LOWER DUNGENESS RIVER ECOSYSTEM RESTORATION

SECTION 544

DRAFT Integrated Detailed Project Report and Environmental Assessment

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LIST OF ABBREVIATIONS AND ACRONYMS

AAHU Average Annual Habitat Unit
ATR Agency Technical Review
BE Biological Evaluation
BMP Best Management Practice
CAA Clean Air Act
CE/ICA Cost Effective/Incremental Cost Analysis
CEQ Council for Environmental Quality
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
CFS Cubic feet per second
Corps U.S. Army Corps of Engineers
CY Cubic yards
CZMA Coastal Zone Management Act
DAHP Department of Archaeology and Historic Preservation
DO Dissolved Oxygen
DPS Distinct Population Segment
DQC District Quality Control
DRMT Dungeness River Management Team
EA Environmental Assessment
EC Engineering Circular
EFH Essential Fish Habitat
EO Executive Order
ER Engineer Regulation
ERDC Engineer Research and Development Center
ESA Endangered Species Act
EPA U.S. Environmental Protection Agency
FERC Federal Energy Regulatory Commission
FONSI Finding of No Significant Impact
FWCA Fish and Wildlife Coordination Act
GHG Greenhouse Gas
IWR Institute for Water Resources
LW Large Wood
LWD Large Woody Debris
MBTA Migratory Bird Treaty Act
MCACES Micro-Computer Aided Cost Estimating System
MMPA Marine Mammal Protection Act
MSFCMA Magnuson-Stevens Fishery Conservation and Management Act
NAGPRA Native American Graves Protection and Repatriation Act
NEPA National Environmental Policy Act
NER National Ecosystem Restoration
NHPA National Historic Preservation Act
NMFS National Marine Fisheries Service
NOAA National Oceanic and Atmospheric Administration
NPDES National Pollutant Discharge Elimination System
NRHP National Register of Historic Places
NWI National Wetlands Inventory
O&M Operations and Maintenance
PDT Project Delivery Team
PPA Project Partnership Agreement
RM River Mile
SHPO State Historic Preservation Officer
SMA Shoreline Management Act
TCP Traditional Cultural Properties
Tribe Jamestown S'Klallam Tribe
TSP Tentatively Selected Plan
U&A Usual and Accustomed
USACE U.S. Army Corps of Engineers
USC United States Code
USFS U.S. Forest Service
USFWS U.S. Fish and Wildlife Service
WDFW Washington State Department of Fish and Wildlife
WDNR Washington State Department of Natural Resources
WDOE Washington Department of Ecology
WRDA Water Resources Development Act
WRIA Water Resource Inventory Area
WQC Water Quality Certification

Executive Summary

This integrated Detailed Project Report/Environmental Assessment (DPR/EA) describes the Federal interest, costs, benefits, and practical and environmental considerations associated with the ecological restoration of habitat along the lower Dungeness River, adjacent to Puget Sound on Washington's Olympic Peninsula. The report concludes with a recommendation to implement ecosystem restoration. The primary feature analyzed in this report is the realignment of a portion of a levee constructed in 1964 by the U.S, Army Corps of Engineers (Corps). Clallam County, WA is the non-Federal sponsor for both the 1964 levee, and the present ecosystem restoration project.

The Dungeness River flows north out of the Olympic Mountains, emptying into the Strait of Juan de Fuca approximately 5 miles northwest of Sequim, WA and 14 miles east of Port Angeles, WA. The project site is located approximately one mile upstream from the mouth of the river.

The Dungeness River is home to a range of fish and wildlife species, including four Endangered Species Act listed salmonids: spring/summer Chinook salmon, summer chum salmon, winter steelhead, and bull trout, as well as pink salmon stocks considered critical under the Washington state evaluation system. Declines in these species are linked to ecosystem degradation in the Dungeness River and Strait of Juan de Fuca.

The Dungeness River is the ancestral river of the Jamestown S'Klallam Tribe. Since time immemorial tribal citizens have been reliant on the resources of the river, and that continues to this day with Tribal fishing for commercial and ceremonial purposes. The multiple species of fish and shellfish resources in the Dungeness River play an integral part of tribal culture, religion, and physical sustenance. The Jamestown S'Klallam Tribe has treaty-protected harvest rights within their Tribe's usual and accustomed (U&A) harvest area.

The problem with greatest impact to habitat in the study area is the degradation of the river meander, channel formation and sediment transport process that create and sustain habitat for the fish species listed above and other riverine, riparian and floodplain wildlife. There are approximately 5.7 miles of levees constraining the lower 10.5 miles of the Dungeness River. The US Bureau of Reclamation (2002) identified realigning or removing the levees present on the lower Dungeness River as one of the most powerful management tools available for restoring fish habitat. There is broad regional support for completing restoration in the reach, and a natural nexus for the Corps to participate given the impacts related to the Federal levee that lines a significant portion of the reach.

This report analyzes three alternative plans to address the identified problems and restore the significant ecosystem resources discussed above. The tentatively selected plan (TSP) would reconnect the Dungeness River to 110 acres of its historic floodplain and reestablish historic off-channel habitat critical for salmonid refuge and rearing. The TSP would not lead to any increase in flood risk to adjacent properties, and in fact would have some incidental flood risk benefits in the reach. The estimated cost to design and implement the TSP is $6,689,000.

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1. Introduction

This report documents the planning process for ecosystem restoration in the vicinity of the Federal levee along the right bank of the lower Dungeness River, Washington, to demonstrate consistency with U.S. Army Corps of Engineers (Corps) planning policy and to meet the regulations that implement the National Environmental Policy Act (NEPA). The following sections provide background information regarding the basis for this study.

1.1 Study Purpose and Scope

The purpose of this detailed project report is to evaluate significant ecosystem degradation in the vicinity of the Federally authorized and constructed levee in the lower Dungeness River; to formulate, evaluate, and screen potential solutions to these problems; and to recommend a project that has a Federal interest and is supported by a local entity willing to provide the necessary items of local cooperation.

Ecosystem restoration is proposed to improve conditions for significant ecological resources that depend on an intact river and floodplain, including salmonid species listed under the Endangered Species Act. The proposed project site includes approximately 0.85 miles of a Federal levee, built by the Corps in 1964 (the entire existing levee is approximately 2.4 miles long). This report provides feasibility level planning details and preliminary engineering, and construction details of the recommended restoration plan, sufficient to support project approval and to lay the groundwork for the design and implementation phase.

1.2 Study Authority

This study is being conducted under Section 544 of the Water Resources Development Act of 2000 (Public Law 106-541, December 11, 2000), Puget Sound and Adjacent Waters Restoration, WA, (PSAWR) which authorizes implementation of critical restoration projects in Puget Sound and its contributing watersheds. The Federal interest in this separable element of the PSAWR program stems from its intent to restore habitat for Endangered Species Act (ESA)-listed species as well as other riverine and floodplain species, habitat which has been impacted by a Federal levee.

1.3 Lead Federal Agency and Non-Federal Sponsors

The study documented herein has been conducted jointly by the Corps (lead Federal agency) and Clallam County, the project cost share sponsor.

1.4 Location of the Study Area

The proposed project is located along the right bank of the Dungeness River approximately one mile upstream from the river's mouth at Dungeness Bay on the Strait of Juan de Fuca, and about five miles northwest of the city of Sequim, in Clallam County, Washington (Figure 1-1). The project area extends downstream from approximately river mile (RM) 1.75 to RM 0.8, ending just upstream from the Schoolhouse Bridge where East Anderson Road crosses the Dungeness River (Figure 1-2).

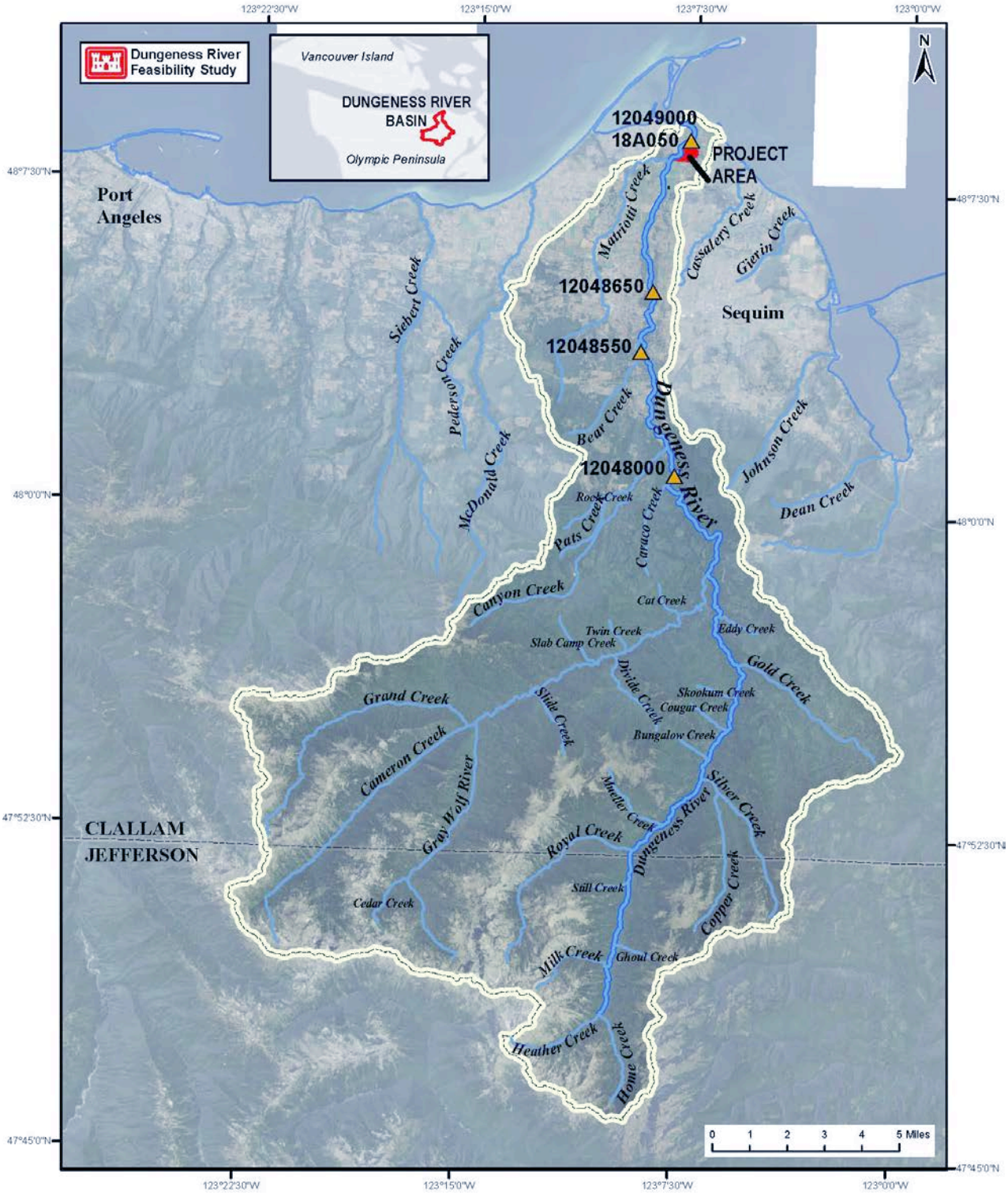

Figure 1-1. Dungeness River Watershed (Project Area in Red)

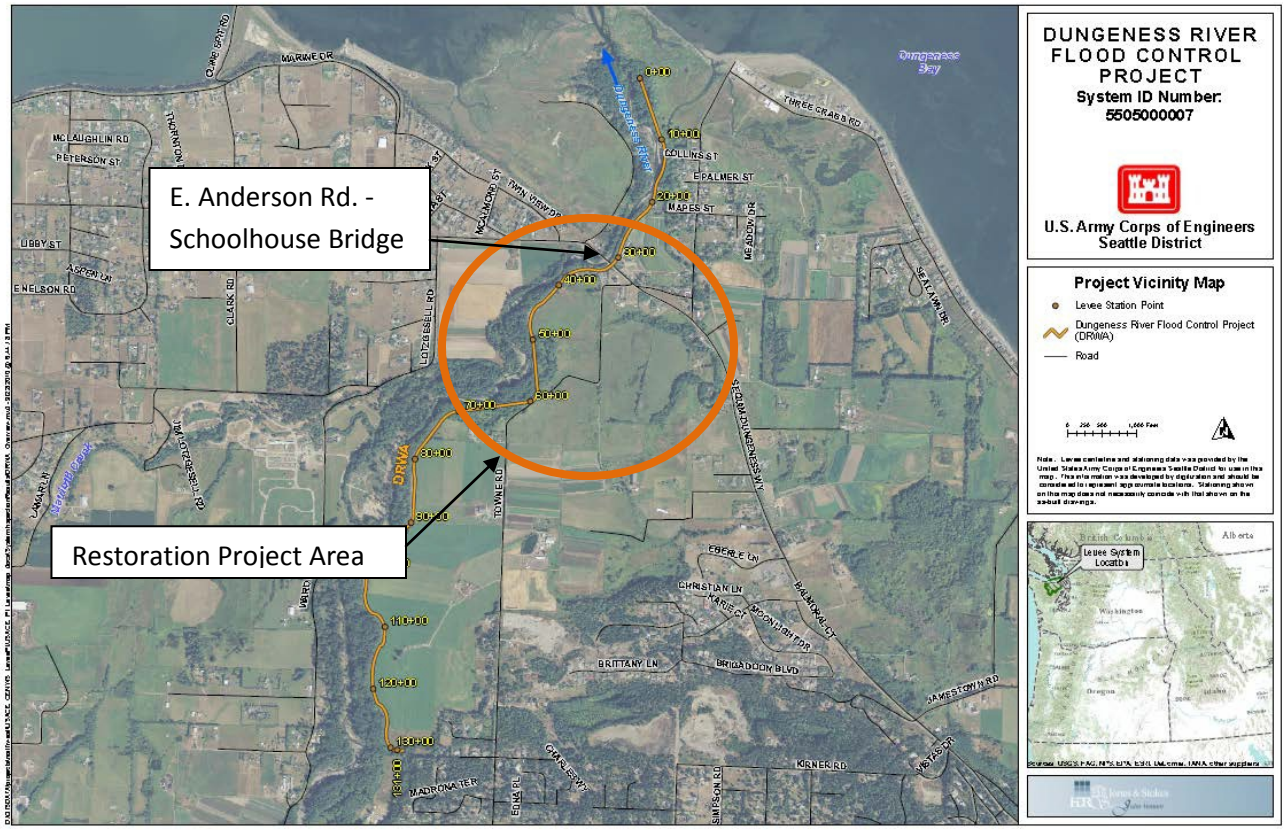

Figure 1-2. Restoration Project Area

1.5 Proposal for Federal Action

The proposal to implement ecosystem restoration along the lower Dungeness River 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 of ecosystem structure, function and processes through reconnection of approximately 110 acres of historic floodplain to the main channel of the Dungeness River, just upstream of the Schoolhouse Bridge at river mile 0.8. This report analyzes the feasibility of measures to improve the environment, including realignment of a levee built by the Corps in 1964 at the request of Clallam County, under the authority of Section 205 of the 1948 Flood Control Act.

1.6 Overview of Integrated DPR/EA

This document is a combined Detailed Project Report (DPR) 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 the environmental effects of the 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 1-1. Overview of DPR/EA

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 significant 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 significant resources.
Step Six – **Select Recommended Plan**	Appears in Chapter 5 and includes details of the Tentatively Selected Plan (agency preferred alternative).

2. Need for and Objectives of Action

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

2.1 Problems and Opportunities

Problems

Ecosystem problems in the study area stem primarily from degradation of riverine processes including channel formation, sediment transport, organic matter exchange, food web support, and wood recruitment. This process degradation came about as a result of levees constructed along the reach, effectively disconnecting the main channel at the time of construction from the historic floodplain. The Federal levee was the first and longest levee constructed in the area disconnecting approximately 410 acres of floodplain, side channel and distributaries from the river. In response, two private dikes - the Beebe and Rivers End dikes - were built on the opposite bank, truncating approximately 111 and 40 acres respectively. Aggradation in the channel has led to a significant reduction in flood protection offered by the levees in the reach.

Problems in the Study Area

- Loss of Off-Channel Fish Habitat
  - Side channel
  - Back channel
- In-channel Fish Habitat Degradation
  - Elevated gravel bars
  - Coarser sediments
  - Fewer stable pools
  - Less woody debris
  - Increased water temperatures
- Disconnection of Floodplain from River
  - Loss of organic matter from floodplain wetlands
  - Loss of terrestrial insect fallout
  - Degraded quantity and quality of floodplain habitat
  - Decreased shading from trees adjacent to channel

Floodplains and side channels provide important spawning, rearing and foraging habitat to juvenile salmon and trout during periods of seasonal inundation (Brown and Hartman 1988; Bryant et. al. 2005; Henning et. al. 2006, 2007). Such inundations are accompanied by high flows in the main channel and juvenile salmon and trout find refuge in lower velocity water provided by floodplains and off-channel habitat. Juvenile salmon and trout also benefit from increased growth rates and foraging opportunities in emergent marshes and inundated terrestrial vegetation (Sommer et al. 2001, 2005; Limm and Marchetti 2009; Eberle and Stanford 2010).

Levee construction adjacent to the main channel has impacted the riverine processes that create and sustain habitat, leading to coarser sediments on the bed, elevated gravel bars, less woody debris, and fewer stable pools. The levees also cut off side channels and result in higher velocities and depths during floods (BOR, 2002). With fewer channels, there is also less riparian area; benefits of riparian areas include providing habitat for mammals, migratory songbirds and raptors, generation of insects of forage value to fish, and shading the river to maintain the cooler temperatures to which native fish have adapted.

In the years since levee construction, the channel in the project area has aggraded with sediment build-up in the channel; as a result the levee provides a lower level of protection than it was designed to provide. Designed to provide a 200-year level of protection, it is estimated to provide a 69-year level of protection, or 1.45% annual exceedance probability. As this project is being conducted under an ecosystem restoration authority, plans will not be formulated primarily to address flood risk, but opportunities to incidentally achieve flood risk reduction will be considered.

Opportunities

- This reach has been identified in several regional planning documents as having high potential for floodplain restoration. A report published by the US Bureau of Reclamation(2002) identified realigning or removing the levees present on the lower Dungeness River as one of the most powerful management tools available for restoring fish habitat. There is broad regional support for completing restoration in the reach, and a natural nexus for the Corps to participate given the impacts related to the Federal levee that lines a significant portion of the reach.
- The river in this reach has aggraded considerably as a result of site-specific topography, ample sediment supply in the headwaters, and channelization by levees. Reconnecting parts of the river to its historic floodplain would have the secondary benefit of reducing flood risks by lowering flood elevations and velocities through expansion of the active floodplain.
- The river in this reach is constrained by levees on both banks. Realigning the publicly held levee on the right bank further from the main channel would improve conditions for a subsequent realignment of the privately held levee on the left bank by lowering the perceived risk associated with that action. Levee realignment along the levee on the left bank would reconnect more floodplain to the channel, further lower the flood elevations in the reach, and set the stage for further floodplain reconnection actions in the reach.

2.2 Purpose and Need for Action

The need for the proposed Federal action arises from the significant degradation of natural processes that sustain the ecological functions of the lower Dungeness River, as described under *Problems,* above. Specifically, disconnection of the river from its historic floodplain has degraded in-channel and off-channel habitat for Federally-listed fish species, as well as the associated riparian zone that historically enhanced the riverine habitat while also providing habitat for mammals, raptors, songbirds and other wildlife.

2.3 Resource Significance – Technical, Institutional, Public

2.3.1 Technical Significance

The Pacific Northwest ecoregion is home to many species of the Salmonidae family. These fish serve as an indicator of the overall health of not only the aquatic environment where they dwell, but also the connected riparian, wetland, and upland habitats. A comprehensive restoration plan for all species in the Salmonidae family, as keystone species, effectively restores habitat and nutrient input for a broad suite of over 130 other native plant and animal species (Cederholm et al. 2000). Keystone species play a unique and crucial role in the way an ecosystem functions; these fish are extremely sensitive to changes in water quality, trophic webs, and perturbations to the river flow, turbidity, and temperature. Pacific salmon are a food source for a variety of marine, freshwater, and land animals and provide a source of marine-derived nutrients to freshwater environments after spawning (Cederholm et al. 1999). Juvenile salmonids feed on aquatic invertebrates that are indicators of water quality.

Generally, the more pristine, diverse, and productive the ecosystem is, the healthier the salmon stocks. A decline in the capacity of a watershed to support juvenile salmonids is one indication of declining ecosystem health. Restoration planning centered on habitat for the Salmonidae family reinstitutes dynamic processes that tend to maintain healthy ecosystem characteristics.

Floodplains and associated wetlands in the Dungeness River basin provide significant ecological functions including rearing and refuge sites for aquatic and land species, storage areas for floodwater, groundwater discharge areas critical to summer low flow, exchange of nutrients and organic material between land and water, and water purification functions through natural filtration. The water quality functions of floodplain and wetlands associated with the Dungeness River benefit water quality in the Strait of Juan de Fuca.

2.3.2 Institutional Significance

Four ESA-listed fish species of the Puget Sound area occur in the Dungeness River, including spring/summer Chinook salmon, summer chum salmon, winter steelhead, and bull trout. The early-timed upper river stock of pink salmon is considered depressed while the lower river stock of pink is critical under the Washington state evaluation system (Washington Department of Fisheries et al., 1993 and WDFW 2002). The decline of these particularly sensitive species indicates degradation of environmental health of the Dungeness River and Strait of Juan de Fuca aquatic systems, representing a crucial need to address degradation in the study area. Restoring the floodplain within this reach is essential to increase the quantity of spawning, rearing and transitional habitat in the Dungeness River (NMFS 2007), for these ESA and state-listed species, and has been identified as a crucial component of successful salmon recovery by multiple technical studies (WDFW and PNPT 2000, Bountry et. al. 2002, Dungeness River Restoration Work Group 1997, Haring 1999).

2.3.3 Public and Tribal Significance

In the lower Dungeness basin, floodplain reconnection and restoration has been a publicly-acknowledged priority since the late 1990's. Multiple partnerships have formed to acknowledge and advocate for restoration of the resources of the Dungeness River Basin. Multi-partner restoration efforts

have resulted in successful projects both in the vicinity of the current project location and immediately downstream. Strong, durable partnerships that have formed in the Dungeness watershed and beyond that seek to halt worsening conditions and restore the river's ecosystem. The Dungeness River Management Team (DRMT) formed in 1988 is a partnership of individuals and stakeholders working to develop and pursue implementation of locally based, long-term solutions to watershed management issues. The DRMT is a diverse, partnership of governments, land managers, the public, and others (including representatives from the Jamestown S'Klallam Tribe, Clallam County, WA Department of Ecology, Washington Department of Fish and Wildlife, City of Sequim, Dungeness-Quilcene Watershed Planning, Sports Fisheries, North Olympic Land Trust, and more) whose purpose is to "exchange information on technical studies, issues, and projects occurring in the Dungeness Watershed; pursue implementation of the *Dungeness River Comprehensive Flood Control Management Plan* (1990), *Dungeness River Area Watershed Management Plan* (1993), and the *Dungeness-Quilcene Water Resources Management Plan* (1994); coordinate the use of staff, funding and other resources among agencies and representatives; and promote public education on watershed processes and activities." This collaborative effort and recognition of a need for restoration is indicative of the public significance of the resources of the Dungeness River.

The Jamestown S'Klallam Reservation is located in the Dungeness Watershed in the community of Blyn, Washington, approximately 10 miles southeast of the project site. The Dungeness River is the ancestral river of the Jamestown S'Klallam Tribe. Since time immemorial tribal citizens have been reliant on the resources of the river, and that continues to this day with Tribal fishing for subsistence, commercial and ceremonial purposes. The multiple species of fish and shellfish resources in the Dungeness River play an integral part of tribal culture, religion, and physical sustenance. The Jamestown S'Klallam Tribe has treaty-protected harvest rights within their Tribe's usual and accustomed (U&A) harvest area, which reflects the historical region in which finfish, shellfish, and other natural resources were collected. As a Federal agency, the Corps has a Federal trust responsibility to act in the Tribes' best interests, including duties to protect Tribal lands and cultural and natural resources. The Jamestown S'Klallam Tribe has invested funds in restoration of the Dungeness River estuary though the Estuary Restoration Act and continues to support restoration of the Dungeness River Basin.

2.4 Planning Objectives

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

- Reconnect and restore the reach's historic side channels and back channels to restore fish rearing, spawning, and refuge habitats, and to reestablish groundwater sources to augment low summer flows in the main channel.
- Improve the quantity, quality, and complexity of native riparian and floodplain habitats in the study area.
- Reestablish riverine processes that create fish and floodplain habitats and establish the dynamic conditions that sustain the quality of that habitat into the future.

Table 2-1. Restoration Objectives and the Problems they Address

	Ecosystem Problems in the Study Area		
Objectives	**Loss of Off-Channel Fish Habitat**	**In-Channel Fish Habitat Degradation**	**Disconnection of Floodplain from River**
Reconnect river to historic side and back channels	x		x
Reconnect/restore floodplain habitats		x	x
Reestablish riverine processes that create/maintain fish habitat	x	x	x

2.5 Planning Constraints

Planning constraints are significant barriers or restrictions that limit the extent of the planning process. Study-specific planning constraints are statements of things unique to a specific planning study that alternative plans should avoid. The following constraints (i.e. limitations on the range of measures and alternatives that can be proposed) have been identified for the study:

1. The Federal levee was constructed under authority of Section 205 of the 1948 Flood Control Act. Measures and alternatives must be developed in a manner that does not adversely impact the authorized purpose of the Federal levee. Levee level of protection outside the restoration project footprint, levee reliability, and the ability of the local sponsor and Corps to operate, maintain, repair, and inspect the levee both during high water events and normal river flows shall not be adversely impacted.
2. The Jamestown S'Klallam is a federally recognized tribal nation that has treaty-reserved fishing, hunting, and gathering rights on the Dungeness River and has strong cultural and economic interests in the Basin. Proposed projects will avoid adverse effects to tribal interests.
3. Measures and alternatives must be developed in consideration of the unique particulars of the site, including site topography; the presence of Meadowbrook Creek, located in a paleochannel of the Dungeness which runs through populated portions of the lower Dungeness valley; and the location of the mapped FEMA floodway.
4. For the purposes of this study, Towne Road access across the site must be maintained or reasonably rerouted. Vacation of the portion of Towne Road that crosses the site is an option the County can elect per the pertaining ordinance following the stipulated public process; however at this time that process is not complete.

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3. Plan Formulation

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

3.1 Management Measures

At the outset of the planning process for the study, the Project Delivery Team (PDT) developed a list of candidate management measures to achieve the planning objectives and address the identified ecosystem problems. The team considered a broad array of possible actions that could benefit the floodplain, riparian and riverine habitat in the reach. The initial array of measures considered is presented in Table 3-1, along with the objectives each addresses. Planning iterations resulted in a focusing of the planning objectives; hence some measures originally considered do not address any of the final planning objectives and were subsequently screened out.

Table 3-1. Management Measures and Relationship to Ecosystem Problems

Measure	Problems		
	Loss of Off-Channel Fish Habitat	In-Channel Fish Habitat Degradation	Disconnection of Floodplain from River
Breach levee in study reach	x	x	x
Remove levee in study reach	x	x	x
Install large wood	x	x	
Excavation of side channels	x		x
Excavation of back channels		x	x
Limit public access			
Public Education			
Invasive plant removal			x
Revegetation with native plants			x

3.2 Screening of Measures

The intent of the screening process for this study was to narrow the array of possible actions to the fundamental elements that require the Corps' expertise, and that would lay the structural groundwork for natural reestablishment of sustainable high quality floodplain, riparian and riverine habitat.

Measures Considered

- Breach Levee
- Large Wood
- Limit Public Access
- Public Education
- Invasive Plant Removal
- Revegetation with Native Plants

Habitat improvements such as large woody debris and revegetation with native species could accelerate the accrual of benefits; in this case however the team determined that those elements should be implemented only as needed to support the fundamental measures that would restore hydrological processes that create and sustain habitat over the long run, i.e. levee realignment and channel excavation to reconnect the river with the floodplain. Wood elements are included only in conjunction with channel excavation, and revegetation with native species is included only where soil is disturbed to limit erosion. Through natural recruitment and prior plantings by local partners, the site has native vegetation established already. Wood elements here are included to facilitate a more gradual habitat transition given that it will take time for a new dynamic equilibrium to be established once the currently constrained and aggraded reach is unconstrained through levee breaching. Once the channel is reconnected to the floodplain, it is anticipated that additional wood recruitment will occur naturally given the characteristics of the upper watershed.

Simply breaching a levee section where channels would form as opposed to complete removal of the section is often a more cost-effective approach to floodplain restoration. However in this case, to breach the levee would mobilize the remaining levee material, leading to significant downstream sedimentation in an already aggraded, leveed system. It would be particularly problematic given the presence of a bridge that constricts the channel at the downstream end of the reach, and potential impacts to commercial shellfish beds in Dungeness Bay. The removed levee material would be reused for the realigned levee section, reducing need for additional material and associated costs.

Public education and limiting of public access do not require Corps expertise, and are best implemented by the Local Sponsor. They are not required to accrue benefits to the environment from the remaining measures.

