U.S. Army Corps of Engineers
Portland District

Trestle Bay Restoration Project

Draft Feasibility Study and Draft Environmental Assessment

March 2015

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 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 900 ft total ft of opening along the South Jetty Root in a manner that provides adequate access to salmon across the full range of the Trestle Bay habitat.

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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 and Non-Federal Sponsor

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.

The Corps and Bonneville Power Administration each have various roles and decisions in approval of the proposed project. More specifically, the Corps is proposing the project and would construct the project. The BPA proposes to provide funds for the planning, design, and implementation of the proposed project. Accordingly, BPA is a cooperating agency under NEPA with expertise in planning and constructing water resource restoration projects in the Columbia River Estuary.

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

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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

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 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/EIS

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 National Environmental Policy Act (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

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

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:

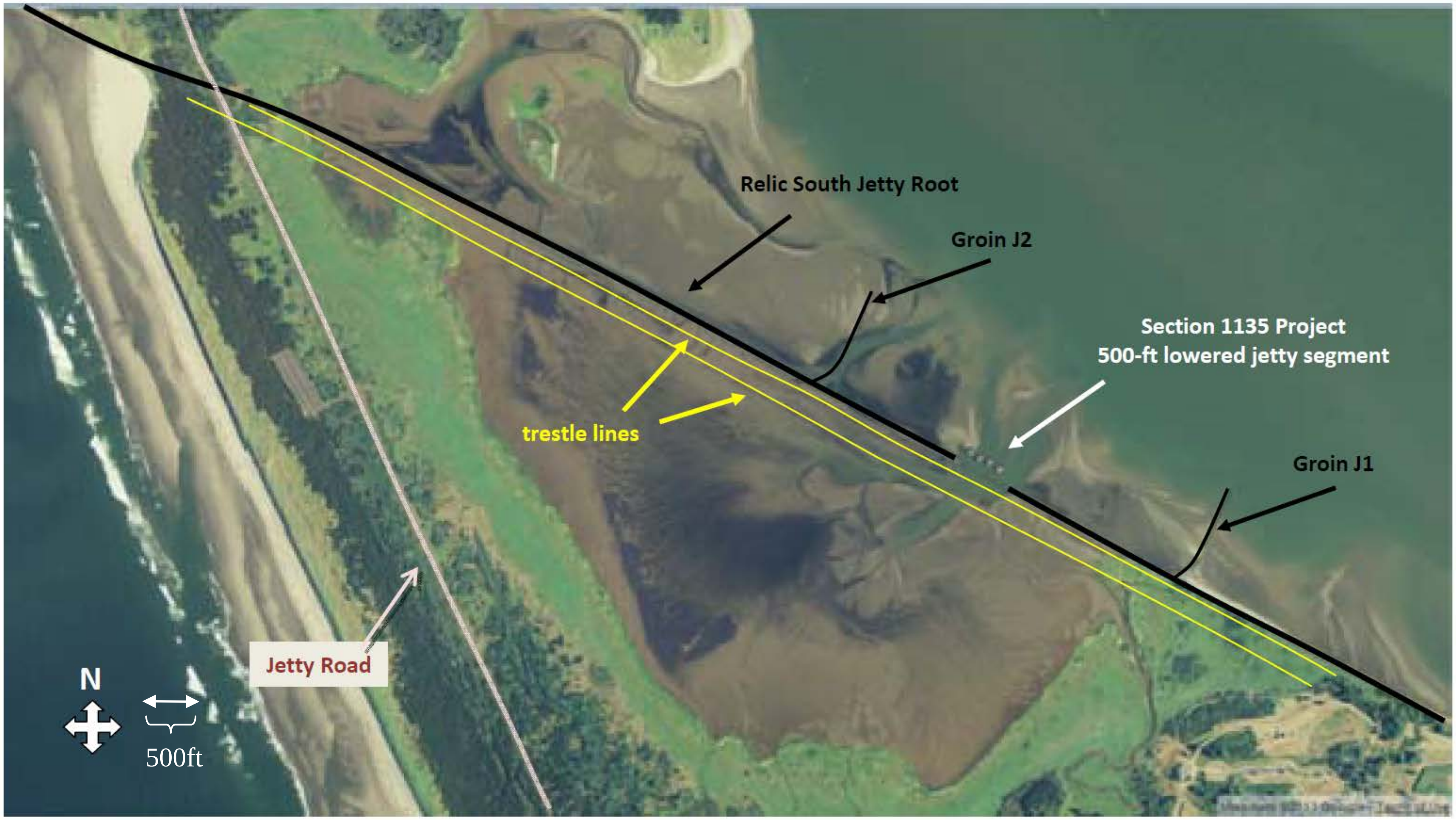
Table 1. Overview of FR/EIS

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. 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.

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. The 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. Lowering segments of the South Jetty Root down to the adjacent riverbed 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:

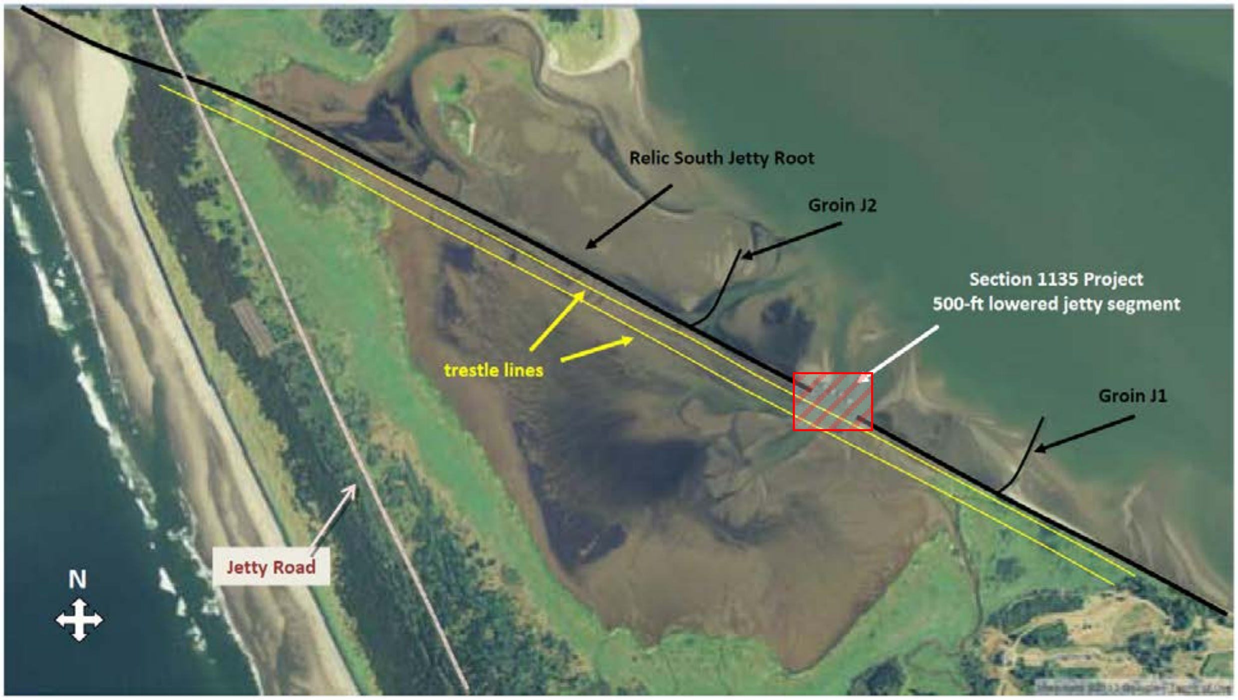
1. Provide improved fish access by reducing fish travel time to more distant reaches in the bay.

2. Fish access would be available throughout the entire tidal cycle by lowering the segments of the jetty down to the riverbed.

