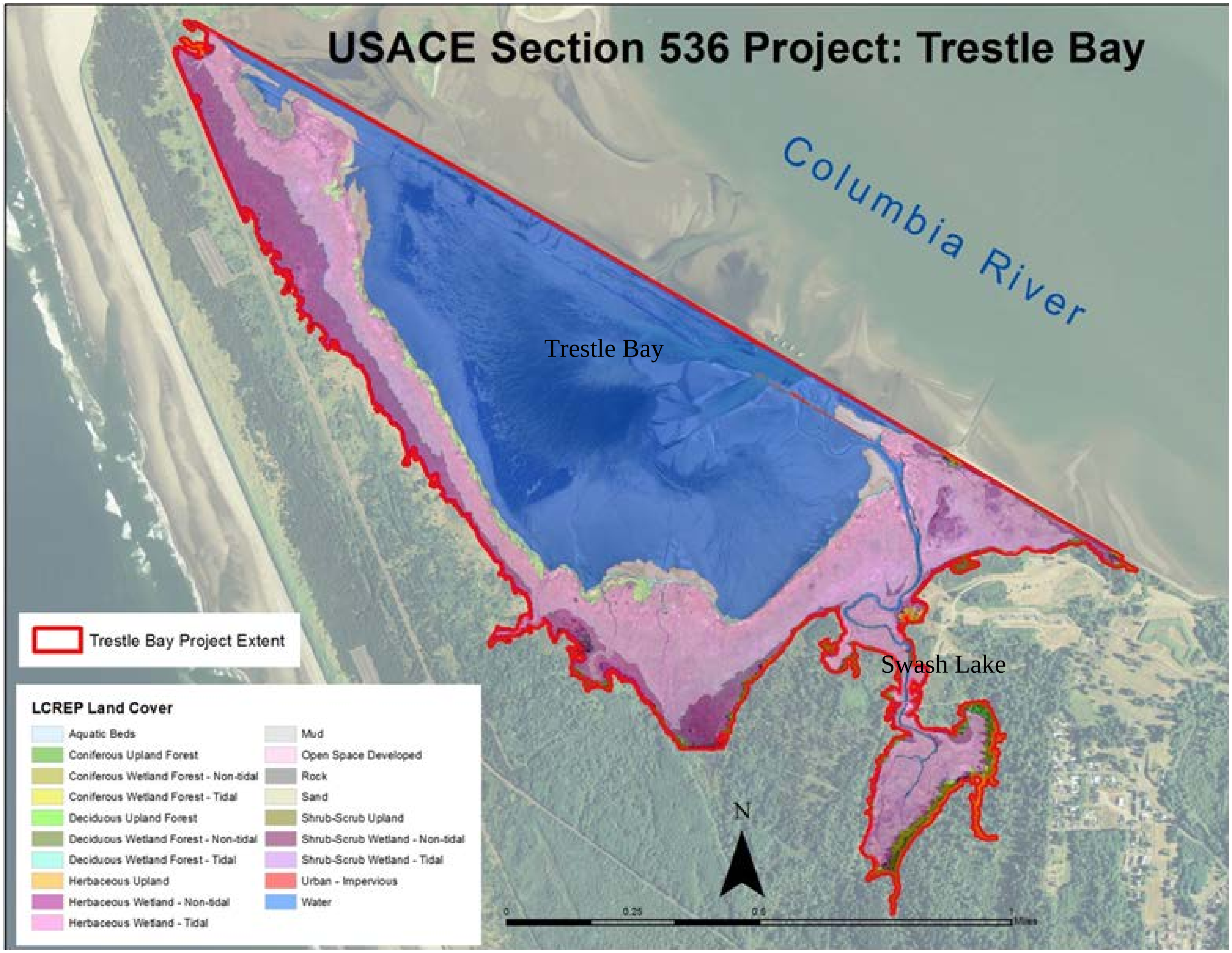
Trestle Bay is a brackish[7] bay consisting of shallow subtidal and intertidal mudflats and intertidal marsh habitats. There are some areas with established growth of eelgrass within the northern mostly submerged mudflats within Trestle Bay. (Hinton and Emmett 2000) Vegetation in and around Trestle Bay has been influenced by the accumulation of sand around the jetty that ultimately created the bay. The bay is surrounded by land to the west, south, and east sides. The enclosed portion of the bay is separated from the mainstem of the Columbia River by a permeable rock jetty on the north, or river, side. According to the Columbia River Estuary Ecosystem Classification (CREEC), Trestle Bay is dominated by tidally influenced herbaceous wetland habitat. Other habitat types identified include non-tidally influenced herbaceous wetlands and coniferous wetland forests. All these habitat-types occur near Swash Lake in the southern end of the bay. Much of the submerged/partially submerged areas within the bay are “uncategorized” by the CREEC, but predominantly include mud/sand flats and submerged aquatic habitat. Using the Lower Columbia River Estuary Partnership’s (LCREP) 2011 Land Cover dataset (see Figure 12), coniferous upland forests, shrub-scrub wetlands and upland areas were identified. The majority of shrub-scrub upland habitat occurs in the southern extent of the project boundary, but several locations contain these habitat types along the borders of the western and northern extent near the Jetty Road. A typical upland area upland area is likely to contain Scotch broom (*Cytisus scoparius*) (LCREP 2010).

The south end of the bay connects with Swash Lake, an estuarine slough complex with a direct tidal connection to Trestle Bay. Swash Lake is receives freshwater; however, the amount of freshwater introduced into this lake is unknown. Biological surveys of Trestle Bay, from 1994, verified the importance of habitat characteristics contained in estuarine wetlands for benthic and epibenthic invertebrates, which are an important food source for salmonids and other marine organisms (Hinton and Emmett 2000). The Section 1135 project was successful in lowering a 500-ft southeast section of the South Jetty Root. This action created limited access to a number of fish species including Endangered Species Act (ESA)-listed salmonid species that were previously prevented from utilizing the bay. The shallow-water estuarine habitats found in Trestle Bay have high primary and detrital productivity rates, which has the potential to benefit increased densities of secondary consumers, such as juvenile salmonids (Hinton and Emmett 2000).

Most of Trestle Bay is permanently flooded shallow estuarine subtidal habitat containing a mixture of marine and freshwater influences (Oregon Parks and Recreation Department [OPRD]

[7] Brackish waters are considered to be more saline than freshwater with typical salinity measuring between .05% and 3%.

Figure 12. Trestle Bay Land Cover.



2001). Open water areas are highly productive for fish, crab, and other marine organisms. In addition, these shallow subtidal areas offer foraging opportunities for a variety of avian species including eagles, migratory geese, and waterfowl. Trestle Bay was identified by the Pacific Northwest National Laboratory (PNNL) (Borde et al. 2012) as one of 51 reference sites analyzed in the Lower Columbia River Estuary for plant community types, accretion rates, channel morphology and vegetation strata. The bay was chosen as a reference site and monitored to assess habitat condition. Native vegetation dominates the wetland habitat with 10 out of 14 identified species being native species comprising 89.35% of the cover within the PNNL study area, the southern tidal channel area connecting to Swash Lake.

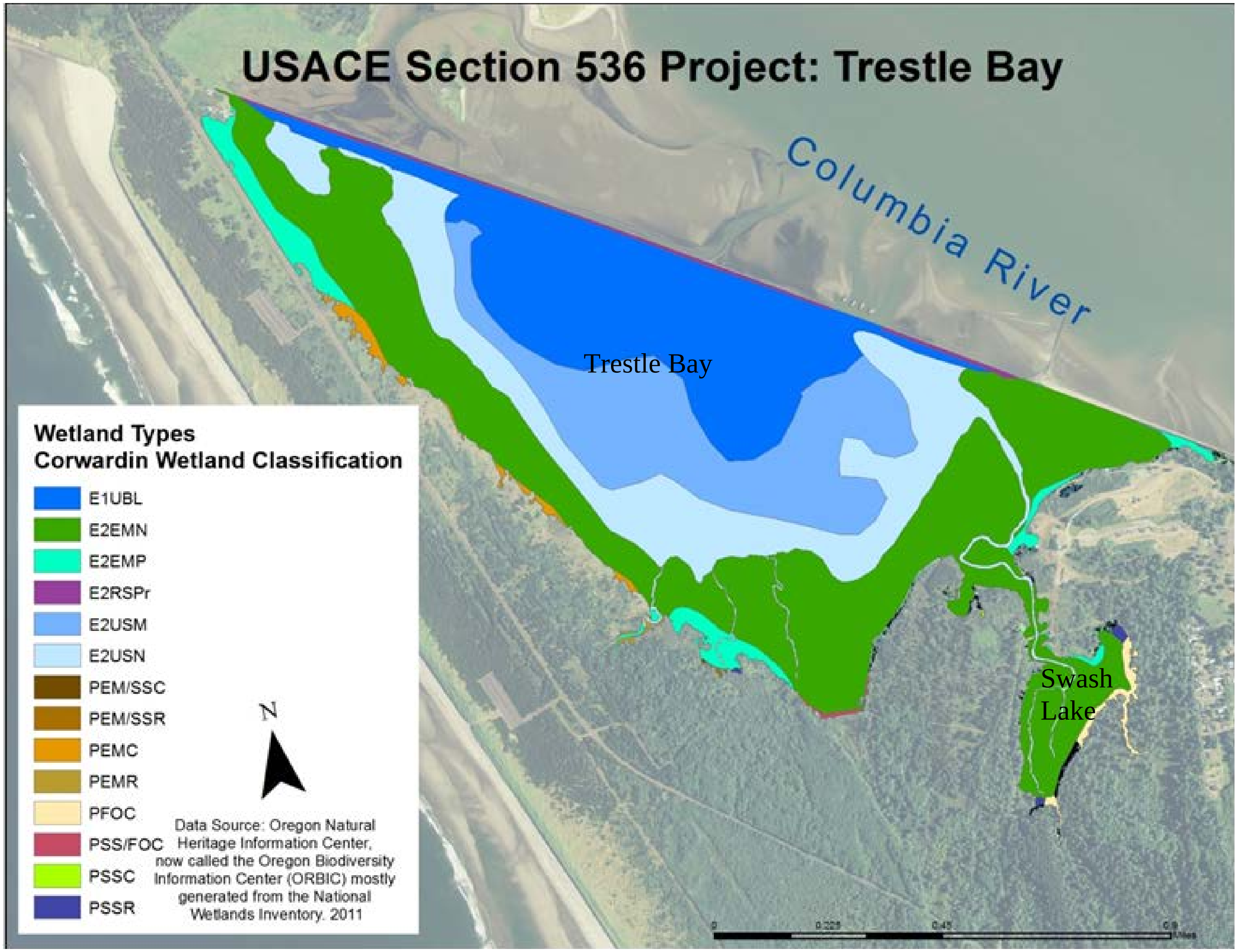
4.1.2.2. Wetlands

Trestle Bay contains numerous wetlands. These wetlands developed as a result of land accretion from the jetty construction projects in the late 1800s and as a result of stable topographic conditions, tidal influence, and soil conditions. According to the Oregon Biodiversity Information Center (ORBIC) and the National Wetlands Inventory (NWI) dataset, Trestle Bay contains the wetland classifications listed in Table 7 and shown in Figure 12. These wetlands provide critical habitat for many marine and estuarine fish and shellfish species. The primary producers within these areas provide extensive cover and foraging habitat. The CREEC dataset has identified several wetland types within the project area and includes intertidal herbaceous wetland habitats.

Table 7. Wetland Types for Trestle Bay

Cowardin Classification	Wetland Type
E1UBL	Estuarine Unconsolidated Bottom – Saltwater Subtidal
E2EMN	Intertidal Estuarine Emergent – Saltwater regularly flooded
E2EMP	Intertidal Estuarine Emergent – Saltwater irregularly flooded
E2RSPR	Intertidal Estuarine Rocky Shore – Saltwater seasonally and tidally flooded
E2USM	Intertidal Estuarine Unconsolidated Shore – Saltwater irregularly flooded
E2USN	Intertidal Estuarine Unconsolidated Shore – Saltwater regularly flooded
PEM/SSC	Palustrine Emergent/Shrub-Scrub – seasonally flooded
PEM/SSR	Palustrine Emergent/ Shrub – Scrub – seasonally and tidally flooded
PEMC	Palustrine Emergent – Non-tidal seasonally flooded
PEMR	Palustrine Emergent – Freshwater seasonally and tidally flooded
PFOC	Palustrine Forested – Non-tidal and seasonally flooded
PSS/FOC	Palustrine Shrub-Scrub/Forested – Non-tidal and seasonally flooded
PSSC	Palustrine Shrub-Scrub – Non-tidal and seasonally flooded
PSSR	Palustrine Shrub-Scrub – Freshwater seasonally and tidally flooded

Figure 13. Wetland classification within Trestle Bay project area.



Trestle Bay herbaceous wetland habitats are tidally influenced lower flooded surge plain wetlands. These habitats in Trestle Bay that are inundated with salt water are considered Sedge Intertidal (SEI-1) wetlands dominated by Lyngby's sedge *(Carex lyngbyei)*, widgeon-grass *(Ruppia maritime)* and beach silverweed (*Potentilla anserina ssp. Pacifica)*. These wetland areas occupy the lower east, west and south shoreline edges of Trestle Bay (Borde et al. 2012). Freshwater wetlands with limited tidal influence primarily contain the Cattail-Bulrush (CBU-2) plant association. Cattail *(Typha latifolia)* and bulrush *(Scirpus acutus)* dominate these freshwater areas. These wetlands typically occupy the higher elevation inland portions of Trestle Bay. Common invasive species include reed canary grass *(Phalaris arundinacea)*, European beach grass *(Ammophila arenari)* (Borde et al., 2012, and OPRD 2001) and purple loosestrife (*Lythrum Slaicaria*).

4.1.2.3. Fish, Aquatic Species and Marine Mammals

Trestle Bay provides habitat and foraging areas to a variety of fish and shellfish species. Benthic and epibenthic invertebrates such as copepods, amphipods, and other species can be found in Trestle Bay and are important prey organisms for juvenile fishes (Hinton and Emmett 2000). Fish and shellfish species known to occur in the Trestle Bay are presented in Table 8.

Steller sea lions breed along the West Coast from California's Channel Islands to the Kurile Islands and the Okhotsk Sea in the western North Pacific Ocean. They are year-long residents along the Oregon Coast. A major haul-out area for Steller sea lions occurs at the head of South Jetty, where the monthly averages between 1995 and 2004 ranged from about 168 to 1106 animals at the South Jetty. Steller sea lions are most abundant in the vicinity during the winter months and tend to disperse elsewhere to rookeries during breeding season between May and July (Corps 2007).