Levee removal in the project reach, excavation of side channels (i.e. flow-thru channels), and excavation of back channels (i.e. channels wetted by river backwater) were retained as primary measures for further evaluation. Large wood placement and revegetation with native plants, while screened out as primary measures, may be retained in so far as they are needed for the successful implementation of primary measures.

3.3 Alternatives

Alternatives were developed based on the results of the screening process, and in consideration of the planning constraints. Alternatives explore three approaches to restoring floodplain and channel habitat in the reach. The alternatives were evaluated and compared, as described below, to identify a preferred alternative.

3.3.1 No Action Alternative

Under the No Action plan, which is synonymous with the "Future Without-Project Condition," the assumption is that no project would be implemented by the Corps to achieve the planning objectives. Because realignment of a Federal levee is central to the proposed restoration, it is unlikely that local interests would implement a comparable project in the reach without the Corps; to do so they would need to follow the procedures prescribed by 33 USC 408 (Section 408). No floodplain acreage would be reconnected with the main channel, and no new side channels would form (unless as a result of a major flood event). The site (excluding the levee) would gradually become forested, which would provide upland habitat of some value to the ecosystem but of no value to any ESA-listed species.

For the purposes of estimating benefits to evaluate the cost-effectiveness of alternatives, and based on the ecosystem benefit report included in Appendix B, we assume a slight increase in the benefits to the ecosystem provided by the project acreage in the future without-project condition over the period of analysis.

Without removal of existing levee, current trends of aggradation and associated habitat simplification will likely continue, punctuated by short periods of channel disturbance (flooding). Due to an increase in the volume of large wood in less confined areas of the channel (due to natural recruitment and storage of the large logs and trees within the channel), flow resistance will increase, which will promote additional sediment storage and channel migration. In areas that are not highly confined logjams and large wood will become more frequent, improving habitat conditions for fish over current conditions, however the unnaturally high velocities and depths in the confined reaches will continue to result in un-natural conditions that degrade the quantity and quality of fish habitat.

Habitat rehabilitation efforts in the main channel will likely be hampered by valid concerns of limited levee freeboard and conveyance. Thus the continued presence of the levees in their current state would limit the viability of other potential restoration actions and perpetuate an already degraded condition. Incidentally to the purpose of this project, residual flood risks would continue to increase.

3.3.2 Alternative 1: Towne Rd

Alternative 1 (Figure 3-1) entails realignment of the levee in the reach to reconnect the channel to 63 acres of floodplain, bounded to the west by the main channel and to the east by Towne Rd (a two-lane county road). This would restore the hydraulic and sediment transport processes that create and sustain suitable fish habitat over the long term. Given the aggraded condition of the channel upstream of and adjacent to the project site, the abrupt removal of the levee in the reach could lead to unfavorable habitat conditions over the near term (5-10 years). Frequent channel migration could lead to a highly braided reach with limited usability for fish. To moderate this risk, historic side channels and back channels would be reconnected through targeted excavation, and hard features (wood) would be

installed to modulate sediment and hydraulic dynamics. These elements are included to the degree needed to achieve some continuity of habitat elements (channels, sediment characteristics) following levee removal and to allow for a more gradual adjustment to post-restoration hydrology and hydraulics.

Approximately 2,600 feet of levee in the reach would be removed, and the material utilized to rebuild the levee away from the channel, just riverward of Towne Road. Levee rebuild is needed as a component of the levee removal measure to address induced flooding concerns, taking a "Do No Harm" approach with the goal to maintain the existing level of protection outside of the project footprint for existing infrastructure (including a major county road), homes, businesses and agricultural lands. The risk of avulsion would further exacerbate potential for flood damages if this step were omitted. The realigned levee would be segmented, or discontinuous, at the southwestern end to allow floodwaters that overtop or breach the levee upstream of the project site to return to the river unimpeded. A discontinuous levee also minimizes the amount of fill placed in the FEMA floodway. While backwater would move south through the gap between remaining levee segments during high water, the southern section of levee-to-remain (Figure 3-21) would extend north far enough to ensure backwater would not flow south beyond the project footprint. The realigned levee would be approximately 4,000 LF long, and occupy approximately 7 acres. The average width of the levee footprint (i.e. width at the base) would be about 75 feet.

Approximately 1,800 linear feet of Towne Road would be decommissioned and rerouted just outside of the rebuilt levee. Roughly half of the decommissioned portion of Towne Road would remain (Figure 3-1: north access road; emergency access only) and an additional gravel access road located just over a mile south of the project site (Figure 3-4; south access road) would be included to ensure adequate emergency access to the Federal levee during flood events.

Areas disturbed by construction would be seeded and/or planted to control erosion, to deter colonization by invasive species and to accelerate habitat recovery.

3.3.3 Alternative 2: Meadowbrook Creek – At-Grade Road

Alternative 2 (Figure 3-2) entails realignment of the levee in the reach to reconnect the channel to 110 acres of floodplain, bounded to the west by the main channel and to the east by Meadowbrook Creek, a groundwater fed stream in a paleochannel of the Dungeness River. This would restore the hydraulic and sediment transport processes that create and sustain suitable fish habitat over the long term. Given the aggraded condition of the channel upstream of and adjacent to the project site, the abrupt removal of the levee in the reach could lead to unfavorable habitat conditions over the near term (5-10 years). Frequent channel migration could lead to a highly braided reach with limited usability for fish. To moderate this risk, historic side channels and back channels would be reconnected through targeted excavation, and hard features (wood) would be installed to modulate sediment and hydraulic dynamics. These elements are included to the degree needed to achieve some continuity of habitat elements (channels, sediment characteristics) following levee removal and to allow for a more gradual adjustment to post-restoration hydrology and hydraulics.

Approximately 2,600 feet of levee in the reach would be removed, and the material utilized to rebuild the levee away from the channel, just west of Meadowbrook Creek. Levee rebuild is needed as a component of the levee removal measure to address induced flooding concerns, taking a "Do No Harm" approach with the goal to maintain the existing level of protection outside the project footprint for existing infrastructure (including a major county road), homes, businesses, and agricultural lands. The risk of avulsion would further exacerbate potential for flood damages if this step were omitted. The realigned levee would be segmented, or discontinuous, at the southwestern end to allow floodwaters that overtop or breach the levee upstream of the project site to return to the river unimpeded. A discontinuous levee also minimizes the amount of fill placed in the FEMA floodway. While backwater would move south through the gap between remaining levee segments during high water, the southern section of levee-to-remain (Figure 3-2) would extend north far enough to ensure backwater would not flow south beyond the project footprint. The realigned levee would be approximately 5,700 LF long, and occupy approximately 10 acres. The average width of the levee footprint (i.e. width at the base) would be about 75 feet.

Approximately 1,800 linear feet of Towne Road would be decommissioned and 2,200 linear feet of new road would be constructed landward of the lower, wetter portion of the site slated for historic channel restoration. Towne Road would be allowed to flood periodically (approximately every 2-5 years on average). A channel would be excavated to allow high water to pass under the road to a lower section to the east, and to allow fish entering the lower area to escape when high water recedes. A bridge would be installed where Towne Road would cross the channel to accommodate flow and to allow terrestrial mammals to avoid the road when traversing the site. Roughly half (900 feet) of the decommissioned portion of Towne Road would remain (Figure 3-2: north access road; emergency access only) and an additional gravel access road located just over a mile south of the project site (Figure 3-4; south access road) would be included to ensure adequate emergency access to the Federal levee during flood events.

Areas disturbed by construction would be seeded and/or planted to control erosion, to deter colonization by invasive species and to accelerate habitat recovery.

3.3.4 Alternative 3: Meadowbrook Creek – Road on Levee

Alternative 3 (Figure 3-3) entails realignment of the levee in the reach to reconnect the channel to 95 acres of floodplain, bounded to the west by the main channel and to the east by Towne Rd (a two-lane county road). This would restore the hydraulic and sediment transport processes that create and sustain suitable fish habitat over the long term. Given the aggraded condition of the channel upstream of and adjacent to the project site, the abrupt removal of the levee in the reach could lead to unfavorable habitat conditions over the near term (5-10 years). Frequent channel migration could lead to a highly braided reach with limited usability for fish. To moderate this risk, historic side channels and back channels would be reconnected through targeted excavation, and hard features (wood) would be installed to modulate sediment and hydraulic dynamics. These elements are included to the degree needed to achieve some continuity of habitat elements (channels, sediment characteristics) following levee removal and to allow for a more gradual adjustment to post-restoration hydrology and hydraulics.

Approximately 2,600 feet of levee in the reach would be removed, and the material utilized to rebuild the levee away from the channel, just west of Meadowbrook Creek. Levee rebuild is needed as a component of the levee removal measure to address induced flooding concerns, taking a "Do No Harm" approach with the goal to maintain the existing level of protection outside the project footprint for existing infrastructure (including a major county road), homes, businesses, and agricultural lands. The risk of avulsion would further exacerbate potential for flood damages if this step were omitted. The realigned levee would be segmented, or discontinuous, at the southwestern end to allow floodwaters that overtop or breach the levee upstream of the project site to return to the river unimpeded. A discontinuous levee also minimizes the amount of fill placed in the FEMA floodway. While backwater would move south through the gap between remaining levee segments during high water, the southern section of levee-to-remain (Figure 3-2) would extend north far enough to ensure backwater would not flow south beyond the project footprint. The realigned levee would be approximately 5,700 LF long, and occupy approximately 25 acres. The average width of the levee footprint (i.e. width at the base) would be about 190 feet.

Approximately 2,600 linear feet of Towne Road would be decommissioned and 3,500 linear feet of new road would be constructed on top of the realigned levee. This would allow for removal of the public roadway through the project site and eliminate the need for a bridge. This would also necessitate a considerably wider levee, and the new road would require a guard rail along the higher portions of it. A channel would be excavated connecting the lower portion on the east side of the site to the river to prevent fish stranding after high water events, and to reduce prolonged ponding adjacent to the rebuilt levee. A small section (900 feet) of Towne Road would remain (Figure 3-3: north access road; emergency access only) and an additional gravel access road located just over a mile south of the project site (Figure 3-4; south access road) would be included to ensure adequate emergency access to the Federal levee during flood events.

Areas disturbed by construction would be seeded and/or planted to control erosion, to deter colonization by invasive species and to accelerate habitat recovery.

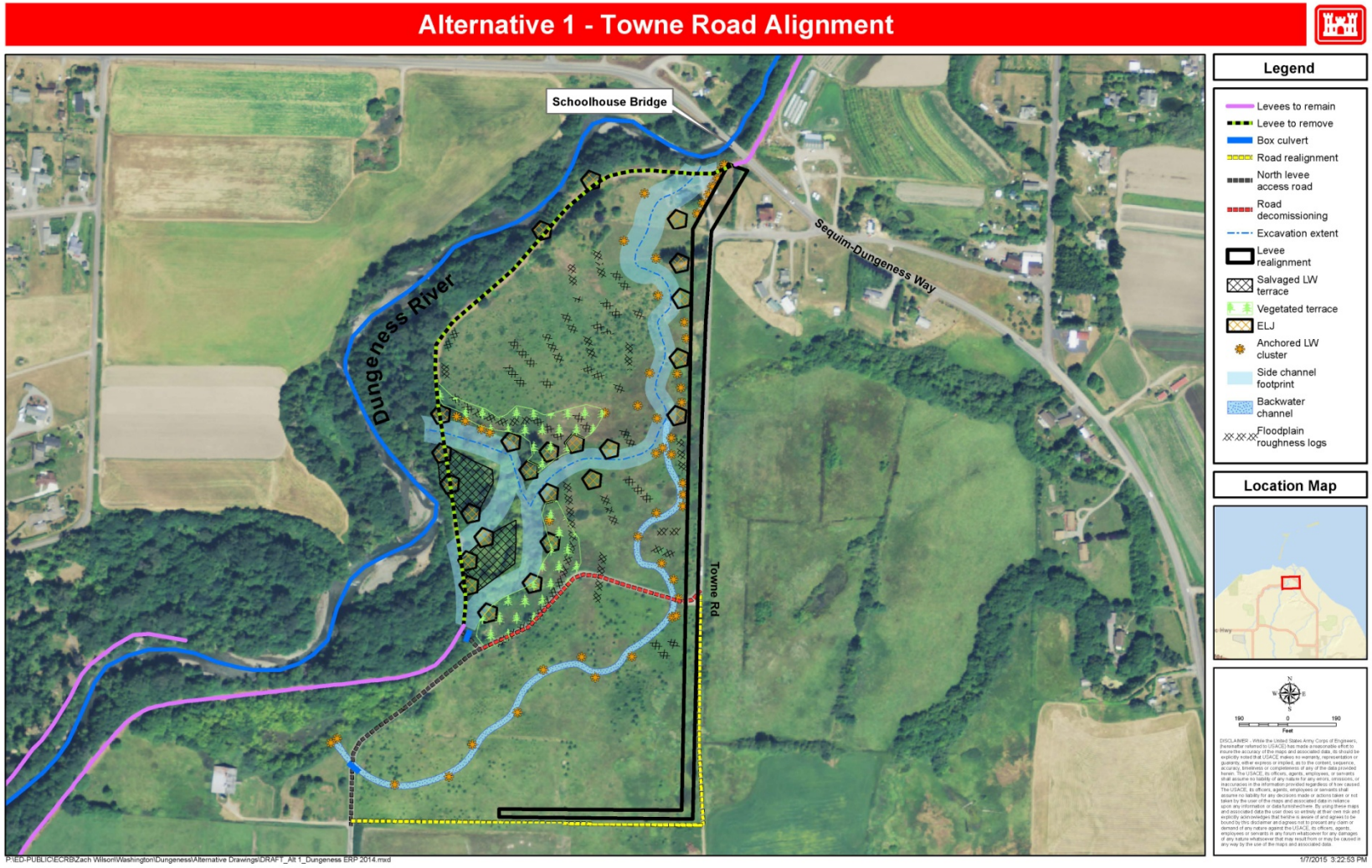

Figure 3-1. Alternative 1: Towne Road Alignment

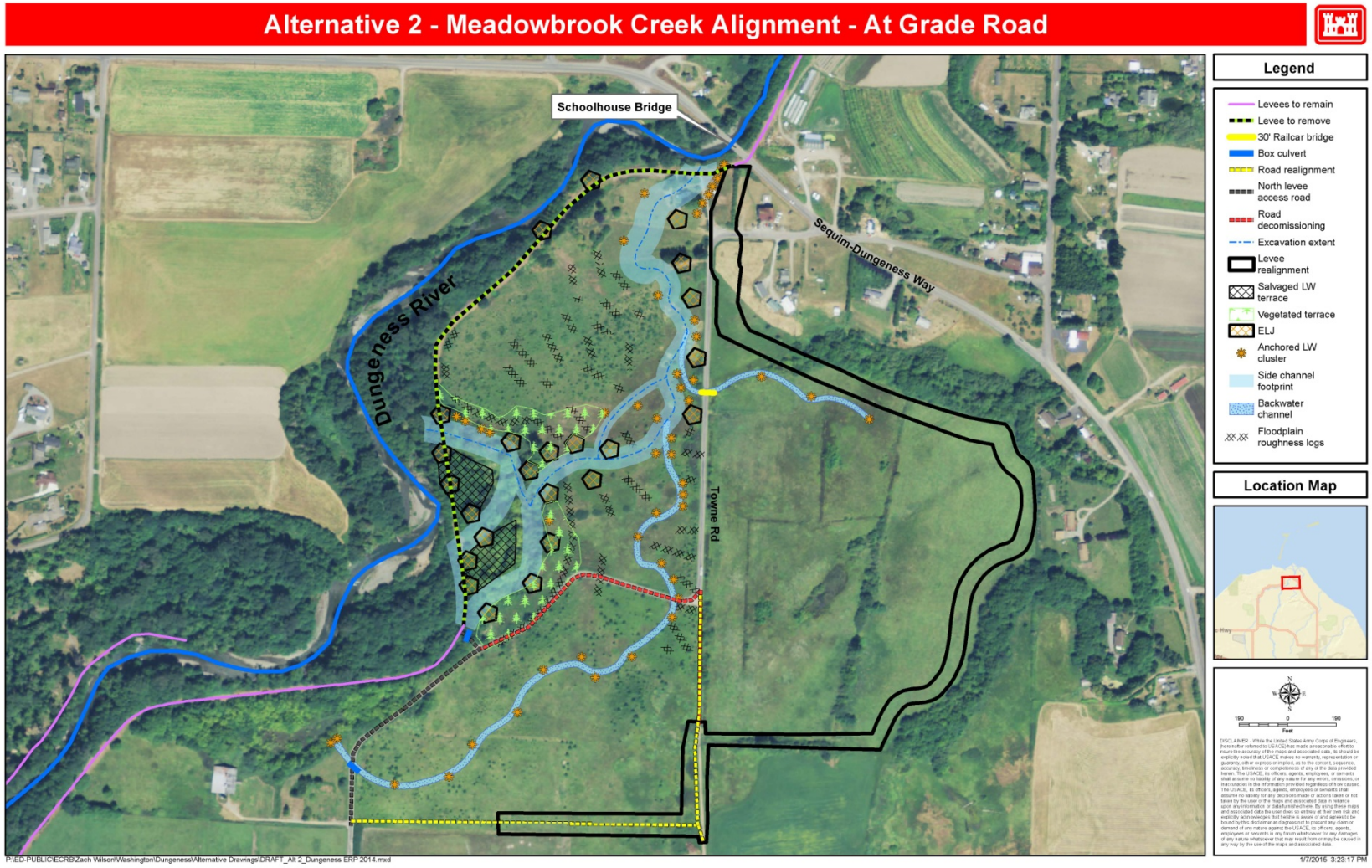

Figure 3-2. Alternative 2: Meadowbrook Creek Alignment - At-Grade Road

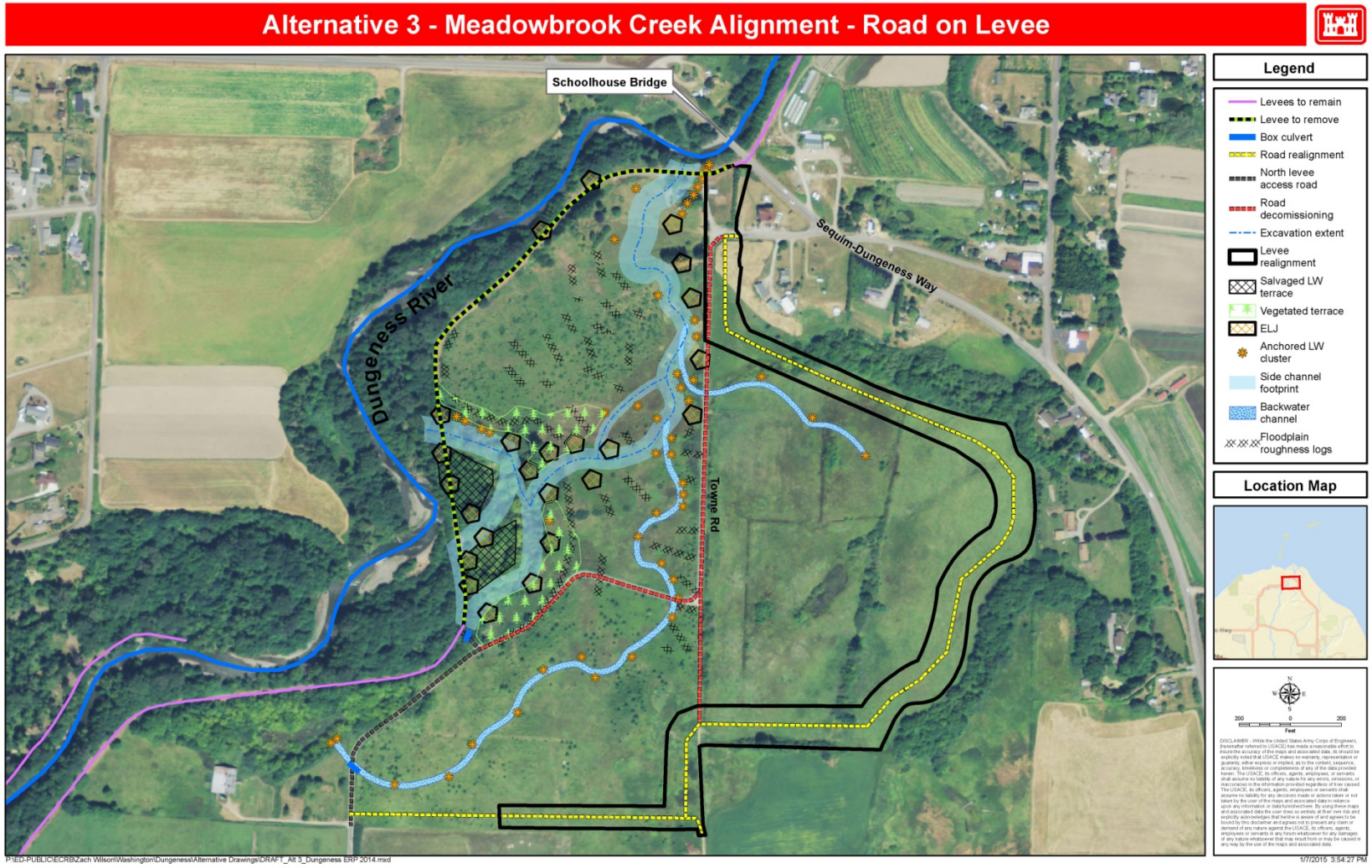

Figure 3-3. Alternative 3: Meadowbrook Creek Alignment – Road on Levee

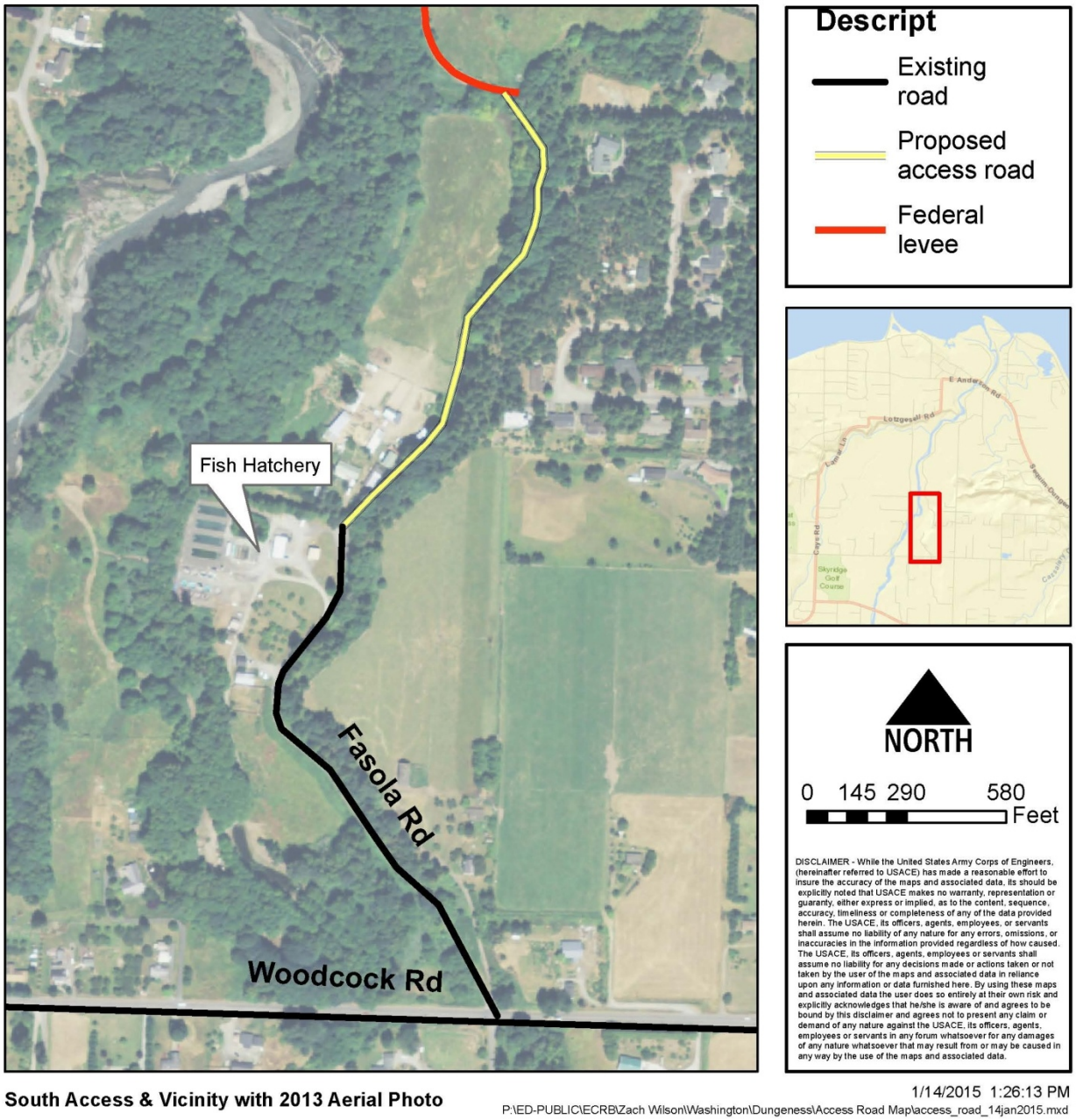

Figure 3-4. Proposed Access Road to South End of Levee

3.4 Evaluation and Comparison of Alternatives

Alternatives are evaluated and compared by assessing or measuring the differences between each with- and without-plan condition and by appraising or weighting those differences. Evaluation and comparison consists of four tasks: (1) forecast the most likely with-project conditions expected from each alternative; (2) compare each with-project conditions to the without-project conditions and document differences between the two; (3) characterize the beneficial and adverse effects by magnitude, location, timing, and duration; and (4) qualify plans for further consideration.

Plans are evaluated and compared based on the following criteria: costs, outputs and plan effects, the study goals and objectives, and the Planning Guidance Notebook's four evaluation criteria (completeness, effectiveness, efficiency, and acceptability). Plans are then compared to identify the National Ecosystem Restoration (NER) Plan, defined as a plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objective. The following sections outline the results of the evaluation and comparison steps.

3.4.1 Cost Estimates

The major features of work include: levee breaching, levee construction, channel excavation, road demolition, road construction, and utility relocation.

Costs used for conducting cost effectiveness and incremental cost analyses include construction, design, real estate, monitoring, and operations and maintenance. Costs are at October 2014 price levels and were annualized using the Federal discount rate for FY15 (3.375 percent). Average annual costs for the alternatives are shown in Table 3-2.

3.4.2 Environmental Outputs

For the purposes of assessing the relative cost-effectiveness of the three alternatives, the net average annual benefits that would accrue over the 50 year period of analysis were estimated for each of the three alternatives. Benefits scores were calculated by multiplying quantity (acres) by quality (indexed from 0.0 – 1.0).

To estimate quality scores for the future without project conditions, and to forecast quality scores for the three alternatives, University of Washington biologists under contract with the study team used the Puget Sound Lowlands Benthic Index of Biological Integrity (B-IBI) to assess stream health (Appendix B). IBI is a methodology that has been endorsed for use in planning studies by the Corps' Ecosystem Restoration Center of Expertise. In order to estimate the biotic changes in the proposed project areas that would be less than permanently inundated (floodplain habitats, to which B-IBI is not applicable) terrestrial arthropods were sampled, and the results compared to a reference site. Many insects that are stream dwellers as juveniles use terrestrial habitats as adults. These include important salmon prey taxa, such as chironomids, mayflies, and stoneflies. Some, like chironomids can be very important in juvenile salmon diets in all life stages (Allan et al. 2003, Hetrick et al. 1998, Mundie 1971). Other arthropods that are exclusively terrestrial such as aphids, ants, and spiders can also be important prey for juvenile salmon.

Net habitat units (HUs) were calculated taking into account the time it is expected to take for the habitat at the site to become reestablished after restoration work is complete (Figure 3-5). A weighting factor was applied to account for the importance of channel acreage as fish habitat, a key component of the project planning objectives.

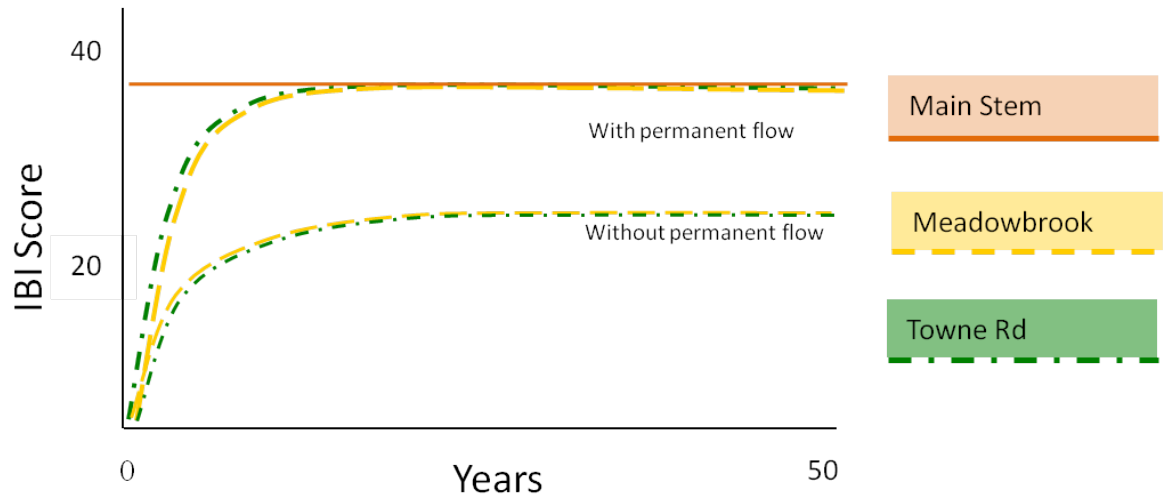

Figure 3-5. Predicted Restoration Response Trajectories

Table 3-2 below displays the average annual costs and the average annual net benefits estimated for each of the three alternatives.