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. An additional planned constraint would be to design the project to be self-sustaining such that no operation or maintenance of the South Jetty Root and adjacent habitat areas should be required.

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 Task Force (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.

Additional measures were formulated by multiplying the length removed to determine a larger and smaller scale alternative. This resulted in the formulation of alternatives to remove 225 ft (half) and 900 ft (double) of length. Quantities were estimated using 2010 LiDar imaging.

Alternatives were limited to 900 ft for several reasons. In informal discussions, ERTG indicated they did not feel aquatic benefits were approaching the maximum potential. Additionally, the goal in constructing projects need to be completed by 2018. In balancing the resources in the total program and investing dollars to projects with the greatest return it was discussed internally and with the Action Agencies and determined that having completed construction was a better use of cost-shared dollars than continued study for minimal gain. The sponsor supported this approach and therefore limited further evaluation was mutually agreed upon.

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:

- Project design involving 2-dimensional hydrodynamic modeling would generate 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 openings. Based on the previous 1135 project and professional judgment, it is assumed that the project design will not differ from what is proposed.
- Openings 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 alternative.

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 team 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 Action Agencies (AA) involved with Federal Columbia River Power System (FCRPS)

Operations' Biological Opinion (BiOp). ERTG is an "invitation-only" group resulting from the implementation of the BiOp's Reasonable and Prudent Alternative action item #37. The group is charged with supporting restoration project selection in the LCR estuary.

Survival Benefit Units (SBUs) were the metric developed for the Biological Assessment for the operation of the FCRPS and used in the NOAA BiOp. They are also the metric used by the ERTG for scoring all ecosystem restoration projects meeting requirements of the FCRPS BiOp for habitat improvements in the lower Columbia River and estuary and have been improved by the ERTG using the best available science for these types of habitats and ecosystems. The ERTG has also developed an extensive set of scoring criteria for the use of SBUs. As these metrics were developed for these actions, have been extensively expanded and improved by the ERTG for project selection and scoring purposes, a decision was made by the Portland District, in consultation and with approval by NWD to use SBU and the metric of measurement for biological and ecological benefits.

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.

The Trestle Bay project 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.

[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.

- 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 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 disposal of material by strategically side casting the stone into the Columbia River, similar to the prior Section 1135 project; removing portions of the Trestle Bay jetty down to grade by removing all of the rock within the jetty footprint.

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 3.5% Federal interest rate. Table 3 outlines the total expected costs for each alternative.

Table 3. Alternative Plan Costs

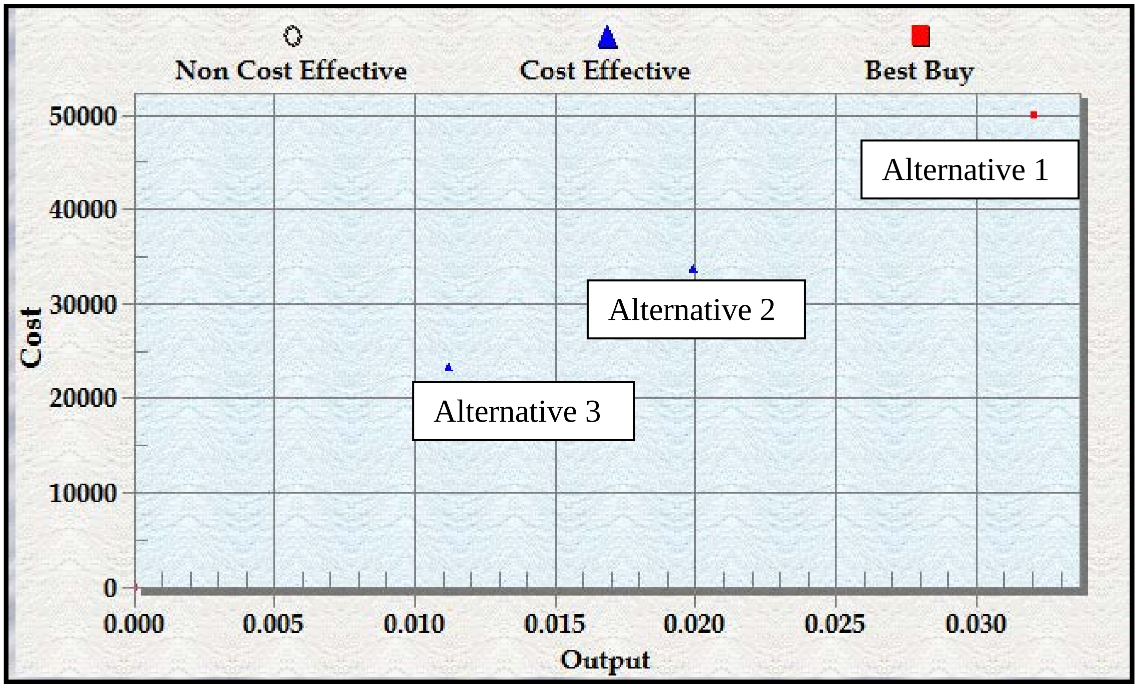
Alt Number	Plan Description	Construction Cost *	Monitoring Costs	RE Costs	O&M Costs	IDC**	Total Investment Costs (PV)	Avg Annual Costs***
1	900 ft of Breaches	$1,126,980	$11,270	$30,000	$ 0	$1,618	$1,169,868	$49,876
2	450 ft of Breaches	$754,902	$7,549	$30,000	$ 0	$1,084	$793,535	$33,831
3	225 ft of Breaches	$509,967	$5,100	$30,000	$ 0	$732	$545,799	$23,269

* includes 40% Contingency, 10% S&A, 20% PED, in FY 14 dollars
**Interest During Construction
*** Average Annual Costs were calculated based on a 3.5% 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 that 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.

- 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 identifies 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 Alternative)

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 will be confirmed after analysis and assessment of 2-dimensional hydrodynamic modeling of various specific configurations. Potential opening locations are depicted in Figure 5. Number of openings could extend to 9 individual openings.

Figure 5. General location of proposed openings.

An effort would be made 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. See Figure 6 for a typical cross-section of jetty opening. 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 the openings.

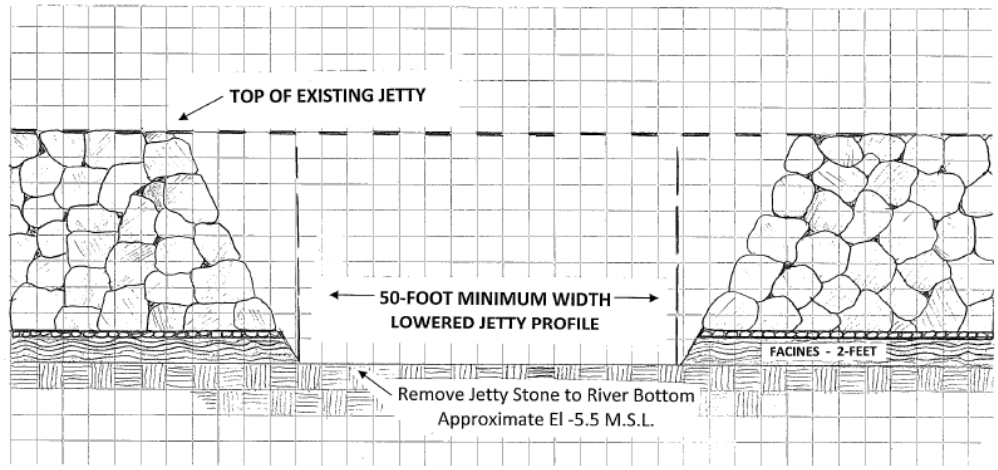


Figure 6. General Cross-Section Profile of a Jetty Opening.