Table 8. Fish and Aquatic Species Known to Occur in Trestle Bay

Common Name	Scientific Name
Prickly sculpin	*Cottus asper*
Surf smelt	*Hypomesus pretiosus*
English sole	*Parophyrus vetulus*
Threespine stickleback	*Gasterosteus aculeatus*
Bay pipefish	*Syngnathus leptorhyunchus*
Shiner perch	*Cymatogaster aggregate*
Saddleback gunnel	*Pholis ornate*
Pacific staghorn sculpin	*Leptocottus armatus*
Starry flounder	*Platichthys stellatus*
Peamouth	*Mylocheilus caurinus*
Yellow shore crab	*Hemigrapsus oregonensis*
American shad	*Alosa sapidissima*
Pacific herring	*Clupea pallasi*
Chinook salmon	*Oncorhunchus tshawytscha*
Juvenile smelt	*Osmeridae*
Banded killifish	*Fundulus iaphanous*
Largemouth bass	*Micropterus salmoides*
Larval flatfish	*Pleuronectidae*
Coho salmon	*Onchorhychus kisutch*
Longfin smelt	*Spirinchus thaleichthys*
Pacific tomcod	*Microgadus proximus*
Dungeness crab	*Metacarcinus magister*

4.1.2.4. Wildlife Species

The intertidal marsh habitat attracts a number of wintering waterfowl to Trestle Bay. Mallards, northern pintail, American wigeon and green-winged teal commonly use Trestle Bay during the fall, winter and early spring. Hundreds to the low thousands of these ducks may visit this location at a given time. Diving and sea ducks, primarily canvasbacks and greater scoup, buffleheads and surf scooters frequent the open water habitat of Trestle Bay. Resident Canada geese and migrant black brant also make sure of Trestle Bay. Mallards and a few other duck species would be expected to nest in upland areas adjacent to Trestle Bay with some brood rearing occurring in the embayment.

Piscivorous waterbirds may use the trestle and jetty area for roosting or nesting. Carter et al. (1995) described double-crested cormorant abundance in the LCR estuary, and observed 262 double-crested cormorants nesting at Trestle Bay in 1980. Nesting by double-crested cormorants was last observed at Trestle Bay in 1992 (Adkins and Roby 2010).

Shorebirds forage on the intertidal marsh and mudflat habitats. Shorebird species are most prevalent during spring migration (up to 5,000 individuals), but also occur in late summer, fall and winter. Western sandpipers and dunlins are the dominant species numerically. Bald eagles are known to forage at Trestle Bay and nearby areas. Peregrine falcons occasionally forage for waterfowl and shorebirds in the project area.

4.1.2.5. Endangered Species Act-listed Species

4.1.2.5.1. ESA-Listed Species Under NMFS Jurisdiction

The federally listed threatened and endangered species and their listed critical habitats or managed fisheries under the jurisdiction of the NMFS that may occur in the proposed project area are shown in Tables 9, 10, and 11.

In 2005, critical habitat was designated for all Columbia River steelhead and Columbia River salmon Evolutionarily Significant Units (ESU), with the exception of lower Columbia River coho salmon ESU. General run-specific life history descriptions for the various salmonid ESUs shown in Table 9 are provided below. In 2005, critical habitat was designated for all Columbia River steelhead and Columbia River salmon ESU, with the exception of lower Columbia River coho salmon ESU. The lower Columbia River coho critical habitat is currently reviewed by NMFS for designation. Critical habitat designation will be determined in 2015.

Table 9. ESA-listed Anadromous Salmonids under NMFS Jurisdiction

Evolutionarily Significant Unit	Status	Critical Habitat	Federal Register (FR) Citation
Chinook Salmon *(Oncorhynchus tshawytscha)*			
Snake River spring/summer run	Threatened	Yes	70 FR 37160; 28 June 2005
Snake River fall run	Threatened	Yes	70 FR 37160; 28 June 2005
Lower Columbia River	Threatened	Yes	70 FR 37160; 28 June 2005
Upper Columbia River spring run	Endangered	Yes	70 FR 37160; 28 June 2005
Upper Willamette River	Threatened	Yes	70 FR 37160; 28 June 2005
Coho Salmon *(Oncorhynchus kisutch)*			
Lower Columbia River	Threatened	Proposed	70 FR 37160; 28 June 2005 78 FR 2725; 14 January 2013
Chum Salmon *(Oncorhynchus keta)*			
Columbia River	Threatened	Yes	70 FR 37160; 28 June 2005
Sockeye Salmon *(Oncorhynchus nerka)*			
Snake River	Endangered	Yes	70 FR 37160; 28 June 2005
Steelhead *(Oncorhynchus mykiss)*			
Snake River Basin	Threatened	Yes	71 FR 834; 1 January 2006
Lower Columbia River	Threatened	Yes	71 FR 834; 1 January 2006
Middle Columbia River	Threatened	Yes	71 FR 834; 1 January 2006
Upper Columbia River	Threatened	Yes	71 FR 834;1 January 2006
Upper Willamette River	Threatened	Yes	71 FR 834; 1 January 2006

Table 10. ESA-listed Fish Species under NMFS Jurisdiction

Species	Status	Critical Habitat	Federal Register (FR) Citation
Southern DPS* Green Sturgeon (*Acipenser medirostris*)	Threatened	Yes	71 FR 17757; 7 April 2006
Southern DPS* Pacific Eulachon (*Thaleichthys pacificus*)	Threatened	Yes	75 FR 13012; 18 March 2010

*DPS = Distinct Population Segment

Table 11. Essential Fish Habitat in the Action Area

Fishery Management Plan with Essential Fish Habitat	Essential Fish Habitat affected	Essential Fish Habitat conservation plan
Pacific Coast Salmon	Yes	Yes
Pacific Coast Groundfish	Yes	Yes
Coastal Pelagic Species	Yes	Yes

General run-specific life history descriptions for the various salmonid ESUs are provided below.

Snake River Spring and Summer Run Chinook Salmon. Fish from this ESU occur in the mainstem Snake River and sub-basins including the Tucannon, Grande Ronde, Imnaha, and Salmon Rivers. Adults migrate in late winter to spring and spawn from late August to November. Spawning occurs in tributaries to the Snake River. Juveniles remain in freshwater from 1-3 years and out-migrate from early spring to summer.

Snake River Fall Run Chinook Salmon. Fish from this ESU occur in the mainstem Snake River and sub basins including the Tucannon, Grande Ronde, Imnaha, and Salmon Rivers. Adults migrate from mid-August to October and spawn from late August to November. Spawning occurs in the Snake River and lower reaches of tributaries to the Snake River. Juveniles rear in freshwater from 1-3 years and out-migrate from early spring to summer.

Lower Columbia River Chinook Salmon. Fish from this ESU occur from the MCR upstream to Little White Salmon River, Washington and Hood River, Oregon and including the Willamette River upstream to Willamette Falls. Adults migrate in mid-August through October (fall run) and late winter to spring (spring run). Spawning occurs from late August to November. Spawning occurs in the mainstem Columbia River to upper reaches of tributaries. Juveniles out-migrate from early spring to fall.

Upper Columbia River Spring Run Chinook Salmon. Fish from this ESU occur in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Adults migrate from late winter to spring and spawn from late August to November. Spawning occurs in the mainstem Columbia River to upper reaches of tributaries. Juveniles out-migrate from early spring to summer.

Upper Willamette River Chinook Salmon. Fish from this ESU migrate upstream from late winter to spring and spawn from late August to November. Juveniles migrate from early spring to summer, some rearing in the Columbia River estuary and some in freshwater.

Lower Columbia River Coho Salmon. It is believed that the majority of fish from this ESU return to the lower Columbia River to spawn between early December and March. Spawning occurs in tributaries to the Columbia River. Young hatch in spring, rear in freshwater for one year, and out-migrate to the ocean the following spring. Most juveniles out-migrate from April to August, with a peak in May. Coho salmon occur in the Columbia River estuary as smolts and limited estuarine rearing occurs (more extensive estuarine rearing occurs in Puget Sound).

Columbia River Chum Salmon. Fish from this ESU are distributed from Bonneville Dam to the MCR. Adults migrate from early October through November and spawning occurs in November and December. Spawning habitat includes lower portions of rivers just above tidewater and in the side channel near Hamilton Island below Bonneville Dam. Juveniles enter estuaries from March to mid-May and most chum salmon leave Oregon estuaries by mid-May. Most juveniles spend little time in freshwater and rear extensively in estuaries.

Snake River Sockeye Salmon. Fish from this ESU occur in the Salmon River, a tributary to the Snake River. This population migrates in spring and summer and spawning occurs in February and March. Spawning occurs in inlets or outlets of lakes or in river systems. Juveniles rear in freshwater and out-migrate in spring and early summer, out-migrating primarily between April and early June. They spend little time in estuaries as smolts and are guided to ocean waters by salinity gradients.

Snake River Basin Steelhead. Fish from this ESU occur in all accessible tributaries of the Snake River. Upstream migration occurs in spring and summer and spawning occurs in February and March. Spawning habitat includes upper reaches of tributaries. Juveniles spend from 1-7 years (average 2 years) in freshwater and out-migrate during spring and early summer.

Middle Columbia River Steelhead. Fish from this ESU are distributed from Wind River, Washington and Hood River, Oregon upstream to the Yakima River, Washington. These fish migrate in winter and summer and spawning occurs in February and March. Spawning habitat includes upper reaches of tributaries. Juveniles spend from 1 to 7 years (average 2 years) in freshwater and out-migrate during spring and early summer.

Upper Willamette River Steelhead. Fish from this ESU are a late-migrating winter group, rearing 2 years in freshwater and 2 years in the Pacific Ocean before returning to spawn. The run timing appears to be an adaptation to ascending Willamette Falls at Oregon City.

Lower Columbia River Steelhead. Fish from this ESU are distributed from Wind River, Washington and Hood River, Oregon downstream to the MCR. These fish migrate in winter and spring/summer and spawning occurs in February and March. Spawning habitat includes upper reaches of tributaries. Juveniles spend from 1-7 years (average 2 years) in freshwater and out-migrate during spring and early summer.

Upper Columbia River Steelhead. Fish from this ESU are distributed from the Yakima River upstream to the Canadian border. These fish migrate in spring and summer and spawning occurs in February and March. Spawning habitat includes upper reaches of tributaries. Juveniles spend from 1-7 years (average 2 years) in freshwater and out-migrate during spring and early summer.

Salmon Ecology in the MCR Area. Adult ESA-listed anadromous salmonids use the MCR area as a migration corridor to spawning areas throughout much of the Columbia River Basin. They are actively migrating and are not expected to use the area for resting or feeding, although they would spend time in the MCR to physiologically acclimate to freshwater. Chum, coho and Chinook salmon and steelhead populations spawn in tributaries to the Columbia River, and chum and Chinook salmon spawn in the mainstem Columbia River in appropriately sized gravels. No spawning would occur in the vicinity of the MCR for these species because of the lack of tributaries and appropriate spawning substrate.

Juvenile ESA-listed anadromous salmonids occur in the MCR area during their out-migration to the ocean. Juveniles that have already become smolts are present in the lower river for a short time period. Juveniles that have not become smolts, such as Chinook salmon sub yearlings, spend extended periods of time rearing in the lower river. They normally remain in the lower river or estuary until summer or fall, or even to the following spring when they smoltify and then migrate to the ocean. Rearing occurs primarily in shallow backwater areas. The majority of juvenile salmonids out-migrate in late spring and early summer, although fall Chinook salmon typically have a more extended outmigration period than other Columbia Basin salmonids and commonly out-migrate in late summer as well. Trestle Bay provides habitat utilized primarily by juvenile Chinook.

General run-specific life history descriptions for the various ESA-listed species shown in Table 10 are provided below.

Green Sturgeon. Green sturgeon is a widely distributed, marine-oriented sturgeon found in nearshore waters from Baja California to Canada (NMFS 2007). They are anadromous, spawning in the Sacramento, Klamath and Rogue rivers in the spring (NMFS 2007). Spawning occurs in deep pools or holes in large, turbulent river mainstreams. Two DPSs have been defined, a northern DPS with spawning populations in the Klamath and Rogue rivers and a southern DPS that spawns in the Sacramento River (NMFS 2007). The southern DPS was listed as threatened in 2006. The northern DPS remains a species of concern. Critical habitat for southern DPS green sturgeon was designated in 2009 and includes all tidally-influenced areas of the Columbia River to approximately RM 46 and up to MHHW and includes adjacent coastal marine areas [74 Federal Register (FR) 52300].

Green sturgeons congregate in coastal waters and estuaries, including non-natal estuaries, where they are vulnerable to capture in salmon gillnet and white sturgeon sport fisheries. Green sturgeon are known to enter Washington estuaries during summer when water temperatures are more than 2°C warmer than adjacent coastal waters (Moser and Lindley 2007). Sturgeon migrations are thought to be related to feeding and spawning (Bemis and Kynard 1997). They suggested that green sturgeon move into estuaries of non-natal rivers to feed. However, the empty gut contents of green sturgeon captured in the Columbia River gillnet fishery suggests that these green sturgeon were not actively foraging in the estuary [T. Rien, ODFW, pers. comm. in Moser and Lindley (2007)]. That they are caught on baited hooks incidentally during the sport season for white sturgeon suggests they are feeding in the estuaries.

Moser and Lindley (2007) used acoustic telemetry to document the timing of green sturgeon use of Washington estuaries. Sturgeon they captured were tagged, and released in both Willapa Bay and Columbia River estuaries. They deployed an array of four fixed-site acoustic receivers in Willapa Bay to detect the estuarine entry and exit of these and any of over 100 additional green sturgeon tagged in other systems during 2003 and 2004. Green sturgeon occurred in Willapa Bay in summer when estuarine water temperatures exceeded coastal water temperatures by at least 2°C. They exhibited rapid and extensive intra- and inter-estuary movements and green sturgeon from all known spawning populations were detected in Willapa Bay. Moser and Lindley (2007) hypothesized that green sturgeon optimize their growth potential in summer by foraging in the relatively warm, saline waters of Willapa Bay.

Information from fisheries-dependent sampling suggests that green sturgeon only occupy large estuaries during the summer and early fall in the northwestern United States. Commercial catches of green sturgeon peak in October in the Columbia River estuary, and records from other estuarine fisheries (Willapa Bay and Grays Harbor, Washington) support the idea that sturgeon are only present in these estuaries from June until October [O. Langness, WDFW, pers. comm. in Moser and Lindley (2007)]. Green sturgeon enter the Columbia River at the end of spring with their numbers increasing through June (B. James, WDFW, pers. comm. 2007 with W. Briner, Portland District). The greatest numbers are caught in the estuary in July through September. The majority of green sturgeon were caught in the lower reaches of the Columbia River based upon harvest information from 1981-2004 (B. James, WDFW, e-mail comm. 2007 with W. Briner, Portland District). There are no known spawning populations in the Columbia River and its tributaries.