Table 3-2. Average Annual Costs and Benefits of the Alternatives

Alternative	Average Annual Cost ($1,000)	Acres	Average Annual Net Benefit (HUs) Years 0-10	Average Annual Net Benefit (HUs) Years 11-50	Average Annual Net Benefit (HUs) Overall	Cost Effective?
No Action	**0**	**0**	**0**	**0**	**0**	**Yes**
Alt 1 - Towne Road	**222**	**70**	**17.2**	**32.7**	**29.6**	**Yes**
Alt 2 - Meadowbrook Creek–At-Grade Road	**284**	**120**	**29.4**	**56.2**	**50.8**	**Yes**
Alt 3 - Meadowbrook Creek–Road on Levee	**540**	**120**	**22.5**	**45.8**	**41.2**	**No**

Note: Price level = October 2014, FY15 discount rate = 3.375%.

3.4.3 Cost Effectiveness and Incremental Cost Analysis

This section describes the cost effectiveness and incremental cost analyses (CE/ICA) conducted using the IWR Planning Suite, version 2.0.6.0 (USACE certified model). The Corps' IWR developed this software to assist with the formulation and comparison of alternative plans. Plans are compared in IWR Planning Suite by conducting CE/ICA, identifying the plans which are the best financial investments.

3.4.3.1 Cost Effectiveness Analysis

The first step in the Corps' economic analysis of ecosystem restoration alternatives is to determine which plans are cost effective. The average annual costs to implement each alternative and the average annual benefits that would accrue (as quantified by the methodology described above) are compared.

Any plan that generates less benefits at an equal or greater cost than any other plan is determined to be not cost effective, and is eliminated from further consideration (Table 3-2).

Alternative 3, Meadowbrook Creek Alignment – Road on Levee, costs more than Alternative 2 and produces fewer benefits; therefore it is not cost effective and is eliminated from further consideration. A sensitivity analysis was conducted to consider how these results might vary taking into account other considerations when quantifying benefits; the results of that analysis are discussed in section 3.4.3.3 below.

3.4.3.2 Incremental Cost Analysis

The second step in the Corps' economic analysis of ecosystem restoration alternatives is to conduct an incremental cost analysis to evaluate and compare costs and benefits of the increments between cost effective plans. A cost effective plan which has a lower incremental cost per incremental output than the next cost effective plan with greater costs and outputs is classed as a "Best Buy Plan". The three cost-effective plans (No Action, Alternative 1 and Alternative 2) were compared and the results are presented below (Table 3-3 and Figure 3-6).

Table 3-3. Incremental Costs and Benefits of Cost Effective Alternatives

#	Alternative	AA Cost ($1,000)	AA Net Benefit (Habitat Units)	$/HU	Incremental $/HU	Best Buy?
	No Action	0	0	0	0	n/a
1	Towne Road	222	29.6	7.5	7.5	N
2	Meadowbrook Creek – At-Grade Road	284	50.8	5.6	2.9	Y

Note: Price level = October 2014, FY15 discount rate = 3.375%.

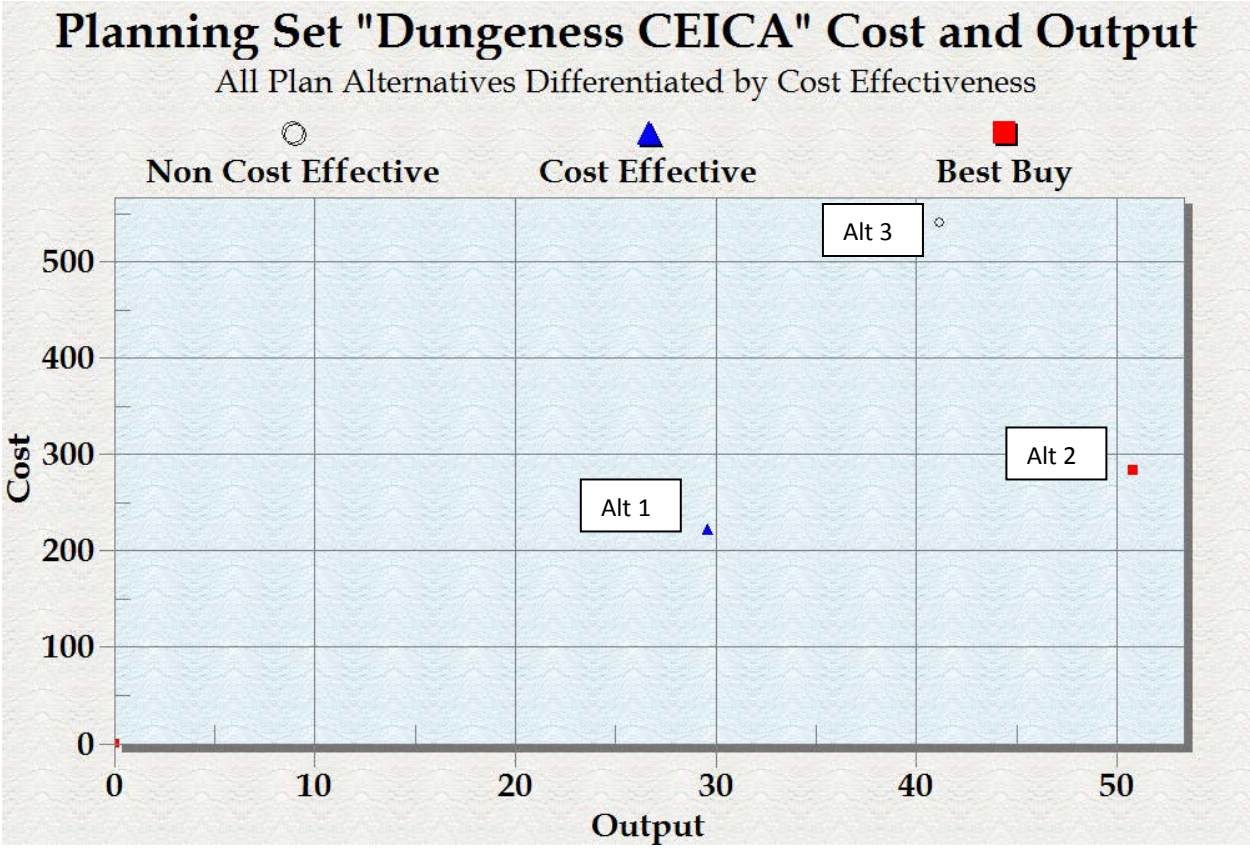

Figure 3-6. Average annual Costs and Outputs of the Alternatives

The incremental costs and benefits of the Best Buy alternatives are displayed in Table 3-4 and Figure 3-7 below. As there is only one Best Buy action alternative (Alternative 2), only one bar appears in the bar chart in Figure 3-7.

Table 3-4. Incremental Costs and Benefits of Best Buy Alternatives

#	Alternative	AA Cost ($1,000)	AA Net Benefit (Habitat Units)	$/HU	Incremental $/HU
	No Action	0	0	0	0
2	Meadowbrook Creek – At-Grade Road	284	50.8	5.6	5.6

Note: Price level = October 2014, FY15 discount rate = 3.375%.

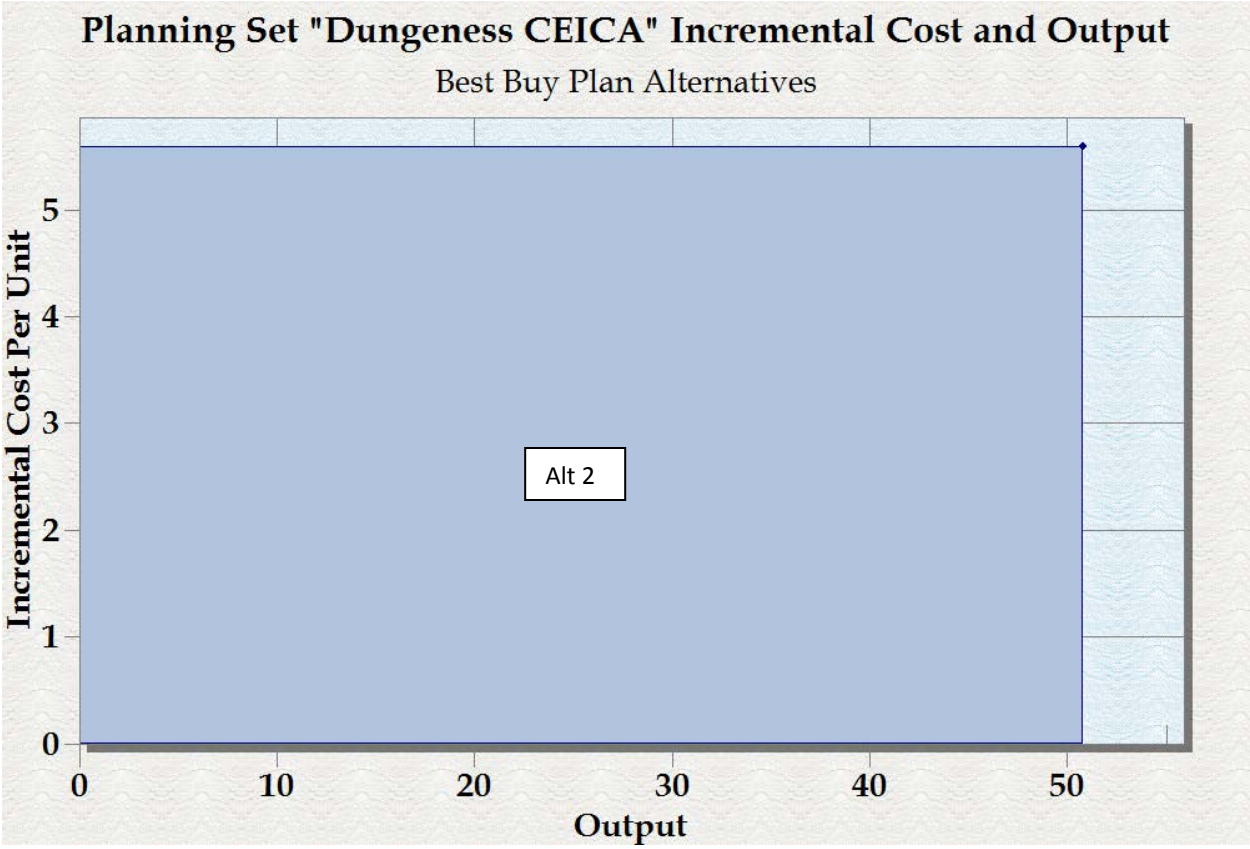

Figure 3-7. Incremental Costs and Outputs of Best Buy Alternatives

Alternative 2, Meadowbrook Creek Alignment with At-Grade Road, is the only action alternative identified as a Best Buy (Table 3-3, Figure 3-7). The cost per habitat unit for Alternative 2 is less than that for Alternative 1, and the incremental cost per habitat unit is less than half that for Alternative 1 (Table 3-3).

3.4.3.3 Sensitivity Analysis

A sensitivity analysis was conducted on the CE/ICA to determine how the results would differ if Alternative 2 was given a lower ecosystem output score due to the fact that Towne Road would traverse the site in that alternative, potentially impacting connectivity across the site. Figure 3-8 and Figure 3-9 below are graphical representations of the incremental cost analysis results. The output scores for the acreage that would be landward of Towne Road were reduced by one half (which results in an overall net benefit score of 34.8), and the analysis was redone using IWR Plan. The reduction factor of one half was chosen to illustrate what impact a change to the quality score of that scale would have on overall habitat units and CE/ICA results; it is strictly for sensitivity analysis purposes and is not tied to a specific habitat model parameter. Per this analysis, Alternatives 1, 2 and 3 are all cost effective. This is useful, as with no greater cost effective plan to compare to, the cost effective plan with the greatest output will always be classed as a Best Buy. The incremental cost analysis conducted on Alternatives 1, 2 and 3 classed all alternatives as Best Buys (as previously noted, the designation is not significant for the costliest/highest output plan in the set, i.e. Alt 3). This demonstrates that even if acres landward of

Towne Road get half the quality score initially calculated for Alternative 2, Alternative 2 still rates as a Best Buy as compared with Alternative 1.

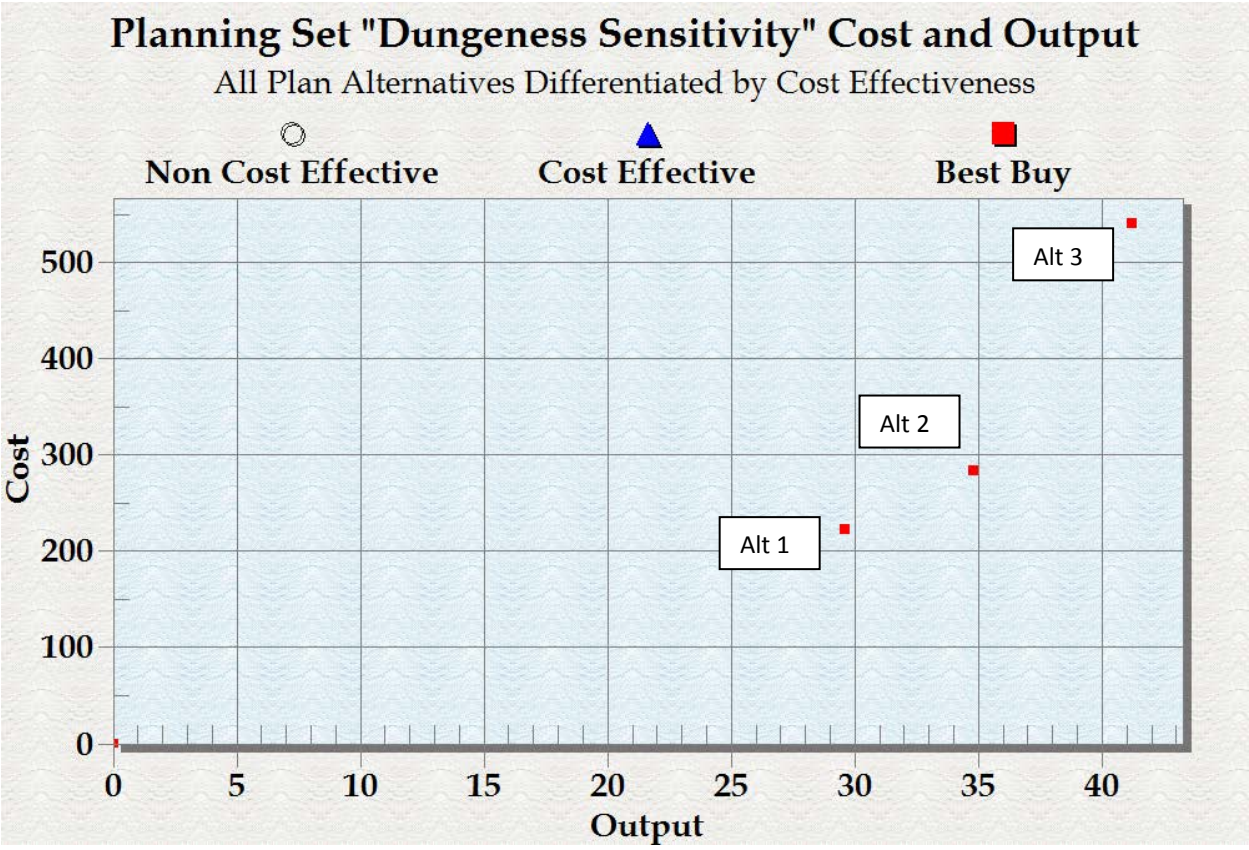

Figure 3-8. Sensitivity Analysis: Average Annual Costs and Outputs with Lower Score for Alternative 2

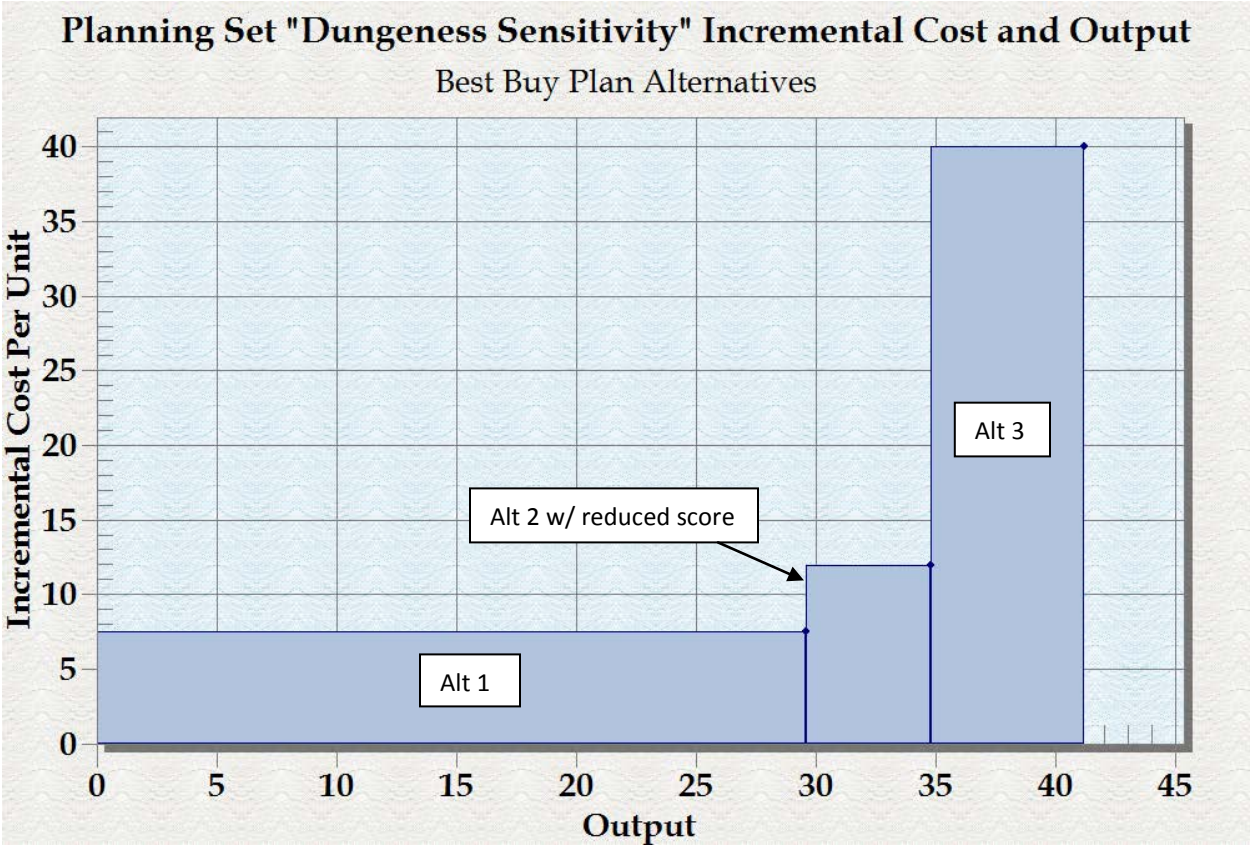

Figure 3-9. Sensitivity Analysis: Incremental Costs and Outputs with Lower Score for Alternative 2

Figure 3-9 illustrates that even with a lowered environmental output score for Alternative 2, the incremental costs per output are comparable to those for Alternative 1 and considerably lower than those for Alternative 3.

3.4.4 Contributions to the Study Planning Objectives

The degree to which each alternative would address the planning objectives is summarized below. One plus sign indicates the objective is met to a lesser degree, and two indicates it is met to a greater degree.

Table 3-5. Comparison of Alternative Plans and Study Objectives

Alternative Plan	Objectives			
	Reconnect river to historic side channels	Reconnect river to historic back channels	Reconnect floodplain habitat	Reestablish riverine processes
No Action				
Alternative 1: Towne Road Alignment	++	+	+	++
Alternative 2: Meadowbrook Ck Alignment – At-Grade Rd	++	++	++	++
Alternative 3: Meadowbrook Ck Alignment – Road on Levee	++	++	++	++

All three alternatives would address all the objectives to some degree, with alternatives 2 and 3 having the greatest beneficial impact. By removing the constraints to the natural flow of the river (i.e. levee material) all three alternatives reestablish the conditions that allow the dynamic processes of channel formation and sediment transport to function naturally, which creates the habitat conditions suited to the fish and other species native to the reach. Side channels and back channels restored by all three alternatives provide important rearing and refuge habitat for salmonids, especially important during high flows, as well as increased riparian vegetation which provides forage (insect drop) and cover. Constructed side and back channels would also help ameliorate the risk that post construction, frequent channel migration would result in a highly braided system less usable by fish. Seventy-five percent more floodplain acreage would be reconnected to the channel and made available for future back channel and side channel formation with Alternative 2 compared to Alternative 1, and roughly fifty-two percent more with Alternative 3 compared to Alternative 1.The historic side channels that were disconnected when the levee was constructed would be reconnected by any of the three alternatives. A back channel that extends east of Towne Road would be connected to the mainstem with Alternatives 2 and 3, but not with Alternative 1.

3.4.5 Completeness, Effectiveness, Efficiency and Acceptability

Completeness, effectiveness, efficiency, and acceptability are the four evaluation criteria specified in the Corps' Principles and Guidelines (Paragraph1.6.2(c)) in the evaluation and screening of alternative plans. Alternatives considered in any planning study should meet minimum subjective standards of these criteria in order to qualify for further consideration and comparison with other plans.

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

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

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

Acceptability is the workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies.

Table 3-6. Comparison of Completeness, Effectiveness, Efficiency, and Acceptability

	Completeness	Effectiveness	Efficiency	Acceptability
Alternative 1: No Action	No	No	No	No
Alternative #1	Yes	Yes	Partially	Partially
Alternative #2	Yes	Yes	Yes	Yes
Alternative #3	Yes	Yes	No	Partially

No-Action Alternative

The No Action Alternative does not meet the completeness criterion because it does not provide any means to realize the planning objectives of this detailed project report.

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

The No Action Alternative is not an efficient alternative because it is not the most cost effective means of alleviating the problems and realizing the opportunities of the study area.

The No Action Alternative is the least acceptable plan with respect to acceptance by State and local entities and the public.

Alternative #1 – Towne Road Alignment

All actions required to achieve the planning objectives are accounted for in Alternative #1 and it is not dependent on the actions of others. Alternative #1 is a complete plan that will enhance the overall goals of restoration of the Dungeness River Basin by complementing other restoration efforts.

Alternative #1 is effective because it alleviates the specified problems and achieves the specified opportunities. This alternative meets all planning objectives to some degree.

Alternative #1 is marginally efficient. With average annual cost her habitat unit of $7,500 Alternative #1 is not the most cost-effective plan, but it is only slightly less cost-effective than Alternative #2.

Alternative #1 is marginally acceptable to local public entities involved in long term planning for the Lower Dungeness valley. Those stakeholders would prefer an alternative that takes advantage of the opportunity to reconnect a larger portion of the historic floodplain, in the reach the majority of which is currently separated from the river by levees. Input during public review of this document will inform its acceptability to the public at large.

Alternative #2 – Meadowbrook Creek Alignment – At-Grade Road

All actions required to achieve the planning objectives are accounted for in Alternative #2 and it is not dependent on the actions of others. Alternative #2 is a complete plan that will enhance the overall goals of restoration of the Dungeness River Basin by complementing other restoration efforts.

Alternative #2 is effective because it alleviates the specified problems and achieves the specified opportunities. This alternative meets all planning objectives more completely than the other alternatives.

Alternative #2 is an efficient plan. With an average annual cost her habitat unit of $6,260 Alternative #2 is the most cost-effective plan.

Alternative #2 is acceptable to local public entities involved in long term planning for the Lower Dungeness valley. Through long-term planning and property acquisition, those stakeholders (including the non-Federal sponsor) have worked to create the opportunity to reconnect as large a portion of the historic floodplain in the reach as is reasonably possible. Towne Road crossing through the site would flood approximately every two to five years; this is considered acceptable to the Sponsor. It also avoids

realigning the road closer to neighboring properties, as preferred by local stakeholders. This alternative maximizes the benefits to ecosystem resources of significance, while avoiding the increased costs associated with co-locating all of Towne Road on top of the realigned levee. Input during public review of this document will inform its acceptability to the public at large, with refinements to be made in the design and implementation phase.

Alternative #3 – Meadowbrook Creek Alignment – Road on Levee

All actions required to achieve the planning objectives are accounted for in Alternative #3 and it is not dependent on the actions of others. Alternative #3 is a complete plan that will enhance the overall goals of restoration of the Dungeness River Basin by complementing other restoration efforts.

Alternative #3 is effective because it alleviates the specified problems and achieves the specified opportunities. This alternative meets all planning objectives to some degree.

With average annual cost per habitat unit of $13,110 Alternative #3 is by far the least cost-effective plan; it does not demonstrate an adequate degree of efficiency to satisfy this criterion.

Alternative #3 is marginally acceptable to local public entities involved in long term planning for the Lower Dungeness valley. Through long-term planning and property acquisition, those stakeholders (including the non-Federal sponsor) have worked to create the opportunity to reconnect as large a portion of the historic floodplain in the reach as is reasonably possible. However the Dungeness County Roads Department as a policy generally does not co-locate County roads with levees. Input during public review of this document will inform its acceptability to the public at large.

3.4.6 Trade-Off Analysis

Trade-off analysis is the procedure the Corps uses to identify the potential gains and losses associated with the array of alternatives. The results of trade-off analysis are used to inform selection of the tentatively selected plan. The study team identified several trade-offs between the three action alternatives.

Table 3-7. Trade-offs Between the Alternatives

Trade-Off Criteria	No Action Alternative	Alternative #1: Towne Rd Alignment	Alternative #2: Meadowbrook Ck Alignment – At-Grade Rd	Alternative #3: Meadowbrook Ck Alignment – Rd on Levee
Cost (Total First Cost)	$0	$4.4 million	$6.3 million	$10.9 million
Total Habitat Units	0 AAHUs	29.6 AAHUs	50.8 AAHUs	41.2
Acres Restored	0 acres	63 acres	110 acres	95 acres
Cost Per Acre (total first cost divided by total acres)	$0	$70K	$57K	$115K
Towne Road Impacts	No Change	No Change	Occasional flooding on site	No flooding – relocated closer to neighboring properties.

While the No-Action Alternative would have no construction costs, it would provide no benefit to the ecosystem, as the floodplain would remain disconnected from the river channel. No increase in water or sediment storage capacity would result. The no action alternative would not impact Towne Road.

Alternative 1 is the least cost of the three alternatives, and has no impacts to Town Road. However, it reconnects to the floodplain only 52% of the acreage reconnected by Alternative 2, and it provides less refuge habitat for Dungeness fish species to utilize during flood events. It provides less water and sediment storage area than Alternatives 2 and 3.

Alternative 2 is the second-most costly alternative, restores the greatest amount of habitat and reconnects the greatest number of acres to the floodplain. It would result in occasional flooding (every 2-5 years) of Towne Road, necessitating a detour of as much as several miles for local properties while the roadway is flooded. Damage to the roadway requiring extensive repairs is not anticipated except in the case of extreme flood conditions. Alternative 2 would have both negative and positive impacts to on-site wetlands. It would also impact a partially disturbed shell midden at the site. Some water and sediment storage capacity would be restored to the river, to a somewhat greater degree than in Alternative 1, and roughly equivalent to Alternative 3.

Alternative 3 is more that 70% more costly than Alternative 2. It provides roughly the same amount of ecosystem benefit (slightly less), floodplain reconnection, and sediment and water storage capacity as Alternative 2. It would result in no impacts to Towne Road access. It would have greater impacts to wetlands and to the identified shell midden.

3.5 Tentatively Selected Plan

In consideration of the criteria discussed in the preceding sections, the study team has identified Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road as the National Ecosystem Restoration (NER) Plan and the Tentatively Selected Plan (TSP). The cost per acre and cost per habitat unit for Alternative 2 is lower than those for Alternatives 1 and 3. Alternative 2 connects 47 more acres to the floodplain than Alternative 1, or 75 percent more, and 15 more acres or 16 percent more than Alternative 3. This is important because restoration of floodplain habitat in the lower river is identified as key to recovery of salmonid populations in the basin (Hals 2003, Bountry et. al. 2002, NMFS 2007, WDFW and PNPT 2000, Bountry et. al. 2002, Dungeness River Restoration Work Group 1997, Haring 1999). For Alternative 2, where Towne Road crosses the site it would flood approximately every two to five years; this trade-off is considered acceptable to the Sponsor. Alternative 2 avoids realigning the road closer to neighboring properties, as preferred by local stakeholders. Alternative 2 reasonably maximizes the benefits to ecosystem resources of significance that can be achieved at the site by taking advantage of the opportunity to reconnect the bulk of the publicly owned historic floodplain acreage to the Dungeness River, while avoiding the increased costs associated with locating Towne Road on top of the realigned levee.