Much of the jetty stone removal will need to be completed during high tide. The project would be completed by a clamshell mounted on a barge. 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 jetty. Piling the stone next to the jetty would be similar to the 1135 project completed in 1995, see Figure 8 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 is scheduled to begin in February 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

Lands required for the project are owned by the United States of America and are under the jurisdiction of the U.S. Army Corps of Engineers. Land acquisition by the non-Federal Sponsor is not required.

The LERRD required to support the project lies below the ordinary high water mark. Therefore, underlying lands including those owned by the State of Oregon are subject to the Government's right to exercise its superior to use underlying lands if the project features relate to flood control, navigation, and or hydropower. The Corps propose asserting Navigational Servitude for the Trestle Bay 536 Project since it would involve removing portions of a navigation feature – the jetty to improve access, opportunity, and ecological function for the benefit of juvenile salmonids and other estuarine species.

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 for 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.

<u>Basis of Design and Estimate:</u> 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.

<u>Construction Schedule</u>: 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.

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

<u>Project Construction</u>.

a. <u>Site Access</u>: Access of personnel and material is by existing roadways, and work areas in and around Astoria, OR. Mob/Demob of the barge and marine equipment is assumed from Longview, WA and the Columbia River.

b. <u>Quantities:</u> 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. <u>Construction Methodology</u>: 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. <u>Unusual Conditions</u>: 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.

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:

Feasibility Report/EA Public Review	April 2015
Begin Design Phase (including hydraulic modeling)	May 2015
NEPA Complete	Summer 2015
Plans and Specifications Complete	August 2015
Issue Request for Proposal	August 2015
Award Contract	September 2015
Begin Construction	1 February 2016
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 are used to predict the effects of an action upon the project area. Alternative assessments conducted against a baseline condition provide a valid 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 is 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 10.4-ft shown in Figure 8. This includes a tidally influenced marsh (called Swash Lake) located to the southeast end of Trestle Bay.[5] 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.

The National Oceanic and Atmospheric Administration (NOAA), National Ocean Service gage at Hammond, OR, (Station 9439011) is located immediately southeast of Trestle Bay with the next nearest NOAA gage at Astoria, OR (Station 9439040). Astronomical tides at Trestle Bay are mixed semi-diurnal with two high waters and two low waters per lunar day. Figure 9 shows an example of a tidal cycle for Hammond, OR. A summary of the tidal information from the Hammond gage is listed in Table 4. 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 acts to accommodate a large portion of the tidal currents that flow

[5] http://www.oregon.gov/oprd/PLANS/docs/masterplans/ft_stevens.pdf

through the jetty. Flows at this opening may be higher in velocity than flows moving through the permeable rock structure.

Figure 8. Inundation Areas for Extreme High Water (10.4 ft) and 50% AEP (11.4 ft).

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

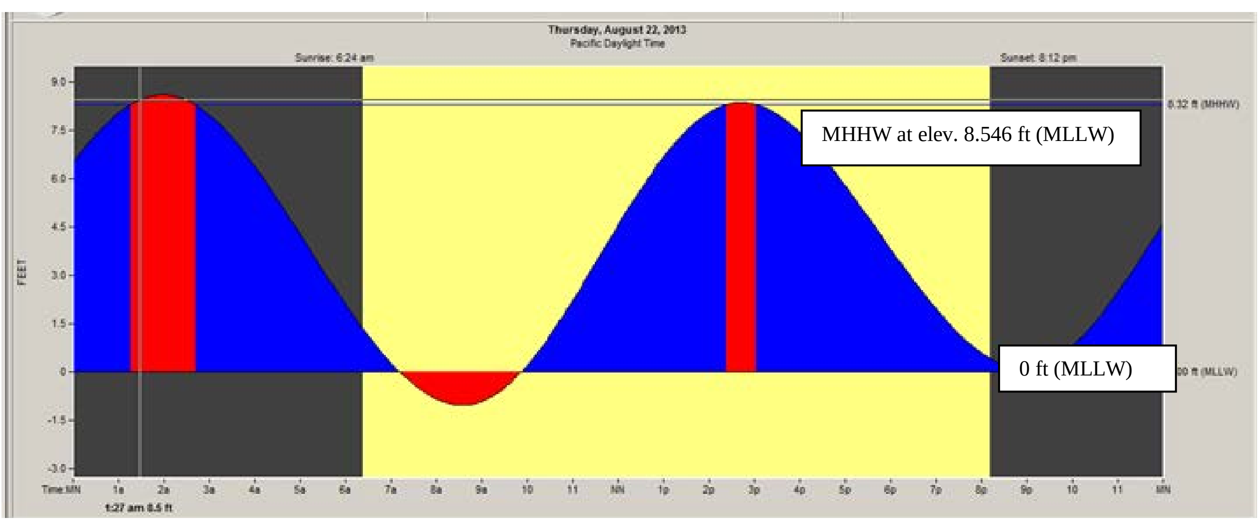


Table 4. Tide Data at Hammond, OR, referenced to NAVD88.

Mean Higher High Water (MHHW)	8.4645 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

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[6] 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[7] 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.

[6] Moderate-energy areas typically exhibit variable velocity and are protected from storm events and extreme changes in water flow.
[7] 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.

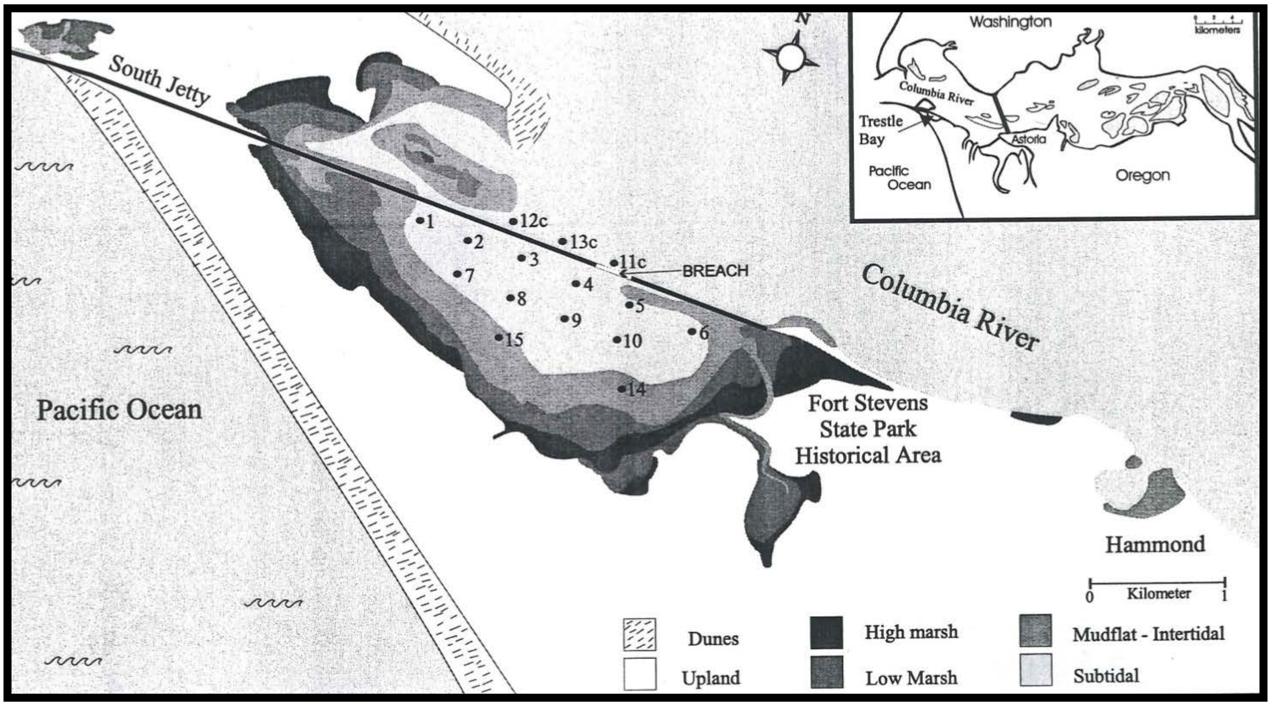


Table 5. Percent fines (silt and clay) at sediment sampling stations in and adjacent to Trestle Bay in the Columbia River estuary.