<u>Pacific Eulachon</u>. The NMFS listed the southern DPS of Pacific eulachon (smelt) as threatened in March 2010. This DPS consists of populations spawning in rivers south of the Nass River in British Columbia, Canada, to and including the Mad River in California. The Columbia River and its tributaries support the largest known eulachon run. The major and most consistent spawning runs return to the mainstem Columbia River (from just upstream of the estuary at RM 25 to immediately downstream of Bonneville Dam) and in the Cowlitz River. Eulachon typically spend 3-5 years in saltwater before returning to freshwater to spawn from late winter through early summer. Spawning occurs in January, February, and March in the Columbia River. Spawning occurs at temperatures from about 39° to 50°F (4° to 10°C) in the Columbia River and tributaries over sand, coarse gravel, or detrital substrates. Shortly after hatching in late spring, the larvae are carried downstream. Shortly after emergence from their egg, eulachon are dispersed by estuarine and ocean currents into the ocean, indicating short rearing time in the estuarine environment. Juvenile eulachon move from shallow nearshore areas to deeper areas over the continental shelf. Larvae and young juveniles become widely distributed in coastal waters and are found mostly at depths up to about 49 ft. (Eschmeyer et al., 1983)

4.1.2.6. ESA-Listed Species Under USFWS Jurisdiction

The federally listed threatened and endangered species under the jurisdiction of the United States Fish and Wildlife Service (USFWS) that may occur in the proposed project area are shown in Table 12.

Table 12. ESA-listed Wildlife Species under USFWS Jurisdiction

Species	Status	Critical Habitat	Federal Register
Western Snowy Plover *(Charadrius nivosus nivosus)*	Threatened	Yes	58 FR 12864 12874; 5 March 1993
Bull Trout *(Salvelinus confluentus)*	Threatened	Yes	63 FR 31693 31710; 10 June 1998
Streaked Horned Lark *(Eremophila alpestris strigata)*	Threatened	Yes	78 FR 61506; 3 October 2013

General life history descriptions for the various ESA-listed species shown in Table 12 are provided below.

Western Snowy Plover. Western snowy plovers historically occurred in the vicinity of Clatsop Spit (USFWS 2001). Abundance of snowy plovers has declined significantly from historic levels but the population has been increasing due to protections afforded under the ESA, and there have been recent observations on the beaches in the vicinity of Clatsop Spit (D. Elbert USFWS personal comm.). In 2012, two snowy plover were sited during surveys at Clatsop Spit, but no nests were observed (Blackstone, 2012). As the snowy plover population on the southern Oregon coast continues to rebound, multiple reports of snowy plovers have been confirmed from historic locations in Clatsop and Tillamook Counties, several as recently as the 2014-2015 non-breeding period (D. Elbert USFWS personal comm.). Snowy plovers also occupy the southern Washington coast, a small population occurs on beaches at Leadbetter Point, Washington, which is more than 20 miles north of the project vicinity but they may pass through the area, or stop over at sites along the coast in Clatsop and Tillamook Counties during migration.

The closest Oregon nesting location is far south of the project vicinity at Bayocean Spit in Tillamook County. Though snowy plovers are not currently nesting at the South Jetty, the Oregon Parks and Recreation Department (OPRD) identified the northern-most tip of Clatsop Spit in their 2010 Habitat Conservation Plan (HCP) for western snowy plovers (OPRD 2010). This area is part of Fort Stevens State Park and would be managed for species recovery as OPRD develops its site management plan. In 2011, the Corps entered into a Memorandum of Agreement with federal and state partners including USFWS and Oregon Parks and Recreation Department (OPRD) regarding cooperation in implementing the snowy plover Habitat Conservation Plan (HCP) for the Clatsop Spit.

Bull trout. Occurrence of bull trout now in the lower Columbia River appear to be incidental. Four distinct life history patterns of bull trout have been identified: anadromous, adfluvial, fluvial, and resident. Habitat in the Columbia River is presently considered to be used sparingly for foraging, overwintering, and migration of adfluvial fish. Bull trout are dependent on cool water and their movements are limited by the availability of cool water.

Because habitat has been degraded in many basins and bull trout populations in these basins may be depressed, fish may utilize less optimal habitat including waters that anadromous salmon could occupy. Although bull trout prefer cold waters and nearly pristine habitat, they may occur in lower quality habitats because of their ability to seek out appropriate habitat niches (U.S. Fish and Wildlife Service 2000). The main environmental factor limiting distribution of bull trout is water temperature. They prefer temperatures of about 50 to 54° F with maximum summer temperatures not above about 60° F (Tomelleri 2002). Among the many factors that contributed to bull trout decline in the Columbia River Basin include: 1) fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements, 2) degradation of spawning and rearing habitat in upper watershed areas, particularly alterations in sedimentation rates and water temperature resulting from past forest and rangeland management practices and intensive development of roads, and 3) the introduction and spread of non-native species particularly brook trout *(Salvelinus fontinalis)* and lake trout *(Salvelinus namaycush).* These trout compete with bull trout for resources and brook trout hybridize with bull trout (Federal Register 2002).

High quality bull trout habitat is typically characterized by cold temperatures; abundant cover in the form of large wood, undercut banks, boulders, etc.; clean substrate for spawning; interstitial spaces large enough to conceal juvenile bull trout; and stable channels (U.S. Fish and Wildlife Service 2000). The Columbia River downstream of Bonneville Dam does not typically achieve water temperatures suitable for bull trout. Bull trout exhibit patchy distribution even in pristine habitats (Rieman and McIntyre 1993). Bull trout are piscivorous and frequent areas with overhead cover and coarse substrate and have been observed overwintering in deep beaver ponds or pools containing large woody debris (U.S. Fish and Wildlife Service 2000; Federal Register 2002).

Bull trout Critical Habitat for bull trout includes the Columbia River main stem downstream of Bonneville Dam to the ocean, along with other areas of the Columbia River Basin. Primary Constituent Elements (PCEs) for bull trout throughout the proposed project area include the following:

- Springs, seeps, groundwater sources, and subsurface water connectivity (hyporebie flows) to contribute to water quality and quantity and provide thermal refugia.
- Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.
- An abundant food base, including terrestrial organisms of riparian origin, macroinvertebrates, and forage fish.

- Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes with features such as large wood, side channels, pools, undercut banks and substrates, to provide a variety of depths, gradients, velocities, and structure.
- Water temperatures ranging from 2 to 15°C (36 to 59 °F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range varies depending on bull trout life history stage and form; geography; elevation; diurnal and seasonal variation; shade, such as that provided by riparian habitat; and local groundwater influence.

Streaked Horned Lark. According to the USFWS (2010b), the streaked horned lark once occurred from British Columbia, Canada, south to northern California and was a common summer resident in larger and smaller valleys on the west side of the Cascade Mountain range, wintering in eastern Washington, Oregon, and Northern California. Streaked horned larks have also been reported on islands in the lower Columbia River. The species is associated with bare ground or sparsely vegetated habitat and are known to nest in grass seed fields, pastures, fallow fields, and wetland mudflats, and can also be found in and along gravel roads and adjacent ditches. Nesting begins in late March and continues into June and consists of a shallow depression built in the open or near a grass clump and lined with fine dead grasses. The streaked horned lark feeds on the ground, and eats mainly weed seeds and insects.

Table 13. ESA-listed plant and insect species under USFWS Jurisdiction.

Species	Status	Critical Habitat	Federal Register
Nelson's checker-mallow (*Sidalcea nelsoniana)*	Threatened	**No**	58 FR 8235-8243; 12 February 1993
Oregon silverspot butterfly *(Speyeria zerene hippolyta)*	Threatened	**Yes**	45 FR 44935; 15 October 1980

General life history descriptions for the various ESA-listed species shown in Table 13 are provided below.

Nelson's Checker-mallow. This perennial herb has tall, lavender to deep pink flowers. Flowering occurs as early as mid-May and extends into September although Coast Range populations generally flower later and produce seed earlier (USFWS 2010c). Nelson's checker-mallow most frequently occurs in Oregon ash swales and meadows with wet depressions, or along streams, and species also grow in wetlands within remnant prairie grasslands or along roadsides at stream crossings where non-native plants, such as reed canary grass, blackberry, and Queen Anne's lace, are also present (USFWS 2010c). Nelson's checker-mallow primarily occurs in open areas with little or no shade and will not tolerate encroachment of woody species (USFWS 2010c). Critical habitat has not been designated.

Oregon Silverspot Butterfly. This butterfly occupies coastal headlands or Coast Range peaks that provide specific habitat features, primarily because of the presence of its host plant, the early blue violet (*Viola adunca*). The closest populations of this butterfly to the project area occur at

Camp Riles in Clatsop County, Oregon to the south and at Long Beach, Washington to the north. Suitable viola habitat was not observed during the plant community surveys on Clatsop Spit, and the only community where it could occur is in the tufted hairgrass community (Tetra Tech 2007b).

4.1.3. Human Environment

4.1.3.1. Cultural Resources

The area of potential effect (APE) has been identified as the relic root of the MCR South Jetty and the area where the rock removed from the jetty would be placed. If project components change, the APE may need to be modified. Jetty construction occurred between 1885 and 1895 on the Trestle Bay portion of the Columbia River South Jetty. Stone comprising the South Jetty and Trestle Bay is from the original construction action.

The South Jetty Root is eligible for listing in the National Register of Historic Places (NRHP) under Criterion A for its historical associations with the regional development and economies. Criterion A recognizes districts, sites, buildings, structures, and objects that are associated with events that have made a important contribution to the broad patterns of our history. In addition to the jetties structural aspects, due to its age and use, the State Historic Preservation Office (SHPO) also considers this structure an archeological site, but it has not been officially documented in their database. The jetty is the only known historic property within the APE. Other cultural resources in the vicinity include shipwrecks closer to the main channel of the Columbia River. The remnants of the train trestle that was used to construct the jetty have also been recorded as an archeological site.

The SHPO concurred with the APE in a letter dated March 16, 2015. The South Jetty was internally determined by the Corps to be eligible for listing in the National Register of Historic Places (NRHP) in 2006 by the Corps Technical Center of Expertise for the Preservation of Historic Buildings and Structures. In addition the South Jetty is listed as a historic structure in the SHPO database, although there is no specific date of concurrence. The trestle remnants were previously recorded as archeological site 35CLT104 during the South Jetty Dune Stabilization Project. At that time the trestle remnants were determined to be eligible for listing in the NRHP which SHPO concurred with August 19, 2013. As the project is currently designed the trestle remnants will not be impacted.

4.1.3.2. Socio Economic, Land Use, and Recreation

Lands at Trestle Bay are owned by the United States of America. Oregon Parks and Recreation Department operates the property as part of Fort Stevens State Park. The state of Oregon collects user fees for access to day use and camping facilities in the park. The Study Area does not support any other industrial, commercial or residential land uses or activities. The closest city to the Study Area is Hammond, Oregon. This city likely experiences economic benefit from the presence of the Fort Stevens State Park and Trestle Bay from tourist revenues. Recreation opportunities are abundant in Fort Stevens State Park. These opportunities include hiking, biking, beach combing, and exploration of historic features of the park. The park does not have trails or public access that access Trestle Bay or the jetty. The project area is far removed from public access and the jetty is not considered a recreational asset for Fort Stevens State Park. (pers. Comm. Dane, Osis, Park Ranger, OPRD, Greta Smith, 30 Dec 2014) Both the Corps and the OPRD stipulate that no official public access is allowed to the jetty structure itself but is not easily enforceable. [8]

4.1.3.3. Hazardous, Toxic, and Radioactive Waste

The Trestle Bay project area was screened for potential contamination from hazardous, toxic, and radioactive waste (HTRW) products during development of the Section 1135 Project (Corps 1994). From 1863 until 1946, the Army operated a harbor defense installation at Fort Stevens. As such, Trestle Bay was identified as part of the former Fort Stevens Military Reservation, which had been investigated and evaluated under the Defense Environmental Restoration Program for Formerly Used Defense Sites.

The closest source of any known upland contamination is approximately ½ mile southeast of Trestle Bay. In 1988, three abandoned transformers were found stored on an old fenced concrete pad on Fort Stevens, 300 ft from the nearest access road. Samples conducted in 1991 determined that less than 1 part per million (ppm) PCBs were present. The transformers were removed in 1991. The area was covered with a one-ft layer of sand and revegetated. In addition, a 1,000 gallon gasoline underground storage tank was removed from the park in 1992. Sampling found 11 ppm total petroleum hydrocarbons in the surrounding fill.[9]

PCBs remain at the transformer site at levels above the state standard of 0.08 ppm. However, given the transformer site's relatively remote location, the limited extent of contamination, and the one-ft sand cap, DEQ determined that the remaining contaminants pose no threat to human health or the environment. DEQ provided the Corps with a No Further Action determination for both sources of contaminants on the Fort Stevens property. The Trestle Bay project area at the north end of the former Army installation is some distance from the affected areas. No other sources of HTRW information were investigated or discovered for this Report. Because Trestle Bay is surrounded by Fort Stevens State Park, there has not been a marked increase in development in the area.

4.1.4. Climate Change

Climate change is likely to play an increasingly important role in determining the fate of wildlife species and the conservation value of habitats in the Columbia River. It is expected that climate change would exacerbate existing temperature, stream flow, habitat access, predation, and marine productivity issues (CIG 2004, ISAB 2007). According to the U.S. Global Change Research Program (USCGRP), average regional air temperatures have increased by an average

[8] As indicated in the Fort Stevens Master Plan:
http://www.oregon.gov/oprd/PLANS/docs/masterplans/ft_stevens.pdf
and the Corps of Engineers Jetty Safety pamphlets:
http://www.nwp.usace.army.mil/Portals/24/docs/pubs/jetty.pdf
[9] This information was obtained from: http://deq12.deq.state.or.us/fp20/data.aspx?mw=709&mh=460

of 1.5°F over the last century (up to 4°F in some areas), with warming trends expected to continue into the next century (2009). Warming is likely to continue during the next century as average temperatures increase another 3 to 10°F (USGCRP 2009).

These changes would not be spatially homogeneous across the Columbia River. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early spring would be less affected. Low-lying areas that historically receive scant precipitation contribute little to total stream flow and are likely to be more affected. Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (USGCRP 2009).