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4. Affected Environment and Environmental Consequences of the Alternatives

This chapter describes the existing conditions and future without-project conditions used for analysis during the study, as well as the probable environmental outcomes of implementing each proposed alternative. Existing conditions are the physical, chemical, biological, and sociological characteristics of the study area. Characterizing resource conditions is critical for understanding the probable future condition of those resources (i.e. the future without-project condition) and for defining problems and opportunities. The assessment of environmental effects is based on a comparison of conditions with and without implementation of the proposed plan and a reasonable range of alternatives; in this case, three action alternatives were formulated through the screening process and are compared to the No-Action Alternative. The analysis focuses only on significant resources that are potentially affected by the alternatives and have a material bearing on the decision-making process. The time scale for analysis is a 50-year period beginning in 2016 and extending to 2065.

4.1 Resources Analyzed and Resources Screened from Detailed Analysis

The following table identifies the resources analyzed or screened from detailed analysis including a rationale for inclusion or exclusion. Resources were excluded from detailed analysis if they are not potentially affected by the alternatives or have a material bearing on the decision-making process.

Table 4-1. Resources Analyzed and Resources Screened from Detailed Analysis

Resource	Included in Detailed Analysis (Y/N)	Rationale for inclusion or exclusion
Geomorphology and Sediment Transport	Y	Problems identified center on the relationships among hydraulics, hydrology, and sedimentation. Proposed alternatives require study of these characteristics.
Hydraulics and Hydrology	Y	Problems identified center on the relationships among hydraulics, hydrology, and sedimentation. Proposed alternatives require study of these characteristics.
Water Quality	Y	Water quality benefits could occur from several of the proposed actions, including improved shading and nutrient input from enhanced riparian habitat and reconnection to the floodplain.
Air Quality	N	The air-pollutant concentrations in Clallam County have consistently been below the National Ambient Air Quality Standards (EPA 2014). Clallam County (which includes the study area) does not have a non-attainment area or maintenance area. Proposed action alternatives are predicted to have a negligible contribution to pollutants; however, the effect would be only during construction and would not be expected to exceed the ecological or human tolerance standards.
Greenhouse Gas Emissions	Y	Required to be analyzed by CEQ guidance (2010).
Climate Change and Sea Level Rise	Y	USACE Engineering Regulation ER 1100-2-8162 requires feasibility studies to consider the sensitivity and adaptability of projects to sea level change. Predicted effects of climate change are described for the alternatives. The effects of climate change on upland hydrology are evaluated using the current climate change guidance for Corps projects in ECB 2014-10.
Noise	N	Sources of noise in the area come from agricultural related machinery and local vehicular traffic. There are no airports, industry or highways in the project vicinity.

Resource	Included in Detailed Analysis (Y/N)	Rationale for inclusion or exclusion
Hazardous, Toxic, and Radiological Waste	N	The proposed action alternatives would not create a significant hazard to the public or the environment through transport, use, or disposal of hazardous materials, nor would they affect hazardous materials otherwise.
Fish	Y	All alternatives would provide long-term benefits for fish populations.
Wildlife	Y	Many species of mammals and birds are associated with riparian and aquatic habitats. While some construction may be disruptive, none of the alternatives would have a significant negative effect on wildlife or their habitat. Resulting conditions for these species would likely improve with any of the action alternatives.
Shellfish	Y	All alternatives may affect shellfish resources in Dungeness Bay.
Vegetation (Wetland, Riparian)	Y	Proposed action alternatives may affect size and type of wetlands and alter riparian vegetation.
Rare, Threatened, and Endangered Species	Y	The proposed action alternatives may have short-term impacts on ESA-listed fish species in the river, yet provide long-term habitat benefits.
Cultural Resources	Y	The project will result in an adverse effect to historic properties
Indian Trust Assets	Y	All alternatives would affect Indian Trust Assets on the Dungeness River
Environmental Justice Communities	N	Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. No group of people will be disproportionally affected by the proposed action and all people will have an equal opportunity to participate in the decision making process by providing comments during the public comment period.
Aesthetics	N	None of the action alternatives will affect scenic resources or impair visual characteristics of the study area.
Land Use and Agricultural Resources	N	All of the lands in the project area are owned by either Clallam County, Washington Department of Fish and Wildlife (WDFW), or the Washington Department of Transportation (WSDOT) for restoration or mitigation purposes. The WSDOT mitigation site includes a buffer swatch through the site set aside for the future footprint of a new levee. All proposed actions would not impact WSDOT wetland rehabilitation and enhancement efforts. Surrounding land use is primarily agricultural and rural residential and should not change. None of the alternatives would have a significant effect on land use or agricultural resources.
Recreation	N	Recreational opportunities will not be changed in the project area. The existing levee is a popular place for local resident to walk, run, and bird watch. These opportunities would still be available under each alternative.
Public Health and Safety	Y	All of the alternatives would have an effect on public health and safety.
Transportation, Utilities, and Public Services	Y	The project area contains or is adjacent to transportation corridors and public utilities. Any impact to these facilities needs to be considered.

4.2 Physical Environment

This section provides an analysis of the existing and future without-project condition of the significant physical resources in the study area, as well as how each alternative would affect these resources. More detailed analysis is provided in Appendix H.

4.2.1 Geomorphology and Sediment Transport

The Dungeness River (Figure 4-1) is a relatively small river that descends steep mountain canyons from the core of the Olympic Mountains and flows into the Strait of San Juan de Fuca. The river and its tributaries drain about 200 mi^2 (322 km^2) and contain over 546 mi (879 km) of river (Thomas et al.,

1999). It is an active high energy river characterized in its upper basin by steep unstable canyon slopes and high flow velocities. The upper watershed contributes gravel and large boulders as well as large wood downriver. Emerging from its upper watershed about eleven miles above its mouth, the Dungeness slows and drops its load of rock and sediment as it flows north through an extensive, flatter middle watershed and a broad lowland plain on its way to the ocean. Unconfined by canyon walls, the lower river meanders and has historically shifted channels dramatically during floods.

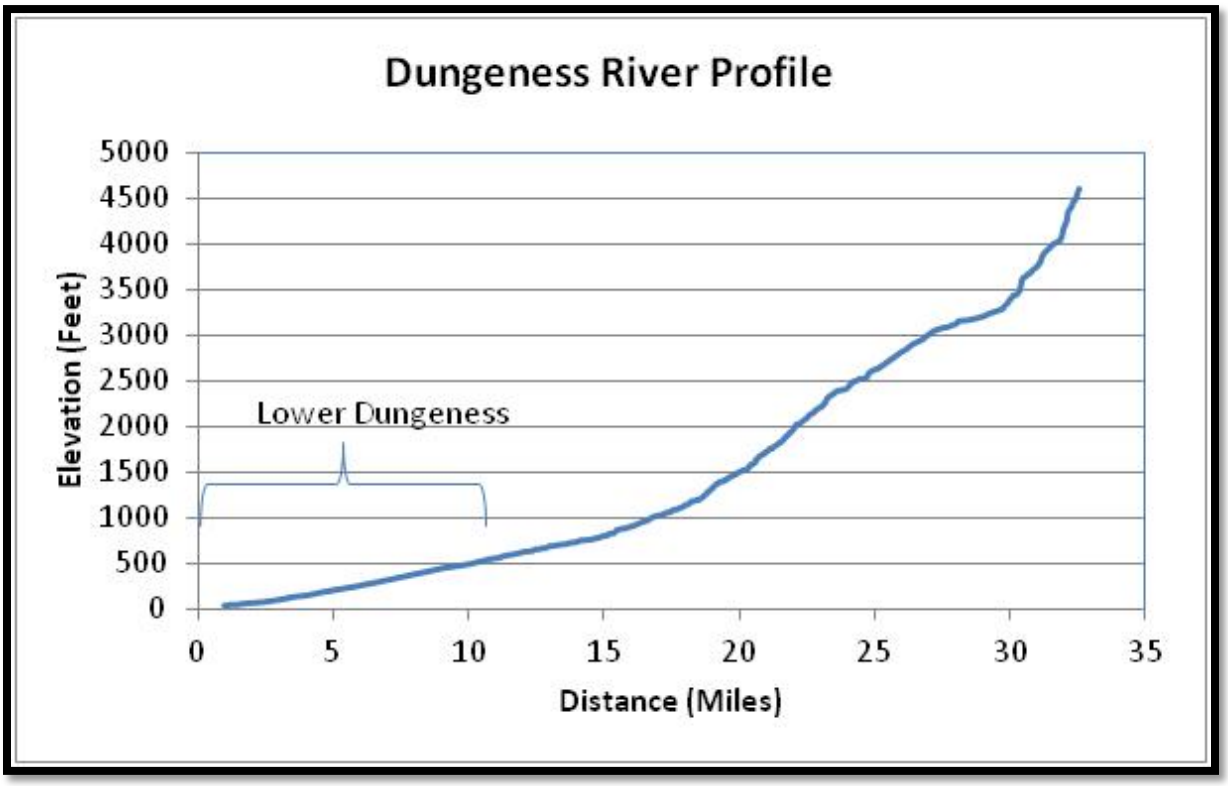

Figure 4-1. Dungeness River Profile (USGS Streamstats)

The river channel in the lower basin exhibits characteristics of a braided river interspersed with meandering single thread and anabranched reaches from about River Mile (RM) 10 to Ward Bridge (RM 3.2), with a shallow, wide (approximately 300 feet active width) channel, steep bed slope and non-cohesive bank material, primarily sand and gravel of glacial origin. The river meanders from south to north, and has not cut a deep canyon into the land surface. Below Ward Bridge, bed slope becomes more gradual and follows a single channel confined by levees on both sides, with an active width of about 100 feet.

Human activity within the Lower Dungeness River (RM 0.0 to 10.5) has altered natural river processes, and as a result, river morphology. The primary human activities responsible for river alterations are the construction of levees and riverbank protection, clearing of riparian and in-stream vegetation, construction of highway and railroad bridges, gravel extraction, clearing of in-channel wood accumulations, and water diversion. As a result of the natural topography and human influences, erosion, slope movement and sedimentation occur at an accelerated rate in the Lower Dungeness River,

resulting in elevated levels of sediment load in the river and severe bed aggradation in the lowest river reach. See the USBR Report (Bountry et. al. 2002) for more details on human alterations of the Lower Dungeness River.

The lowest reach of the river (RM 0.0 to 2.6) has experienced the greatest human impacts. On the east bank, the Federal Levee extends from RM 2.6 all the way downstream to near the mouth. At RM 0.8, the Schoolhouse Bridge (also referred to as Anderson Road Bridge) crosses the river channel. On the west bank, the Beebe Levee extends from RM 2.6 to RM 1.6. From RM 1.6 to RM 0.8, the west side of the prehistoric and present flood plain is bounded by a high glacial outcrop limiting channel migration in that direction. Downstream of the Schoolhouse Bridge on the west side, a formerly private levee, River's End Levee, is now maintained by Clallam County. This levee extends downstream to near the mouth but is much lower in elevation than the Federal Levee on the east side of the river. All of the levees were built to protect property and infrastructure from flooding, however the River's End levee is actively being eroded by the river and nearby lands have been acquired for conservation purposes (Randy Johnson, JSKT, pers. communication 2013).

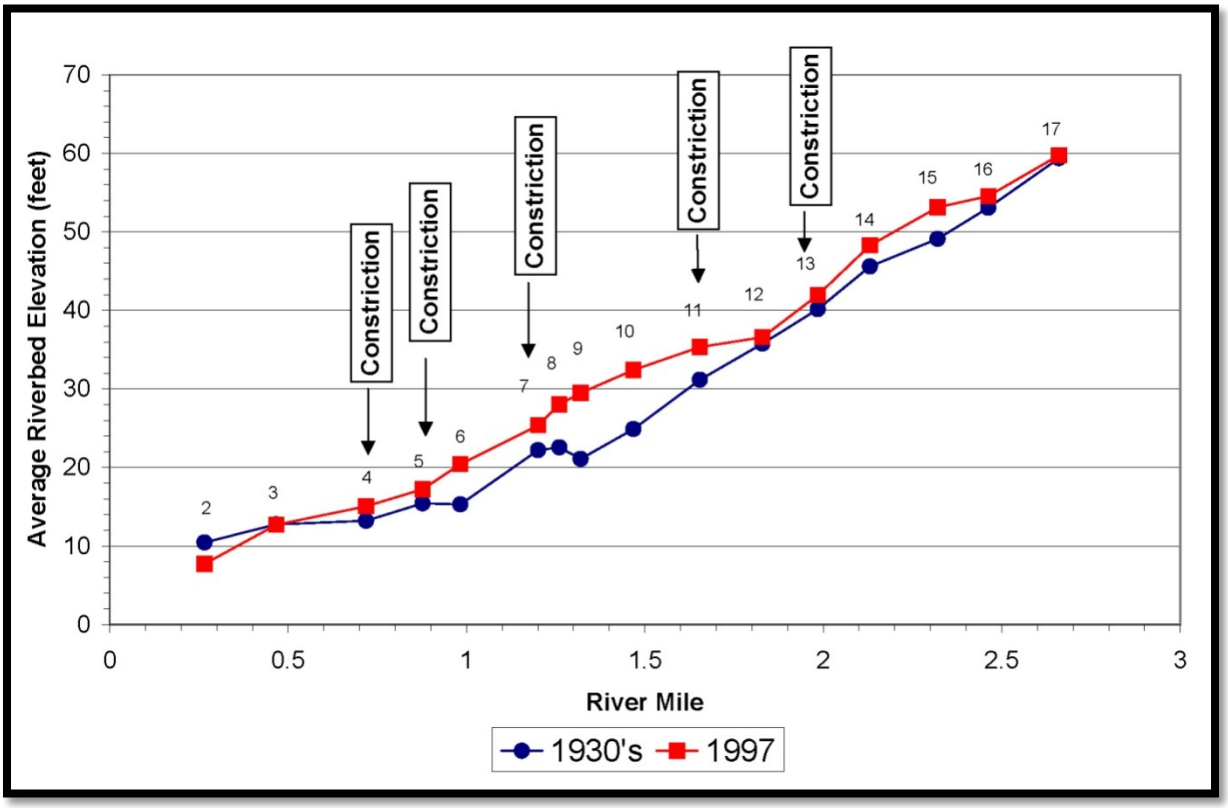

Figure 4-2. Comparison of Existing and Historic Channel Beds in Reach 1 (USBR 2002)

While the overall sediment transport capacity decreases from RM 2.6 to 0.0 as a result of the flattening in slope, several areas of high sediment transport capacity exist where levees or natural features have constricted the river channel. This results in a high level of variation with some locations aggrading much more quickly than others (Figure 4-2). The largest amount of aggradation noted in the Bountry et. al. (2002) study was observed upstream of RM 1.26 (cross section 9 in Figure 4-2) where the bed had

accreted almost 10 feet. Current estimates by the Corps indicate this reach could experience as much as 6 feet of additional deposition in a typical 50 year project lifetime (see Appendix H).

The Federal Levee and Beebe levees cut off the floodplain from the active channel in several locations. As mentioned above, the levees collectively constrict the river channel to smaller widths than were present in 1935 and result in a backwater area upstream. The aggradation of the riverbed that has occurred at some locations, such as at cross section 8 (in profile above) at RM 1.26, is shown in Figure 4-3. The river channel is now higher than the surrounding flood plain and channel capacity has been reduced.

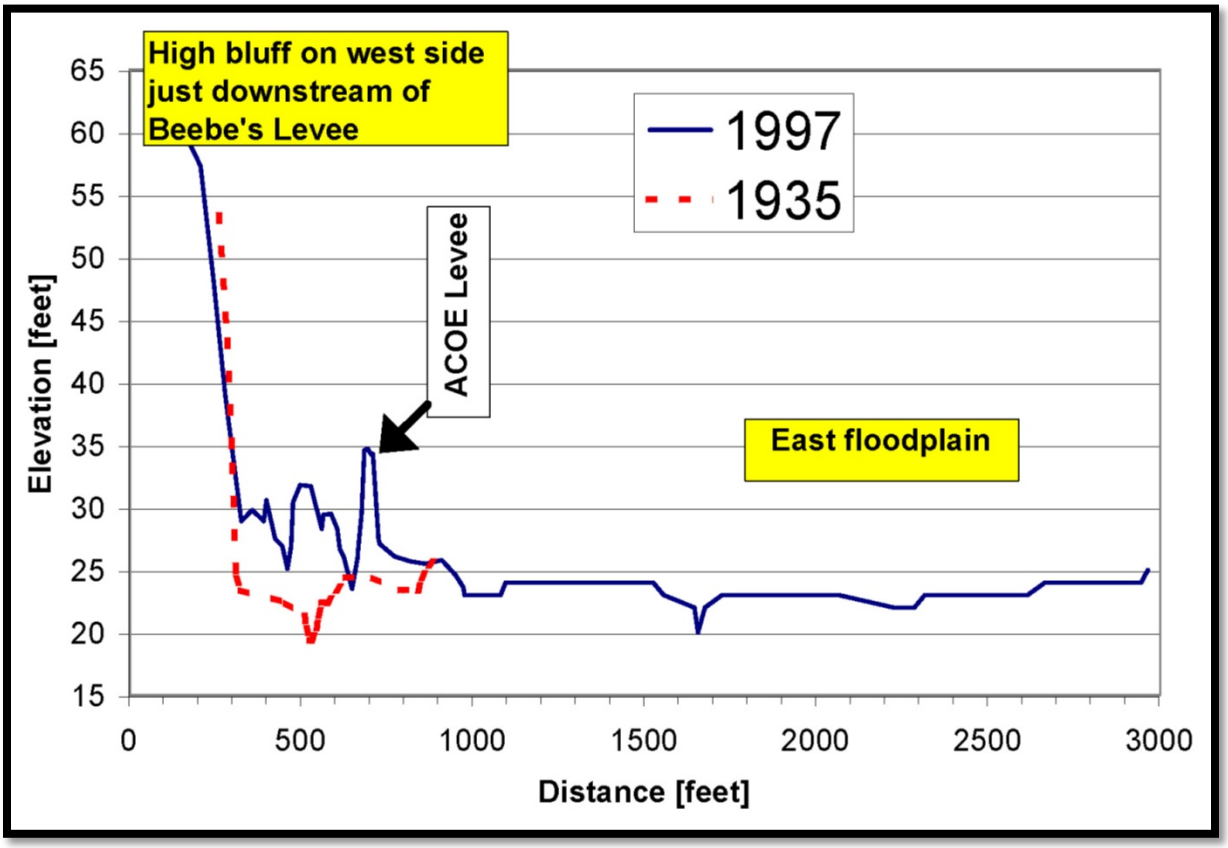

Figure 4-3. Channel Cross-section & Bed Elevation – River Mile 1.26 – 1935 & 1997 (USBR 2002)

In 2013 Cardno-Entrix conducted a geomorphic assessment of existing conditions and through comparison of new cross section data obtained in 2010 determined that the rate of aggradation documented by the USBR had declined significantly relative to historic rates, with less than 1 inch of average change between 1997 and 2010. Significantly for the Federal levee, the aggradation continued at the greatest rate where the levee is most prone to overtopping in major floods (between RM 1.3 and 1.65). The concurrent downstream erosion is potentially due to local reduction in the sediment supply caused by the trapping of bed material just upstream.

In 2013 and 2014 Corps hydraulic engineers conducted a comparison of channel surveys from 1984 to 1997-1999, from 1997-1999 to 2013, and from 2008 to 2012 using LIDAR data. The work documented historical erosion and aggradation in the lower 4 miles of the river. Within the project reach (Federal levee upstream of Anderson Road Bridge) there was a consistent trend of aggradation.

Table 4-2 provides an estimate of future aggradation within the existing river channel by projecting the observed deposition rates for the different analysis intervals 50 years into the future. Average cross section bed elevations could increase from 0.05 to 6.1 feet adjacent to the Federal Levee if observed rates hold into the future. See Section 3.4 of the Appendix H for more discussion of the aggradation rates and implications.

Table 4-2. 50 Year Estimated Project Reach Sediment Deposition

Data Sets Compared	50 Year Aggradation (yd^3)	50 Year Vertical Change (feet)
1984 to 1997-1999	606,250	6.1
1997-1999 to 2013	48,850	0.05
2008 to 2012	133,397	3.55

4.2.1.1 No-Action Alternative/Future Without-Project Conditions

Geomorphic and sediment conditions expected without restoration are summarized as follows:

- Floodplain processes and fish habitat will continue to be degraded in areas cut off from the main channel. The current levee locations cause the main river channel to have coarser sediments on the bed in the highly constricted areas, along with bars of finer material in the backwatered areas immediately upstream of the constraints. These reaches also have less woody debris and fewer stable pools.
- The recruitment of wood into the channel will continue as long as mature trees are available on the river banks of the project reach, however, much of the wood is likely to remain perched on high sediment bars, limiting the formation of stable debris and habitat. Levee freeboard for the design flood event could continue to decrease. It is probable that continued aggradation will eventually lead to local overtopping of the levee and the possibility of a levee breach.
- If the river aggrades at the average observed rate over the next 50 years (about 3 feet) in the reach where the Federal levee is most vulnerable to overtopping, overtopping frequency could increase by 3.5 fold, from about once in 70 years (1.4 percent annual exceedance) to about once in 20 years (5 percent annual exceedance).
- Localized impacts predicted in modeling by the UWCIG include reduced snowpack and snowmelt runoff in the spring and summer, increasing rainfall runoff in the fall and winter,

changes in precipitation patterns, timing, and intensity which could increase or decrease flooding depending on the season.

- Climate change could cause runoff to increase, vegetative cover to change, and snowpack to decrease, which collectively could cause basin sediment loads to increase, increasing deposition rates along the entire river, including the project reach. Quantitatively estimating the effects of climate change on sedimentation is beyond the scope of the study.
- Climate change projections of increased runoff suggest that the peak flood discharge for the 5% exceedance chance flood event could increase by 40%. Applying this scale factor to other flood events results in an increase in the 1% exceedance flood peak discharge at the project site to 12,740 cfs which falls within the confidence limits of the 500-year (0.2% exceedance chance) event. Similarly, the annual exceedance probability of experiencing a levee capacity flow (about 9,000 cfs), could increase from 1.5% under current conditions to 7% by 2080, assuming current riverbed elevations remain unchanged.
- The combined effects ongoing aggradation, and climate change induced increases in peak flood discharge, coupled with potentially increased sediment delivery from the basin strongly suggest that the existing levee will be overtopped more than once in the next 50 years resulting in damaging flooding to properties near the Town site of Dungeness
- In the case of levee overtopping or underseepage resulting in levee breach, the possibility exists for an avulsion of the channel into a different alignment. The exact nature of an avulsion depends on the amount of aggradation in the main channel and location and orientation channel features such as bars and woody debris jams at the time of overtopping. Within the confines of the leveed reach, the river channel will continue to experience non-normative rates of channel disturbance during floods due to the artificially high velocities and mobility of sediments at high flows. It is likely that erosion of the bluff at RM 1.26 will continue with the possibility of development of a meander cut-off and a steepening of channel gradient at this location.

4.2.1.2 Action Alternatives/Future With-Project Conditions

<u>Alternative 1 - Towne Road Alternative</u>
If Alt 1 is implemented, we could expect the following:

- The likelihood of levee overtopping leading to flooding outside the project footprint would not be increased, and in fact would be marginally decreased.
- Removal of 2,600 feet of the existing Federal levee upstream of Anderson Road bridge would restore fluvial processes to up to 20 acres of mainstem Dungeness River and up to 63 acres of historic forested floodplain habitat will be restored. Initially approximately 7 acres of active side channel habitat would be restored, and 1.4 acres of back channel habitat. As these channels experience flooding, erosion, sedimentation, debris recruitment, and vegetation colonization the size, elevation, and position of the channels, including the mainstem river will change.
- The portion of the site that is low elevation and prone to ponding during floods will remain dominated by wetland vegetation and a high water table until sediment deposition during

floods allows for colonization by the adjacent riparian forest stands. It is anticipated that in 10-20 years the higher elevation portions of the site will be dominated by young cottonwood and alder, with patches of young conifer, while the lower elevation portions of the site will be dominated by water tolerant willows, shrubs and sedges. In 40 years when the cottonwoods are at full maturity and begin to die off, the conditions for sustaining forested island conditions will be achieved, and the site will begin to transition to conifer dominated canopy where elevations allow.

- Preliminary analysis of system-wide flood risks indicate that flood risks could be reduced significantly with this project, even though upstream (unmodified) levee segments will remain in place and could experience overtopping.
- In the case of an upstream levee breach, the segmented design of the realigned levee would allow floodwater to flow through the restoration site and reenter the main channel to the north.
- The total expected sedimentation in 50 years for Alternative 1 in the project reach after levee removal ranges from 0.1 to 3.3 feet (average of 1.4 feet) vs. 0.3 to 10.2 feet (average of 4.3 feet) for no-action future conditions.
- Similar to existing conditions, The combined effects of ongoing aggradation, and climate change induced increases in peak flood discharge, coupled with potentially increased sediment delivery from the basin strongly suggest that the existing levee will be overtopped more than once in the next 50 years. The most severe sedimentation impacts and risks of levee overtopping are located upstream of the restoration project, where it is assumed the levee will remain un-modified.
- If the upstream levee segment is modified by elevating in place, aggradation will continue at its current or increased rate, with little effect in the project reach or downstream. If the levee segments upstream and downstream are set back aggradation rates will decrease, which could result in a reduction in aggradation in the project reach.

<u>Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road</u>

If Alt 2 is implemented, we could expect similar conditions as described for Alternative 1, except that up to 110 acres of floodplain habitat would be restored. In addition, a significantly larger portion of the site would be available as a sediment sink to receive gravels and sands during floods. This alternative could reduce aggradation rates within the site modestly (average of 1.1 feet vs. 1.4 feet) as compared with Alternative 1 (see H&H appendix). Due to the provision of a large ponding area next to the levee a greater quantity of suspended fine sediment is likely to be deposited within the site. Conditions upstream and downstream would likely remain unchanged as compared with Alternative 1.

<u>Alternative 3 – Meadowbrook Creek Alignment - Road on Levee</u>

If Alt 3 is implemented, we could expect similar conditions as described for Alternative 1, except that up to 95 acres of floodplain habitat would be restored. In addition, a significantly larger portion of the site would be available as a sediment sink to receive gravels and sands during floods. . This alternative could reduce aggradation rates within the site modestly (average of 1.1 feet vs. 1.4 feet) as compared with

Alternative 1 (see H&H appendix). Due to the provision of a large ponding area next to the levee a greater quantity of suspended fine sediment is likely to be deposited within the site. Conditions upstream and downstream would likely remain unchanged as compared with Alternative 1.

Cumulative Effects

No significant negative cumulative effects to geomorphology or sediment transport are anticipated.

4.2.2 Hydrology and Hydraulics

Streamflow has been measured on the Dungeness River since 1898, however the record is discontinuous (Table 4-3). Three stations have been used to measure discharge. The longest running station (12048000) is located at river mile 11.8 (drainage area 156 mi^2) maintained by the USGS. Since 1999, the WA State Department of Ecology has measured continuous discharge near the old USGS gage site (12049000) at the Schoolhouse Bridge (RM 0.7, drainage area 197 mi^2 Gage ID 18A050,).

For this study USACE reviewed and summarized existing studies, and recomputed the daily flow duration and peak flood frequency statistics for the gage near Sequim. In addition, a comparison of peak discharges for the last 11 years was conducted between the two gages and compared with estimated peak discharges using USGS Regional Regression transfer techniques. Relevant figures and data from previous studies are provided in Appendix H.

Hydrology for the period of record up until 2002 is well documented in the USBR Report for the Jamestown S'Klallam Tribe, *Physical Processes, Human Impacts, and Restoration Issues of the Lower Dungeness River* (Bountry et. al. 2002). Information in this report was updated in 2007 by the USBR and USACE has updated the flood frequency and flow duration statistics as part of this effort.

Table 4-3. Streamflow Gages in the Dungeness River Basin

USGS Gaging Station No.	Station Name	Drainage Area (mi2)	River Mile	Period of Record	Maximum Discharge and Date	Maximum Unit Discharge (ft3/s/mi2)
12048000	Dungeness River near Sequim	156	11.8	06/1923-09/1930, 06/1937-present	7,610 ft3/s, 7 Jan 2002	48.8
12048500	Dungeness River below Canyon Creek near Sequim	170	10.8	07/1897-07/1898	2,950 ft3/s 11/18/1897	17.4
12049000	Dungeness River at Dungeness (Sequim)	197	0.7	07/1898-12/1901, 1999-Present	7,540 ft3/s 12/20/1900	38.3

Daily Discharge Summary

Daily streamflow trends are discussed in detail in the Dungeness River Comprehensive Flood Hazard Management Plan (2009) and USBR report (Bountry et. al. 2002). Generally the basin streamflows are characterized as having two high runoff periods (late fall/early winter & late spring/early summer) with low flow periods in March and later summer.

Typical late summer streamflows average less than 200 cubic feet per second (cfs), while average winter flows in December through February are approximately 400 cfs. Peak sustained flows occur during snowmelt in May, June, and July. Average annual daily discharge is 382 cfs, which represents 33 inches/year of runoff from the watershed, which is equivalent to 276,000 acre-feet of runoff in a year (USGS 2008). Daily flow exceedance values for the period of record at the gage near Sequim are provided in Figure 4-4 below and in Appendix H.