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 as by Clatsop County as a "noise sensitive" property.

4.1.2. Biologic Environment

4.1.2.1. Aquatic and Terrestrial Communities

Trestle Bay is a brackish[8] 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, a 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]

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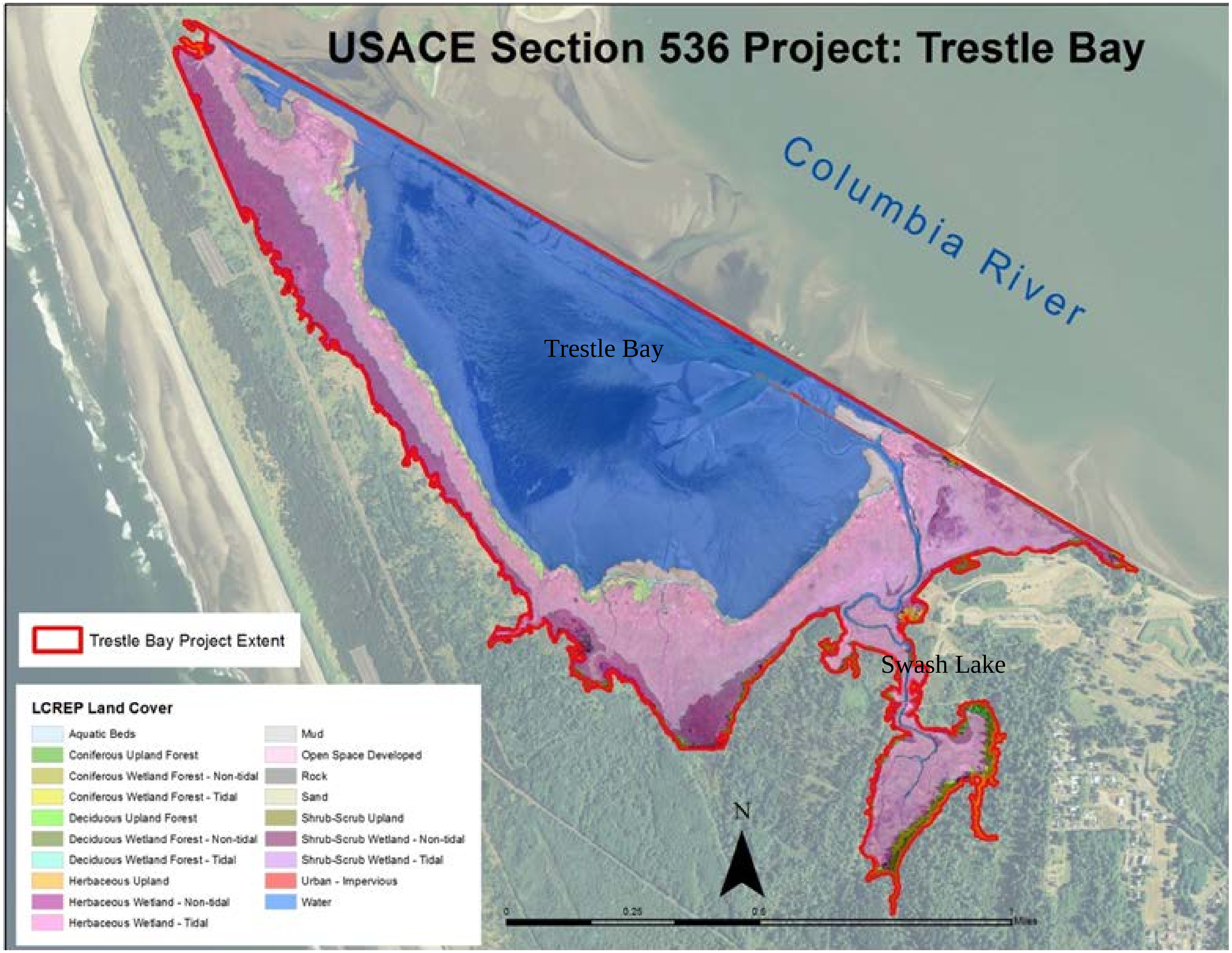
[8] Brackish waters are considered to be more saline than freshwater with typical salinity measuring between .05% and 3%.

Figure 12. Trestle Bay Land Cover.



2001). These 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.

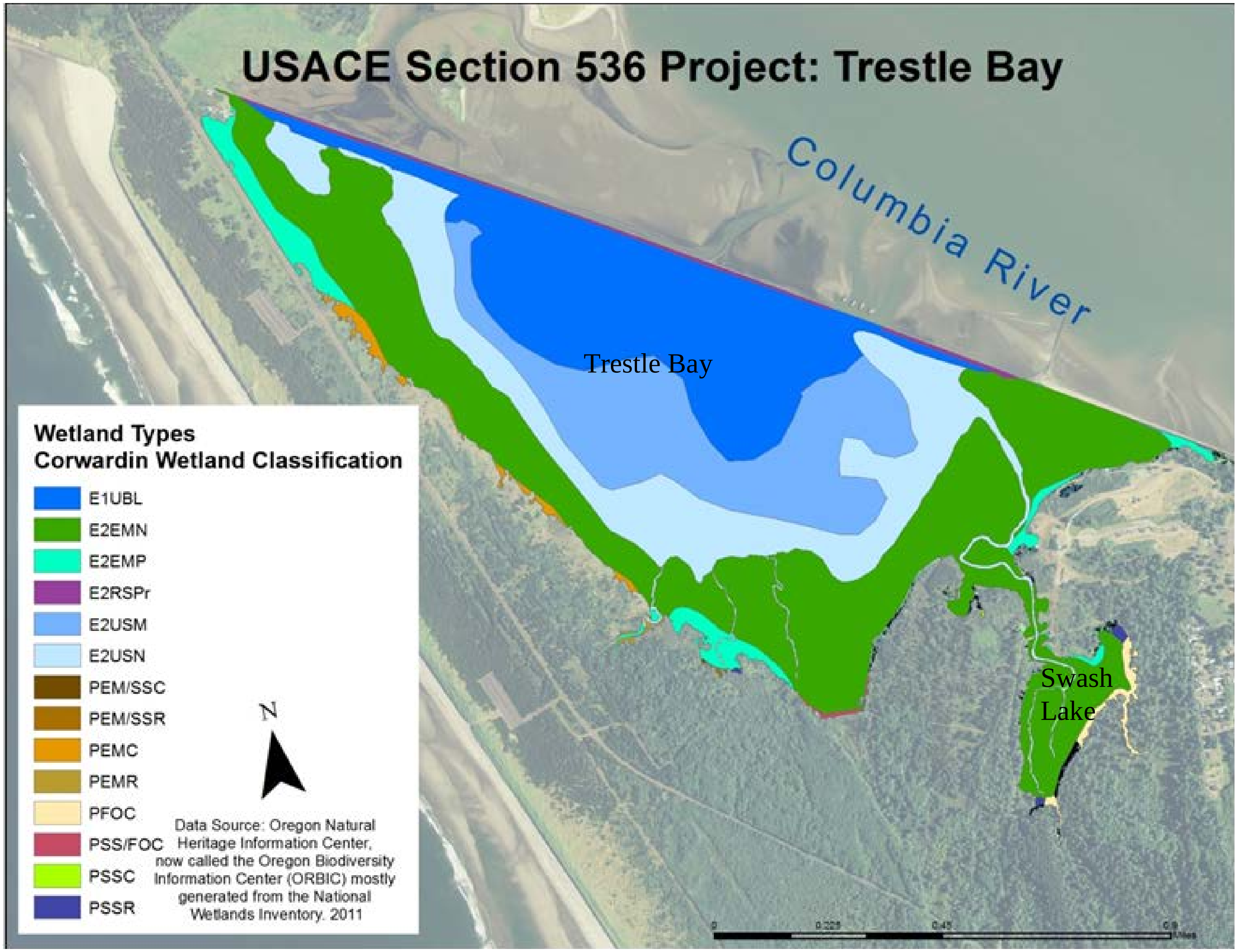
4.1.2.2. Wetlands

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),* widgeongrass *(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 and Aquatic Species

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.