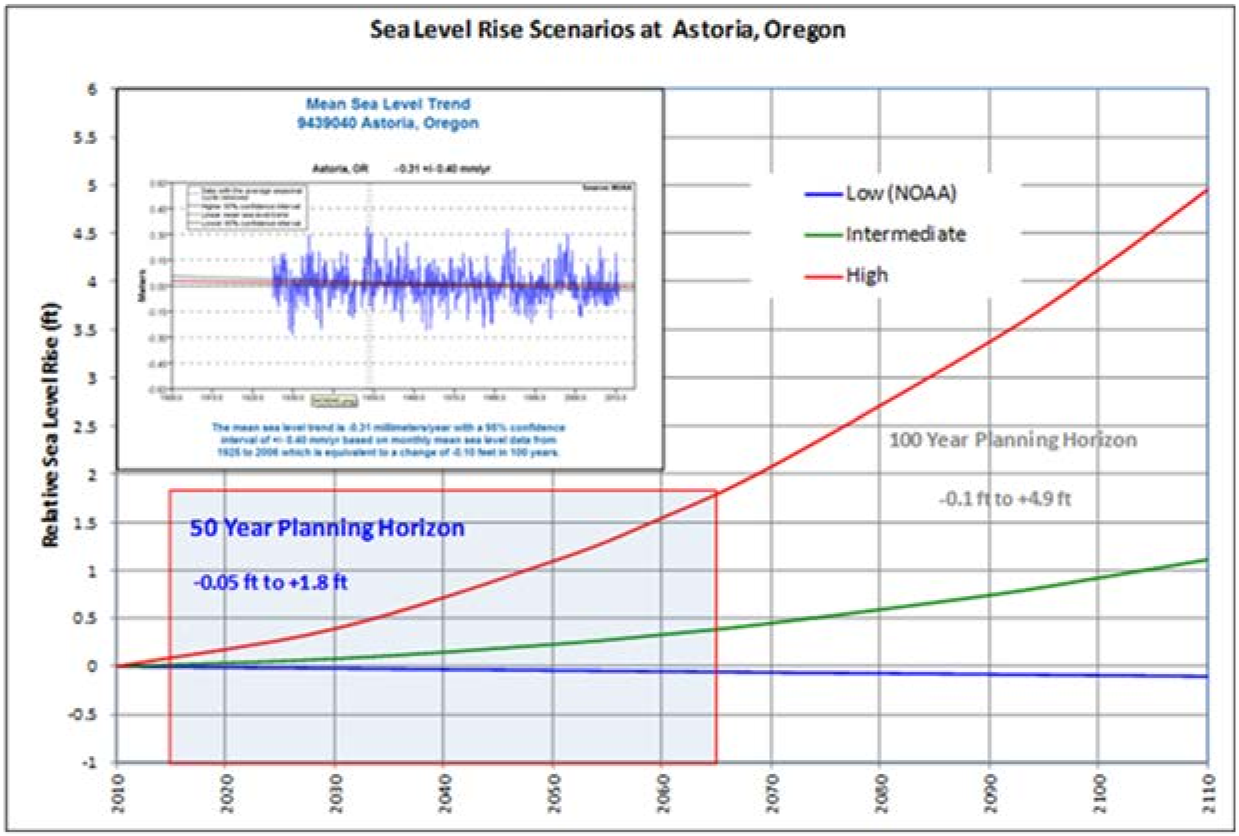
Precipitation trends during the next century are less certain than for temperature but more precipitation is likely to occur during October through March and less during summer months, and more of the winter precipitation is likely to fall as rain rather than snow (ISAB 2007, USGCRP 2009). If stream flows are unregulated, the Columbia River freshet is expected to occur three to four weeks sooner (Snover et. al, 2013).

Higher winter stream flows increase the risk that winter floods in sensitive watersheds would damage spawning redds and wash away incubating eggs (USGCRP 2009). Earlier peak stream flows would also flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and the risk of predation (USGCRP 2009). Lower stream flows and warmer water temperatures during summer would degrade summer rearing conditions, in part by increasing the prevalence and virulence of fish diseases and parasites (USGCRP 2009). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, variation in quality and quantity of tributary rearing habitat, and increased competition and predation risk from warm-water, non-native species (ISAB 2007).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend. Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances (USGCRP 2009). Ocean conditions adverse to salmon and steelhead may be more likely under a warming climate.

Evaluation of future sea level rise is outlined in EC-1165-2-212 (USACE 2011). The EC prescribes a method for defining three future projections of sea levels that are used to bound the estimate for sea level rise over time. The sea level projections (curves) are site specific and are derived based on the historical sea level trend (the local sea level change) blended with the eustatic change (the change in sea level due to changes in either the volume of water in the world oceans or net changes in the volume of the ocean basins). In EC-1165-2-212, Curve #1 defines the lowest expected bound for sea level rise, Curve #2 defines a prudent expected trend, and Curve #3 defines the highest expected bound. The sea level projections shown in Figure 14 are based on sea level data from the National Ocean Service (NOS) Station at Astoria, Oregon. Based on EC-1165-2-212, the degree of sea level change that may affect the project (at 50 years from 2014) would increase tidal water level elevations by 0 ft, 0.4 ft, or 1.8 ft; depending upon which of the three curves is applied.

Figure 14. Projected Sea Level Change



4.2. Future Without Project Condition (No-Action)

The Future Without Project (FWOP) Condition (also referred to as the No-Action under NEPA) forecasts expected changes to the study area without a Federal project. The FWOP Condition would still have limited access for aquatic species because the South Jetty Root would still be in place and would not degrade over time. The restricted access is due to the limited openings available on the jetty root structure and the elevation of that opening that does not enable access during lowest observed tidal water levels. In general, conditions within the study area are not anticipated to appreciable degrade during the period of analysis, nor are they anticipated to markedly improve. The study area would continue to experience full tidal circulation and habitats that currently exist are expected to persist. It is assumed that in the FWOP conditions sea level rise would be similar to what is describe in section 4.1

5. Environmental Consequences

The environmental baseline conditions described in Chapter 4 of this document establish a current description of the affected environment or environmental condition of a project area. Baseline conditions are used to evaluate and predict the effects of taking no action (FWOP) or implementing the proposed action (FWPC). As described in Section 4 of this document, prior to the construction of the MCR jetties in the late 1800s, the entrance into the Columbia River was dominated by a large open-water network of submerged, shallow sandbars. Construction of the MCR South Jetty contributed to the evolution of the present-day morphology of Clatsop Spit. Trestle Bay formed as a jetty lagoon on the Clatsop Spit side of the South Jetty, forming a closed bay. In 1995, a 500-ft segment of the South Jetty Root was lowered, allowing for Trestle Bay to be directly accessible to certain aquatic species for the first time since the formation of Trestle Bay. Currently, Trestle Bay consists of 628 acres of varied partially enclosed natural habitat.

This section describes direct, indirect and cumulative impacts to environmental resources that are likely to occur under the no action and the proposed action alternatives. The no action alternative would be the state of the project area under the anticipated future condition if no action is implemented. The proposed action alternative would be the state of the project area under the anticipated future condition if the proposed action is implemented. The following effects of the no action and proposed action are described: physical, biologic, and human environment. Section 7 addresses applicable environmental laws and regulations and describes how the Corps is complying with applicable laws.

5.1. Physical Environment

5.1.1. Tidal Hydraulics

5.1.1.1. No Action Alternative

If no action were taken, the tidal hydraulics and inundation in the project area would remain relatively unchanged. Trestle Bay would remain a partially enclosed, tidally influenced riverine embayment. The Columbia River along this reach would continue to serve as a navigation corridor and would retain natural river flow characteristics. The Section 1135 opening would continue to concentrate higher velocity flows at mid tides.

5.1.1.2. Proposed Action Alternative

Under the proposed action, the tidal water levels are not expected to change because there is full tidal exchange already occurring through the permeable rock jetty under present-day conditions. With each flood and ebb tide, the volume of water passing through the entire length of the jetty (estimated at approximately 800 acre-ft between Mean High and Mean Low Tide) will remain unchanged assuming there is no associated erosion or accretion within Trestle Bay.

The proposed action will increase the openings in the jetty, i.e., it will increase the cross sectional area through which the tidal water volume of each flood and ebb tide will pass. Therefore, there will be a corresponding lowering of the overall water velocities passing through the entire length of the jetty at any given time in the tidal cycle following the volumetric flow rate equation as follows:

$$Q = vA,$$

where, Q, is volumetric flow rate in cubic feet per second at any particular moment in the tidal cycle, v, is velocity in feet per second, and A, is cross sectional area in square feet. The 900 cumulative linear feet of proposed opening is approximately 10% of the 8,800 linear feet of existing jetty that encloses the bay. This corresponds to an approximate increase in cross sectional area, A, of 10%, which would translate into a relative decrease in overall velocity, v, through the jetty of approximately 10% at any given time in the tidal cycle. This relationship is maintained because Q will remain unchanged as long as there is no net erosion or accretion within the enclosed bay as a result of the project.

The permeable rock jetty exerts greater frictional forces on the flows through the circuitous pathways through the jetty than would be exerted on flows through the full openings in the jetty. This difference in frictional forces between the proposed openings and the circuitous pathways through the permeable jetty will be the primary driver of the changes in circulation patterns of flows in the bay, particularly at the jetty. Locating the openings at existing prominent drainage/flow paths through the degraded jetty would more likely result in changes that would continue to support the present day functioning of the existing system while maximizing access opportunities.

Localized lowering of water velocities is generally associated with increased sedimentation and/or accretion. Localized increases in water velocities, greater than the threshold for incipient motion of the local sediment, is generally associated with sediment scour/erosion. Thus, the changes in current patterns and circulation within Trestle Bay will also result in changes in sedimentation patterns. The extent of these changes will depend on the exact details of the opening sizes and locations. The 2-dimensional hydrodynamic modeling efforts will provide depth-averaged information regarding the changes in the current patterns and circulation within Trestle Bay, which can be used to infer the associated changes in sedimentation patterns so that a balance can be maintained between the localized effects of any possible erosion and accretion.

5.1.2. Water Quality and Sediment Quality

5.1.2.1. No Action Alternative

If no action were taken, the long-term water quality and sediment quality would remain relatively unchanged. It is expected there will be no changes to sediment quality because there is no expected change to sediment transport mechanisms (tidal action) or the erosion/deposition rates (generated by storm events). Tidal action is expected to continue to scour sediments at the Section 1135 breach as demonstrated in a comparison of aerial photographs taken before and after 1997. Current photographs show the formation of dendritic channels at the Section 1135 breach site. No accretion of sediments have been observed. This is further supported by the general trend in the reduction of fines from the 2000 NMFS study of the Section 1135 project. This reduction in fines potentially leads to less organic material within the sediment in Trestle Bay. The reduction in organic material would likely not change the current water or sediment quality within the project area. Any changes in Trestle Bay's turbidity generated naturally during tidal and storm events would not be discernible. There are no foreseeable changes in potential sources of contamination to the water column or sediment.

5.1.2.2. Proposed Action Alternative

The proposed action at Trestle Bay may have a long-term beneficial effect on water quality. The openings would allow for improved water quality as well as nutrient and detritus exchange due to improved interchange of water with the Columbia River. There may be a temporary increase in localized turbidity during and immediately following the construction of the openings in the jetty due to in-water work.

The large jetty rock being moved does not contain fine sediments. Jetty rocks imbedded in the riverbed would also be moved, disturbing finer grained sediments, resulting in localized turbidity. Placement of rock material from the South Jetty Root into the Columbia River adjacent to the structure may result in localized, temporary disturbance of submerged soils. This would temporarily increase turbidity and temporarily degrade water quality. However, the project would be constructed in February, when turbidity levels are naturally higher. Turbidity generated as a result of the construction may not be discernible when compared to surrounding conditions. Localized turbidity is expected to return to ambient conditions when construction ends.

The proposed action may see a discountable change in the sediment profile within and adjacent to Trestle Bay over time. The additional openings in the jetty would allow for improved sediment and nutrient exchange. No long-term sediment quality effects are anticipated because no new sediments are being introduced to the site. Existing on-site sediments are expected to be scoured in the area of the additional openings during ebb tides, exposing previously accumulated coarse-grained native sediments. The rock removed from the existing jetty root will be side cast into waters of U.S. However, this rock has been in place since the 1880s and does not contain contaminants due to its coarse size. The proposed action would not introduce sources of contaminated sediment nor expose contaminated sediment. Under the proposed action, sediment quality would likely remain unchanged.

5.1.3. Geology and Soils

5.1.3.1. No Action Alternative

If no action were taken, geology and soils in the project area would remain unchanged.

5.1.3.2. Proposed Action Alternative

The proposed action would have localized minor effects on geology and soils. Placement of rock material from the South Jetty Root into the Columbia River adjacent to the structure may result in localized, temporary disturbance of riverbed. This is not anticipated to result in long-term adverse instability of the soils in the project area. Project design of the opening size and the quantity of opening would be constrained to ensure that the resulting environment does not experience substantial amounts of sediment accretion or erosion of the substrate that exists in the bay.

5.1.4. Air Quality and Noise

5.1.4.1. No Action Alternative

If no action were taken, there would be no impact to air quality and no construction noise generated and no change to existing conditions.

5.1.4.2. Proposed Action Alternative

Project construction may result in short term increase of regulated air pollutants from construction equipment; however, these emissions will not exceed the standards set by NAAQS. There also would be temporary and localized increases in noise levels from construction equipment, however these impacts would be minor and temporary in nature (construction is scheduled to be complete in less than one month), and would cease once removal of the rock and subsequent placement is completed.

5.2. Biological Environment

5.2.1. Aquatic and Terrestrial Communities

5.2.1.1. No Action Alternative

If no action were taken, the terrestrial vegetation currently present in the project area may experience naturally occurring successional habitat change but this change is not anticipated to greatly change the overall vegetation quantity or quality in the project area. The habitat would remain isolated from the rest of the LCR estuary and would continue to remain inaccessible to fish during low tide.

5.2.1.2. Proposed Action Alternative

The proposed action is not likely to have a measureable impact on aquatic or terrestrial habitat within the project area. Ground disturbing activities would not occur within vegetated areas, and the removed rock material would not be placed in vegetated areas. Further, the project would not result in changes to water surface elevations or area inundation. As such, it is not anticipated that the quantity or composition of the project area upland plant community would change as a result of this project. Naturally occurring aquatic habitat succession may alter the habitat composition over time. The project area would be reconnected to the LCR estuary and would provide improved fish access to Trestle Bay. Changes in the overall embayment circulation and redistribution of current velocity across multiple opening may promote eelgrass growth. (Short and Coles 2001) Eelgrass potentially could populate more of Trestle Bay, leading to increased productivity and ultimately, potential increased use by juvenile salmonid. Increased productivity in Trestle Bay could improve overall habitat and wildlife/aquatic foraging opportunities in the lower Columbia River. It is assumed that any increases in overall habitat and foraging opportunities within the lower Columbia River would be beneficial.