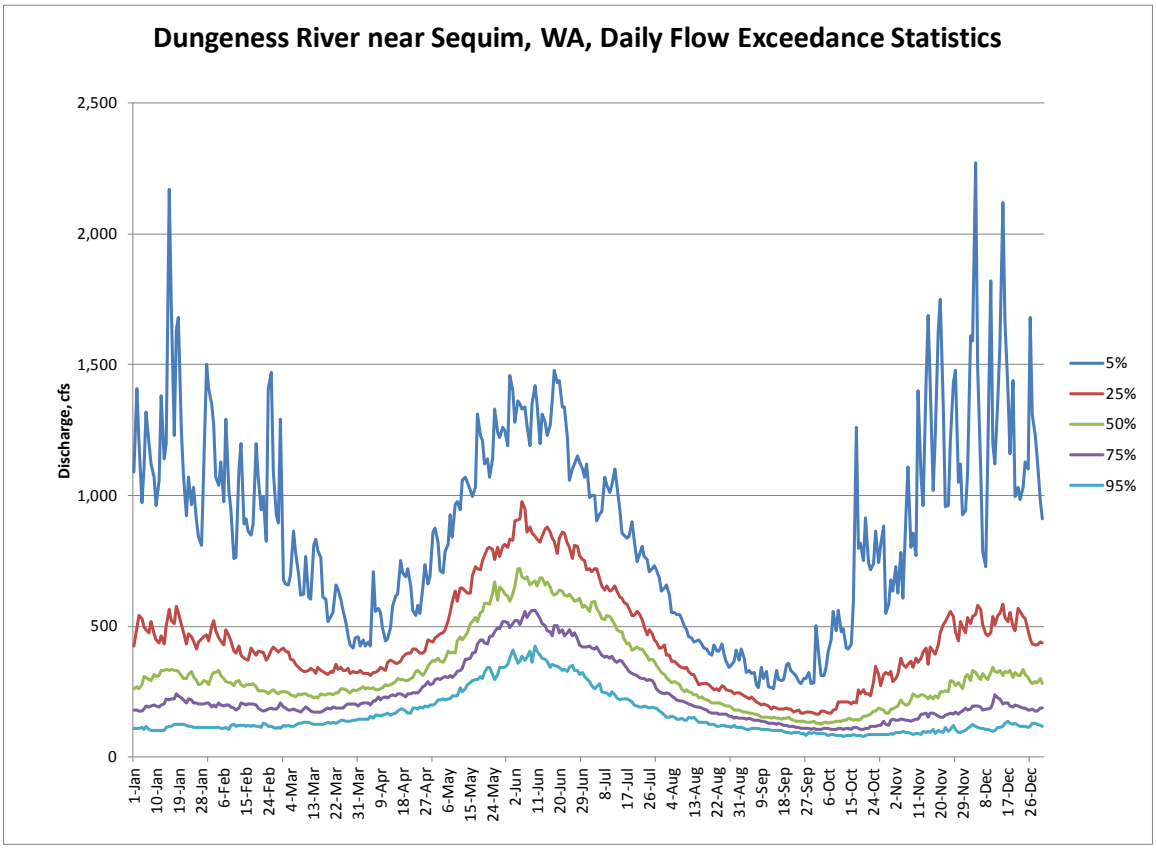

Figure 4-4. Daily Flow Exceedance Values for Dungeness River near Sequim for the Period of Record

Dungeness River Basin Peak Streamflow and Flooding

As seen in the daily discharge summary graph (Figure 4-4), two periods of high water and potential flooding occur on the Dungeness in any given year, with the largest floods tending to occur in the November through February period, when warm winds and heavy rains associated with atmospheric rivers of sub-tropical origin produce high intensity rainfall and potentially snowmelt. In some years, rain flooding is infrequent, and the largest floods of the year occur in the summer, driven by higher temperatures and snowmelt. Given its relatively small basin size, rainfall driven floods on the Dungeness have short durations, with a rapid rise, a peak lasting hours, followed by a rapid recession. Spring snowmelt floods have lower peaks but can occur over several days (see Appendix H for more detail). Since snowpack is expected to decrease with climate change spring and summer snowmelt, important

for reworking flood deposits from the fall and winter, will be reduced. This has geomorphic implications as it could increase the percentage of the river that is braided.

4.2.2.1 No-Action Alternative/Future Without-Project Conditions

Per the Dungeness River Comprehensive Flood Hazard Management Plan (Clallam County, 2009):

> "Predicting future flooding is very difficult due to changing trends for temperature, precipitation, and runoff in the region. Records have been maintained at the USGS gaging station for approximately 80 years (1899-1901, 1924-1930, 1938-present). The largest peak flow recorded was experienced in 2002, at 7,610 cfs. Other very large flows were experienced during periods of no gaging, and may have been as large. It might be reasonable to base future estimates of likely maximum flood levels on this past record, were it not for the measured change in climate and snowpack experienced in the area in the last several decades. Climate models indicate the likelihood of more frequent high magnitude storm events, with consequences for flood levels and frequency. Apart from evidence for global warming, there is localized evidence in the flow record that the Dungeness River does not enjoy some, "steady state" condition but varies widely across a range of peak flood values. England (1999) estimated that the 95 percent confidence limit on the 100-year flood that could be experienced on the Dungeness River is 11,400 cfs, substantially higher than the 2002 flood of record. Floods at that level would redefine the entire river morphology and would likely overtop many existing flood structures. It is therefore even more important to focus on reducing susceptibility to flooding by emphasizing funding efforts on removing or relocating residences and other structures from the floodplain and on restoring natural river processes."

Hydrologic conditions expected without restoration are summarized below.

- Under existing conditions, during the design flood event, it is possible that the levee could be overtopped, and flow would leave the main channel causing widespread flooding along the lower reaches of Meadowbrook Creek.
- Without construction of a restoration project, no change to local drainage patterns is expected, although it is likely that discharge rates from the project site into Meadowbrook Creek could increase over time as the river bed continues to aggrade.
- If the levee remains in a degraded condition due to deferred maintenance, it is possible that seepage rates around the drainage culverts into the site could increase over time.
- If the river were to breach the levee during a major flood event, conditions throughout the site would be significantly affected, as the river would supply a large volume of coarse sediment, organic material, and water to the low lying pasture areas. This could result in significant alterations in local drainage patterns and hydrology.
- Climate change modeling projections for the Dungeness River basin include increased flood runoff due to loss of snowpack, and increased rainfall intensity which may increase peak flood flows significantly, resulting in increased flood damages along the river and within the project

site. Reductions in average annual streamflow will likely be associated with a reduced groundwater table, however, it is theorized that confining geology near the downstream perimeter of the site may force a portion of the available groundwater to the land surface within the project site, given its low relative elevation. This effect may be amplified by increased seepage from the river as the river continues to aggrade between the levees.

- Sea level rise is likely to push the head of tides landward, likely resulting in increased deposition and channel migration in the delta fan as it is pushed landward toward Schoolhouse (Anderson) road. Due to the steepness of the channel the influence will not be widespread within the project reach. Intrusion of salt water landward is not likely to have significant effect within the project reach due to the average site elevation being above elevation 25 and the presence of the dense till outcrop on the northern boundary of the site.
- Due to sea level rise, the groundwater table may also be forced upwards between 3 Crabs Road and of Sequim Dungeness Way which could cause increased flooding and higher seasonal water levels on or adjacent to low lying private property. This may result in abandonment of the floodplain (benefit to ecological processes) or construction of flood mitigation measures (dikes, raised road, houses, pump stations) which may degrade local ecological processes.

4.2.2.2 Action Alternatives/Future With-Project Conditions

<u>Alternative 1 - Towne Road Alternative</u>
If Alt 1 is implemented, the following are anticipated to occur:

- Surface water and groundwater availability within the restoration site will likely increase significantly throughout the year after construction of a setback levee due to a majority of the site being lower than parts of the river. Efforts to construct and naturally maintain channels and ponds will not be hindered by a lack of water. Arguably due to the depressed topography, and location within a gaining reach of the river, the restoration site will become a large wetland complex, with ample groundwater exchange and will likely be a cold water refuge during warm periods.
- Sea level rise and upstream seepage may increase groundwater elevations within and north of the project which could compensate for small expected local losses of flow on Meadowbrook Creek due to redirection of water down the mainstem by the proposed setback levee.
- Peak flood discharges on the mainstem could increase slightly downstream of the project due to the presence of the setback levee (which redirects flood flows destined for populated areas along Meadowbrook Creek back to the river) but this is not expected to be problematic. An existing low lying berm along the left bank just downstream of the Anderson Road bridge conveys high flows to tidelands along lands dedicated to conservation, so the increase in flow is not likely to adversely affect private landowners.

- The frequency of flooding along Meadowbrook Creek and near the town site of Dungeness will be reduced as compared with existing conditions due to reductions in flood elevations within the project site and provision of a new levee.
- The risk and frequency of levee overtopping upstream of the project will remain unchanged, as will flood elevations upstream of the project.
- Because Towne road will be located behind the levee, it will remain passable at high water.

Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road

- If Alternative 2 is implemented, similar conditions as described for Alternative 1 are expected, with the following differences:
- During flood events, Town Road will be overtopped closing access temporarily. This could occur more than once per year to once every 5 years depending on the final design of the project. At the lowest point within the site, water will be allowed to pond to depths potentially exceeding 8 feet adjacent to the proposed setback levee. This is a significant change from existing conditions, where flows spread out across the fields until concentrating in swales, ditches and channels. During flood events, water may cross over Towne Road. For this reason a drainage channel is included to freely drain ponded water trapped between the road (local drainage divide) and the setback levee as the river recedes.
- The ponding described above will store floodwater reducing flood discharges and elevations downstream slightly compared with the Towne Road alternative.
- The presence of the discontinuous setback levee will result in diversion of flood waters in major flood events from Meadowbrook Creek, reducing flood discharges, heights and damages along Meadowbrook Creek and the 3 Crabs road area. Flood heights and discharges in the main river channel will increase slightly downstream of the project but this is not expected to be problematic. A low lying berm along the left bank just downstream of the Anderson Road bridge conveys high flows to tidelands along lands dedicated to conservation, so the increase in flow is not likely to adversely affect private landowners.
- Due to the provision of the setback levee and floodwater return channel some of the local runoff and shallow groundwater generated within the site will be diverted to the Dungeness River instead of following its natural course along Meadowbrook Creek. The amount of rainfall runoff diverted could entail 8 percent of the small watershed area (less than 40 acres out of 0.8 square mile watershed). In the 50 percent annual chance rainstorm a total of 0.35 cfs is estimated to runoff from the portion of the existing catchment that is diverted to the river. The amount of shallow groundwater diverted is likely higher due to the larger catchment area, however groundwater modeling would be needed to predict how much water is diverted.

Alternative 3 – Meadowbrook Creek Alignment - Road on Levee

If Alt 3 is implemented, we would expect essentially the same conditions hydrologic conditions as Alternative 2, except that due to wider levee, less floodwater will be stored next to the levee. Due to the

greater weight and the earthwork required for the realigned levee, the amount of shallow groundwater diverted from Meadowbrook Creek will likely be higher than for the other two alternatives.

Cumulative Effects

Removal of the levee will convert a large pasture area with an elevated water table to active, frequently flooded floodplain. Cumulative effects on hydrology are expected to be highly visible and concentrated within the confines of the restoration site. Due to the infrequency of very large floods that could overtop the levee and flow down Meadowbrook Creek, and the small amount of rainfall runoff generated within the site, the cumulative hydrologic effect of any of the project alternatives on the mainstem or Meadowbrook Creek in terms of peak flood discharge is expected to be small. The project could decrease surface water entering Meadowbrook Creek by approximately 8 percent. Without use of a groundwater model it is not possible to quantitatively estimate the impacts of the realigned levee alternatives on Meadowbrook Creek hydrology, however conceptually the presence of compacted levee embankment material across a natural drainage way will divert a small portion of the groundwater flowing into Meadowbrook Creek toward the mainstem. Lenses of gravel and cobble are present on site that may allow some transmission of shallow groundwater under the levee. Since the ultimate destination of this water along either flow path is Dungeness Bay, conditions are not expected to be impacted considerably.

4.2.3 Water Quality

Water quality within the Dungeness River, tributaries, and estuary is influenced by the dominant land uses in the upper and lower basins. Land use changes and physical alterations in the lower basin such as floodplain development, riparian vegetation removal, and an extensive irrigation system are factors in stormwater pollution, low in-stream flows, bacterial contamination, and degraded aquatic habitat. In the upper basin, sediment input from unstable soils on steep slopes and forest management practices have produced excessive sediment loads in the river. Water quality impairments on the lower Dungeness, which include elevated fecal coliform levels and low in-stream flows, can affect salmonids and marine life, recreation opportunities, commercial fishing, and tribal fishing. Recreational and commercial shellfish beds are an important resource at Dungeness Bay and are sensitive to the water quality affected by the land uses in the valley. Characteristic uses of the study area such as recreation and shellfish harvesting are impacted by fecal coliform levels. Closures of Dungeness Bay to tribal and non-tribal shellfish harvests began in 2000 (Sargeant 2004). Sources of fecal coliform pollution include humans, livestock, domestic animals, wild animals, and septic system failures due to flooding, high water tables, and improper maintenance. Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas as well as bacteria and nutrients from livestock also contribute to non-point source water pollution in the study area.

In 2002, a bacteria total maximum daily load (TMDL) was created and applied to the lower Dungeness River and several tributaries (WDOE 2002). Per the 2012 EPA-approved water quality assessment, the Dungeness River is not included on the 303(d) list of impaired waterbodies in Washington State. However, the TDML for bacteria is still in effect and being studied. Also, two segments of the river are impaired for instream flow. One impaired flow segment includes the project site, from RM 1.1 – 2.7

(WDOE 2012). In 2012, WDOE implemented a new water management rule for the Dungeness watershed that secures water supplies for current and future uses in the Sequim area. The rule is designed to prevent new water withdrawals from causing further degradation to stream flows and fish habitat, and to protect the rights of senior water users.

4.2.3.1 No-Action Alternative/Future Without-Project Conditions

In the future without-project condition, water quality may slightly improve with the continued implementation of TMDL's and other regulations and programs. However, fecal coliform levels will continue to be a concern in the lower basin and pose a risk to public health. Agricultural practices, increased urbanization, and other land use practices will continue to contribute non-point-source pollution. Low flows will also continue without further changes to the water withdrawal system.

4.2.3.2 Action Alternatives/Future With-Project Conditions

All three action alternatives would provide long-term incremental water quality improvements as a result of the restoration plan. The reconnected floodplain and associated wetlands would remove nutrients, suspended sediment, metals, and bacteria and help moderate the temperature of the water. Plants would filter receding floodwaters, trapping fine-grained sediments and capturing pollutants. Fecal coliform bacteria adsorbed to particulates would be retained in the onsite wetlands and floodplains, promoting bacteria die-off since many of the microorganisms associated with fecal matter cannot survive for long periods of time without a host organism (Hemond and Benoit 1988, Johnston et al., 1990). The increased floodplain connections and inundation would also result in increased groundwater recharge and subsequent discharge that could provide cooler water to the river during low flows.

Temporary impacts to water quality, mainly turbidity, may occur during construction of the project. Impacts would be minimized by isolating construction activities prior to making a connection to the river. The largest impact would occur during the connection of the side channel with the river, resulting in short term turbidity increases as the channel adjusts to the new flow. Localized shifting of sediments would continue sporadically as the new side and back channels adjust.

In order to reduce temporary increases in turbidity and potential related effects on juvenile salmonids, all 'in-water' construction work would take place during the established fish window (July 15 – September 30), which is the driest time of the year. Construction techniques, sequencing, and timing would minimize soil disturbance to the extent practical to reduce the generation of turbidity during connection of the new channels. Similarly, the design and implementation of the erosion-control and the Storm Water Pollution Prevention (SWPPP) plans would incorporate best management practices (BMPs) such as installation of a silt fence, placement of staging areas in uplands, minimizing the number of trips heavy equipment makes though the site, and revegetation of disturbed areas to further reduce the duration and magnitude of the temporary increases in turbidity. Turbidity monitoring during construction would ensure that these temporary increases are in compliance with State Water Quality Standards.

Cumulative Effects

The short-term cumulative effects to water quality during and immediately following construction of any of the action alternatives would not be significant, and would end soon after construction is complete. Long-term cumulative effects are anticipated to be an overall benefit to water quality in the lower Dungeness basin.

4.2.4 Greenhouse Gas Emissions

Emissions of carbon dioxide from hauling activities represent a significant fraction of GHG that would be produced under various alternatives. The Corps performed a simplified estimation of GHG emissions for hauling activities for all alternatives and compared the results.

Table 4-4 shows the estimated volumes of materials to be excavated for each of the alternatives, total gallons of diesel consumed, which includes an estimate of truck trips for placement of materials as well as for excavation hauling, and an estimate of carbon dioxide that would be produced from all truck trips and equipment operation.

Table 4-4. Estimated Volumes of Excavated Material, Fuel Consumed by Vehicles, and CO_2 Produced

	Cubic yards excavated material	Total gallons of diesel and gas consumed	Tons carbon dioxide
No Action Alternative	0	0	0
Alt 1 - Towne Road Alternative	113,953	22,400	240.2
Alt 2 - Meadowbrook Creek Alignment - At-Grade Road	195,323	70,880	773.4
Alt 3 - Meadowbrook Creek Alignment - Road on Levee	271,454	132,320	1,449.3

To put these quantities into perspective, a passenger vehicle that travels 10,000 miles per year and burns diesel at a rate of 20 miles per gallon emits approximately 5.6 tons of carbon dioxide per year.

4.2.4.1 No-Action Alternative/Future Without-Project Conditions

GHG emissions will most likely increase as urbanization and development occur in the Dungeness basin. Associated effects of urbanization include the need for more infrastructure such as roads which will increase motor vehicle use and emissions.

4.2.4.2 Action Alternatives/Future With-Project Conditions

Alternative 1 - Towne Road Alternative

This alternative would have localized short-term increases in GHG emissions during the construction period. For every gallon of diesel fuel burned, 22 pounds of CO_2 are produced, and every gallon of gasoline produces 19.4 pounds of CO_2 (EPA 2009). The estimated amount of carbon dioxide produced under this alternative is approximately 240 tons. Alternative 1 is not expected to cause any substantial

adverse cumulative impacts associated with global climate change, and there are no formally adopted NEPA thresholds of significance for GHG emissions.

Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road

Alternative 2 would produce approximately 773 tons of carbon dioxide. Alternative 2 is not expected to cause any substantial adverse cumulative impacts associated with global climate change, and there are no formally adopted NEPA thresholds of significance for GHG emissions.

Alternative 3 – Meadowbrook Creek Alignment - Road on Levee

Alternative 3 would produce approximately 1,449 tons of carbon dioxide, which is the highest of the action alternatives. This is due to the increased number of vehicles and equipment needed to transport materials and construct the larger levee footprint. Alternative 3 is not expected to cause any substantial adverse cumulative impacts associated with global climate change, and there are no formally adopted NEPA thresholds of significance for GHG emissions.

Cumulative Effects

The potential effects of GHG emissions are by nature global and cumulative because they mix throughout Earth's atmosphere from various global sources. While the GHG releases from the proposed project will contribute to the GHG accumulating in Earth's atmosphere, an effect to global climate change would only occur when GHG emissions from all sources and sinks combine with the GHG emissions from the proposed actions on a global scale. Emissions will not exceed EPA's *de minimi*s threshold levels (100 tons/year for carbon monoxide and 50 ton/year for ozone) or affect implementation of Washington's Clean Air Act implementation plan. Therefore, it is reasonable to assume that none of the alternatives for this project is large enough to have an appreciable effect on the climate because it would represent a very small portion of the total GHG emissions produced globally.

4.2.5 Climate Change and Sea Level Rise

USACE Engineering Regulation ER 1100-2-8162 1 October 2011 requires feasibility studies to examine three scenarios to consider the sensitivity and adaptability of projects to sea level change (SLC). These scenarios include a low, medium, and high forecast of SLC for the period of analysis, which is 2016 to 2065. The guidelines require an active tide station with at least a 40-year record to estimate sea-level change for a project. Projected sea level change was calculated per the guidance in U.S. Army Corps of ER 1100-2-8162 for low medium and high sea level change scenarios for the Port Townsend tide gauge. Table 4-5 indicates that the range of projected sea level change over the next 50 years varies from approximately 0.3 to 1.9 feet.

The effects of climate change on upland hydrology are evaluated using the current climate change guidance for Corps projects in ECB 2014-10.

Table 4-5. Projected Sea Level Change at Port Townsend, WA

Projected Sea Level Change after 50 years (in feet)	
Low	0.3
Medium	0.7
High	1.9

4.2.5.1 No-Action Alternative/Future Without-Project Conditions

The No-Action Alternative will result in continued episodic flooding and bank erosion, and lateral migration of the river and side channels, potentially at increased frequency and magnitude due to global climate change. Global climate change is also likely to have a significant effect on temperature and precipitation in the Olympics which will result in alterations to hydrology (precipitation timing, magnitude, type) and vegetative land cover through the Dungeness basin. Hydrologic changes resulting from expected climate change are likely to result in larger and more frequent rain dominated floods in the fall, reduced snowpack, and reduced spring and summer runoff and base flows. The higher peak flow and lower spring melt may result in more channel disturbance (increased episodic delivery of sediment to channel) and reduced runoff for reworking flood deposits. This could increase the tendency for channel braiding if sediment supply begins to overwhelm transport capacity. Reductions in stream flow coupled with increased sediment delivery and a reduction in vegetative cover associated with braiding are likely to degrade salmon habitat over time.

Sea level rise will push the head of tides up valley, likely resulting in increased deposition and channel migration as the delta fan is pushed landward toward Schoolhouse road. Due to the steepness of the channel the influence will not be widespread or significant within the project reach. Intrusion of salt water landward is not likely to have significant effect within the project reach due to the average site elevation being above elevation 25 and the presence of the dense till outcrop on the northern boundary of the site. Future increases in sea level or flood discharge or frequency could result in abandonment of the floodplain (benefit to ecological processes) or construction of flood mitigation measures (dikes, raised road, houses, pump stations) which may degrade local ecological processes.

4.2.5.2 Action Alternatives/Future With-Project Conditions

<u>Alternative 1 - Towne Road Alternative</u>

Alternative 1 will give the river and side channels room to migrate across the floodplain during increased flooding events as a result of global climate change.

Projected SLC of up to 2 feet in the next 50 years indicates that the zone of tidal influence within the river will increase over time; however, due to the steep slope in the river it is unlikely that this increase will significantly affect the project area.

Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road

Alternative 2 would have similar channel migration benefits to those described in Alternative 1, but would also provide significantly more flood storage due to the greater amount of connected floodplain.

Alternative 3 – Meadowbrook Creek Alignment - Road on Levee

As compared to the other action alternatives, Alternative 3 would provide the most acreage for channel migration to occur since Towne Road would be located on the levee. Alternative 3 would also have slightly less flood storage benefits than Alternative 2.

4.3 Biological Environment

4.3.1 Fish

The Dungeness River is a short and steep river that is home to seven species of Pacific salmon that utilize the Dungeness watershed for all or a portion of their life cycle. Included in the list of salmon are Chinook (*Oncorhynchus tshawytscha;* 1 run), coho (*O. kisutch*; 1 run), chum (*O. keta*; 2 runs),pink (*O. gorbuscha*; 2 runs), steelhead (*O. mykiss*; 2 runs), cutthroat trout (*O. clarkii*; anadromous and resident), and bull trout (*Salvelinus confluentus;* anadromous, resident, and fluvial). The Dungeness is also home to other typical cold water fisheries including various sculpin (*Cottus sp.)*, three spine stickleback (*Gasterosteus aculeatus*), and lamprey (*Lampetra* sp.). Of the 32 miles of stream in the Dungeness, about 29 miles are available to migratory fish. Chinook and summer chum salmon, steelhead, and bull trout are presently listed as threatened species under the Federal Endangered Species Act (Table 4-6). The early-timed upper river stock of pink salmon is considered depressed while the lower river stock of pink is critical under the Washington state evaluation system (Washington Department of Fisheries et al., 1993 and WDFW 2002).

Salmon are excellent indicators of watershed health. Migratory Pacific salmon spawn in freshwater, migrate from streams and rivers to the sea as juveniles, and spend the majority of their lives in the ocean before returning to freshwater to spawn. Their dependence on cool, well oxygenated water as well as their utilization of various riverine habitats throughout the entire watershed during some portion of their life history makes them the optimal indicator for ecological change. Salmon carcasses are also an excellent source of protein and minerals for many of the resident fauna in the basin.

As in many regions of the Pacific Northwest, former timber harvest, agricultural practices and floodplain development in the Dungeness watershed has occurred concurrent with declining salmon populations. The installation of levees within the lower reaches of the river has resulted in the loss of a number of distributary channels and simplification of the Dungeness delta and surrounding salt marsh habitats (Bountry et al. 2002, Collins 2005). Sedimentation has also been an issue in the lower river as the channel continues to aggrade and fine particulate matter has settled into the gravels limiting spawning success and benthic invertebrate production. The accumulation of sediment has also filled in some of the pools within the river channels that are important to both resident and migratory fish. A similar effect is also seen with the lack of large wood input. There is very little wood that is necessary to scour pools in the lower river that provide refuge for smolts to keep out of high flows. As a result there has

been a continual decline in population of many species for salmon in the River. Table 4-6 summarizes most of these declines.

Table 4-6. WRIA 18 Salmon and Steelhead Stock Designations and Associated Status

Stock	SASSI Status 1992	SASSI Status 2002	ESA Listing Status
Dungeness Spring/Summer Chinook	Critical	Critical	Threatened
Dungeness Summer Chum	Not Identified as Distinct Stock	unknown	Threatened
Dungeness River/East Strait Tribs Fall Chum	Unknown	Unknown	Not Warranted
Dungeness Coho	Depressed	Unknown	Candidate
Upper Dungeness Pink	Depressed	Depressed	Not Warranted
Lower Dungeness Pink	Critical	Critical	Not Warranted
Dungeness Summer Steelhead	Depressed	Unknown	Not Warranted
Dungeness Winter Steelhead	Depressed	Depressed	Threatened
Bull trout			Threatened

4.3.1.1 No-Action Alternative/Future Without-Project Conditions

In the future-without project condition, fish stocks would continue to decline. The project area and other portions of the lower river would continue to be isolated from its historic floodplain and distributary channels by levees on both sides. Off-channel habitat (i.e., wetted habitat that still maintains a surface hydrological connection, but is out of the high flow channel) used for rearing and refuge functions would be scarce. The mosaic of habitats (forested islands, riparian areas, wetlands, off-channel and mainstem) would continue to be altered, not meeting the habitat needs of salmon and a variety of other aquatic related species such as otter, amphibians and waterfowl.

4.3.1.2 Action Alternatives/Future With-Project Conditions

<u>Alternative 1 - Towne Road Alternative</u>

Alternative 1 would reconnect 63 acres of floodplain and restore natural riverine processes beneficial to fish and wildlife. Pools, riffles, boulders, logjams, side channels, wetlands and other features would be reconnected with the floodplain and the river. Realignment of the levee would improve fish habitat by giving the river channel the opportunity to migrate and promote bar, island, and side channel formation. This alternative would also create approximately 2,900 feet of side channel and 2,400 feet of back channel habitat currently lacking in the Lower Dungeness basin. Side and back channels would have lower water velocities during floods, providing valuable fish habitat and acting as storage areas for sediment in the watershed. As these channels experience flooding, erosion, sedimentation, and debris recruitment the size and position of the channels, including the mainstem river will change. Riparian plantings, constructed terraces, and placed LWD will restore food sources, create floodplain structure and roughness, provide cover, and pool habitat in an area that is fallow pasture land at present. ELJs

and anchored large wood clusters will dissipate energy in floods, maintain large pools, and store woody material and gravel, which will retain nutrients and benthic invertebrates needed for ecosystem recovery. Maturation of native tree and shrub species in the restored riparian and floodplain habitat would contribute to the long-term recruitment of large wood into the river to further promote and maintain channel processes.

Alternative 1 is expected to be more energetic (higher depths and velocities) due to the significantly lower flood storage compared to Alternatives 2 and 3 and the channelization created by the modified levee. The side channels, ELJs, clusters, and large wood placements should behave similarly for all alternatives, as they would have nearly equivalent hydraulics at the location where the river will enter these channels. Hydraulically the projects provide similar habitat outputs for fish with the exception of the large difference in off channel refuge and rearing habitat offered by both Meadowbrook Creek Alternatives.

Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road

Alternative 2 would have the same fish benefits as described in Alternative 1, but would also provide considerably more area available for refuge from high velocity floodwater that dominates the existing river channel. Flooding of the larger area will provide additional exchange of nutrients and organic material between land and water, thus increasing habitat complexity via food subsidies and large wood.

Alternative 3 – Meadowbrook Creek Alignment - Road on Levee

Alternative 3 would have similar fish benefits as Alternative 1, with the added benefits of refuge from high velocity floodwater and nutrient exchange described in Alternative 2.

Cumulative Effects

This project combined with other future Federal, State, and local restoration projects would result in long-term, cumulative benefits to the amount and functional value of restored habitat, improvements in the overall watershed condition, and would ultimately increase the ability of the watershed to support critical life history stages of native fish populations.