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.

Other waterbirds present include cormorants and grebes. A small colony (less than 100 nests) of double crested cormorants nests atop the remnant portions of the innermost wooden trestle. 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.

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).

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. Although western snowy plovers historically occurred in the vicinity of Clatsop Spit, no breeding or wintering plovers have been reported from these beaches in recent years (USFWS 2001). In 2012, two snowy plover were sited during surveys at Clatsop Spit, but no nests were observed (Blackstone, 2012). A small population of western snowy plovers occurs on beaches at Leadbetter Point, Washington, which is more than 20 miles north of the project vicinity. 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 habitats 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 South Jetty Root itself and the area where the rock from the jetty would be placed. If project components change, the APE may need to be modified. 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 trestle that was used to construct the jetty have also been recorded as an archeological site.

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. [9]

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

[9] 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

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.[10]

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 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).

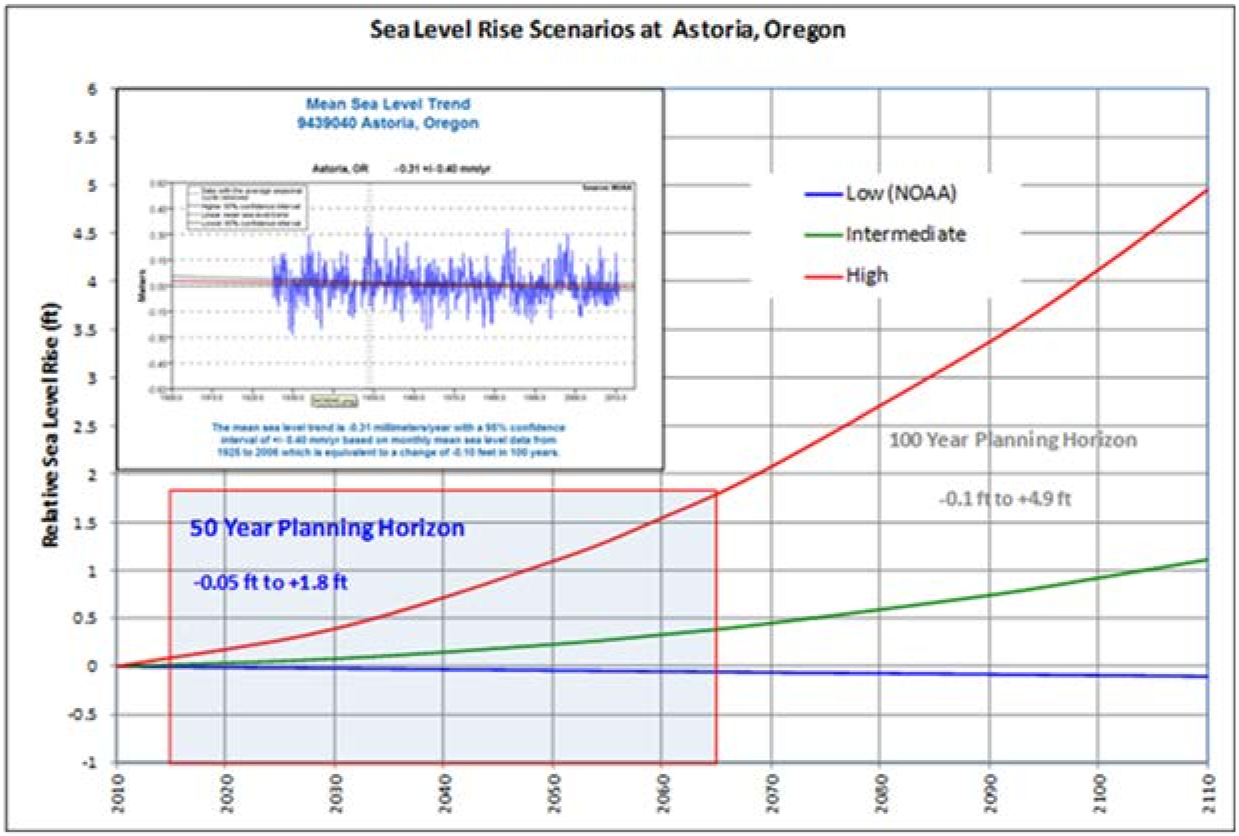
[10] This information was obtained from: http://deq12.deq.state.or.us/fp20/data.aspx?mw=709&mh=460

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 Alternative)

The Future Without Project (FWOP) Condition 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 the entire tide cycle.

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.

5. Environmental Consequences

The baseline conditions described in section 4 of this document establish a current description of the environmental condition of a project area. Baseline conditions are used to predict the effects of a No Action Alternative and the Proposed Action Alternative upon the project area. Alternative assessments conducted against a baseline condition provide a valid comparison of anticipated effects of a preferred alternative. As reviewed 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 aquatic species for the first time since the formation of Trestle Bay. Currently, Trestle Bay consists of 628 acres of varied partially closed-water natural habitat.

This section reviews the impacts to the project area for the No Action Alternative and the Proposed Action Alternative. 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. This section consists of the current state of the project area and the conditions that is likely to develop over the next 50 years as a result of implementing the No Action or the Proposed Action Alternative. The following effects of the No Action and Proposed Action Alternative are described: physical, biologic, and human environment. The direct, indirect, and cumulative impacts are described for both the No Action Alternative and the Proposed Action Alternative.

5.1. Physical Environment

5.1.1. Tidal Hydraulics

Executive Order 11988 (Floodplain Management) directs all federal agencies to refrain from conducting, supporting, or allowing actions in floodplains unless it is the only practicable alternative. Additionally, the Corps follows guidelines as set by Engineering Regulation (ER) 1165-2-26 for the operations and maintenance programs conducted by the Corps.

5.1.1.1. No Action Alternative

Trestle Bay would remain a partially closed, 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 this point. Under the No Action Alternative, the tidal hydraulics and inundation in the project area would remain relatively unchanged.

5.1.1.2. Proposed Action Alternative

Under the Proposed Action Alternative, the tidal water levels are not expected to change, as there is full tidal exchange 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 Alternative 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.

The permeable rock jetty exerts greater frictional forces, on the ebb and flood flows, than full openings in the jetty will exert. This difference in frictional forces between the openings and the permeable jetty will be the primary driver of the changes in current patterns of the ebb and flood flows at the jetty. The localized water velocities at the openings, locations of lower frictional resistance, will be greater than the localized water velocities through the permeable rock jetty. Thus, the circulation within Trestle Bay is expected to change in response to the new openings.

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.

While the localized water velocities through the jetty openings will be greater than the velocities through the permeable rock jetty; there will be an overall decrease in water velocities through the numerous openings of the Proposed Action Alternative as compared to the solitary existing lowered section. Localized scouring is expected to occur at the newly created openings until the areas equilibrate to the new flow conditions. Sedimentation is likely to occur in the areas that exhibit reduction in velocities. The changes in the water velocities throughout the openings are expected to provide minor beneficial improvement to the tidal hydraulics within Trestle Bay; however, the effects on overall increased tidal exchange within Trestle Bay would be muted against existing conditions in the lower Columbia River and these effects would be inconsequential.