5.2.2. Wetlands

5.2.2.1. No Action Alternative

If no action were taken, wetlands within in the project would remain unchanged in the short term but could change over time due to natural habitat succession of plant communities in estuarine environments.

5.2.2.2. Proposed Action Alternative

Under the proposed action, wetlands within in the project area may naturally evolve over time due to natural habitat succession normally experienced by plant communities. However, it is anticipated that there would not be a great deal of change within the wetland community in Trestle Bay. The proposed action would have no effect on wetlands. Ground disturbing activities would not occur within wetlands, and rock material would not be placed in a wetland. Further, the project would not result in indirect changes to wetlands because the water surface elevation or area inundation would remain the same. As such, it is not anticipated that the quantity or composition of the wetland community would change as a result of this project.

5.2.3. Aquatic Species and Marine Mammals

5.2.3.1. No Action Alternative

If no action were taken, access to Trestle Bay would continue to be limited for salmonid species. The aquatic species population composition may change if the environment adjacent to the project area experiences natural successive change to the habitat present to support different species. These different species might then enter the existing Trestle Bay access point to occupy the bay. However, it is not anticipated that much change in the fish and aquatic species population composition would occur under the No Action.

5.2.3.2. Proposed Action Alternative

Under the proposed action, there may be short-term minor adverse effects on fish and aquatic species present within the project area. Placement of rock material from the South Jetty Root into the Columbia River adjacent to the structure may result in localized, temporary disturbance of submerged soils and may displace fish and aquatic species present in the placement zone. Placement of rocks could generate a convective displacement plume, pushing fish and aquatic species out of the impact zone. There would be some loss of benthic organisms during initial placement of rocks within the water column.

The proposed action would temporarily increase turbidity, and cause temporary disturbance to adjacent aquatic habitat. The proposed action has a relatively short duration with construction anticipated to occur over a three week period. Construction would occur during the wintertime, when turbidity levels are naturally higher. Turbidity generated as a result of the construction may not be discernible when compared to surrounding conditions. Localized turbidity is expected to return to ambient conditions when construction ends. The work would be conducted during the in-water-work window of 1 November thru 28 February (ODFW 2008). It is expected that there would be fewer fish migrating though the LCR during this time period.

Rock would be placed in the adjacent aquatic habitat. The placement of rock would permanently convert the sandy substrate into a rocky outcrop; however, the areas containing the rocks previously would become aquatic, sandy habitat. It is anticipated that there would be no gain or loss of shallow water habitat as a result of the proposed action. The placement of the rock will result in localized permanent loss in benthic habitat; however, the newly exposed riverbed is expected to recolonize with benthic invertebrates. It is expected that there will be no net gain or loss in overall benthic habitat. The proposed project would have long-term beneficial effects on fish and aquatic resources. By opening up sections of the South Jetty Root and increasing the availability of access along the structure, the opportunity for access to the off channel habitat of Trestle Bay increases. Increased habitat availability improves survivability and population dispersal.

The proposed construction activities could potentially disturb Steller sea lions or other marine mammals migrating through the Columbia River. Equipment used in the removal and placement of jetty stone and mobilizing the barge to the project area could cause some marine mammals to avoid the area as they migrate through the lower Columbia River estuary. However, it is unlikely this would rise to a level of harm or harassment of marine mammals because of the short duration of construction (i.e. approximately 3 weeks total), the barge will be grounded to minimize movement of construction equipment and that the nearest known haul-out for Stellar sea lions is 2 miles downstream.

5.2.4. Wildlife Species

5.2.4.1. No Action Alternative

If no action were taken, wildlife species would continue to utilize the Trestle Bay area for foraging and roosting as described in Chapter 4.

5.2.4.2. Proposed Action Alternative

Wintering birds or other wildlife that roost, or forage near the project area may be disturbed or may avoid the area during construction activities (Nov 1- Feb 28). The proposed action may have some long term beneficial impact on wildlife by improving the composition of fish and aquatic populations in Trestle Bay.

5.2.5. Endangered Species Act-listed Species

5.2.5.1. ESA-Listed Species Under NMFS Jurisdiction

5.2.5.1.1. No Action Alternative

Under the no action, aquatic access to Trestle Bay would remain limited. Threatened, endangered, and special status salmonid species population composition may change if the shoreline adjacent to the project area experiences successive changes to the habitat; however, it is anticipated that the main habitat adjacent to the South Jetty Root will remain as an estuarine embayment and there would be little to no change in the threatened, endangered, and special status species population composition in the project area.

5.2.5.1.2. Proposed Action Alternative

Under the proposed action, there may be short-term minor adverse effects on salmonids and aquatic species present within the project area during construction. It is unlikely that green sturgeon and eulachon utilize Trestle Bay as it is not their preferred habitat. All ESU of salmonids may utilize Trestle Bay during their rearing and outmigration; Chinook are more likely to use this habitat due to their extended rearing time in the lower Columbia River.

The majority of potential impact likely would occur during the construction phase of the project. Construction would be conducted by a crane mounted on a barge. One rock would be removed and placed at a time. Salmonids are able to escape entrainment by mechanical equipment and are able to vacate the area during the intentional placement of rock. Placement of rock material from the South Jetty Root into the Columbia River adjacent to the structure may result in localized, temporary disturbance of submerged soils. This would temporarily increase turbidity, degrade water quality, and cause temporary disturbance to adjacent aquatic habitat. However, the project would be constructed in the wintertime, when turbidity levels are naturally higher. Turbidity generated as a result of the construction may not be discernible when compared to surrounding conditions. Localized turbidity is expected to return to ambient conditions when construction ends. Turbidity is expected to return to preconstruction water quality and habitat conditions would return to preconstruction conditions.

The threatened, endangered, and special status species population composition may change if the environment adjacent to the project area experiences naturally occurring successive changes to the habitat. Though there may be short-term minor adverse effects on listed salmonids, the proposed action is expected to have long-term beneficial effects to listed salmonids. The purpose of the project is to provide improved foraging and rearing conditions and increase access to shallow-water habitat. It is anticipated that the threatened and endangered juvenile salmonid species would use Trestle Bay more frequently due to improved access to suitable foraging and rearing habitat. It is likely Trestle Bay would continue to mainly attract juvenile Chinook. Increased habitat availability improves survivability and population dispersal.

5.2.5.2. ESA-Listed Species Under USFWS Jurisdiction

5.2.5.2.1. No Action Alternative

Under the no action, bull trout access to Trestle Bay would remain limited. It is likely that bull trout would not access this habitat. Trestle Bay does not provide the type of habitat preferred by bull trout. Sightings of western snowy plovers may increase as the population increases as described in Section 4.1.2.6. Use by streaked horned larks within Trestle Bay would remain unlikely under the no action, as the bay is continually inundated and does not provide the type of habitat preferred by the species.

5.2.5.2.2. Proposed Action Alternative

Under the proposed action, bull trout access to Trestle Bay would improve, however it is unlikely that bull trout would utilize Trestle Bay because it does not provide the type of habitat preferred by bull trout. Use of the LCR estuary near Trestle Bay by bull trout is likely minimal or nonexistent; bull trout from the Columbia River Basin are not anadromous, nor has there been recent documentation of bull trout presence close to the mouth of the Columbia River (USFWS 2010a).

Western snowy plovers have been documented foraging within the intertidal zone, and gathering food from both above and below the sand surface. Use of intertidal areas may be greater where there is no offshore kelp beds to form well-developed wrack such as in northern California, Oregon, and Washington. The proposed action could will likely result in some localized scour at where the jetty root is opened which in the long term could result in increased sediment or loss of intertidal zone. However based on monitoring results from NMFS after the 1995 opening, this would represent a small portion of the remaining intertidal zone and would not limit overall potential foraging opportunities for Western snowy plovers in the project area.

Streaked horned lark presence within or use of Trestle Bay would remain unlikely under the proposed action, as the bay is continually inundated and does not provide the type of habitat preferred by the species. The Corps determined that the proposed action would have no effect to bull trout, western snowy plovers, and streaked horned larks and would have no effect to their critical habitat. The proposed construction would have no effect on adjacent Western snowy plover or streaked horned lark habitat. All work would be conducted from the water and not near designated critical habitat. The Corps contacted USWFS to discuss the proposed action; based on these discussions, the Corps determined there would be no effect to listed species or their critical habitat under the jurisdiction of USFWS and that ESA consultation is not required. (Allen, C. and Roberts, K. USFWS. Pers. Comm. 16 September 2014. Smith, G.)

5.3. Human Environment

5.3.1. Cultural Resources

The only known property eligible for listing in the National Register of Historic Places within the project area is the jetty root itself. This includes considering the jetty as a structure and an archeological site per the Oregon State Historic Preservation Office guidance. There are no other historic properties within the project area and the likelihood for them to exist in this location is low.

5.3.1.1. No Action Alternative

If no action were taken, cultural resources in the project area would not change. The South Jetty root would not be directly affected.

5.3.1.2. Proposed Action Alternative

The proposed action would remove 900 linear ft of the South Jetty root which is considered an historic property eligible for the National Register of Historic Places. However, there would still be approximately 7,400 linear ft of jetty intact within Trestle Bay, and thus the action would only have a minimal impact on the overall historic structure. Furthermore, the segment of jetty in Trestle Bay which would be removed became obsolete as a functional jetty soon after it was constructed. Therefore while the structure is considered eligible to the National Register for its contribution to regional development and economies, the proposed action would not affect the components of the structure which make it eligible.

During early informal coordination with the SHPO, it was requested that the jetty be recorded as a structure and an archeological site due to its age. That documentation has been completed and consultation was initiated on the Corps' effects determination with a letter dated May 14, 2015. The South Jetty Root that extends into Trestle Bay is being considered a historic structure at this time. Archeological Investigations Northwest (AINW) in collaboration with CREST and the Corps evaluated the proposed action while considering the characteristics that make the South Jetty eligible for the NRHP. In this evaluation they recommended the South Jetty in its entirety as retaining integrity of location, materials, workmanship, design, setting association, and feeling. In considering these characteristics AINW recommended a finding of "No Historic Properties Adversely Affected." The Corps has reviewed that document and concurs with that finding. More specifically the Corps concurs that the abovementioned historical characteristics will not be adversely affected considering a substantial portion of the jetty within Trestle Bay will be extant. In addition the segment of the jetty within Trestle Bay is not as significant operationally as the segment on the west side of Clatsop Spit that extends into the Mouth of the Columbia River. This determination along with the documentation produced by AINW will be coordinated with SHPO.

With respect to archeological considerations, since this project will be done by barge there will be no in-water or upland ground disturbance associated with the project with the exception of the placement of the rock adjacent to the jetty itself (if that is the preferred alternative). Therefore, although there are sites I the vicinity, they would not be affected by the proposed project. If one was to consider the jetty itself an archeological site that would imply that the jetty is no longer an extant structure. As such the jetty segment in Trestle Bay was documented only as a structure for the purposes of this project given the characteristics that make it significant are structural and not archeological.

For tribal coordination, government-to-government initial coordination letters have been sent out and to date no concerns have been received. In addition to this coordination, the “no adverse effect” determination is also being coordinated with the tribes with a request for any information pertaining to potential Traditional Cultural Properties. The following Tribes have been consulted as part of the this process: Confederated Tribes of the Grand Ronde, Confederated Tribes of Siletz Indians, Confederated Tribes of Warm Springs, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes and Bands of the Yakama Nation, the Cowlitz Tribe, and the Nez Perce Tribe. Given Clatsop Spit has been created in modern times and the immediate project APE would have been substantially disturbed by the construction of the jetty itself, significant tribal concerns are not expected on this project

5.3.2. Socio Economic, Land Use, and Recreation

5.3.2.1. No Action Alternative

If no action were taken, socio-economic, land uses, and recreation in the project area would remain unchanged.

5.3.2.2. Proposed Action Alternative

The proposed action would have no effect on the socio-economic landscape, adjacent land uses, or recreation. Project construction would not change uses of the adjacent park, displace homes or business, or result in long-term economic changes to nearby communities. Prior to construction, OPRD would be notified. OPRD would determine whether a construction caution advisory would need to be issued to the public. It is likely that there would be no change to recreational access due to inaccessibility and lack of staging area.

5.3.2.3. Hazardous, Toxic, and Radioactive Waste

Hazardous materials including hazardous substances and wastes are regulated by many federal laws. Statutes govern the generation, treatment, storage and disposal of hazardous materials, substances, and waste, and the investigation and mitigation of waste releases, air and water quality, human health, and land use.

5.3.2.4. No Action Alternative

If no action were taken, there would be no change in existing conditions described in Section 4.3.2.4.

5.3.2.5. Proposed Action Alternative

No HTRW sites are known to occur within the project area. Land uses within the project area would not change as a result of the proposed action to enable industrial or other high risk uses. As such, under the proposed action, HTRW in the project would remain unchanged.

5.4. Climate Change and Sea Level Change

5.4.1.1. No Action Alternative

The effects of climate change under the no action alternative (the planning horizon of this project is 50 years, extending from present to the 2060s) may result in changes in temperature, precipitation, and sea levels at Trestle Bay. As described in the previous Chapter 4, Section 4.1.4, the annual mean temperatures in the Lower Columbia River system are likely to rise through the end of century (an increase of anywhere from 3 to 10 degrees F). Seasonal variations are likely to result in summertime warming to be greater than the current mean annual temperatures. Precipitation patterns are likely to change in the Columbia River watershed basin (from the source to the mouth and all tributaries). Annual precipitation amounts will likely be about the same; however, winter and fall will likely be wetter and summer times will be drier. The Columbia River flow regime will likely change. The climate change forecast that unregulated Columbia freshets will arrive on average 4 weeks earlier. Hydro-regulation makes anticipating the exact form and duration of future freshets difficult to estimate.

Sea level rise is projected to change by the 2060s. The Corps provides estimates and guidance (EC 1165-2-212) for addressing and quantifying climate change induced sea level change (SLC). Based on the Corps' SLC curves (using relative sea level rise as measured at the Astoria gage), the project could experience changes in tidal elevations of -0.1 ft, +0.4 ft, or +1.8 ft (lowest, expected trend, and highest expected).

5.4.1.2. Proposed Action Alternative

The proposed project is situated at the MCR where flows are diffused across the wide river mouth. Complex tidal and hydrologic forces (i.e. large synoptic storm fronts) are frequently at play in this location. Further, mixing of salt and fresh water create a complex and sensitive tidal habitat. Climate change may alter the nature of these existing processes at the site. In particular, the medium and high levels of sea level change have the potential to impact shoreline habitat within Trestle Bay.