4.3.2 Shellfish

The Dungeness Bay estuary area contains a rich shellfish resource that is used by tribal, commercial, and recreational harvesters. Shellfish species common in Dungeness Bay include Dungeness (*Cancer magister*) and red rock (*Cancer productus*) crabs; butter (*Saxidomus giganteus*), native littleneck (*Leukoma staminea*), eastern soft shell (*Mya arenaria*), and geoduck (*Panopea generosa*) clams; and Pacific oysters (*Crassostrea gigas*) (USFWS 2007). These native and non-native species are associated with the intertidal and subtidal zones; crabs and oysters dwell on the substrate surface while the clams bury themselves at various shallow depths. The substrate preferences range from mud and sand to gravel and rocks (Dethier 2006).

Commercial shellfish harvest has been impacted by bacterial pollution problems in Dungeness Bay and the lower Dungeness River watershed that began in the 1990s. In 2000-2003, the Washington State Department of Health (DOH) downgraded over 400 acres near the mouth of Dungeness Bay from

Approved to *Prohibited* year-round for commercial harvest based on high fecal coliform bacteria levels. Clallam County was therefore required by RCW 90.72.045 to establish a shellfish protection district and program to address the cause of the pollution. In April 2011, DOH upgraded approximately 500 acres of the Dungeness Bay growing area from *Prohibited to Conditionally Approved* for commercial shellfish harvest. The 2011 upgrade is due to improved water quality at monitoring stations near the mouth of the Dungeness River. The upgrade was prompted by a comprehensive review of pollution conditions and water quality data by DOH combined with years of cleanup actions, monitoring, and public outreach by Clallam County, Clallam Conservation District, the Jamestown S'Klallam Tribe, and other partners. Figure 4-5 is a map of current commercial shellfish growing area classifications.

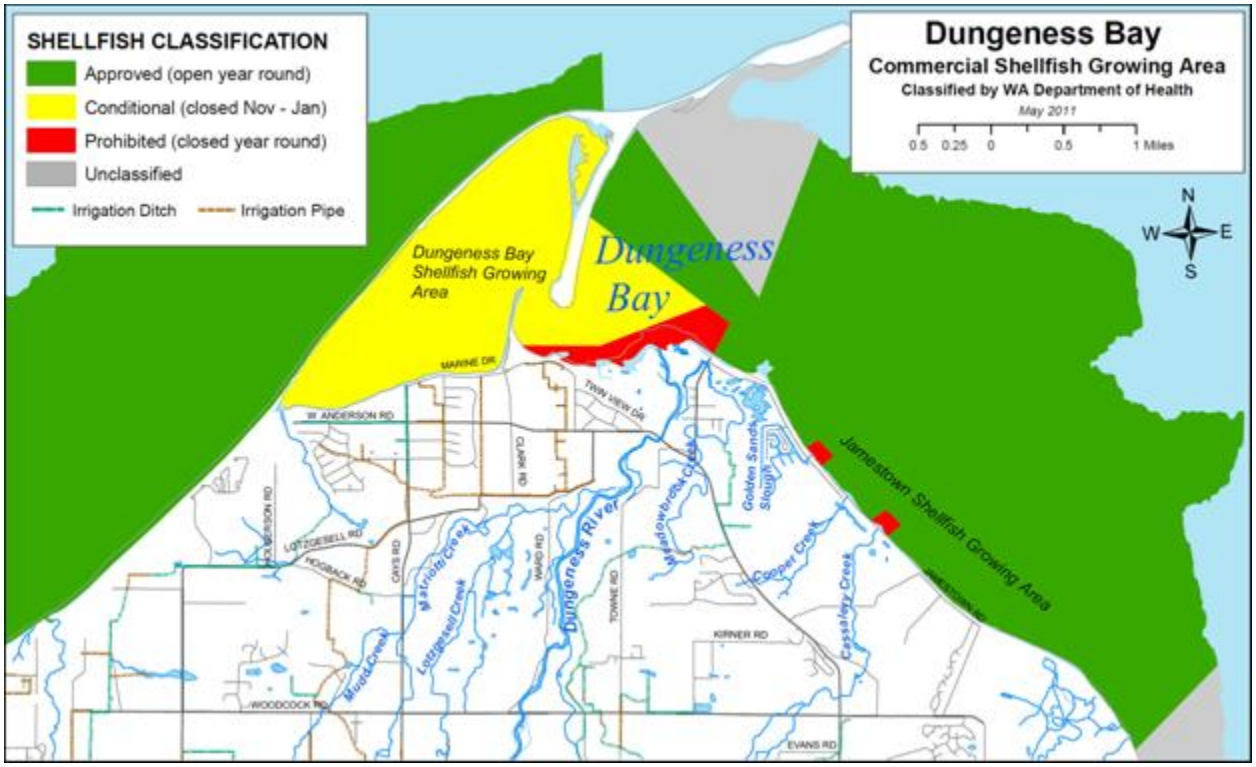

Figure 4-5. Dungeness Bay Commercial Shellfish Growing Area Classifications

In the future-without project condition, continued work by local entities to reduce fecal coliform is expected to slowly improve conditions. Given multiple confounding factors, it is difficult to predict with any confidence what the shellfish populations could be through the 50-year study period.

4.3.2.1 Action Alternatives/Future With-Project Conditions

<u>Alternative 1 - Towne Road Alternative</u>

If Alt 1 is implemented, 63 acres of floodplain would provide incremental water quality improvements. During storm events, fine river-borne sediment would be retained on the floodplain, which would otherwise be deposited into Dungeness Bay. Also plants within the floodplain would filter pollutants,

improving water quality conditions downstream. Thus, restored floodplain functions could improve conditions for shellfish in Dungeness Bay.

Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road

If Alt 2 is implemented, 110 acres of floodplain would provide water quality improvements similar to Alternative 1 that would benefit shellfish resources in Dungeness Bay, but on a much larger scale.

Alternative 3 – Meadowbrook Creek Alignment - Road on Levee

If Alt 3 is implemented, 95 acres of floodplain would provide water quality improvements similar to Alternative 2, benefitting shellfish resources in Dungeness Bay.

Cumulative Effects

Cumulative effects that would accrue for shellfish with implementation of any of the action alternatives include improved water quality from reconnection of the floodplain and wetlands. This would add to the efforts of Clallam County to improve water quality for the Sequim Bay-Dungeness Watershed Clean Water District.

4.3.3 Wildlife

The Dungeness River and associated riparian community includes a diverse assemblage of over 200 species of fish and wildlife. Large megafauna in the watershed include Roosevelt elk (*Cervus canadensis*), Columbian black-tailed deer (*Odocoileus hemionus columbianus*), and black bear (*Ursus americanus*). Other mammals at the project site include river otter (*Lutra Canadensis*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), opossum (*Didelphis virginianus*), rabbit, and various rodents. Amphibians likely present include long-toed salamander (*Ambystoma macrodactylum*), northwestern salamander (*A. gracile*), Pacific treefrog (*Pseudacris regilla*) , and western toad (*Anaxyrus boreas*). Bird species include owls, hawks, falcons, woodpeckers, flycatchers, warblers, sparrows, waterfowl, and other species.

4.3.3.1 No-Action Alternative/Future Without-Project Conditions

In the future without-project condition, there is likely to be some restoration of terrestrial habitats. Local restoration projects will likely be implemented by the County, Tribes, and other entities to improve fish and wildlife habitat in the lower watershed. However, continued population growth and development may convert existing habitat to residential or other land uses.

4.3.3.2 Action Alternatives/Future With-Project Conditions

Alternative 1 - Towne Road Alternative

If Alternative 1 is implemented, 63 acres of floodplain would be reconnected to the river. The floodplain, including riparian and wetland habitat, would be restored through levee realignment and natural riverine processes, benefitting many species of wildlife. Over time, the restored riparian zone will further benefit the Dungeness River and new side channels by providing shading and input of large and small woody debris and other detritus and insects, further contributing to cover, habitat diversity, and the riverine food web. The restored riparian zone will also improve wildlife migratory corridors and provide cover and nesting/foraging habitats.

At the time of construction, wildlife may be temporarily displaced due to the noise and movement of the machinery. Vegetation clearing, earthwork, and debris removal may impact foraging or nesting grounds for amphibians, reptiles, birds, and small mammals. However, these effects would be temporary and displaced wildlife would be expected to return to the area after construction is completed.

Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road

In addition to the benefits described in Alternative 1, 47 more acres of floodplain would be reconnected to the river under Alternative 2. Installation of a bridge where Towne Road crosses a back channel would provide safe passage for terrestrial species traversing the site.

As described in Alternative 1, wildlife may be temporarily displaced during construction and would be expected to return to the area upon project completion.

Alternative 3 – Meadowbrook Creek Alignment - Road on Levee

Alternative 3 would provide similar benefits and temporary impacts to wildlife as described in Alternative 2.

Cumulative Effects

This project combined with other future Federal, State, and local restoration projects would result in long-term, cumulative benefits to the amount and functional value of restored habitat, improvements in the overall watershed condition, and would ultimately increase the ability of the watershed to support critical life history stages of native wildlife populations.

4.3.4 Vegetation

Currently the mainstem has levees constricting the river on both sides in the study area with very little connected floodplain. The study area has been significantly impacted by grazing and past land use activities, ditching, drain tiles, removal of riparian vegetation, and its separation from the Dungeness River. At the project site to the west and south of Towne Road, the Jamestown S'Klallam Tribe has conducted vegetative restoration projects by planting a variety of native woody vegetation species including western red cedar (*Thuja plicata*) , Douglas fir (*Pseudotsuga menziezii*), serviceberry (*Amelanchier alnifolia*), and currant (*Ribes* sp.). Also located to the east of Towne Road is the Washington State Department of Transportation's (WSDOT) mitigation site for the Highway 101 Shore Road to Kitchen-Dick Road Widening project.

Riparian Vegetation

Adjacent to the levees in the study area and inclusive of the mainstem is a riparian zone. The riparian zone has been impacted by vegetation clearing and levee construction. The riparian area is contiguous with the river throughout the study area and in most places found on both sides of the levee, but not within the levee prism. In a few spots there are vegetated islands located on the flood side of the levee extending into the main channel. Most of the riparian vegetation consists of black cottonwood (*Populus balsamifera*) and red alder (*Alnus rubra*) trees, with a few patches of western red cedar. The understory community includes snowberry (*Symphoricarpos albus*) and Indian plum. The trees appear to be about

sixty years old and presumably were planted or recruited naturally around the time of construction. Since many of the trees within the river corridor have not matured there is a lack of woody debris recruitment within the system. As shown in the photograph below while there are abundant amounts of gravels there are very few scour holes to provide habitat for fish.

Figure 4-6. Riparian Corridor in the Project Area

Wetlands

Within the entire Dungeness Area Watershed, there are about 350 regulated wetlands totaling 4,525 acres, and 174 artificially created ponds totaling 156 acres. The largest wetland systems are located in the lower watershed where the proposed project is located. The predominant wetland type is palustrine emergent, occupying 2,142 acres (47 percent of identified wetland acreage). The National Wetland Inventory (NWI) shows several wetlands in the historic floodplain within the project area. Wetlands identified in the NWI inventory of the area show wetland types as palustrine emergent marsh (PEM), palustrine forested (PFO), and some small ponds.

Five wetlands are located in the project area on both sides of Towne Road totaling over 60 acres (Figure 4-7). Two wetlands located to the west of Towne Road were delineated by USACE biologists in September 2013 and three wetlands located to the east of Towne Road were delineated by Washington State Department of Transportation biologists in February 2010. The western half of the site is

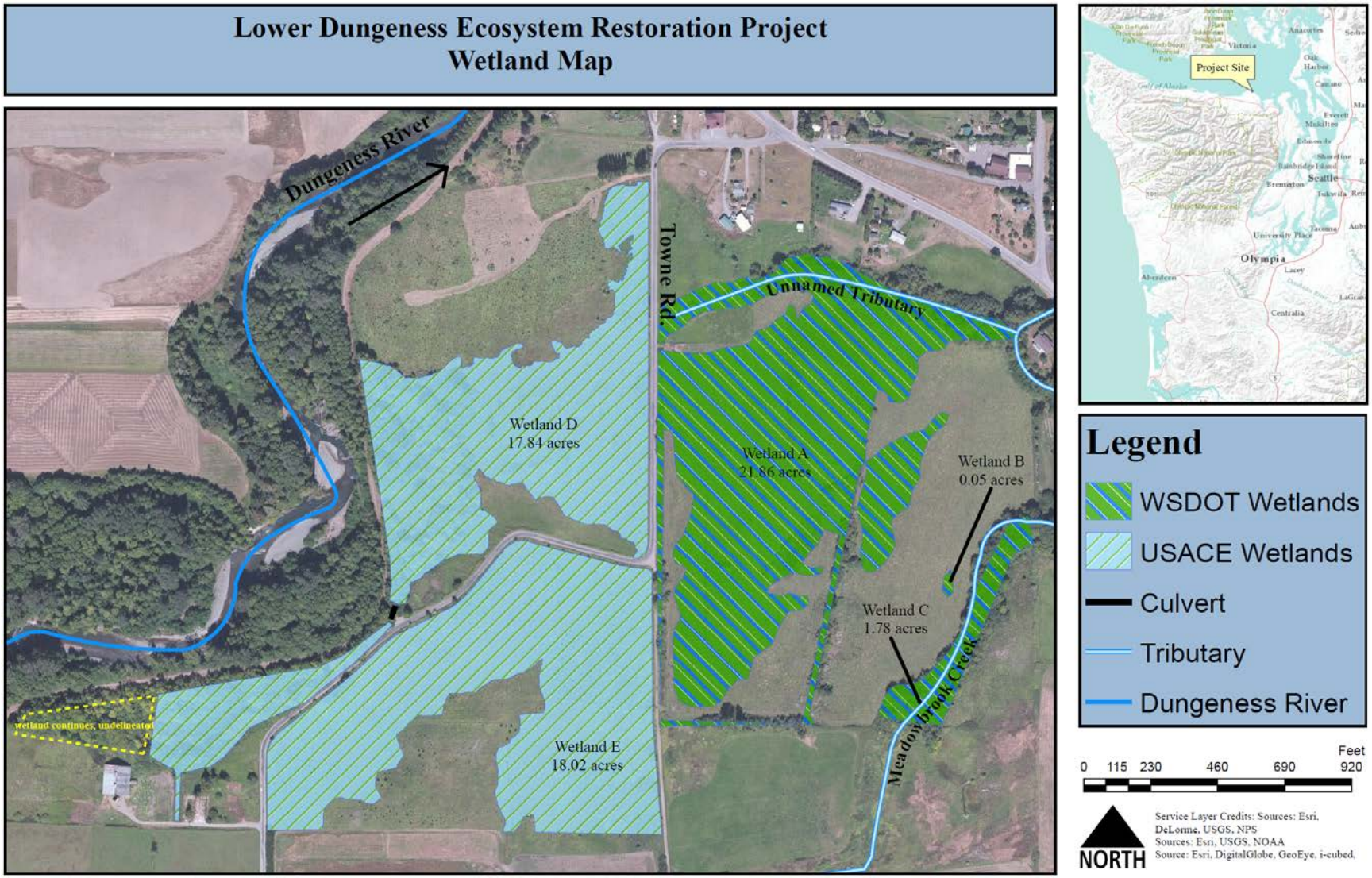

Figure 4-7. Wetlands Located in the Project Area

composed primarily of palustrine emergent depressional wetlands containing tall fescue (*Festuca arundinacea*), velvet grass (*Holcus lanatus*), small-fruited bulrush (*Scirpus microcarpus*), sawbeak sedge (*Carex stipata*), giant horsetail (*Equisetum telmateia*) and cattail (*Typha latifolia*). There is also a palustrine forested component located adjacent to the levee. Here the vegetative community is comprised of red alder in the overstory, salmonberry (*Rubus spectabilis*) in the shrub layer, and creeping buttercup (*Ranunculus repens*) and reed canarygrass (*Phalaris arundinacea*) in the herbaceous layer. The eastern side of the project site hosts the WSDOT compensatory mitigation site for the Highway 101 widening project. The degraded wetlands have been impacted by past agricultural activities, thus a combination of wetland re-establishment, enhancement, and preservation is encompassed in the mitigation site. Approximately 7.8 acres of the mitigation site was set aside for a potential future levee realignment.

4.3.4.1 No-Action Alternative/Future Without-Project Conditions

Local entities would likely undertake various vegetation enhancement projects to address the loss of riparian vegetation and wetland degradation within the watershed. However, at the project site, Federal levee realignment would be highly unlikely to occur without Corps involvement, thus floodplain reconnection and the resulting benefits to the riparian zone and existing wetlands would not accrue. Plantings installed by the Jamestown S'Klallam Tribe to the west and south of Towne Road and plantings installed by WSDOT at the mitigation site would mature, but all areas would still be disconnected from the Dungeness River without project implementation. Lack of quality riparian habitat and floodplain access would continue to be major limiting factors to the recovery of ESA-listed salmonids and other fish and wildlife species.

4.3.4.2 Action Alternatives/Future With-Project Conditions

<u>Alternative 1 - Towne Road Alternative</u>

Implementation of the Towne Road Alternative would restore the existing riparian zone through levee removal and natural recruitment of native woody vegetation. Maturation of native tree and shrub species in the restored riparian and floodplain habitat would contribute to the long-term recruitment of large wood into the river to further promote and maintain channel processes. Over time, the restored riparian zone will benefit the Dungeness River and new side channels by providing shading and input of large and small woody debris and other detritus and insects, further contributing to cover, habitat diversity, and the riverine food web. The restored riparian zone will also improve wildlife migratory corridors and provide cover and nesting/foraging habitats.

Construction activities associated with levee removal, realigned levee site preparation, or side/back channel excavation would require vegetation removal. Removed trees would be stockpiled for later use in the construction and placement of floodplain habitat structures. Native trees and shrubs would also be planted in vegetated terraces, disturbed areas, and along the newly excavated side and back channels to minimize erosion and sedimentation and accelerate habitat recovery.

In order for floodplain reconnection to occur, the project must modify the levee system and maintain current levels of flood protection for adjacent properties. For Alternative 1, this realignment results in 2

acres of wetland fill, 8.4 acres of wetland conversion to side and back channels, and reconnects 63 acres of floodplain habitat to the river. The onsite wetland and upland functions will be enhanced through periodic overbank flooding and plantings and recruitment of native woody species, increasing the overall habitat complexity and function of the site. The increase in function and values expected from the reconnected floodplain and channel network combined with the systemic benefits throughout the lower Dungeness ecosystem are expected to outweigh the wetland impacts.

The proposed south access road alignment follows existing roads and a future buried irrigation pipeline alignment (see Figure 3-4 and description under *Transportation, Utilities, and Public Services*), thus no impacts to wetlands are anticipated. A wetland reconnaissance and vegetation survey of the south access road alignment would be conducted to confirm no impacts to wetlands or riparian vegetation would occur from use or improvement of the south access road.

<u>Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road</u>

If Alternative 2 is implemented, riparian zone benefits and vegetation removal activities are expected to be similar to those under Alternative 1. However, under Alternative 2 levee realignment would result in 1.2 acres of wetland fill, 9.2 acres of conversion to side and back channels, and would reconnect 110 acres of floodplain habitat to the river (Table 4-7). Compared to the other action alternatives, Alternative 2 results in the least amount of wetland fill and provides the largest acreage of reconnected floodplain. The increase in function and values expected from the additional acres of reconnected floodplain and channel network combined with the systemic benefits throughout the lower Dungeness ecosystem are expected to outweigh the wetland impacts.

The proposed south access road alignment follows existing roads and a future buried irrigation pipeline alignment (see Figure 3-4 and description under *Transportation, Utilities, and Public Services*), thus no impacts to wetlands are anticipated. A wetland reconnaissance and vegetation survey of the south access road alignment would be conducted to confirm no impacts to wetlands or riparian vegetation would occur from use or improvement of the south access road.

<u>Alternative 3 – Meadowbrook Creek Alignment - Road on Levee</u>

Alternative 3 would provide similar riparian zone benefits and vegetation removal activities as the other two action alternatives. In comparison, Alternative 3 levee realignment would result in 4.1 acres of wetland fill, 9.2 acres of wetland conversion to side and back channels, and 95 acres of reconnected floodplain. Although Alternative 3 results in a comparable amount of reconnected floodplain as Alternative 2, it requires nearly 3 more acres of wetland fill.

The proposed south access road alignment follows existing roads and a future buried irrigation pipeline alignment (see Figure 3-4 and description under *Transportation, Utilities, and Public Services*), thus no impacts to wetlands are anticipated. A wetland reconnaissance and vegetation survey of the south access road alignment would be conducted to confirm no impacts to wetlands or riparian vegetation would occur from use or improvement of the south access road.

Table 4-7. Summary of Wetland Fill, Conversion to Channels, and Reconnected Floodplain Acreage

Action Alternative	Acres of Wetland Fill	Acres of Wetland Converted to Side and Back Channels	Acres of Reconnected Floodplain
Alternative 1	2.0	8.4	63
Alternative 2	1.2	9.2	110
Alternative 3	4.1	9.2	95

Cumulative Effects

The Corps anticipates no adverse cumulative effects to vegetation to accrue from any of the alternatives. Restoration and enhancement of riparian and wetland vegetation in the lower Dungeness Basin would add to the vegetation restoration work of the Jamestown S'Klallam Tribe, Clallam County, and other entities have achieved. The proposed restoration would provide an important connection between these two valuable habitat types in the Dungeness Basin and would therefore have a cumulative benefit to overall biodiversity of the vegetation communities.

4.3.5 Rare, Threatened, and Endangered Species

Nine species identified under the ESA as endangered or threatened potentially occur in the study area: four fish species, four bird species, and one invertebrate species (

Table 4-8). No Federally listed plants, amphibians, or reptiles are found in the study area. The Corps will undertake ESA Section 7(a) consultation as part of the EA process. Results of the consultation will be incorporated into the Final EA. Preliminary effects determinations as anticipated through this initial analysis are included in the following descriptions of effects of the alternatives.

Table 4-8. ESA-Listed Species that Potentially Occur in the Study Area

Common Name (*Scientific name*)	Federal Listing Status/Critical Habitat	Year Listed	Jurisdiction	Potential for Occurrence
Northern spotted owl (*Strix occidentalis caurina*)	Threatened/ Designated	1990	USFWS	Unlikely
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened/ Designated	1992	USFWS	Unlikely
Short-tailed albatross (*Phoebastria* (=*diomedea*) *albatrus*)	Endangered	2000	USFWS	Unlikely
Western yellow-billed cuckoo (*Coccyzus americanus*)	Threatened/Designated	2001	USFWS	Unlikely
Puget Sound Chinook Salmon ESU (*Oncorhynchus tshawytscha*)	Threatened/ Designated	1999	NMFS	Confirmed
Hood Canal Summer-Run Chum	Threatened/	2005	NMFS	Confirmed

ESU	Designated			
Puget Sound Steelhead DPS	Threatened/ Proposed	2007	NMFS	Confirmed
Coastal/Puget Sound Bull trout DPS (*Salvelinus confluentus*)	Threatened/ Designated	1999	USFWS	Confirmed
Taylor's checkerspot (*Euphydryas editha taylori*)	Endangered/ Designated	2013	USFWS	Unlikely

The existing condition and future without-project condition (No Action Alternative) for each confirmed or likely ESA species is discussed below, followed by analysis of effects in the future with-project condition (action alternatives) for the broader group of species.

Northern Spotted Owl

Northern spotted owls inhabit old growth or late successional coniferous or mixed conifer-hardwood forests, and the Dungeness watershed is within their range. The closest report of spotted owl recorded in the WDFW (2014) database is a sighting in 2002 over six miles south of the project site. No critical habitat is located within fifteen miles of the study area. In the future without-project condition, northern spotted owl populations are expected to continue to decline due to habitat loss, reduction in prey, and competition for home range from other species such as the barred owl.

Marbled Murrelet

Marbled murrelets nest in mature and old growth forests of at least seven acres in size. They forage in deeper water of entrance channels of rocky shores, estuaries, and protected bays where they dive in pursuit of prey fish such as Pacific herring, sand lance, and surf smelt. Critical habitat includes upland forested stands used for nesting, but does not include marine water. Marbled murrelets have been observed within their designated critical habitat in forested areas upstream from the study area (WDFW 2013b).

Recent trends indicate a continued steady decline of marbled murrelets, with a decrease in population of eight percent from 2000 to 2009 in Puget Sound and the Strait of Juan de Fuca (USFWS 2009). The 2010 population estimate for Puget Sound and Strait of Juan de Fuca was around 4,000 (Pearson et al. 2011). Population declines occur through habitat loss from timber harvest and natural events such as wildfires, insect outbreak, and windthrow in their terrestrial environment, and harmful algal blooms, declining prey availability (forage fish), and catastrophic events such as oil spills in their marine environment. In the future without-project condition, marbled murrelet population declines may occur through habitat loss and catastrophic events beyond the scope of this feasibility study, such as oil spills.

Short-tailed albatross

The short-tailed albatross once ranged over the North Pacific Ocean and Bering Sea. Historically, breeding colonies were found on numerous isolated islands off of Japan and Taiwan, yet today they are only found on two Japanese islands. There are no breeding populations of short-tailed albatrosses in

the United States, but several have been regularly observed during the breeding season on Midway Atoll in the northwestern Hawaiian Islands (USFWS 2000). Short-tailed albatross feed in nearshore and coastal waters of the North Pacific. Short-tailed albatross are not expected to occur in the study area as it does not contain suitable breeding or foraging habitat.

Yellow-billed cuckoo

This migratory bird formerly had a range across much of North America, but is now limited primarily to the eastern and central United States with a few populations in the West. The preferred breeding habitat is open lowland deciduous woodlands with clearings and shrubby vegetation, especially near rivers and streams with nests in willows and cottonwoods that make up long contiguous riparian zones. Yellow-billed cuckoos are not expected to occur in the study area as there have only been four sightings in western Washington between 1950-2000 and they no longer breed in Washington state (Tweit 2005). No effect to yellow-billed cuckoo or its critical habitat is expected.

Puget Sound Chinook Salmon

Puget Sound Chinook salmon are ESA-listed as threatened (NMFS 2005). Critical habitat was designated throughout Puget Sound and its tributaries in 2005. Chinook return to the Dungeness River from late spring to mid-summer and spawn throughout the Dungeness River from early-August to early-October.

The decline of Chinook salmon in the Dungeness River prompted officials to form the Dungeness River Management Team in the mid-1980's. Extensive in-river spawner escapement surveys were conducted by the USFWS (snorkel surveys) and WDFW (redd surveys) resulting in a "critical" classification of the stock due to chronically depressed levels of spawners (WDFW et. al. 1993). Dikes, levees and other actions to control the lower reaches of the river have impacted natural Chinook production by degrading vital refuge and over-wintering habitat for juvenile salmon, and contribute to the scouring of redds (NOAA 2007). Loss of riparian habitat to urban development, sedimentation resulting from forest practices in the upper watershed, bank erosion and natural landslides, loss of spawning and rearing habitat from water withdrawals for irrigation, removal of larger woody debris, and pollution from storm water runoff are also limiting factors to natural production.

Efforts to rebuild Chinook populations are underway to prevent extinction. A captive brood stock hatchery program was started in 1992 (Smith and Wampler 1995) along with efforts by intergovernmental and local forums to develop and implement strategies for restoring fish habitat in the Dungeness River.

Hood Canal Summer-Run Chum Salmon

Hood Canal summer-run chum salmon were listed as threatened in March 1999; this status was reaffirmed in 2005 (70 FR 37160). Critical habitat was designated in September 2005. Today, summer-run chum are present in the Dungeness River; however the status of the species is unknown (Sele 1995). Summer chum have been periodically observed in the Dungeness River during the months of September and October in the course of monitoring and collecting Chinook and pink salmon data (WDFW and PNPTT 2000).

Puget Sound Steelhead

Puget Sound steelhead was listed as a threatened species in May 2007 (72 FR 26722); critical habitat is under development. The Dungeness River supports summer-run and winter-run steelhead. Summer-run adults have been documented to the impassable falls on the mainstem (RM 18.7), and to at least 3-Forks on the Gray Wolf River (RM 9.6) (Haring 1999). Dungeness River winter steelhead spawning distribution extends from the upper extent of tidewater to RM 18.7 (Haring 1999). As of 2002 the status of the summer steelhead stock was designated as unknown, but a re-designation to critical is under review (Blanton et. al. 2011). Stock status for winter steelhead is depressed due to a long-term negative trend in abundance, but re-designation to critical is possible (Blanton et. al. 2011).

Bull Trout

The Coastal/Puget Sound bull trout was listed as a threatened species in November 1999 (64 FR 14307); critical habitat was designated in September 2005 (USFWS 2005) and revised in 2010 (USFWS 2010b). Bull trout are known to exhibit four types of life history strategies: adfluvial, which migrate between lakes and streams; fluvial, which migrate within river systems; resident, which are non-migratory; and anadromy, which occurs when the fish spawn in fresh water after rearing for some portion of their life in the ocean. The Dungeness River may support anadromous, fluvial, and resident life history forms of bull trout. Little is known about the abundance of bull trout in the Dungeness River.