5.1.2. Water Quality and Sediment Quality

The Clean Water Act (CWA) governs the release of pollutants into waterways. There are four applicable sections to the Proposed Action: section 401, section 402, section 404, and section 303(d). Section 401 requires certification from the state where the discharge to waters of the U.S. would occur. The certification is granted by the state certifying that the discharge would not violate the states' water quality standards. EPA retains jurisdiction in limited cases. Water Quality Certification (WQC) will be required from Oregon Department of Environmental Quality (DEQ) for this project. Section 402 authorizes the EPA, or states to which the EPA has delegated authority, to permit the discharge of pollutants under the NPDES program. The discharge of dredged or fill material into waters of the U.S., including wetlands, is regulated by the Corps under Section 404 of the CWA. The Corps does not issue itself a 404 permit for discharges of dredged or fill material, but does apply the 404(b)(1) guidelines when determining project impacts. Only when there is no practicable alternative would any discharge of fill material occur. An evaluation to demonstrate that the proposal is in compliance with the 404(b)(1) Guidelines will be prepared after further design work is completed. This evaluation and Compliance determinations will be included in the final EA.

Section 303(d) of the CWA establishes that states are to list waters which are not meeting applicable water quality standards. The list includes priority rankings set by the states for the listed waters. Once the impaired waters are identified, Section 303(d) requires that the states establish total maximum daily loads (TMDLs) that would meet water quality standards for each listed waterbody. The Columbia River adjacent to the project area has been inventoried by the DEQ as having impaired water quality and is listed on the 303(d) list.

5.1.2.1. No Action Alternative

The No Action Alternative at Trestle Bay is not expected to have any changes to water quality for this area. 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. Under the No Action project condition, the long-term water quality and sediment quality would likely remain unchanged.

5.1.2.2. Proposed Action Alternative

The Proposed Action Alternative 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 Alternative 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 Alternative, sediment quality would likely remain unchanged.

5.1.3. Geology and Soils

5.1.3.1. No Action Alternative

Under the No Action Alternative, geology and soils in the project area would remain unchanged.

5.1.3.2. Proposed Action Alternative

The Proposed Action Alternative 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

The Clean Air Act (CAA) prohibits federal agencies from funding, authorizing, or approving plans, programs, or projects that do not meet or conform to the NAAQS requirements. Any marine or terrestrial construction equipment used by the Corps would be required to meet EPA emission standards.

5.1.4.1. No Action Alternative

Under the No Action Alternative air quality and noise in the project area would remain unchanged.

5.1.4.2. Proposed Action Alternative

The Proposed Action Alternative would have no long-term effect on air quality or noise. Project construction may result in a localized increase of regulated air pollutants and may result in increased noise generation. The construction of the project would not exceed NAAQS standards. There would be a temporary and localized reduction in air quality during construction due to emissions from equipment used at the project site; however, these emissions will not exceed the standards set by NAAQS. There also would be temporary and localized increases in noise levels from this equipment. These impacts would be minor and temporary in nature, and would cease once removal of the rock and subsequent placement is completed.

5.2. Biologic Environment

5.2.1. Aquatic and Terrestrial Communities

This section discusses natural communities of concern. The focus of this section is on biological communities, not individual plant or animal species. The Columbia River serves as a wildlife and fish corridor; habitat fragmentation is discussed. Wildlife corridors are areas of habitat used by wildlife for seasonal or daily migration. Habitat fragmentation involves the potential for dividing sensitive habitat and thereby lessening its biological value. There are a wide range of regulations and laws that dictate and provide protection for components of the biologic environment. The applicable laws and compliance with the laws is detailed in Chapter 7. Species and habitat areas that have been designated under the ESA are reviewed in section 3.1.2.5 of this document.

5.2.1.1. No Action Alternative

Under the No Action Alternative, 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 Alternative would have no measureable adverse 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

Executive Order 11990 directs federal agencies to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. In planning their actions, federal agencies are required to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided.

5.2.2.1. No Action Alternative

Under the No Action Alternative, 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.

5.2.2.2. Proposed Action Alternative

Under the Proposed Action Alternative, 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 Alternative 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

5.2.3.1. No Action Alternative

Under the No Action Alternative, access to Trestle Bay would remain limited. 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 Alternative.

5.2.3.2. Proposed Action Alternative

Under the Proposed Action Alternative, 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 may be some loss of aquatic species during initial placement of rocks within the water column.

The Proposed Action Alternative would temporarily increase turbidity, degrade water quality, and cause temporary disturbance to adjacent aquatic habitat. Any turbidity will remain within duration and extent set by the State of Oregon's Department of Environmental Quality Water Quality Certificate (WQC). Any terms and conditions issued in the WQC would be complied with. It is expected that turbidity will return to preconstruction water quality upon completion of construction. 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 appropriate in-water-work window of 1 November thru 28 February (last updated in 2008 by Oregon Department of Fish and Wildlife). It is expected that there would be less fish moving through the system during this window.

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.

5.2.4. Wildlife Species

5.2.4.1. No Action Alternative

Under the No Action Alternative, wildlife species population composition may change if the environment adjacent to the project area experiences successive change to the habitat present to support different species. These different species might utilize Trestle Bay as foraging habitat. However, it is not anticipated that much change in the wildlife species composition would occur under the No Action Alternative.

5.2.4.2. Proposed Action Alternative

The Proposed Action Alternative would have a temporary minor adverse impact on wildlife. Birds or other wildlife that roost, rest, or forage near the project area may be disturbed during construction activities. The Proposed Action Alternative may have a long-term minor beneficial impact on wildlife by improving the composition of fish and aquatic populations in Trestle Bay.

It is possible that the Proposed Action Alternative could disturb the Steller sea lion and other pinnipeds with the use of equipment in Trestle Bay, but it is unlikely that the effects would rise to the level of harm or harassment. Pinnipeds are able to move away from the project area if disturbed. The Proposed Action Alternative may increase foraging opportunities for birds and other wildlife but are not expected to rise to levels of concern for salmonid predation rate.

5.2.5. Endangered Species Act-listed Species

The federal law protecting threatened and endangered species is the ESA. See 16 United States Code (USC) 1531, et seq. and implementing regulations at 50 CFR Part 402. The ESA and its subsequent amendments provide for the conservation and recovery of endangered and threatened species and the ecosystems upon which they depend. Under Section 7 of the ESA, federal agencies are required to consult with USFWS and/or NMFS to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. Critical habitat is defined as geographic locations critical to the existence of a threatened or endangered species. The outcome of consultation under Section 7 may include a Biological Opinion with an Incidental Take statement, a Letter of Concurrence and/or documentation of a no effect finding. Section 3 of the ESA defines Take as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1976, was established to conserve and manage fishery resources found off the coast, as well as anadromous species and Continental Shelf fishery resources of the United States. This act is implemented by exercising (a) sovereign rights for the purposes of exploring, exploiting, conserving and managing all fish within the exclusive economic zone established by Presidential Proclamation 5030, dated 10 March 1983, and (b) exclusive fishery management authority beyond the exclusive economic zone over such anadromous species, Continental Shelf fishery resources and fishery resources in special areas. Essential Fish Habitat (EFH) is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” (50 CFR 600.10). Adverse effects include the “direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH.” (50 CFR 600.810).

5.2.5.1. ESA-Listed Species Under NMFS Jurisdiction

5.2.5.1.1. No Action Alternative

Under the No Action Alternative, 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. It is anticipated that a discountable change in the threatened, endangered, and special status species population composition would occur under the No Action Alternative.