The Corps' guidance indicates that projects should incorporate the direct and indirect physical effects of future sea level change across the life cycle of the project. The PDT performed vertical alignment of the climate change issues. At this point in the process, it was decided that climate change should be addressed using the information available and approach the issue with a qualitative assessment. Future uncertainty could be reviewed during future stages of the project (design stage) by providing a more in-depth inundation and sedimentation analysis and model. Providing this analysis will provide more clarity about the potential habitat impacts related to climate change. However, items such as specific sea level rise impact, where distinct projections had been identified for the site using Corps' methodology and information, would be considered qualitatively at this time. Therefore, PDT qualitatively evaluated the risk associated impacts from the range of possible future rates of sea level change represented by the 3 scenarios (low, intermediate and high sea level change).

Comparisons between the no action and proposed action indicate that the SLC and its impacts would be the same; there is not a relative change in risks between these two future project conditions. Overall, SLC (i.e. sea level rise) will potentially create additional access to the site and may increase the expected ecological benefits, just sooner. However, there is a risk element from SLC.

The proposed action considers impacts from future climate change, e.g. SLC, as a risk element to be addressed by the alternative formulation. For this project the impact from SLC was qualitatively considered. Another guiding principle is to not discount potential ecological benefits attainable in the immediate time frame because of potential future climate change. The PDT approached climate change with the goal of addressing it but not at the expense of attainable ecological benefits obtained through implementation of the proposed action.

SLC impact was assessed for this study based on the Corps' SLC curves noted above. Qualitative determination of effects indicate that change in sea level would likely result in distinct physical changes to Trestle Bay. Increased water depth (which increases the potential area of inundation within Trestle Bay) may lead to changes along the shoreline in Trestle Bay. SLC was considered to have the highest level of certainty (i.e. a specific target condition to evaluate) as well as having a medium potential to impact the surrounding habitat. A general rise of water level usually results in a recession of the existing shoreline relative to the current one. Secondary effects were also considered; SLC may be result in increased sedimentation within Trestle Bay as the future inflow volume and sediment loads potentially increases. These physical changes of water surface change could affect the existing fridge habitat. There is a feedback component, as accretion could offset relative SLC. There was not enough accretion rate information or hydraulic modeling to quantitatively estimate this impact.

The most likely impact from climate change would be the effect of SLC on the fringe habitat. The habitat within Trestle Bay is sensitive to changing water levels. A rise as minimal as a 0.4 foot in elevation has the potential to impart rapid successional changes to fringe and shoreline habitat. However, due to the complexity of the interactions, it is difficult to quantify the future effects. The potential effects to consider from SLC on habitat include a change in nutrients available for foraging wildlife and fish. It is assumed that any effects climate change might have across the project area during this timeframe would be negligible and effects to any aquatic or terrestrial habitat would be immeasurable when compared to the no action described above.

In Summary, Anticipate sea level rise will not measurably change the project. The future with project and future without both have similar SLR changes, (there is no significant difference between the two). The proposed project does not exacerbate the impacts caused by climate changes, and therefore there is no impacts, such as to shoreline habitat shifts or erosion, that this project contributes to in the climate change scenario.

5.5. Cumulative Impact

Cumulative effects are defined 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). Cumulative impacts can result from individually minor, but can collectively become a measureable impact actions taking place over a period of time. Resources determined not to have the potential to result in measurable cumulative effects were not addressed in this analysis. These resources include: geology, hydrology, sediment quality, cultural/historic and recreation. In general, effects of a particular action or group of actions would be considered to have a measureable cumulative impact if one of the following conditions is met:

- Effects of several actions occur in a common location;
- Effects are not localized (i.e., can contribute to effects of an action in a different location);
- Effects on a particular resource are similar in nature (i.e., affects the same specific element of a resource); and
- Effects are long-term (short-term impacts tend to dissipate over time and cease to contribute to cumulative impacts)

Noting that environmental impacts may result from many diverse sources and processes, Council on Environmental Quality (CEQ) guidance observes that "no universally accepted framework for cumulative effects analysis exists," while noting that certain principles have gained acceptance and "the list of environmental effects must focus on those that are truly meaningful." *Considering Cumulative Effects Under the National Environmental Policy Act* (1997). Assessing cumulative impacts may involve assumptions and uncertainties because data on the environmental effects of other past, present, and reasonably foreseeable actions are often incomplete or unavailable. As a result, impacts on resources often must be expressed in qualitative terms or as a relative change. For this section cumulative impacts were assessed using guidance from CEQ.

Geographic boundaries for the analyses of cumulative effects vary for each resource. The proposed temporal boundary for analyses of cumulative impacts is the late 1880s, when the original authorization of the federal channels and the North and South Jetties first occurred and to the extent that they have had lasting effects contributing to cumulative impacts. The reasonably foreseeable nature of potential future actions helps define the forward-looking temporal boundary. While ongoing restoration activities could continue for many more years and could contribute to cumulative impacts during that timeframe, it would be speculative to consider actions beyond what is reasonably foreseeable. Given this limitation, the forward-looking temporal boundary has been established at about 10 years, which is a reasonable timeframe by which the reasonably foreseeable future actions identified below would likely be completed. Cumulative impacts are those that result from past, present, and reasonably foreseeable future actions, combined with the potential impacts of the proposed project. A cumulative effect assessment looks at the collective impacts posed by individual land use plans and projects. Cumulative impacts can result from individually minor, but collectively substantial impacts taking place over a period of time.

Cumulative impacts on resources in the project area may result from the impacts of constructing openings in the South Jetty Root together with other past, present, and reasonably foreseeable projects such as residential, commercial, industrial, and other development. Such land use activities may result in cumulative effects on a variety of natural resources such as species and their habitats, water resources, and air quality. Additionally, they can also contribute to cumulative impacts on the urban environments such as changes in community character, traffic volume and patterns, increased noise, housing availability, and employment.

5.5.1. Affected Environment

This section identifies past, present, and reasonably foreseeable projects that could incrementally contribute to resources affected by the no action or the proposed action.

Past actions relevant to the cumulative analysis in this document are those that have previously taken place and are largely complete, but that have lasting effects on one or more resources that would also be affected by the proposed action. For these past actions, CEQ guidance states that consideration of past actions is only necessary to better inform agency decision-making. Typically the only types of past actions considered are those that continue to have present effects on affected resources. Past actions are summarized below and their effects, which have resulted in the existing conditions, as described in Section 22.

- Early settlement of the Columbia River Basin during the late 1800s and early 1900s.
- Authorization of the Federal Navigation Channel and associated navigation projects (side channels, basins, anchorage areas) by the Rivers and Harbors Acts of 1878, 1884, 1892, 1902, 1910, 1912, 1919, 1930, 1933, 1935, 1937, 1938, 1945, 1946, 1954, and 1960.
- Construction, maintenance and periodic reconstruction of the jetties at the MCR by the Corps.
- Construction, maintenance and periodic reconstruction of pile dikes, levees, and bridges in, over, or adjacent to the Columbia River.
- Continued use, maintenance, and operation of multi-purpose dams in the Columbia River and Willamette River basins.
- Continued human use and modification of the Columbia River estuary, the surrounding area, and tributaries feeding into the river up until the passing of the CWA. This included clearing for timber harvest and agricultural development, urban development of towns and cities near the shoreline, highways and railroads, and power and utility lines.
- Navigation facilities (including both commercial and recreational docks and marinas) constructed and maintained by various ports along the Columbia River.
- Corps' annual maintenance dredging and placement activities.
- Recreational facilities established by federal, state, and local agencies.
- Federal permits for aquatic and wetland impacts within the lower Columbia River and tributaries.

Commercial and residential development has occurred in the area. Present actions are those that are currently occurring and also result in impacts to the same resources as would be affected by the proposed action. Present actions generally include on-going use activities (waterfront activities) and recently completed development (new or replaced docks, dredging, and waterfront development).

Reasonably foreseeable future actions are those actions that are likely to occur and affect the same resources for the proposed action. For a future action to be considered reasonably foreseeable there must be a level of certainty that it would occur. This level of certainty is considered met with the submission of a formal project proposal or application to the appropriate jurisdiction, approval of such a proposal or application, inclusion of the future action in a formal planning document, or other similar evidence. For future actions in the proposal stage, the action also must be sufficiently defined in terms of location, size, design, and other relevant features to allow for meaningful consideration in the cumulative analysis. Present and reasonably foreseeable actions include many of the same operational and maintenance activities described in the above list. To determine whether there are other present and/or future actions reasonably certain to occur in the project area, Corps studies of the area were reviewed, outstanding Corps regulatory permits were reviewed for proposed large-scale actions and county planning offices queried. The following actions were identified as being reasonably certain to occur over the next ten years:

Corps actions:

- Mouth of Columbia River Jetty Rehabilitation Project: continuing to support the functional life of the north and south jetties and maintaining deep-draft navigation through the entrance. The project still requires environmental review, final design and funding. However, it is anticipated that maintenance and/or rehabilitation of the existing jetties would be needed within the next 10 years.
- Mouth of Columbia River, Columbia River, and auxiliary side channels Federal Navigation Project: Continued annual maintenance dredging and placement activities associated with Columbia River are expected.
- General Investigation studies.
- Maintenance of Columbia River pile dike system.
- Management of a double-crested cormorant and Caspian tern colonies on East Sand Island.

5.5.2. Effect of Cumulative Impacts

The following section analyzes the potential cumulative impacts for each of the environmental resource categories in which the implementation the proposed action might contribute to cumulative impacts when considered with other past, present, and reasonably foreseeable actions. Resources determined not to have the potential to result in cumulative effects were not addressed in this analysis. These resources include: geology, hydrology, sediment quality, socio-economic, cultural/historic and recreation. Since environmental analyses for some of the listed activities are not complete or do not include quantitative data, cumulative impacts are addressed qualitatively. As in the analysis of environmental consequences discussed in Chapter 4, the no action serves as the reference point against which cumulative effects are measured. This analysis uses the same thresholds of measureable impacts used to assess the environmental impacts of no action and the proposed action.

<u>Water Quality</u>: The geographical boundary for this resource is confined to the lower Columbia River watershed.

The lower Columbia River is water quality-limited for PCB, arsenic, and DDT. These toxins likely were introduced to the Columbia River through water-runoff carrying residue from land-based commercial and residential application of these chemicals. A number of ongoing or planned actions in the watershed focus on improving water quality. These actions include operational or structural changes to the lower Columbia River by the Corps and the implementation of more stringent non-point source pollution standards by the states, such as the implementation of stricter water quality standards. These actions and stricter controls on foreseeable future projects would reduce short-term, adverse impacts and are anticipated to provide long-term, cumulative benefit to the water quality in the lower Columbia River.

New development projects would also result in long-term increases in impervious surfaces and associated runoff into the watershed. However, the identified present and future actions are required to adhere to local, state, and federal surface and stormwater control regulations and best management practices, which are designed to limit negative impacts to surface waters from both construction and ongoing operations. Compliance of present and future projects with these regulations, which are subject to change based on regional assessments, would minimize adverse cumulative impacts.

There is a *de minimus* degree of effects between the no action and the proposed action for cumulative water quality effects. As a result, the combined effects from present and reasonably foreseeable future actions, in combination with the no action or proposed action would have negligible effects on water quality.

Air Quality: The geographical boundary for this resource includes the project area (upland, shoreline, and in-water) from the Mouth of Columbia River to Hammond, OR.

The identified past, present and future reasonably foreseeable actions, when combined with the effects of the no action and the proposed action, could incrementally increase in-air and in-water noise levels within Columbia River. However, these impacts would be temporary in nature (reaching highest levels during construction). Both out-of-water and in-water noise levels must meet specific thresholds during construction activities to avoid and minimize impacts to ESA-listed species. Any future project in the area would also need to assess, minimize and/or mitigate for both construction and operational in-air noise levels that could impact nearby residents. Additive increases in noise are unlikely to impact nearby residents as most of the reasonably foreseeable future projects are not located immediately adjacent to residential areas. Therefore, cumulative noise impacts from the proposed action, in combination with past, present and reasonably foreseeable actions are less than what would be considered a measureable impact.

The geographical boundary for cumulative air quality effects is the NAAQS Air Quality monitoring area. Cumulative projects, as well as the Project, would have to comply with EPA standards and the Air Quality Program. The Air Quality Program protects the region's air through program planning development and guidance, industrial source control, major new source review, coordination of permit and plan review programs, data analysis and reporting, and regulation. Compliance with these regulatory agencies would minimize cumulative impacts from the Project.

There is a *de minimus* degree of effects between the No Action and the Proposed Project Alternative for cumulative air quality effects.

Biological: The geographical boundary for this resource is the LCR estuary. Past development within the LCR estuary has resulted in losses of aquatic and riparian habitats, which has caused adverse impacts to fish and wildlife resources. Most of the losses were due to filling, hydrologic alterations (including channelization, diking and draining of wetlands), and upland forestry practices to support development, industry and agriculture uses. In-water biological resources have been impacted by commercial and recreational fishing activities. These actions occurred in a regulatory landscape very different from what exists today.

Completion of present reasonably foreseeable projects has the potential to directly and indirectly impact biological resources in the Columbia River cumulatively for the no action and the proposed action. Direct impacts include the physical removal of habitat through dredging, burial of habitat or conversion of a habitat. Indirect cumulative impacts to biological resources are a result of temporary increases in turbidity, in-air noise and in-water noise. For example, excavating or filling in areas previously undisturbed, and at the same time, could fragment shallow water habitat used for feeding, shelter and migration by ESA-listed salmon and other aquatic species. However, many of the foreseeable projects are already working with federal, state and local resource agencies to adhere to conservation measures and Best Management Practices (BMPs) (in-water work windows to avoid key migration times for salmonids, etc.); and, developing mitigation plans to offset adverse impacts on biological resources. Future land uses are also required to comply with local land use and shoreline plans and even more specific local area plans (i.e. the local comprehensive land use plans for counties in Washington and Oregon; these plans provide policies to guide management and planning of land activities that may affect the Columbia River). Compliance of future development with these plans and applicable BMPs and conservation measures would minimize direct and indirect cumulative impacts to biological resources.

5.5.3. Determination of Cumulative Impacts

The Columbia River has been substantially altered from the 1800s by early settlement, timber harvest and fishing, agriculture, population growth and the commercial/industrial and residential developments and the resulting introduction of non-native species, and; rivers and streams have been physically altered; and fish and wildlife resources have been impacted by habitat alteration or loss. Changes in public expectations concerning how resources are managed began in the 1970s, and today the protection of unique ecosystems, such as coastal estuaries, has increased with the support of stricter environmental regulation.

This cumulative effects analysis considered the effects of implementing the proposed action alternative against the no action in association with past, present, and reasonably foreseeable future actions by the Corps and other parties in and adjacent to the project area. It is unlikely that cumulative impacts could result for the resources identified above. Any action impacts would be minimized through the Corps proposed conservation measures. Additionally, the fact that all projects would be required to avoid, minimize and mitigate any measurable impacts through the current environmental review and regulatory process (i.e. monitoring and mitigation are required for new development projects that impact environmental resources). The required regulatory review also results in coordination between many of the resource agencies and between those agencies proposing action(s).