Taylor's checkerspot butterfly

The Taylor's checkerspot butterfly is a medium-sized butterfly with a checkered pattern of orange to brick red, black and cream. The historical range of the Taylor's checkerspot butterfly extended from the southern tip of Vancouver Island in British Columbia and other smaller adjacent islands south through the Puget Trough and north Olympic Mountains to the Willamette Valley in Oregon (Stinson 2005). The Taylor's checkerspot butterfly is a resident, non-migratory butterfly species. As of 2009, it had been documented from a total of 14 distinct populations, including eleven in Washington, two in Oregon, and one in Canada. The habitat components of the Puget Sound region populations of Taylor's checkerspot butterfly are dependent upon open prairie habitat composed of select larval host resources and a diverse group of nectar plant species. These resources must be present in quantities to support self-sustaining butterfly populations. Larval host plants used by Taylor's checkerspots include: *Castelleja hispidaa* and *C. levisecta* (harsh; golden paintbrush), *Plantago laceolata* (English plantain), *Plectritis congesta* (sea blush), and *Collinsia parviflora* (small blue-eyed Mary). Primary nectar plants include *Cammasia quamash* (common camas), *Armeria maritima* (sea thrift), *Lomatium triternatum* (nine-leaved lomatium), *Lomatium utriculatum* (spring gold), *Fragaria virginiana* (broadpetal strawberry), and *Balsamorhiza deltoidea* (Puget balsamroot). Taylor's checkerspot butterfly is not expected to occur in the study area as its habitat requirements (larval host and nectar plant species) are not present.

4.3.5.1 No-Action Alternative/Future Without-Project Conditions

In the future without-project condition, ESA-listed salmonid species will continue to face obstacles to recovery. Limiting factors such as low stream flows, disconnected side channels, lack of accessible floodplain habitat, and lack of large wood must be addressed in order to recover and sustain Chinook, summer-run chum, steelhead, and bull trout populations. Representatives of federal, tribal and state

agencies are working together with property owners, farmers, and local jurisdictions to address habitat protection and restoration opportunities on the Dungeness River. Restoration actions such as riparian restoration, removal/replacement of fish passage barriers, and fish habitat improvements will provide long-term benefits to salmonid habitat conditions. However, progress may be slow since implementation of habitat restoration projects are dependent on adequate funding and land owner cooperation.

The No-Action alternative would have no effect on the listed bird or invertebrate species.

4.3.5.2 Action Alternatives/Future With-Project Conditions

Aspects Common to All Action Alternatives

Marbled murrelets would likely only be flying high over the action area in transit between aquatic foraging areas and roosts in the upper watershed and the other listed bird species are not expected to be in the action area. None of the proposed action alternatives would be expected to affect the behaviors or habitats of the four listed bird species. Taylor's checkerspot butterflies are also not expected to be in the action area, as it lacks their preferred host and nectar plants. Therefore, the Corps has determined that there would be **no effect** to these species.

Alternative 1 - Towne Road Alternative

The Towne Road Alternative would reconnect 63 acres of floodplain and restore natural riverine processes beneficial to fish and wildlife. Realignment of the levee would improve listed salmonid habitat by giving the river channel the opportunity to migrate and promote bar, island, and side channel formation. This alternative would also create 2,900 feet of side channel and 2,400 feet of back channel habitat currently lacking in the Lower Dungeness basin. Side and back channels would have lower water velocities during floods, providing valuable salmonid habitat and acting as storage areas for sediment in the watershed.

Construction for the Towne Road Alternative would have minimal in-water work and minimal disturbance to salmonids as machinery works to remove the existing levee. In-water construction would be conducted during the established fish work window to avoid and minimize short-term disturbance to salmonids that may be present during the July 15 – September 30 window. Turbidity is the primary concern for stress to salmonid species during construction. Construction techniques, sequencing, and timing would minimize soil disturbance to the extent practical to reduce the generation of turbidity during connection of the new channels.

Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road

Alternative 2 would provide the greatest acreage (110 acres) of reconnected floodplain, wetlands, and off-channel aquatic habitats, benefitting all listed salmonid species. During high-water events, Alternative 2 would provide more area available for refuge from high velocity floodwater in the mainstem river channel. Flooding of the larger area will provide additional exchange of nutrients and organic material between land and water, thus increasing habitat complexity via food subsidies and large wood.

Temporary turbidity impacts would be avoided and minimized through construction techniques, sequencing, and timing as described above for Alternative 1.

Alternative 3 – Meadowbrook Creek Alignment - Road on Levee

Alternative 3 would have the same benefits for salmonids as Alternative 1, with additional benefits and acreage (95 acres total) for refuge from high velocity floodwater and nutrient exchange described for Alternative 2.

Temporary turbidity impacts would be avoided and minimized through construction techniques, sequencing, and timing as described above for Alternative 1.

Cumulative Effects

This project combined with other future Federal, State, and local restoration projects would result in long-term, cumulative benefits to the amount and functional value of restored habitat, improvements in the overall watershed condition, and would ultimately increase the ability of the watershed to support critical life history stages of listed salmonid populations. Realigning this levee segment would also improve conditions for a subsequent realignment of the privately held levee on the left bank by lowering the perceived risk associated with that action. Levee realignment along the left bank would reconnect more floodplain to the channel, restore habitat, and set the stage for further floodplain reconnection actions in the reach.

4.4 Cultural Resources

For the purposes of this analysis, the Corps is coordinating its review of this project under NEPA with its review under the National Historic Preservation Act (NHPA). The NHPA provides a regulatory framework for the documentation, evaluation, and protection of cultural resources that may be affected by federal projects or by private projects operating under federal license, using federal money, or occurring on federally managed land. The NHPA further defines the criteria which cultural resources must meet to be deemed significant and necessitating further consideration under the act. Federal law requires that agencies analyze project effects in terms of their area of potential effect (APE), which is the geographic area within which an undertaking may directly or indirectly cause changes in the character or use of significant cultural resources

The Corps has defined the APE as the 110 acre setback area, the half mile of levee to be removed, the new levee alignment and the proposed one mile emergency south access road connecting to the south of the levee. It is assumed that construction access would be through existing roads and that staging areas would occur within the 110 acre setback area.

With the exception of the south access road, the entire APE has been examined for cultural resources albeit thru four separate surveys. In 2010, Fred Crisson and Stephen Emerson of Archaeological and Historical Services (AHS) inventoried 45 acres east of Towne Road for a wetland mitigation project associated with the widening of US 101. Their survey includes 45 of the 110 acres of the currently proposed project's APE. They excavated 171 shovel probes and encountered archaeological site 45CA650, a partially disturbed shell midden. Three discrete loci were delineated. In June of the same

year, AHS returned to the field to complete evaluative testing of the site. The Washington Department of Transportation in cooperation with Department of Archaeology and Historic Preservation determined that the site was eligible for the National Register under Criterion D for its ability to generate information about coastal settlement and subsistence (Appendix C).

In 2011, Clallam County retained the services of Artifacts Consultants to record and evaluate the Chang house, a known historic structure within the APE. The County had purchased the property with the goal of removing it for the ecosystem restoration project. Prior to submitting the final Historic Property Inventory Form (HPIF), the Corps became involved with the project and the removal of any structures became part of the larger federal undertaking. The Corps determined that the house was eligible for the National Register of Historic Places under Criteria A and C. Later that same year the Corp recorded the Mapes Barn within the APE and also determined that the structure was eligible for the National Register under Criteria A and C (Appendix C).

And finally in 2013, the Corps completed a cultural resources inventory of the remaining 55 acre parcel located between the current Dungeness levee and Towne Road. The survey consisted of pedestrian transects spaced at no greater than 30 meter intervals and shovel probes excavated along the transect lines every 30 meters. A total of 185 shovel probes were excavated. The Corps documented the archaeological remains associated with the now demolished Mapes Barn and recorded the Dungeness levee, built in 1964, as a historic structure. The levee is not associated with significant patterns or events such as an increase in settlement or industrial development. The Corps had determined that the levee is not eligible for the National Register under any criteria (Appendix C)

The south access road was added to the project late in feasibility. The route is currently proposed to be placed over Clallam Conservation District's proposed pipeline. Clallam County is responsible for conducting a cultural resources survey prior to constructing their pipeline. It is anticipated that the inventory conducted by the county will meet the needs of the Corps and the results of that survey will be incorporated into this analysis once it become available.

In addition to completing cultural resource surveys, the Corps sent letters soliciting knowledge or concerns for the project area to both the Jamestown S'Klallam Tribe and the Port Gamble S'Klallam Tribe in August of 2011. The current levee alignment bisects archaeological site 45CA650. Conversations about impacts to the archaeological site have been ongoing between the Corps and the Jamestown S'Klallam. The Lower Elwha Tribe has deferred to the Jamestown S'Klallam as the main point of contact.

4.4.1.1 No-Action Alternative/Future Without-Project Conditions

There would be no direct or indirect effect to cultural resources under the No action alternative. It is likely that the County or Jamestown S'Klallam Tribe would move forward with small scale restoration projects in the vicinity; however, those actions would be subject to Federal and/or State regulations that would still require consideration of project effects on cultural resources.

4.4.1.2 Action Alternatives/Future With-Project Conditions

Alternative 1 - Towne Road Alternative

No National Register eligible properties currently exist within the APE for the Towne Road alternative. Prior to the Dungeness Project, historic era agricultural and domestic structures once existed within the setback area. Ancillary features and debris may be encountered during project construction.

Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road

In addition to the impacts described in Alternative 1, construction of the Meadowbrook Creek levee alignment would result in an adverse effect to archaeological site 45CA 650. An adverse effect under NHPA does not necessarily require an EIS under NEPA. The archaeological site, a small shell midden with three loci, was previously determined eligible under Criterion D. The site is located within the proposed levee alignment. Archaeological materials are located within the upper 30 cm of the site and would be directly impacted by the grubbing and clearing required for levee construction. The levee alignment was adjusted to avoid directly impacting the best preserved section of the site. Consultation to address the adverse effects to archaeological site 45CA650 is ongoing with the Jamestown S'Klallam Tribe and the DAHP. Limited data recovery (archaeological excavation) is the most likely mitigation option. The avoidance and mitigation measures will be stipulated in a Memorandum of Agreement executed by the Corps, Clallam County the Jamestown S'Klallam Tribe and any other interested parties identified during consultation.

Alternative 3 – Meadowbrook Creek Alignment - Road on Levee

Impacts to cultural resources would be the same as Alternative 2

Cumulative Effects

Past, present, and cumulative land-altering activities for the Sequim Dungeness Valley include urbanization, flooding, recreation, levee modifications, and changes to floodplain connectivity. Most salient to this analysis is the abandonment and removal of early historic era features. As part of their early planning efforts, Clallam County began purchasing parcels of land for the eventual construction of an ecosystem restoration project. Two of these parcels contained historic structures, the Mapes barn and the Chang house. Both structures were determined to be eligible for the National Register under Criteria A and C due to their associations with the region's late nineteenth century Euro American settlement and agricultural development, and for design values and features expressive of that period. The structures were removed as an early planning effort for the Dungeness Ecosystem Restoration Project. The proposed project contributes to overall changes to the valley's setting and feeling from its early historic era, namely the ongoing loss of early historic era structures especially those related to the Valley's rich dairying history.

4.5 Social and Economic Resources

This section presents an overview of major socioeconomic characteristics and trends within the study area.

4.5.1 Indian Trust Assets

In addition to the Federal government's responsibilities under NHPA, the Federal government must consider the effects its actions may have on American Indian traditions and cultural practices. The Federal basis of a tribe's legal status rests within the context of U.S. Constitutional provisions for Federal government's powers for treaty making with other sovereign nations, and American Indian tribes' inherent sovereignty.

The S'Klallam Tribe, with other Tribes and bands of the Twana, Skokomish, and Chimakum peoples, signed the Treaty of Point-No-Point with the Federal Government on January 26, 1855. The Skokomish Indian Reservation was formed through this treaty and required all signatory tribes to move to the current reservation location at the mouth of the Skokomish River. The S'Klallam Tribe did not move to the reservation as they wished to remain near their traditional fishing areas. The present day S'Klallam Tribe is divided into three separate federally recognized bands - the Jamestown S'Klallam Tribe, the Lower Elwha Klallam Tribe and the Port Gamble S'Klallam Tribe. The Jamestown S'Klallam own land at Blyn on Sequim Bay. The Lower Elwha Klallam is located west of Port Angeles at the mouth of the Elwha River. The Port Gamble S'Klallam reside on the northwest end of the Kitsap Peninsula.

The Dungeness River is the ancestral river of the Jamestown S'Klallam Tribe. Since time immemorial tribal citizens have been reliant on the resources of the river, and that continues to this day with Tribal fishing for subsistence, commercial and ceremonial purposes. However, the once abundant fish runs have been severely depleted. Chinook, summer chum, steelhead, and bull trout are presently listed as threatened species under the Federal Endangered Species Act (ESA). The early-timed upper river stock of pink salmon is considered depressed while the lower river stock of pink is critical under the Washington state evaluation system. The Treaty-protected right to harvest is an empty promise if there are no fish in the Tribe's ancestral watershed and other waters of the Tribe's usual and accustomed (U&A) harvest area. Multiple technical reports describe that the lower river's disconnected floodplain and impaired habitat severely limit salmon productivity. Much of the Dungeness floodplain loss is attributable to federal action. The dike facility built by the Corps in 1963, at Clallam County's request, disconnected approximately 410 acres of floodplain, side channel and distributaries from the river. Without these natural features to convey floodwaters, flooding along the west side of the river was seriously increased. In response, two private dikes- the Beebe and Rivers End dikes- were built, truncating approximately 111 and 40 acres respectively. As a Federal agency, the Corps has a Federal trust responsibility to exercise its authority so that Jamestown S'Klallam Tribe receives the benefit of the rights reserved in the Point No Point Treaty. The Jamestown S'Klallam Tribe has invested financial and technical resources into the restoration of the Dungeness River and estuary through multiple programs over a 20 year time period and continues to support restoration of the Dungeness River Basin.

4.5.1.1 No-Action Alternative/Future Without-Project Conditions

The Jamestown S'Klallam Tribe would be affected by the No Action Alternative. As salmon populations continue to decline and shellfish habitat is degraded/lost, the cultural and spiritual identity of the Tribe would be impacted. U&A fishing areas will continue to degrade, jeopardizing the Federal government's trust responsibility to the Tribe.

4.5.1.2 Action Alternatives/Future With-Project Conditions

Alternative 1 - Towne Road Alternative

Alternative 1 would reconnect 63 acres of floodplain and restore natural riverine processes beneficial to fish and wildlife. Realignment of the levee would improve fish habitat by giving the river channel the opportunity to migrate and promote bar, island, and side channel formation. The floodplain, including riparian and wetland habitat, would be restored through levee realignment and natural riverine processes, benefitting many species of fish and wildlife important to the Tribe.

Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road

Alternative 2 would provide the greatest acreage (110 acres) of reconnected floodplain, associated wetlands, and off-channel aquatic habitats, benefitting all listed salmonid species and many wildlife species important to the Tribe.

Alternative 3 – Meadowbrook Creek Alignment - Road on Levee

Alternative 3 would provide similar benefits to tribal resources as Alternative 2, with slightly less acreage (95 acres) of reconnected floodplain, associated wetlands, and off-channel aquatic habitat.

4.5.2 Public Health and Safety

4.5.2.1 No-Action Alternative/Future Without-Project Conditions

Barring modification of the lower Dungeness River levee system, future without-project flood risks will continue to worsen due primarily to natural processes and an over-constrained floodplain. These flood risks are likely to be exacerbated by expected changes to climate and hydrology, including sea level rise. If the river were to breach the levee during a major flood event, conditions throughout the project site would be significantly affected, as the river would supply a large volume of coarse sediment, organic material, and water to the low lying pasture areas. This could result in significant alterations in local drainage patterns and hydrology. While the project site is perpetually in conservation, the lands outside the site (protected by the levee) are slowly being converted from agricultural use to residential use, which increases the number of people in harm's way.

4.5.2.2 Action Alternatives/Future With-Project Conditions

Alternative 1 - Towne Road Alternative

Levee rebuild is needed as a component of the levee removal measure to address induced flooding concerns, taking a "Do No Harm" approach with the goal to maintain the existing level of protection outside of the project footprint for existing infrastructure (including a major county road), homes, businesses and agricultural lands. The rebuilt levee would be segmented to allow water overtopping the levee upstream of the site to return to the river unimpeded, and to minimize fill in the FEMA floodway. While backwater would move south through the gap between remaining levee segments during high water, the southern section of levee-to-remain (Figure 3-21) would extend north far enough to ensure backwater would not flow south beyond the project footprint. Failure of the levee upstream of the project site due to breaching or overtopping will pose less downstream flood risk than it does

currently. Floodwaters would be allowed to flow through the gap in the levee, and back to the river, attenuating the amount of water that would otherwise pond upstream of Sequim Dungeness Way and flow down through Meadowbrook Creek to Dungeness Bay. The diversion of flood waters in major flood events from Meadowbrook Creek would reduce flood discharges, heights and damages along Meadowbrook Creek and the 3 Crabs Road area. Flood heights and discharges in the main river channel will increase slightly downstream of the project but this is not expected to be problematic, because an existing low lying berm along the left bank just downstream of the Anderson Road bridge conveys high flows to tidelands along lands dedicated to conservation, so the increase in flow is not likely to adversely affect private landowners.

Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road
Alternative 2 would provide similar life safety and flood risk reduction as Alternative 1.

Alternative 3 – Meadowbrook Creek Alignment - Road on Levee
Alternative 3 would provide similar life safety and flood risk reduction as Alternative 1.

4.5.3 Transportation, Utilities, and Public Services

The project site is located in a rural area. Sequim-Dungeness Way/E. Anderson Road is the local arterial that provides access to the project area, connecting the community of Dungeness and area farms to the city of Sequim. Towne Road, a two-lane County road that connects to Sequim Dungeness Way, bisects the project site. Traffic is comprised mainly of light cars and trucks as there are no large industrial facilities in the area.

4.5.3.1 No-Action Alternative/Future Without-Project Conditions

Under the No Action Alternative vehicle traffic may increase due to general population growth, but the change is not expected to be substantial.

4.5.3.2 Action Alternatives/Future With-Project Conditions

Alternative 1 - Towne Road Alternative
During construction activities, vehicles and equipment associated with the project may disrupt local traffic. This increase in traffic would be localized and of short duration, with no long term impacts. A traffic control plan would be developed and implemented to minimize traffic impacts during construction. Implementation of the Towne Road Alternative would retain the existing level of flood protection to residences, businesses and associated public infrastructure. Avulsion or migration of the river through the restoration site toward the Schoolhouse Bridge could occur, but would be managed by a buried riprap toe to prevent head cutting and avulsion within the site. No significant short or long term effects to transportation, utilities, and public services would occur.

As a result of the discontinuous levee design, vehicular access for inspection, patrol, or emergency actions could not be maintained along the top of levee access road for the entire length of the levee project. To ensure ease of access for inspection and emergency response during flood conditions, the plan includes a north access road (Figure 3-1) and a south access road at the southern end of the Federal levee (Figure 3-4). South access will be provided through the WDFW fish hatchery on Fasola Road,

connecting to an existing farm use road which leads to an irrigation ditch that is slated for conversion to pipe by the irrigation district. The irrigation district owning the pipe will provide an easement for Clallam County to maintain a gravel access road above the new pipe alignment. This will connect to the upstream terminus of the Dungeness River, WA Federal Levee Project, providing access to the discontinuous upstream segment of the levee.

Alternative 2 – Meadowbrook Creek Alignment – At-Grade Road

Possible effects to transportation, utilities, and public services associated with this alternative are similar to those describe in Alternative 1. However, in this alternative Towne Road would be subject to periodic flooding (of short duration, potentially every 2-5 years) which would impede local traffic movement through the project site. Presently properties to the south of the project site can access Sequim-Dungeness Road by travelling north on Towne Road approximately 1 mile through the proposed project site, or by travelling south and east approximately 3 miles. If the portion of Towne Road that runs through the project site becomes impassable due to floodwaters, residents may be inconvenienced temporarily by having to take the longer (2 miles) southerly route to Sequim-Dungeness Road.

The buried riprap toe at the Schoolhouse Bridge, north levee access road, and south levee access road described in Alternative 1 would also be included in Alternative 2.

Alternative 3 – Meadowbrook Creek Alignment - Road on Levee

Possible effects to transportation, utilities, and public services associated with this alternative are similar to those describe in Alternative 1, except that disruptions to local traffic during construction would be of greater duration because construction would take longer.

The buried riprap toe at the Schoolhouse Bridge, north levee access road, and south levee access road described in Alternative 1 would also be included in Alternative 3.

5. Tentatively Selected Plan - Agency Preferred Alternative

The Corps objective in ecosystem restoration planning is to contribute to national ecosystem restoration (NER). Contributions to NER (outputs) are increases in the net quantity and/or quality of desired ecosystem resources. The NER Plan must reasonably maximize ecosystem restoration benefits compared to costs, consistent with the Federal objective. The selected plan must be shown to be cost effective and justified to achieve the desired level of output. After analysis of all relevant environmental benefits and impacts, the Corps has identified the TSP (NER Plan) as the environmentally preferred alternative per NEPA regulations at 40 CFR 1505.2 (b).

5.1 Description of the Tentatively Selected Plan (NER Plan)

The Tentatively Selected Plan (Figure 5-1) entails realignment of approximately 2600 LF of levee upstream of RM 0.7 (the Schoolhouse Bridge) to reconnect the Dungeness River to 110 acres of floodplain, bounded to the west by the main channel and to the east by Meadowbrook Creek, a groundwater fed stream in a paleochannel of the Dungeness River. Historic side channels and back channels will be reactivated, and the hydraulic and sediment transport processes that create and sustain suitable fish habitat would be restored. For more detail see Appendix A.

Approximately 2,600 feet of levee in the reach will be removed, and the material utilized to rebuild the levee away from the channel, just west of Meadowbrook Creek.

Approximately 1,800 linear feet of Towne Road will be rerouted landward of the lower, wetter portion of the site. Towne Road will be allowed to flood periodically (approximately every 2-5 years on average). A bridge will be installed where Towne Road crosses a new back channel, allowing high water to pass under the road to a lower section to the east, and allowing fish entering the lower area to escape when high water recedes. The bridge will also allow terrestrial mammals to avoid the road when traversing the site.

A new box culvert will be installed to replace the existing corrugated metal pipe culvert that connects the wetland area at the southwest corner of the site to the river, and a new box culvert under the remaining north levee access road (currently Towne Road) will provide access over the groundwater fed side channel that will need to convey river backwater flowing into the site and potentially upstream levee overflows during major floods. The provision of culverts prevents fish stranding, creates connectivity between restored areas that would otherwise be disconnected, and maintains existing levee access routes.

Engineered log jams, large cottonwood livestakes, and anchored large wood clusters will be installed to modulate hydraulic forces with the intent of accelerating development of channels suitable for fish, and to reduce avulsion risk tied to the elevated (aggraded) condition of the existing river bed and site topography. These elements are included to the degree needed to achieve some continuity of habitat elements following levee removal, as hydrologic and sediment processes establish a new (dynamic) equilibrium.

Planting/seeding will be completed to control erosion, to deter colonization by invasive species and to accelerate habitat recovery where soils are disturbed due to construction.

Because the levee realignment will result in a segmented levee, a north access road (Figure 5-1) and a south gravel access road (Figure 3-4) are included as part of the project to ensure adequate emergency access. The south access road will follow the alignment of an irrigation pipeline that is planned by the Clallam Conservation District to replace an existing irrigation ditch.

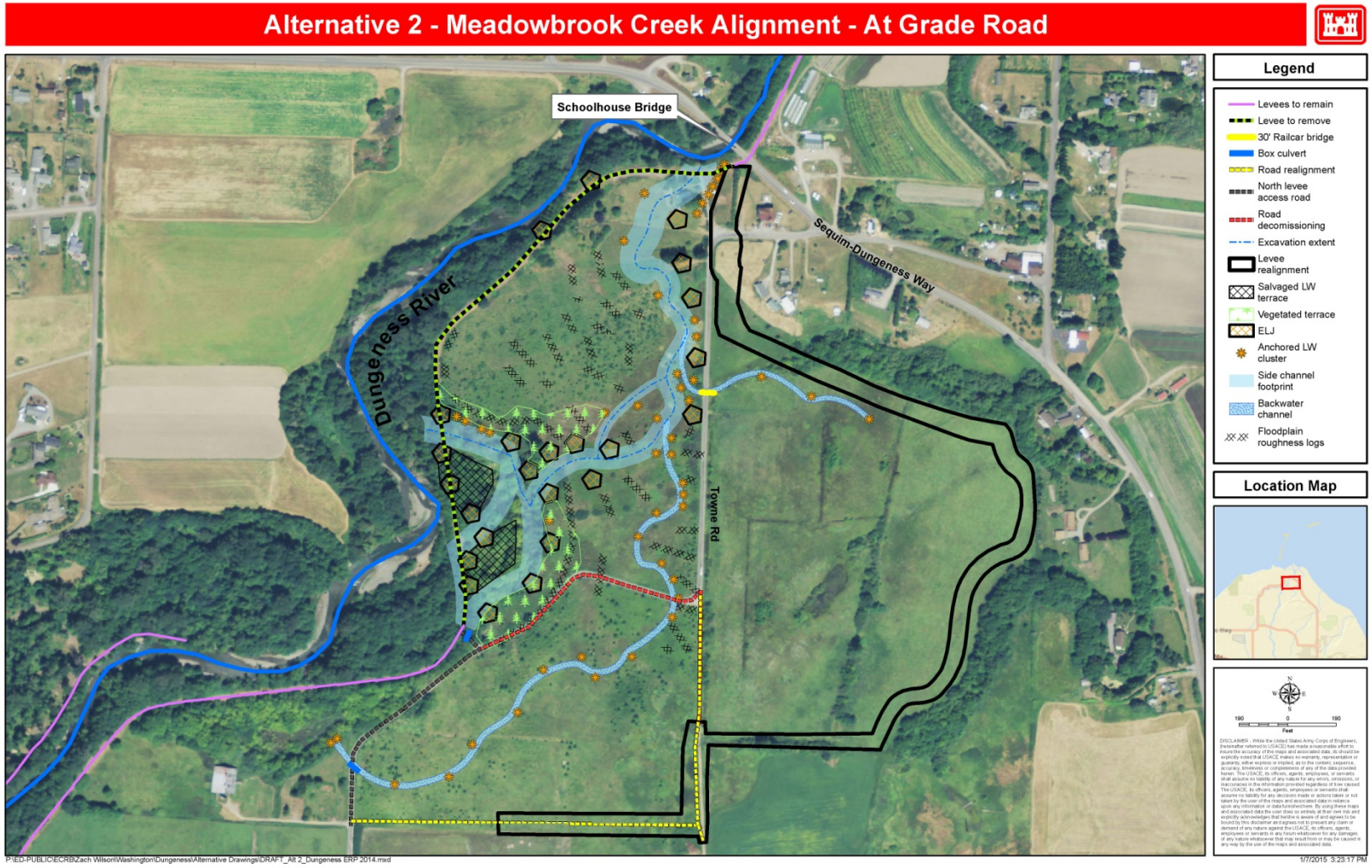

Figure 5-1. Tentatively Selected Plan

5.2 Design and Construction Considerations

The study team considered realignment to the existing Federal levee in order to increase riverine access to the restoration site. This requires partial removal of the levee from the bridge at the downstream end to an access ramp at the upstream end of the segment to be removed. The levee embankment material and riprap removed will be handled onsite and reused to rebuild the levee along an alignment that allows greater river access to the floodplain. Additional material will required.

Levee alignment was selected based on hydraulic water surface elevation, tie-in points to the downstream bridge approach, and an existing WSDOT wetland mitigation site in the eastern portion of the project extents. The selected alignment is segmented, or discontinuous, to minimize fill in the FEMA regulatory floodway. Based on the modeled flood extents, the upstream end of the discontinuous levee segment was set. The levee travels east toward the WSDOT wetland mitigation site. The WSDOT mitigation plan includes a buffer swatch through the site for the future footprint of the planned new levee. This buffer was followed to the maximum extent possible. At this stage of conceptual design, the levee footprint falls within this buffer. Once the levee has looped through the mitigation site, it returns to the alignment of Towne Road, heading north, past the old Schoolhouse, to tie into the bridge at the downstream end of the restoration project.

As a result of the segmented levee design, vehicular access for inspection, patrol, or emergency actions could not be maintained along the top of levee access road for the entire length of the levee project. To ensure ease of access for inspection and emergency response during flood conditions, the plan includes a north access road (Figure 5-1) and a south access road (Figure 3-4) at the south end of the Federal levee. Southern access will be through the WFDW fish hatchery on Fasola Rd., connecting to an existing farm use road, which leads to an irrigation ditch that is slated for conversion to pipe. The irrigation district owning the pipe will provide an easement for Clallam County to maintain a gravel access road above the pipe alignment. This will connect to the upstream terminus of the Dungeness River, WA Federal Levee Project, providing access to the discontinuous upstream segment of the levee.

For the new levee segment, a buried toe of riprap will be required at the downstream end of the restoration project, as the levee ties into the bridge approach. This toe will be excavated to an elevation of approximately 12 feet NAVD 88 to match the existing river channel elevation. The excavation will proceed at a slope of 2H:1V where riprap is to be placed and, as a result of soils present and OSHA and USACE Safety EM 381-1-1, the far side of the excavation can be no steeper than 1.5H:1V. This excavation will be backfilled with excavated soil following riprap placement.