5.2.5.1.2. Proposed Action Alternative

Under the Proposed Action Alternative, 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 alternative is expected to have long-tern 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 Alternative, 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 and streaked horned larks within Trestle Bay would remain unlikely under the No Action Alternative, as the bay is continually inundated and does not provide the type of habitat preferred by these two species.

5.2.5.2.2. Proposed Action Alternative

Under the Proposed Action Alternative, bull trout access to Trestle Bay would improve. It is unlikely that bull trout would utilize Trestle Bay. Trestle Bay does not provide the type of habitat preferred by bull trout. Western snowy plovers and streaked horned larks within Trestle Bay would remain unlikely under the No Action Alternative, as the bay is continually inundated and does not provide the type of habitat preferred by these two species. The Corps determined that the Proposed Action Alternative 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 snowy plover or streaked horned lark habitat. All work would be conducted from the water and conducted well removed from any suitable habitat. The Corps contacted USWFS to discuss the Proposed Action; the results of these discussions determined 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 National Historic Preservation Act of 1966 (NHPA), as amended, sets forth national policy and procedures regarding historic properties, defined as districts, sites, buildings, structures, and objects included in or eligible for the National Register of Historic Places (NRHP). Section 106 of NHPA requires federal agencies to take into account the effects of their undertakings on such properties and to allow the Advisory Council on Historic Preservation (ACHP) the opportunity to comment on those undertakings, following regulations issued by the ACHP (36 CFR Part 800). The Archaeological Resources Protection Act (ARPA) applies when a project may involve archaeological resources located on federal or tribal land. ARPA requires that a permit be obtained before excavation of an archaeological resource on such land can take place.

5.3.1.1. No Action Alternative

Under the No Action Alternative, cultural resources in the project area would remain unchanged.

5.3.1.2. Proposed Action Alternative

The only known property eligible for listing in the National Register of Historic Places within the APE is the jetty 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 APE and the likelihood for them to exist in this location is low. Although this project would have a direct impact on the jetty itself, the impact would likely not be adverse. This is due to the following:

- The maximum amount of rock to be removed as part of this action would be 900 linear ft. There is approximately 8,800 linear ft of jetty still intact within Trestle Bay, and thus this action would only have a minimal impact on the overall structure.

- While the portion of the South Jetty on the west side of Clatsop Spit is still operational and serving its purpose of supporting navigation, the segment of jetty in Trestle Bay became obsolete as a functional jetty soon after it was constructed. Therefore while the structure is eligible for its contribution to regional development and economies, the proposed project is within Trestle Bay and would not affect that significance.

Therefore based on this information, the Corps has made a preliminary determination that this action would likely have *no adverse effect* on properties on or eligible to the National Register of Historic Places. The Corps has had initial, informal discussion with the Oregon State Historic Preservation Office regarding early designs for the proposed action.

During early informal coordination with the State Historic Preservation Office, it was requested that the jetty be recorded as a structure and an archeological site due to its age. That documentation is currently in progress and when it is completed formal consultation regarding the initial "no adverse effect" determination with the State Historic Preservation Office will be finalized. The following Tribes will also be consulted at that time: 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

5.3.2. Socio Economic, Land Use, and Recreation

5.3.2.1. No Action Alternative

Under the No Action Alternative, socio-economic, land uses, and recreation in the project area would remain unchanged.

5.3.2.2. Proposed Action Alternative

The Proposed Action Alternative 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. 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.

The primary federal laws regulating hazardous wastes/materials are the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Resource Conservation and Recovery Act of 1976 (RCRA). The purpose of CERCLA, often referred to as "superfund," is to identify and clan up abandoned contaminated sites so that public health and welfare are not compromised. RCRA provides for “cradle to grave” regulation of hazardous waste generated by operating entities.

5.3.2.3. No Action Alternative

The No Action Alternative would have no effect to any HTRW products. No known HTRW sites occur within the project area. Land uses within the project area are not anticipated to change to enable industrial or other high risk uses. As such, under the No Action Alternative, any potential for HTRW contaminants in the project would remain unchanged.

5.3.2.4. Proposed Action Alternative

The Proposed Action Alternative would have no effect to HTRW. No known HTRW sites occur within the project area. Land uses within the project area are not anticipated to change to enable industrial or other high risk uses. As such, under the Proposed Action Alternative, 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 to 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 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, described in section 4.1.4, 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).

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).

5.4.1.2. Proposed Action Alternative

At Trestle Bay site, there is an opportunity to reconnect habitat to the Lower Columbia River estuary. The proposed action is to construct up to 900 ft of openings along the South Jetty Root. The intent of this alternative is to improve tidal flushing of the bay and to improve salmonid access to fringe habitat within the bay. This section briefly characterizes the perceived impact of climate change on the 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.

Comparisons between the no action and proposed action alternative against projected future conditions indicate that the SLC and its impacts are 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 alternative should consider obvious and likely 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.

The inherent uncertainty of climate change impacts on the site may be addressed by implementation of an adaptive management plan that includes monitoring of the water levels as well as the habitat response to changes in water levels. The plan would contain information as to how often to collect and analysis the monitored information as well as thresholds on water depth and habitat composition and spatial extents that are threshold points for action. 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 Alternative described above.

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 are 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 Alternative or the Proposed Action Alternative.

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 Alternative. 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 that 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, waterfront development).

Reasonably foreseeable future actions are those actions that are likely to occur and affect the same resources for the Proposed Action Alternative. 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 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 Alternative 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 Section 4, the No Action Alternative 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 Alternative and the Proposed Action Alternative.

Water Quality: 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 Alternative and the Proposed Action Alternative 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 Alternative 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 Alternative and the Proposed Action Alternative, 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 Alternative, 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 Alternative 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 Alternative and the Proposed Action Alternative. 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 Project Alternative against the No Action Alternative 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 general public and appropriate public agencies is an essential part of the environmental process to determine the scope of environmental documentation, the level of analysis, potential impacts and avoidance, minimization, and/or related environmental requirements. Agency consultation for this project has been accomplished through a variety of formal and informal methods. This draft EA is being issued for a 30-day public review period. Review comments are requested from federal and state agencies, as well as various interested parties. Responses to public comments would be prepared. Public concerns identified in comments would aid in determination of whether or not an environmental impact statement (EIS) is necessary for the Tentatively Selected Plan. If it is determined that an EIS is not required, a Finding of No Significant Impact (FONSI) would be signed, concluding the NEPA process.

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

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.). From this draft EA, the Corps selects one of the following; (a) select one of the alternatives and prepare a FONSI or (b) determine that the impacts rise to the level of significance. With (b), if the Corps should pursue the action, the preparation of an EIS is initiated.

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 Corps uses best management practices (BMPs) to avoid effects to bald eagles. The Without and With action does not involve forestry practices, use of aircraft or other motorized equipment, blasting, or other work that can result in loud or intermittent noises within 660-ft of an active or alternate eagle nest between 1 January and 15 August. The actions would not disturb bald or golden eagles and therefore *complies with* the Bald and Golden Eagle Protection Act.

7.3. Clean Air Act

The CAA of 1970, as amended, established a comprehensive program for improving and maintaining air quality throughout the United States. The intent of the Act is achieved through permitting of stationary sources, restriction of toxic substance emissions from stationary and mobile sources, and the establishment of NAAQS. Noise pollution is addressed through Title IV of the Act. The actions would have short-term intermittent reduction in air quality during the construction of openings in the South Jetty Root and subsequent rock placement in water. Noise impacts would be minor and temporary in nature and would immediately return back to background levels at the completion of the actions. The Without and With action would be *in compliance* with the CAA.

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. The Corps will seek certification from the Oregon Department of Environmental Quality (DEQ); all terms and conditions within the WQC would be complied with.