6. Coordination and Public Involvement

Early and continuing coordination with the public and appropriate agencies is an essential part of the NEPA process to determine the scope of environmental documentation, the level of analysis, potential impacts and avoidance, minimization, or mitigation of impacts. Agency consultation and coordination to comply with related environmental laws and regulations has been accomplished through a variety of formal and informal methods which are described in Chapter 7.

The draft Feasibility Report with integrated draft EA was issued for a 30-day public review period beginning March 13 and ended April 11, 2015. In addition to the posting of the draft EA on the Corps website, a notice requesting comments regarding this EA was sent to the following agencies and groups:

National Marine Fisheries Service
U.S. Coast Guard
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service

Confederated Tribes of Siletz
Cowlitz Indian Tribe

Clatsop County, Oregon

Oregon State Historic Preservation Office
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Department of State Lands
State of Oregon Governor's Office

American Rivers
Columbia River Estuary Study Taskforce
Columbia River Inter-Tribal Fish Commission
Northwest Environmental Advocates
Pacific States Marine Fish Commission
Pacific Northwest Waterways
Port of Longview
Portland Audubon Society
Salmon for All

The following comments were received during the comment period:

Commenter	Comment	Corps Response
U.S. Coast Guard (USCG)	Is the "trestle" a bridge that crosses a navigable water of the United States (Trestle Bay is tidal therefore navigable). Can/does it carry pedestrians, bicycles, vehicles? If so it may be subject to Coast Guard bridge permitting.	The trestle is not a functioning bridge and does not require a Section 10 permit. The proposed project will not affect the wooden trestles that remain from the railroad bridge.
Oregon Department of State Lands (ODSL)	The project is for fish passage and not for the purpose of navigation and is not exempt from DSL permitting. There would be no fee but the application would go through our normal processing for an individual permit. An access agreement authorization may also need to be arranged with our proprietary staff (Patricia Fox (503-986-5233) if it is on state- owned lands.	The draft EA stated the Corps was proposing to assert navigational servitude for the proposed project. However, this has been removed from the final EA because the Corps will not assert navigational servitude for this restoration project. The Corps and project sponsor (CREST) has coordinated with ODSL regarding required permits. Only a fill/removal permit will be required and no access agreement/easement is necessary because the project falls under Oregon Administrative Rule (OAR) 141-085-0534 Exemptions for Certain Voluntary Habitat Restoration Activities http://arcweb.sos.state.or.us/pages/rules/oars_100/oar_141/141_085.html (personal communication P. Fox 6/3/2015)
Oregon Department of Land Conservation and Development (ODLCD)	We received the public notice for the Trestle Bay Restoration Project. I noticed that you mention the requirements for the DEQ 401 certification, but CZMA federal consistency is not. Do you plan to address CZMA federal consistency regarding this project?	The final EA has been revised to include information regarding compliance with CZMA. The Corps has determined the proposed project removal of portions of the South Jetty root is consistent with authorized activities of Nationwide Permit (NWP) # 27 (See Chapter 7, Section 7.4). The Corps will be meeting the CZMA conditions that are a part of the Corps' Nationwide Permit Program in Oregon. The ODLCD has conditionally concurred via letter dated March 29, 2012 with the Corps finding that the NWP's (including NWP # 27) is to the maximum extent practicable, consistent with the enforceable policies of the Oregon Coastal Management Program (see Chapter 7, Section 7.4.

7. Compliance with Applicable Laws and Regulations

7.1. National Environment Policy Act

This integrated Feasibility Study Report/EA was prepared in order to help fulfill and complete the requirements of the NEPA of 1969, as amended (42 USC 4321 et seq.). Based on the analysis in the final EA, agency coordination and comments received, the Corps has determined the proposed project will not result in significant impacts and has prepared a Finding of No Significant Impact (FONSI) statement.

7.2. Bald and Golden Eagle Protection Act

This Act provides for the protection of bald and golden eagles by prohibiting the taking, possession and commerce of such birds, except under certain specified conditions. The Act defines take as “to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.” “Disturbance” relates to activities that affect the viability of eagle populations (e.g., from nest or chick abandonment), which would result from otherwise normal, lawful business practices. The U.S. Fish and Wildlife Service, National Bald Eagle Management Guidelines (USFWS 2007) identify measures to avoid impacts to eagles during the nesting season. These measures are different depending on the type of activity (i.e. road construction, timber operations, off road use, etc.).

Finding: Because the proposed action will occur during the winter and outside of the nesting season for eagles, this proposed action does not integrate any measures from the USFWS guidelines. Bald eagles are opportunistic and generalist predators and the proposed action would not appreciably limit or change overall prey availability during construction activities. Therefore, these impacts would not substantially interfere with normal feeding behavior and would not result in "take" as defined by the Act.

7.3. Clean Air Act

The Clean Air Act (CAA) established a comprehensive program to preserve, protect and enhance air quality throughout the United States based on permitting of stationary sources of air pollution emissions, restricting the emission of toxic substances from stationary and mobile sources, establishing National Ambient Air Quality Standards (NAAQS) Title IV of the Act includes provisions for complying with noise pollution standards. Section 118 (42 U.S.C. § 7418) of the CAA specifies that each department, agency, and instrumentality of the executive, legislative, and judicial branches of the Federal Government (1) having jurisdiction over any property or facility or (2) engaged in any activity resulting, or which may result, in the discharge of air pollutants, shall be subject to, and comply with, all Federal, State, interstate, and local requirements respecting the control and abatement of air pollution in the same manner, and to the same extent as any non-governmental entity. Corps activities resulting in the discharge of air pollutants must conform to NAAQS and State Implementation Plans, unless the activity is explicitly exempted by Environmental Protection Agency (EPA) regulations.

Finding: The NAAQS are health standards set for criteria pollutants- carbon monoxide, lead, nitrogen dioxide, 8-hour ozone, particulate matter (PM-10) and (PM-2.5), and sulfur dioxide. The EPA sets these standards and maintains a list of areas/counties that have exceeded these health standards and are considered "non-attainment" areas. In Oregon the only areas that are considered "non-attainment" are Oakridge for P.M. 2.5 and P.M. 10, Klamath Falls for P.M. 10 and Eugene-Springfield for P.M. 10. http://www.epa.gov/oaqps001/greenbk/anayo_or.html. In Washington the only areas that are considered "non-attainment" are Tacoma in Pierce County for P.M. 2.5 http://www.epa.gov/oaqps001/greenbk/anayo_wa.html. The proposed action does not occur in a "non-attainment" area as defined by the Act and does not require additional review to determine conformity to a State Implementation Plan.

7.4. Clean Water Act

The CWA governs the release of pollutants into waterways.

Section 401 **–** Requires certification from the state that a discharge to waters of the U.S. in that state would not violate the states' water quality standards. The EPA retains jurisdiction in limited cases.

Section 402 **–** Authorizes the EPA, or states to which the EPA has delegated authority, to permit the discharge of pollutants under the National Pollutant Discharge Elimination System (NPDES) program. Sections 301, 302, 306, and 307 of the CWA establish effluent limitations; water quality related effluent limitations; national standards of performance for new sources; and toxic and pretreatment standards, respectively. These requirements relate to point source discharges and are the foundation for conditions to be incorporated in NPDES permits issued to the point sources.

Section 404 **–** Section 404 requires all activities involving the discharge of dredged or fill material into waters of the U.S. be evaluated for water quality and other effects prior to making the discharge. Under Section 404(e) of the CWA, the Corps can issue general permits (also referred to as Nationwide Permits (NWPs) to authorize activities that have minimal individual and cumulative adverse environmental effects. There are currently 49 NWPs and they authorize a wide variety of activities such as mooring buoys, residential developments, utility lines, road crossings, mining activities, wetland and stream restoration activities, and commercial shellfish aquaculture activities. Per 40 C.F.R. Part 230, the Corps does not issue itself a 404 permit for discharges of dredged or fill material, but does apply the 404(b)(1) guidelines.

Finding: Ecosystem restoration projects such as the proposed action are routinely undertaken and authorized under NWP #27 for Aquatic Habitat Restoration, Establishment, and Enhancement Activities. The proposed action is consistent with activities authorized under the NWP. Specifically the removal of portions of the South Jetty root is consistent with authorized activities of NWP #27 for "…removal of water control structure to restore hydrological function, resulting in a net increase in aquatic resource function and service…" by substantially improving access for juvenile salmonids to hundreds of acres of shallow water habitat in Trestle Bay. The proposed action meets all the general conditions of the NWP

#27 and the Portland District's Nationwide Regional Permit Conditions. Each NWP has undergone a Section 404(b)(1) analysis. For NWP #27 see section 6.0 http://www.usace.army.mil/Portals/2/docs/civilworks/nwp/2012/NWP_27_2012.pdf

The Oregon Department of Environmental Quality (ODEQ) is the agency of the State of Oregon designated to carry out the certification functions prescribed by Section 401. On April 9, 2012 issued a water quality certification for the five year duration of the Corps' 2012 NWP program. The full 401 Certification is available at: http://www.nwp.usace.army.mil/Portals/24/docs/regulatory/nationwide/DEQ_2012_NWP_WQC.pdf

The proposed action will not disturb more than one acre of new ground and does not require a Stormwater Pollution Prevention Plan (SWPPP). However, recent changes to the NPDES Program in December 2014 require that a small vessel general permit is in place prior to initiating construction.

Oregon Department of State Lands (ODSL) - Fill/Removal Program

ODSL has jurisdiction to the elevation of the "highest measured tide" (HMT) which is defined as the highest tidal elevation, not including storm surges. The HMT may be "determined by a land survey referenced to the closest tidal benchmark based upon the most recent tidal epoch and reference to both the tidal datum (MLLW) and fixed geodetic datum (NAVD88)", or by using field indicators such as the uppermost drift or wrack line, water-mark line, intertidal zone inhabited by aquatic invertebrates, and/or a marsh to upland plant community shift (DSL 2014; OAR 141-085-0515(2)). The Corps will apply for the ODSL fill/removal permit.

7.5. Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) encourages coastal states to develop and implement coastal zone management plans that are consistent with national policies to preserve, protect, develop, and where possible, restore or enhance, coastal zone resources. Section 307 of the CZMA requires that any federal action occurring in or outside of the coastal zone which affects coastal land or water uses or natural resources must be consistent with the state's Coastal Management Program.

Finding: The Corps has determined the proposed project removal of portions of the South Jetty Root is consistent with authorized activities of NWP #27. The Corps will be meeting the CZMA conditions integrated into the Corps' NWP Program in Oregon. The conditions are available at: http://www.nwp.usace.army.mil/Portals/24/docs/regulatory/nationwide/DLCD_CZM_Conditions_full.pdf. The ODLCD has conditionally concurred via letter dated March 29, 2012 with the Corps' finding that the NWP's (including NWP #27) is, to the maximum extent practicable, consistent with the enforceable policies of the Oregon Coastal Management Program.

7.6. Endangered Species Act

In accordance with Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed species within NMFS and USFWS jurisdiction. Information on federally listed species and their designated critical habitat is presented in this document.

Finding for species under NMFS jurisdiction:

The Corps determined the proposed action was *not likely to adversely affect* southern DPS green sturgeon *(Acipenser medirostris)* and their designated critical habitat but was *likely to adversely affect* the following listed species and their designated critical habitat:

1. Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*)
2. Upper Willamette River (UWR) Chinook salmon
3. Upper Columbia River (UCR) spring-run Chinook salmon
4. Snake River (SR) spring/summer run Chinook salmon
5. SR fall-run Chinook salmon
6. Columbia River (CR) chum salmon (*O. keta*)
7. LCR coho salmon (*O. kisutch*)
8. Oregon Coast (OC) coho salmon
9. Southern Oregon/Northern California Coasts (SONCC) coho salmon
10. SR sockeye salmon (*O. nerka*)
11. LCR steelhead (*O. mykiss*)
12. UWR steelhead
13. MCR steelhead
14. UCR steelhead
15. Snake River Basin (SRB) steelhead
16. Southern distinct population segment eulachon (*Thaleichthys pacificus*)

The Corps completed consultation with NMFS on March 30, 2015 with confirmation from NMFS that the proposed action is consistent with categories of actions considered and evaluated in the *ESA Section 7 Programmatic Conference and Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Revisions to Standard Local Operating Procedures for Endangered Species to Administer Stream Restoration and Fish Passage Improvement Actions Authorized or Carried Out by the U.S. Army Corps of Engineers in Oregon (SLOPES V Restoration Biological Opinion)* (NMFS 2013). See Section 7.19 for project design criteria and terms and conditions applicable to the proposed action.

Finding for species under USFWS jurisdiction: The Corps contacted USWFS to discuss the proposed action; based on these discussions, the Corps determined there would be *no effect* to listed species or their critical habitat under the jurisdiction of USFWS and that ESA consultation is not required. (Allen, C. and Roberts, K. USFWS. Pers. Comm. 16 September 2014. Smith, G.)

7.7. Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments

This order requires federal agencies to establish regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, and strengthen the United States government-to-government relationships with Indian tribes.

Finding: The following tribes have been consulted for the proposed action: Confederated Tribes of the Grand Ronde, Confederated Tribes of Siletz Indians, Confederated Tribes of Warm Springs, and Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes and Bands of the Yakama Nation, the Cowlitz Tribe, and the Nez Perce Tribe. No comments have been received by the tribes regarding the proposed action.

7.8. Executive Order 12898 – Environmental Justice

This order requires federal agencies to minimize impacts on subsistence, low-income or minority communities, ensuring no persons or group of people bear a disproportionate burden of negative environmental impacts resulting from the execution of this country's domestic and foreign policies.

Finding: No subsistence, low-income or minority communities would be affected by the proposed project because these populations do not occur in or directly adjacent to the project area.

7.9. Executive Order 13514 – Federal Leadership in Environmental, Energy and Economic Performance

Federal agencies shall increase energy efficiency; measure, report, and reduce their greenhouse gas emissions from direct and indirect activities; conserve and protect water resources through efficiency, reuse, and stormwater management; eliminate waste, recycle, and prevent pollution; leverage agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products, and services; design, construct, maintain, and operate high performance sustainable buildings in sustainable locations; strengthen the vitality and livability of the communities in which federal facilities are located; and inform federal employees about and involve them in the achievement of these goals.

Finding: The proposed action is in compliance with this Order because all actions would be conducted in a manner as to prevent pollution and chemical spills by following BMPs.

7.10. Executive Order 11988 – Floodplain Management

Executive Order 11988, Floodplain Management requires federal agencies to consider how their actions may encourage future development in floodplains, and to minimize such development.