Section 402 **–** Authorizes the EPA, or states to which the EPA has delegated authority, to permit the discharge of pollutants under the NPDES program. The Corps would ensure that a small vessel general permit under the NPDES program is in place prior to initiating construction.

Section 404 **–** Regulates the discharge of dredged or fill material into waters of the U.S. The Corps does not issue itself a 404 permit for discharges of dredged or fill material, but the Corps does apply the 404(b)(1) guidelines (40 CFR Part 230). Only when there is no practicable alternative would any discharge of fill material occur in waters of the U.S., including wetlands. An evaluation to demonstrate that the proposal is in compliance with the 404(b)(1) Guidelines will be prepared after further design work is completed. This evaluation and Compliance determinations will be included in the final EA.

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. The Corps will prepare a consistency determination and coordinate with the Department of Land Conservation and Development to ensure that the proposal is consistent to the maximum extent practicable with the State's Coastal Zone Management Program.

7.6. Comprehensive Environmental Response, Compensation, and Liability Act and Resource Conservation and Recovery Act

The CERCLA established a method to assign liability to parties responsible for the release of hazardous wastes, and established a trust fund to pay for their cleanup to reduce associated dangers to public health and the environment.

The project area is not within the boundaries of a designated Superfund site as identified by the EPA or Oregon for a response action under CERCLA, nor is the project area on the National Priority List (http://www.epa.gov/superfund/sites/npl/index.htm); therefore, this Act is *not applicable* to the Without and With action. There is no indication that any hazardous, toxic, and radioactive wastes are in the vicinity of the Network. Any presence of these types of wastes would be responded to within the requirements of the law and Corps' regulations and guidelines.

7.7. 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. Any incidental take as a result of the construction of the Proposed Action Alternative would be coordinated between NMFS, USFWS, and the Corps. Information on federally listed species and designated critical habitat is presented in this document.

The Corps has initiated consultation with NMFS. ESA consultation for the Proposed Action is expected to be accomplished through the use of the following Biological Opinion:

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)

The project would likely fit under Category 31 (Off- and Side-Channel Habitat Restoration) and/or Category 33 (Set-Back Existing Berms, Dikes and Levees).

In the SLOPES V Restoration Biological Opinion, NMFS concluded that the proposed action is not likely to adversely affect southern DPS green sturgeon *(Acipenser medirostris)* and their designated critical habitat. NMFS also concluded that the proposed program is not likely to jeopardize the continued existence of the following 16 species, or result in the destruction or adverse modification of their proposed or designated critical habitats.

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 SLOPES V Restoration Biological Opinion contains an incidental take statement (ITS) with the opinion. The ITS describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this program. The ITS also sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal action agency must comply with to carry out the reasonable and prudent measures. The Proposed Action would follow the terms and conditions set forth by SLOPES V Restoration Biological Opinion.

No consultation is needed for USFWS ESA-listed species because there will be no effect on USFWS ESA-listed species.

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

Federal agencies shall 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. The following Tribes would be consulted for the Proposed Action Alternative.: 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.

7.9. Executive Order 12898 – Environmental Justice

This order requires federal agencies to minimize health 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. No subsistence, low-income or minority communities would be affected by the No Action Alternative and the Proposed Action Alternative because these populations do not occur in or directly adjacent to the project area. Therefore, there would be no change in population, economics or other indicator of social well-being. Consequently, the project action is *in compliance* with this Order because no environmental justice implications exist for the No Action Alternative and the Proposed Action Alternative.

7.10. 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. The No Action Alternative and the Proposed Action Alternative are *in compliance* with this Order because all actions would be conducted in a manner as to prevent pollution and chemical spills by following BMPs.

7.11. 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 No Action Alternative and the Proposed Project Alternative 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. The proposed activities are *in compliance* with this Order because the actions not within the floodplain.

7.12. Executive Order 13112 – Invasive Species

Federal agencies are required to combat the introduction or spread of invasive species in the United States. This order defines invasive species as “any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, this is not native to that ecosystem whose introduction does or is likely to cause economic or environmental harm or harm to human health.” The Corps would follow BMPs to minimize the spread of invasive species. The No Action Alternative and the Proposed Action Alternative is *in compliance* with this Order because the action would not intentionally spread invasive species.

7.13. Executive Order 13186 – Migratory Birds

This order further strengthens the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act, the Fish and Wildlife Coordination Act (FWCA), the ESA and the NEPA. Federal actions resulting in any “take” (intentional or otherwise) of a migratory bird are required to develop Memorandum of Understanding with USFWS to promote the conservation of migratory bird populations and resources. There would be no intended impact to any migratory birds resulting from the No Action Alternative and the Proposed Action Alternative; therefore, the action is *in compliance* with this Order.

7.14. Executive Order 11990 – Protection of Wetlands

The purpose of this executive order is to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. In planning their actions, federal agencies are required to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. Only when there is no practicable alternative would any discharge of fill material occur. There would be no intended impact to any wetland resulting from the No Action Alternative and the Proposed Action Alternative; therefore, the actions are *in compliance* with this Order.

7.15. Farmland Protection Policy Act

This Act, without authorizing federal agencies to regulate the use of private or non-federal lands, encourages federal agencies to minimize the impact of federal programs on the unnecessary and irreversible conversion of farmland (prime or unique) to nonagricultural uses. It follows that federal programs shall be administered in a manner that, as practicable, would be compatible with state and local government and private programs and policies to protect farmland. The No Action Alternative and the Proposed Action Alternative is *in compliance* with this Act because the activities would not occur on lands utilized for agricultural purposes, nor would the landscape be converted to alternative land uses.

7.16. 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 has determined that the Proposed Action Alternative is *in compliance* with this act because there would be no net loss or gain of habitat within Trestle Bay, diversion or modification of habitat, or permanent changes to habitat quality within Trestle Bay as a result of the Proposed Action Alternative.

7.17. 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.

The Corps is currently in consultation with NMFS for the Proposed Action Alternative through the use of the SLOPES V Restoration Biological Opinion. 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.

7.18. 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.

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 Project Alternative could disturb the federally listed Stellar sea lion and other pinnipeds 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. The No Action Alternative and the Proposed Action Alternative is *in compliance* with this Act because there would be no take of marine mammals.

7.19. 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. This action is not applicable to the No Action Alternative and the Proposed Action Alternative because there will be no transportation of dredged materials for the purpose of dumping it into the ocean waters.

7.20. 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. Provisions are in place for the protection of migratory bird, part, nest, egg or product. Under the MBTA, "migratory birds" essentially include all birds native to the U.S. and the Act pertains to any time of the year, not just during migration. The No Action Alternative and the Proposed Action Alternative could displace birds by altering flight patterns, or cause other behavioral changes; however, it is not expected that effects would rise to the level of take.

7.21. Wild and Scenic Rivers Act

This Act applies only to rivers designated by Congress as "wild and scenic" in order to safeguard the special character of these rivers. Under this Act, federal agencies may not assist the construction of a water resources project that would have a direct and adverse effect on the free-flowing, scenic, and natural values of a federally designated wild or scenic river. The Columbia River along this reach is not designated as a Wild and Scenic River[11]; as a result, this Act is *not applicable* to the No Action Alternative and the Proposed Action Alternative.

7.22. 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.

The Corps has made a preliminary determination that this action would likely have no adverse effect on historic properties. As project components are refined, this determination would be coordinated with the State Historic Preservation Office and Native American tribes.

[11] As verified through this link: http://www.rivers.gov/wildriverslist.html

8. Conclusions and Recommendation

8.1. Conclusions

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

Under Section 536 the cost share is split 65/35. The total estimated project cost is $692,000 with a Federal share of $450,000 for Design and Implementation and a non-Federal share of $242,000.

8.2. 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.

8.3. 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.

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