The Proposed Action would not affect development of floodplains or the management of floodplains as all aspects of the actions are in-water and not within the floodplain.

Finding: The proposed action is *in compliance* with this Order because the actions will not induce development within the floodplain.

7.11. Executive Order 13112 – Invasive Species

This Executive Order established the National Invasive Species Council and required federal agencies (to the extent practicable) to identify actions that may spread invasive species and use relevant programs and authorities to prevent the introduction of invasive species; to research, monitor and otherwise control invasive species; to restore native species and habitat conditions in ecosystems that have been invaded; and promote public education on invasive species.

Finding: The Corps would minimize the spread of invasive species by ensuring equipment used in construction is clean and free of invasive species, thus the proposed action is *in compliance* with this Order.

7.12. Executive Order 13186 – Migratory Birds

This Order identifies federal agency responsibilities to protect migratory birds and their habitats, and directs executive departments and agencies to undertake actions that will further implement the MBTA. The Order encouraged each agency to immediately begin implementing the fifteen identified conservation measures, as appropriate and practicable. These conservation measures include avoiding or minimizing adverse impacts on migratory bird resources, lessen the amount of unintentional take, restoring and enhancing the habitat of migratory birds, promote research and information exchange related to the conservation of migratory birds including coordinated inventorying and monitoring. It also directs federal agencies to develop a Memorandum of Understanding (MOU) with the USFWS to promote the conservation of migratory bird populations, including their habitats, when their actions have, or are likely to have, a measurable negative effect on migratory bird populations.

Finding: The Department of Defense (DoD) signed an MOU with the USFWS, 31 July 2006, to comply with this executive order http://www.dodpif.org/plans/migratory/mbtadod.php The MOU states the DoD shall, among other things, “encourage incorporation of comprehensive migratory bird management objectives in the preparation of DoD planning documents (…including NEPA analyses).” This NEPA document analyzed the potential for migratory birds to be affected by the proposed action. No conservation measures were integrated into the proposed action because the construction activities have limited potential to affect migratory birds.

7.13. Fish and Wildlife Coordination Act

The FWCA (16 USC 661, *et seq*.) directs federal agencies to prevent the loss and damage to fish and wildlife resources in; specifically, wildlife resources shall be given equal consideration in light of water-resource development programs. Consultation with the USFWS is required when activities result in the control of, diversion or modification to any natural habitat or associated water body, altering habitat quality and/or quantity for fish and wildlife. The Corps and USFWS signed a Memorandum of Agreement (MOA) in 2003 for Conducting Fish and Wildlife Coordination Act Activities.

Finding: Per the MOA, the Corps has coordinated with USFWS and received informal comments. The Corps submitted the draft EA to the USFWS and specifically requested comments from on the proposed action specific to the FWCA. Informal comments were received May 12, 2015. The USFWS comments were specific to new information regarding observations of Western snowy plovers on the beaches in the vicinity of Clatsop Spit and their use of inter-tidal areas for foraging. The EA was updated with this information (see Chapter 4, Section 4.1.2.6 and Chapter 5 Section 5.2.5.2.2). The USFWS also commented on the effects determination made by the Corps under ESA and suggested the proposed action may impact Western snowy plovers if the project results in a change in the amount or availability of foraging habitat to the species in the project area (see Chapter 5, Section 5.2.5.2.2).

7.14. Magnuson-Stevens Fishery Conservation and Management Act

Also known as the MSA, this is designed to actively conserve and manage fishery resources found off the coasts of the United States, to support international fishery agreements for the conservation and management of highly migratory species. The MSA established procedures designed to identify, conserve, and enhance EFH for fisheries regulated under a federal fisheries management plan. Federal agencies must consult with the NMFS on all federal actions authorized, funded, or carried out by the agency that may adversely affect EFH.

Finding: The Corps completed consultation with NMFS for the proposed action through the use of the SLOPES V Restoration Biological Opinion (see Section 7.6). The SLOPES V Restoration Biological Opinion contains an EFH analysis within the Biological Opinion. NMFS issued four conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These conservation recommendations are a subset of the SLOPES V Restoration Biological Opinion's ESA take statement's terms and conditions. The proposed action would follow the conservation recommendations set forth by SLOPES V Restoration Biological Opinion (see Section 7.19).

7.15. Marine Mammal Protection Act

This Act established a federal responsibility to conserve marine mammals within waters of the United States. With certain specified exceptions, the Act establishes a moratorium on the taking and importation of marine mammals, as well as products taken from them, and establishes procedures for waiving the moratorium and transferring management responsibility to the states.

Finding: Marine mammals could potentially occur in the project area. The nearest known sea lion haul out is located at the tip of the South Jetty in the Pacific Ocean, more than 2 miles away. It is possible that the proposed action could disturb Stellar sea lions and other marine mammals with the movement of construction equipment through the Columbia River, but it is unlikely that the effects would rise to the level of harm or harassment. No pile-driving activity would occur as a result of this project.

7.16. Marine Protection, Research, and Sanctuaries Act

The Marine Protection, Research, and Sanctuaries Act is also known as the Ocean Dumping Act and it prohibits the transportation of dredged material for the purpose of dumping it into ocean waters that would degrade or endanger human health or the marine environment.

Finding: There will be no transportation of dredged materials for the purpose of dumping it into the ocean waters and no further consideration of this Act is necessary.

7.17. Migratory Bird Treaty Act

The MBTA makes it unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not.

Finding: The proposed action would occur outside of the nesting season for migratory birds in the lower Columbia River and would not result in take as defined by the Act.

7.18. National Historic Preservation Act

Section 106 of the NHPA requires agencies to consider the potential effects of their projects and undertakings on historic properties eligible for, or listed on, the NRHP. Historic properties include archaeological sites or historic structures or the remnants of sites or structures. To determine the potential effect of the project on known or unknown historic properties, the following items are analyzed: the nature of the proposed activity and its effect on the landscape; the likelihood that historic properties are present within a project area; whether the ground is disturbed by previous land use activities and the extent of the disturbance; reviewing listings of known archeological or historic site locations, including site data bases and areas previously surveyed or listings of sites on the NRHP.

Finding: The Corps has determined this action would result in *no adverse effect* on historic properties. Consultation with the Oregon State Historic Preservation Office and potentially affected tribes under Section 106 was initiated with a letter dated May 14, 2015.

7.19. Permits and Environmental Commitments

The following permits are required to implement the proposed action and will be obtained prior to construction:

Permit	Permitting Agency
NPDES Small Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels Less than 79 Feet	EPA
Fill/Removal Permit	ODSL
Access Agreement Authorization	ODSL

For the purposes of this NEPA document, environmental commitments are defined as best management practices, avoidance, minimization or mitigation measures that are built into the proposed project or result from agency consultation or permit conditions to minimize impacts to environmental resources. The following environmental commitments are a part of the proposed action:

Environmental Commitment/Permit Condition	Agency Consultation
In order to minimize potential impacts to water quality, aquatic species and habitat, in-water work will be limited to November 1st through February 28th.	NWP regional general conditions, SLOPES, ODEQ 401general condition
Before entering the water, inspect any gear to be used in or near water and remove any plants, soil, or other organic material adhering to the surface.	SLOPES, NWP regional general conditions
Place mats or pads onto wetlands or tidal flats to provide site access.	NWP regional general conditions,
Turbidity would be monitored daily during in-water work and sediment and erosion control measures in place to meet the ODEQ standard rule that a project not cause more than a 10% increase above background turbidity levels. However, if all reasonably available controls and practices are implemented by a permittee, turbidity exceedances of more than 10% above background are allowed for limited times depending on the severity of the increase.	ODEQ 401 general condition
Monitor and record in a daily log stream turbidity levels during work below ordinary high water, compare turbidity caused by authorized actions to background levels, and adapt activities to minimize project-caused turbidity.	ODEQ 401 general condition
Monitor and record in a daily log stream turbidity levels during work below ordinary high water, compare turbidity caused by	ODEQ 401 general condition

Environmental Commitment/Permit Condition	Agency Consultation
authorized actions to background levels, and adapt activities to minimize project-caused turbidity. Required monitoring steps include identifying a background and compliance location to compare turbidity readings.	
Submit findings prepared by the local land use jurisdiction that demonstrates the activity's compliance with the local comprehensive plan. Such findings can be submitted using Block 7 of the Joint Permit Application, signed by the appropriate local official.	ODEQ 401 general condition; CZMA general condition
Keep a copy of all applicable 401 WQG conditions on the job site and readily available for reference by the permittee, their contractors and other appropriate state and local government inspectors.	ODEQ- 401 general condition,
Obtain required permits or other authorizations from the ODSL fill/removal program before any regulated work may begin.	CZMA general condition
Obtain any required lease, license, or other authorization for the use of state lands or waters from ODSL before any regulated work may begin.	CZMA general condition

8. Monitoring and Adaptive Management Plan

Monitoring and adaptive management will conform to requirements of Section 2039 of WRDA 2007 and subsequent Corps implementation guidance, and monitoring will be conducted until such time as the Corps determines that the project has achieved success.

This monitoring and adaptive management plan has been developed to ensure the success of the recommended ecosystem restoration plan in meeting project objectives and a process to identify if any adaptive management actions are warranted. The proposed monitoring plan will measure the following key elements: connectivity to the estuary to insure access to the embayment and meeting objective 1, the sill elevation to all breaches provides for full tidal range and access into the embayment meeting objective 2. This will be a simplified monitoring approach to confirm the continued existence of the openings.

The Portland District Corps of Engineers will add this project to our existing program for inspection of completed environmental projects. It is assumed based on the 20-year history of the previous Section 1135 project that this action will be minimal. If additional monitoring is warranted it would not be part of the total project cost and will be 100% non-Federal costs.

Adaptive Management Trigger:

If embayment connection frequency and fish passage are not met more than 20 percent during all tidal stages then the Corps and non-federal sponsor will review the data and causal factors to identify preferred management actions. Possible actions could include additional rock removal.

Adaptive management would be triggered by the above identified conditions if the monitoring targets are not met. At this time, it is anticipated that this will not be required based on past history, and therefore no additional costs were included in the total project cost

9. Conclusions and Recommendation

9.1. Conclusions

This integrated Final Feasibility Report/Environmental Assessment has included an examination of all practicable alternatives for meeting the study purpose of improving access for aquatic species to Trestle Bay. The need for habitat restoration is predicated on industrial, commercial, and residential development within the Lower Columbia River estuary over the past 150 years has led to the decline of available and suitable tidally influenced, estuarine habitat for aquatic species, namely salmonids.

This report has been prepared under the authority of Section 536 Lower Columbia River and Tillamook Bay Ecosystem Restoration Program (Section 536) authorizing the Corps to conduct studies and implement ecosystem restoration projects on the lower Columbia River and Estuary necessary to protect, monitor, and restore fish and wildlife habitat. Section 536 was authorized by Water Resources Development Act of (WRDA) 2000, Public Law number 106-541.

The recommended plan is to construct several opening with the cumulative openings of no more than 900 lineal feet in the MCR South Jetty root structure to existing riverbed depth. The exact location and number of opening will be determined in the design and implementation phase through two-dimensional hydrodynamic modeling. The openings will be strategically distributed across the 8,800 ft structure in order to provide equidistance access for salmon to fringe habitat within Trestle Bay. Each opening would be no less than 50 ft wide in order to provide adequate access for salmon use. See Figure 6 for a typical cross-section of jetty opening. No openings would be placed in or immediately adjacent to the existing Section 1135 project area. Openings would be placed in locations that avoid excessive substrate erosion and negative impact to wetlands within Trestle Bay. Openings would be placed in locations that would avoid impacts to the Columbia River Federal Navigation Channel. Openings would be designed to avoid destabilization of adjacent jetty side slopes the openings.

This project will restore natural hydrological functions and restore degraded habitat. These habitat types are particularly scarce in the Columbia River due to development over time by levees. This project is important to the out-migration for juvenile salmon and provides critical resting rearing and feeding habitat. Additionally, these habitats provide a significant food source for stream type salmonids that reside in the main stem by the export of detritus developed within the floodplain wetland and prey sources associated with this exported detritus. This project will benefit 13 ESUs listed salmonids. Juvenile salmon are broken into two specific life history types, stream-type and ocean-type. Stream-type salmonids primarily use the river as a migration corridor from their natal streams to the estuary and ocean spending days to weeks of their life-cycle in the river before going out into the ocean, where they will spend 2 to 5 years prior to returning to their natal stream to spawn. The ocean-type salmonids move through the river system more slowly and can spend up to several months using floodplain wetland habitats as refugia from predators and for feeding and growth prior to ocean entry where they also can spend 2 to 5 years before returning to their natal streams to spawn.

The monitoring and adaptive management anticipated for this project is minimal. Project modification will not increase the operation, maintenance, repair, replacement and rehabilitation (OMRR&R) cost for the Columbia River at the mouth project. No operation and maintenance cost are foreseen for this project.

It is also recommended that this project be converted from Section 536 to Section 1135.

The recommended plan is the incrementally justified and cost-effective alternative that produces 1.60 ocean-type SBUs and 0.49 stream-type SBUs.

9.2. Authority Conversion

Section 1135 of WRDA 1986 (Public Law 99-662), as amended, states "…and to undertake measures for restoration of environmental quality where the construction or operation of a water resources project built by the Corps has contributed to the degradation of the quality of the environment and such measures do not conflict with the authorized project purposes." For the reasons outlined below, it is recommended that this Section 536 project be converted to a Section 1135 project.

- Trestle Bay was created by the construction of jetty structures at the Mouth of the Columbia River; a project built by the Corps.
- The project entails the physical modification of a project structure constructed, operated, and maintained by the U.S. Army Corps of Engineers.
- Implementation of the project is responsive to environmental needs in the region.
- Therefore, the Trestle Bay Project is a better candidate under Section 1135 criteria compared to Section 536 as the habitat in the area continues to be impacted by the construction and operation of the Mouth of the Columbia River jetties.

Under Section 1135 the cost share is split 75/25. The total estimate project cost is $692,000 with a Federal share of $519,000 for Design and Implementation and a non-Federal share of $173,000.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the Chief of Engineers may modify the recommendations. The sponsor, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

9.3. Recommendation

Careful consideration has been given to the overall public interest, including the environmental, social, economic, and engineering. The recommended plan described in this report provides substantive production of SBUs.

The recommendations contained herein reflect the information available at the time and current Department of the Army policies governing formulation of projects. They do not reflect program and budgeting priorities inherent in the formulation of national Civil Works construction program nor the perspective of higher levels within the Executive Branch.

Date: ______________________ ___________________________

Jose L. Aguilar
Colonel, Corps of Engineers
District Commander

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