Initial levee design was based on the existing sections of the Federal project. For feasibility design, both riverward and landward slope angles were set at 3H:1V. The majority of the levee will not be equipped with riprap erosion protection as a result of expected low velocity flows. Grass sod cover will be the only means of erosion protection to the levee. Therefore, it will be critically important for levee performance and integrity to properly maintain the grass according to USACE recommendations. According to the Levee Design and Construction Engineering Manual, EM 1110-2-1913, the steepest slope a mower can comfortably drive on is 3H:1V, setting this as the steepest allowable slope for design. These slopes are expected to be stable and large enough to resist seepage through the levee during flood events.

As a result of expected saturated soils, soft foundation conditions, organics, and wetland crossings, clearing and grubbing, as well as replacement of unsuitable materials, was recommended to a depth of 2 feet. This over-excavation will help to improve settlement of the levee structure. Levee top elevation has also been overbuilt to account for conceptual settlement estimates.

Construction is anticipated to occur over one summer season. Project construction will require removal of the existing levee, which currently provides protection to the leveed area. Removal of this levee section would take place after snowmelt flood season ends and before rain flood season begins, during expected August-September low flows. Construction during summer should minimize work in saturated ground conditions because the groundwater table will be lower with lower river flows. In general, the groundwater table is near the surface, from 0-4 feet of below ground surface (typical).

The TSP will require ramps to carry Towne Road onto, and off of the levee in two locations as a result of site reconfiguration and road realignment.

5.3 Real Estate Considerations

The majority of the proposed project lands are owned by Clallam County, Washington State Department of Transportation (WSDOT) and the Washington Department of Fish and Wildlife (WDFW). Generally, fee title is required for ecosystem restoration project measures. Since it is unlikely that WSDOT and Washington Department of Fish and Wildlife (WDFW) owned lands will be conveyed to Clallam County in fee, both WSDOT and WDFW have been approached as possible Non-Federal Sponsors for the sole purpose of providing State owned fee lands required to support the proposed project ecosystem restoration measures. Local representatives of both State agencies are highly supportive of the project and have agreed to escalate the partnership opportunity to their respective senior management team. USACE has provided examples of other ecosystems projects cosponsored by the State of Washington for the sole purpose of providing project lands. The District will continue discussions with the State and County Agencies. USACE approval to deviate from policy and to use a Non Standard Ecosystem Restoration Estate will be pursued in the event WSDOT and WDFW are unable to become project partners. A status update will be provided during the next project phase.

Real Estate values were derived from a NWS-RE produced Land Cost Estimate dated 11/25/2014. The majority of the project lands have perpetual conservation-related encumbrances upon them that substantially reduce the estimated fair market value. As a result, the estimated value of lands, easements and rights-of way is $111,000. The need for disposal or borrow areas are not anticipated. Relocation costs are estimated at $617,000.

5.4 Cost Estimate

The fully funded current cost estimate to design and construct the recommended plan is $6,689,000 of which $4,348,000 will be Federal funding. Feasibility costs totaled $760,000, of which $430,000 were Federal funds. The sum of Federal funding for this project is $4,778,000. The cost includes a contingency of 20 percent to capture project risks and unknowns. Costs were escalated to the midpoint of construction, assumed to be winter of 2016.

The methodology used to develop cost estimates and contingency is described in section 3.4.1. The cost engineering report and Total Project Cost Summary are provided in Appendix E.

Table 5-1. Tentatively Selected Plan Cost Estimate

	Project First Costs (Constant Dollar Basis; $1,000s)	Total Project Cost (Fully Funded; $1,000s)
Construction	$4,580	$4,694
Relocations	$633	$649
Lands & Damages (LERRD)	$112	$112
Design	$707	$707
Construction Management	$503	$527
Total Design & Implementation Costs	**$6,536**	**$6,689**

Table 5-2. Project Cost Share of Tentatively Selected Plan

	Federal ($1,000s)	Non-Federal ($1,000s)	Total ($1,000s)
Construction	$4,694	$0	$4,694
Relocations	$0	$649	$649
Lands & Damages (LERRD)	$0	$112	$112
Design	$707	$0	$707
Construction Management	$527	$0	$527
Cash Contribution/Reimbursement	($1,580)	$1,580	
Total Project Cost Share	**$4,348**	**$2,341**	**$6,689**
Total Project Cost Share (percent)	**65%**	**35%**	**100%**

5.5 Monitoring and Adaptive Management

Ecological Success

The Corps' Implementation Guidance for Section 2039 of the Water Resources Development Act (WRDA) of 2007 defines monitoring as "the systematic collection and analysis of data that provides information useful for assessing project performance, determining whether ecological success has been achieved, or whether adaptive management may be needed to attain project benefits" (USACE 2009a). Even the most strategically planned restoration actions can yield unexpected results. Monitoring includes documenting and diagnosing these results especially in the early, formative stages of a project, providing information useful for taking corrective action. In this way, monitoring reduces the risk of failure and enables effective, responsive management of restoration actions.

A draft monitoring and adaptive management plan is included in Appendix J. The plan lays out steps to assess the response of the site to the restoration measures and related adaptive management measures. Items to monitor include channel development, plantings, and instream cover. Habitat monitoring and adaptive management will be carried out by the non-Federal sponsor.

New Levee Section Performance

The Sponsor will continue to be responsible for monitoring and maintaining the levee, to include the new levee section. Requirements for levee monitoring and maintenance are described in the project

Operations and Maintenance (O&M) Manual (USACE, 1964). Updates to O&M manual, if needed, will be made during the Design and Implementation phase.

5.6 Summary of Cumulative Effects of the Tentatively Selected Plan (Preferred Alternative)

The overall cumulative effects of the TSP would be synergistic benefits to all aquatic species through process-based restoration in the lower Dungeness Basin. The project will restore geomorphic function and fluvial processes to the project site and corresponding reach of the Dungeness River. As the side and back channels experience flooding, erosion, sedimentation, and debris recruitment the size, position, and substrate conditions of the channels, including the mainstem river will change. Reconnecting aquatic habitats in the adjacent floodplain, creation of side and back channel habitat, and restoring the riparian zone along this reach of the river would provide significant benefits to fish and wildlife habitat, especially for salmon species. As an indicator species in Pacific Northwest ecosystems, the Corps assumes benefits to salmon would similarly accrue for all other fish, wildlife, and plants in the study area. These benefits would combine with restoration efforts led by other local, State, or Federal entities that would complement the Corp's preferred alternative (TSP). The reach of river proposed for restoration in this feasibility study is a critical link between these habitats.

Levee realignment is expected to reduce flood elevations from 0-3 feet (average of 2.6 feet). The realigned levee will reduce overtopping and breaching risk along the new levee segment and have a modest benefit for the most floodprone segment just upstream of the project boundary, next to the Beebe levee. Failure of the upstream levee due to breaching or overtopping will pose less risk than it does currently. Floodwaters will be allowed to flow through the gap in the levee, and back to the river, attenuating the amount of water that would otherwise pond upstream of Sequim Dungeness Way and flow down through Meadowbrook Creek to Dungeness Bay.

5.7 Summary of Environmental Consequences

NEPA requires disclosure of environmental consequences caused by the proposed Federal action should it be implemented. The following sections summarize the analysis provided in Chapter 4 on the potential environmental effects from implementation of the TSP (agency preferred alternative).

5.7.1 Unavoidable Adverse Environmental Effects

Unavoidable adverse effects of the proposed project include:

(1) Noise disturbance to wildlife and home owners in the vicinity due to operating heavy machinery during excavation and construction of the restoration site; most wildlife are anticipated to avoid the area while work is in progress. To reduce impacts, work would be conducted only during daylight hours in accordance with local noise ordinances.

(2) Disruption of local traffic in the project vicinity during construction. Proper signage and flagmen would be utilized to address safety concerns and move traffic through the area as quickly as possible.

(3) Excavation and filling of approximately 1.2 acres of existing wetland and excavation of about 9.2 acres of wetland to create side and back channel habitat. Levee realignment resulting in periodic

overbank flooding, enhancement of the remaining wetlands, expected conversion of additional upland to wetland, and plantings and recruitment of native woody species would compensate for this loss by increasing the overall habitat complexity and function of the site.

(4) Temporary impacts to turbidity during the connection of the side channel to the river. These impacts would be minimized by the use of best management practices.

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

5.7.2 Irreversible and Irretrievable Commitment of Resources

The proposed restoration project would not entail any significant irretrievable or irreversible commitments of resources. The construction work would require use of existing machinery and export of the fill material to an existing, licensed landfill for disposal. Installation of the side and back channels would require the importation of stream gravel, and large wood. Replanting the newly established stream banks and disturbed wetland areas would require contracting with local existing nurseries for native plant materials and hiring existing contractors to plant the site.

5.7.3 Areas of Controversy and Unresolved Issues

NEPA requires disclosure of controversial issues to the decision-maker. At this time, the Corps, non-Federal sponsors, and public have no unresolved issues or areas of controversy.

5.8 Best Management Practices to Avoid Adverse Environmental Effects

NEPA requires that agencies identify and include in the action all relevant and reasonable measures that could reduce negative effects of the Federal action. Implementation of the TSP would involve construction activities in the aquatic environment and in close proximity to other ecological resources. Through the analysis of effects, certain adverse effects were identified as summarized above. The project would have short-term construction related effects with varying spatial and temporal scales and degrees of intensity. Final design would include practices that avoid and minimize effects to affected resources. This section describes methods to avoid and minimize adverse construction effects of the proposed restoration sites.

<u>Best Management Practices During Construction</u>

Final design and construction timing would include the following standard measures:

- The Corps would schedule the connection of newly excavated side channels during established in-water work windows as established by WDFW per Washington Administrative Code (WAC) 220-110-271.
- Utilization of marsh mats / swamp pads to minimize impacts to wetland soils.
- All required de-watering activities during construction would use appropriate devices (i.e. pumps, sand bags, sumps). All water removed from the site would be discharged in a vegetated upland location, a de-siltation basin, or location that would not incur damage due to water discharge.
- Drive trains of equipment would not operate in the water.

- All equipment would be cleaned prior to in-water construction work.
- No refueling would occur near the Dungeness River or wetlands.
- Construction equipment shall be regularly checked for drips or leaks.
- Construction equipment would include dust suppression methods to minimize airborne particulate matter that would be created during any ground disturbing activities that could create dust. Additionally, all equipment and vehicles would be required to be kept in good operating condition to minimize exhaust emissions. Standard practices would be used to control fugitive dust during the construction phase and during daily operations and maintenance of the proposed project.
- Traffic alterations would be designed to minimize impediments, with the shortest and least disruptive detours possible, and in coordination with Clallam County.

5.9 Implementation Requirements and Permits

The following sections outline the requirements for implementation of the TSP.

5.9.1 Non-Federal Sponsor

Clallam County is the cost-sharing non-Federal sponsors of the study. The County has provided a letter of reaffirmation indicating their support of the TSP and proceeding with the design and implementation phase. The Corps will request non-Federal sponsor self-certifications of financial capability prior to execution of a project partnership agreement (PPA).

5.9.2 Operation, Maintenance, Repair, Rehabilitation, and Replacement Requirements

After completion of construction and the monitoring and adaptive management period, the non-Federal sponsor(s) will assume O&M responsibility for the entire project footprint. The non-Federal sponsor is responsible for all long-term project operations, maintenance, repairs, replacements, and rehabilitations following completion of construction. O&M costs have been estimated for the base measure and increments recommended in the TSP. At this time it is assumed that the TSP will require minimal maintenance only (approximately $5,000 per year or less with O&M activities focusing on levee inspection and periodic levee maintenance activities). An O&M manual will be developed during the Design and Implementation phase.

5.9.3 Schedule

The Corps will officially request the non-Federal partner(s) to acquire the necessary real estate immediately after the signing of the project partnership agreement. Upon completion of design, the advertisement of the construction contract will follow the certification of the real estate. The final acceptance and transfer of the project to the non-Federal partner(s) will occur after delivery of an operations and maintenance manual and as-built drawings.

Table 5-3. Schedule

Item	Date
Report Approval	March 2015
PPA Executed	August 2015
Design and Implementation Phase Initiated	September 2015
Design Complete	May 2016
Construction Contract Award	September 2016
Construction Complete	March 2017
Physical Turnover to Non-Federal Sponsor	March 2018
Project Closeout	June 2018

5.10 Risk and Uncertainty

The following table identifies uncertainties and associated risks as well as steps for reducing residual risks to an acceptable level.

Table 5-4 - Risk and Uncertainty

With Project Risk Summary Table							
	Uncertainty	**Potential Consequence**	**Conse-quence Rating**	**Likelihood** (if no action taken over project life)	**Possible Actions to Reduce Risk**	**Timing of Action** (project phase)	**Likelihood** (if actions taken to reduce risk)
1	Levee realignment would move levee closer to Sequim-Dungeness Way and nearby homes.	Levee failure (from overtopping or piping) during flood conditions would release water suddenly; flash flooding with depths reaching 3.5 feet at the lowest structure could lead to loss of life, and property damage. Up to 150 structures could be flooded. (New levee would be closer to dwellings than old levee, reducing time for residents to evacuate, however failure of existing levee puts more homes at risk for flooding.)	High	Low-Medium	Design levee to: a) Prevent piping failure, and b) Reduce frequency of overtopping by raising levee height, and/or c) Withstand overtopping in the event that the design flood is exceeded. Levee maintenance, monitoring and repair by the county (monitoring and maintenance plan)	Design & Implemen-tation Phase. Operations and Maintenance Phase	Low
2	Potential for debris blockage of the main channel or the return channel at the Anderson Road bridge during high flood events.	Increased water elevations and durations of loading; could trigger consequences described in #1 above.	High	Low	Ensure proper LWD anchor design to prevent installed material from breaking loose; diligent maintenance and monitoring by the county, especially during flood events (monitoring and maintenance plan).	Design & Implemen-tation Phase. Operations and Maintenance Phase	Low
3	Unpredictable flow distribution (and depths) between main river channel and site after levee removal due to perched river channel, uneven topography and unpredictable deposition patterns	Without sufficient depth in at least one channel, this reach could become temporarily impassable by fish, cutting them off from spawning grounds for several spawning seasons. The potential is greatest in late summer or early spring when flows are lowest.	Medium	Medium-High	Design restoration project to maintain flow both in river and constructed channel guided by 2D hydraulic modeling and geomorphic studies. Maintenance and monitoring by the county (monitoring and maintenance plan).	Design & Implemen-tation Phase, Operations and Maintenance Phase	Medium
4	Uncertain floodplain regulations: County and FEMA regulations prohibit construction in the mapped floodway if flood elevations increase as a result. Floodplain and floodway map are outdated due to the short period of hydrologic record and ongoing river aggradation. FEMA standards for levee performance evaluations are not final.	Including a cross levee in the design that spans the FEMA floodway could induce flooding and trigger the need for revision of FEMA floodway map as part of a CLOMR/LOMR. Guidance on how to conduct analysis is in draft form and could change mid-study. Due to induced flooding the resulting floodplain maps could generate local opposition from stakeholders delaying project.	Medium	High	1. Design levee to avoid floodway and reduce or eliminate induced flooding risk. 2. Modernize FEMA floodway maps with current hydrology and attempt to move floodway riverward of existing levee.	Design & Implemen-tation Phase	Low
5	Realigned levee height. Variables to factor in when setting levee height that are subject to uncertainty include: model accuracy, natural variability and changes over time in vegetation and roughness within the site, future sedimentation, geomorphology, hydrology (such as climate change). Also, levee foundation conditions and levee materials	If levee is built too low, the levee will be at higher risk of overtopping or breach than the current condition, leading to increased potential for failure and associated flood damages and life safety risk. If levee is built too high, restoration dollars will be spent to reduce flood risks, reducing the amount of ecosystem restoration that can be implemented.	High	Low (increased floodplain area can accommodate likely sediment accumulation w/ out impacting stage significantly)	1. Define acceptable risks for new facility to determine if future changes in hydrology (climate change) should be accounted for in design. 2. Use observed sedimentation rates to predict future conditions, accounting for the increase in deposition area available for deposition. Assume flood stages for a given event could increase by up to 1.4 feet in the project lifetime (vs. 4.3 feet under existing conditions) 3. Account for other sources of hydrologic and geotechnical uncertainty associated with levee, per Corps guidance	Design & Implemen-tation Phase	Low

6	Meadowbrook Creek hydrology could be impacted by realigned levee. Realigned levee would cut off ~ 8% of surface water entering Meadowbrook Creek. Groundwater impacts are uncertain.	Reduced flow in Meadowbrook Creek could impact ecology and habitat for species in the creek and at its mouth at the Dungeness delta on the Strait of Juan de Fuca.	Low	Medium	Conduct outreach to stakeholders to see if hydrologic impact is acceptable as part of restoration. If not, conduct further analysis during design to provide a better estimate of impact. If impacts are found to be significant, incorporate flow management structure(s) to maintain or increase flow in Meadowbrook Creek.	Design & Implementation Phase	Low

6. Compliance with Environmental Statutes

This chapter provides documentation of how the TSP (agency preferred alternative) complies with all applicable Federal environmental laws, statutes, and executive orders (EOs).

6.1 National Environmental Policy Act

Section 1500.1(c) and 1508.9(1) of the National Environmental Policy Act of 1969 (as amended) requires federal agencies to "provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact" on actions authorized, funded, or carried out by the federal government to insure such actions adequately address "environmental consequences, and take actions that protect, restore, and enhance the environment". This assessment evaluates environmental consequences from the proposed environmental restoration project in Sequim, Washington. The draft DPR/EA will be made available for public review on January 20 through February 18, 2015 via mailings and posting on the public Corps website. NEPA will be concluded prior to construction contract award.

6.2 Endangered Species Act of 1973

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species. For projects that intend to restore fish habitat, agencies can accomplish their ESA consultation requirements by complying with a programmatic biological opinion for habitat restoration. To fulfill the requirements for consultation under ESA, the Corps will prepare a Specific Project Information Form (SPIF) and submit this form under the Habitat Restoration Programmatic Biological Opinion (2008). The consultation process will be completed prior to the finalization of this DPR/EA.

6.3 Clean Water Act of 1972

Section 401 – Any project that involves placing dredged or fill material in waters of the United States or wetlands, or mechanized clearing of wetlands, requires a water quality certification from the State agency as delegated by the U.S. Environmental Protection Agency (EPA). For the Dungeness River, the delegated authority is WDOE. When the site-specific construction drawings and contract are prepared, the Corps will provide these and all other necessary documentation for WDOE to certify that the action will not violate established water quality standards. The water quality certification will be obtained prior to construction contract award.

Section 402 – The National Pollutant Discharge Elimination System (NPDES), controls discharges into waters of the United States. NPDES permits contain industry-specific, technology-based, and/or water-quality-based limits, and establish pollutant monitoring and reporting requirements. EPA has established a program to address stormwater discharges. These regulations require that facilities or construction sites with stormwater discharges from a site that is one acre or larger apply for an NPDES permit. A stormwater discharge permit would be obtained prior to construction.

Section 404 – The Corps administers regulations under Section 404(b)(1) of the Clean Water Act, which establishes a program to regulate the discharge of dredged and fill material into waters of the U.S., including wetlands. The Corps will evaluate potential project-induced effects subject to these regulations during feasibility-level design and provide a public notice to solicit comments on the project design and evaluation under the Section 404 of the Clean Water Act. This draft DPR/EA includes a draft 404(b)(1) evaluation in Appendix I.

6.4 Clean Air Act of 1972

The Clean Air Act (CAA) as Amended (42 U.S.C. §7401, et seq.) prohibits Federal agencies from approving any action that does not conform to an approved State or Federal implementation plan. Three agencies have jurisdiction over air quality in the project area: EPA, WDOE, and the Olympic Region Clean Air Agency. The EPA sets standards for concentrations of pollutants in outdoor air and the WDOE establishes regulations that govern contaminant emissions from air pollution sources. Construction activities associated with the proposal will create air emissions, but the emissions will not exceed EPA's *de minimis* threshold levels (100 tons/year for carbon monoxide and 50 ton/year for ozone) or affect implementation of Washington's Clean Air Act implementation plan.

6.5 National Historic Preservation Act of 1966

The National Historic Preservation Act (NHPA) and its implementing regulations 36 CFR §800 provides a regulatory framework for the identification, documentation, and evaluation of cultural resources that may be affected by federal undertakings. Under the Act, Federal agencies must take into account the effects of their undertakings on historic properties (cultural resources that have been found to be eligible for listing in the National Register of Historic Places) and afford the Advisory Council a reasonable opportunity to comment on such undertaking. Additionally, a Federal agency shall consult with any tribe that attaches religious and cultural significance to such properties.

To meet the Agency's responsibilities under NHPA, the project site has been examined for cultural resources. Three properties eligible for the National Register are currently located or were previously located within the area of potential effect. In 2011, Clallam County retained the services of Artifacts Consultants to record and evaluate the Chang house, a known historic structure within the APE. The County had purchased the property with the goal of removing it for the ecosystem restoration project. Prior to submitting the final Historic Property Inventory Form (HPIF), the Corps became involved with the project and the removal of any structures became part of the larger federal undertaking. The Corps determined that the house was eligible for the National Register of Historic Places under Criteria A and C. Later that same year the Corp recorded the Mapes Barn within the APE and also determined that the structure was eligible for the National Register under Criteria A and C.

The Corps, in agreement with the Department of Archaeology and Historic Preservation (DAHP), found that the demolition of the structures constituted an adverse effect. A memorandum of agreement (MOA) stipulating that the historic materials from the two structures would be salvaged and made available for historic restoration was prepared in 2012. All aspects of the salvage operation was to be administered by the Washington Trust for Historic Preservation. The MOA was signed by the Corps, DAHP, the Washington Department of Fish and Wildlife, U.S. Fish and Wildlife, Clallam County, the

Washington Trust for Historic Preservation, the Washington State and Recreation and Conservation Office, and the Jamestown S'Kllallam Tribe (Appendix C)

The remaining historic property, archaeological site 45CA650, is located within the proposed levee alignment. The Washington Department of Transportation in cooperation with Department of Archaeology and Historic Preservation determined that the site was eligible for the National Register under Criterion D for its ability to generate information about coastal settlement and subsistence. Construction of the levee over the archaeological site would result in an adverse effect to the site. The Corps is currently working with the Jamestown S'Klallam Tribe and the Department of Archaeology and Historic Preservation to identify mitigation measures acceptable for all parties. The stipulations for mitigation will be codified in a Memorandum of Agreement signed by all consulting parties prior to the finalization of the DPR/EA.

6.6 Federal Trust Responsibility

The Federal trust responsibility to Native American Tribes is a protection and preservation of land and certain rights for them. Treaties with the Tribes are the supreme law of the land, superior to State laws, and equal to Federal laws. The trust responsibility is derived from the special relationship between the U.S. and Native American Indian Tribes, first defined by U.S. Supreme Court Chief Justice John Marshall in Cherokee Nation v. Georgia, 30 U.S. 1 (5 Pet.) (1831). Later, in Seminole Nation v. United States, 316 U.S. §286 (1942), the Supreme Court noted that the U.S. "has charged itself with moral obligations of the highest responsibility and trust" toward Native American Indian Tribes. The scope of the Federal trust responsibility is broad and incumbent upon all Federal agencies. The U.S. government has an obligation to protect tribal land, assets, resources, and rights, as well as a duty to carry out the mandates of Federal law with respect to Indian Tribes.

Federal agencies have a trust responsibility to preserve and rebuild fisheries in Washington State within tribes' usual and accustomed fishing areas and to do so in consultation and coordination with the federally recognized tribes. The Dungeness River is the ancestral home of the Jamestown S'Klallam Tribe. The Tribe has invested financial and technical resources into the restoration of the Dungeness River and estuary through multiple programs over a 20 year time period and continues to support restoration of the Dungeness River Basin. The study team anticipates that the proposed ecosystem restoration would have significant benefits to ecosystem and fisheries resources, which are of economic and cultural value to the Tribe, and is consistent with the Tribe's treaty rights.

6.7 Executive Order 13175 Consultation and Coordination with Indian Tribal Governments

Executive Order 13175 reaffirmed the Federal government's commitment to a government-to-government relationship with Indian Tribes, and directed Federal agencies to establish procedures to consult and collaborate with tribal governments when new agency regulations would have tribal implications. The Corps has a government-to-government consultation policy to facilitate the interchange between decision makers to obtain mutually acceptable decisions. In accordance with this Executive Order, the Corps has engaged in regular and meaningful consultation and collaboration with the Jamestown S'Klallam throughout the course of the study.

6.8 Bald and Golden Eagle Act of 1940

The Bald and Golden Eagle Protection Act (16 U.S.C. §668-668c) applies to Corps civil works projects through the protection of bald and golden eagles from disturbance. Construction activities associated with the proposed action have potential to disturb bald and golden eagles due to the presence of heavy machinery and elevated noise levels. These impacts would be minimized by surveying for nests and roosts prior to and during construction, and, if nests and/or roosts are nearby, the Corps would monitor and coordinate with USFWS.

6.9 Fish and Wildlife Coordination Act of 1934

The U.S. Fish and Wildlife Coordination Act (FWCA, 16 USC 470) requires that wildlife conservation receive equal consideration and be coordinated with other features of water resource development projects. Formal reporting requirements of the FWCA are not applicable for small restoration projects such as the Dungeness Project. Nevertheless, the Corps will fully coordinate with the UWFWS and give full consideration to fish and wildlife conservation during project planning. The Corps will continue to coordinate closely with the USFWS during the final design and construction phases.

6.10 Magnuson-Stevens Fishery Conservation and Management Act of 1976

The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §1801 et. seq.) requires Federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH). The objective of an EFH assessment is to determine whether the proposed action(s) "may adversely affect" designated EFH for relevant commercial, federally managed fisheries species within the proposed action area. EFH includes those waters and substrate necessary for fish spawning, breeding, feeding, or growth to maturity. The assessment describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action. The Corps will prepare an effects analysis addressing EFH, which will be provided to NMFS within the BE required under ESA Section 7. Although habitat disturbance may have temporary adverse effects to designated EFH, the conservation measures that the Corps will include as part of the proposed site design to address ESA concerns should be adequate to avoid, minimize, or otherwise offset potential adverse effects to the EFH. The proposed restoration site would result in long-term benefits to salmonids, but are not anticipated to have any effect on EFH of the coastal pelagic species or groundfish.

6.11 Migratory Bird Treaty Act of 1918 and EO 13186 Migratory Bird Habitat Protection

The Migratory Bird Treaty Act (16 U.S.C. §703-712) as amended protects over 800 bird species and their habitat, and commits that the U.S. will take measures to protect identified ecosystems of special importance to migratory birds against pollution, detrimental alterations, and other environmental degradations. Executive Order 13186 directs Federal agencies to evaluate the effects of their actions on migratory birds, with emphasis on species of concern, and inform the USFWS of potential negative effects to migratory birds. Migratory bird habitat will be investigated during the design phase to determine whether any negative effects will occur and will coordinate appropriate actions with USFWS.

6.12 Executive Order 12898 Environmental Justice

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

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

6.13 Executive Order 11988 Floodplain Management Guidelines

Executive Order 11988 requires federal agencies to evaluate the potential effects of actions on floodplains and to avoid undertaking actions that directly or indirectly induce growth in the floodplain or adversely affect natural floodplain values. The project is an ecosystem restoration project that will maintain the existing level of flood protection for adjacent properties, will not induce growth in floodplain, and will not adversely affect natural floodplain values.

6.14 Executive Order 11990 Protection of Wetlands

The purpose of Executive Order 11990 is to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands". To meet these objectives, the order requires Federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. A portion of the project will fill 1.2 acres of existing wetlands and convert 9.2 acres of wetland to side and back channel habitat. However, since a majority of the reconnected floodplain is lower than parts of the river and the site is located in a gaining reach of the river, the restoration site is expected to become a large wetland complex with ample groundwater exchange. Over time the project site is likely to contribute to an increase in wetlands in the reach, despite the initial loss. Additionally, the overall gain in floodplain and aquatic habitat functions and value that would result from levee realignment combined with the creation of vegetated terraces, placement of woody debris and ELJs, placement of gravel suitable for fish spawning and invertebrate colonization, and planting native riparian vegetation are expected to offset the initial wetland impacts.

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7. Public Involvement

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

7.1 Public Involvement Process

During the planning and design of this project, the Corps coordinated with various state, federal, Tribal, and local agencies to discuss design alternatives and potential impacts to the project vicinity. A copy of the Notice of Availability will be provided to the following agencies, Tribes and the interested public for public review and comment: Jamestown S'Klallam Tribe, Clallam County, National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Ecology, Washington Department of Fish and Wildlife, and local residents.

This document serves the public coordination mandates under NEPA. A Notice of Availability for the DPR/EA will be issued for the proposed project from January 20, 2015 to February 18, 2015. Comments received and Corps responses will be incorporated into the final DPR/EA.

7.2 Agency and Public Comments Received

[TO BE COMPLETED FOLLOWING PUBLIC REVIEW OF THE DPR/EA]

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8. Recommendations

I recommend that the tentatively selected plan for ecosystem restoration for the lower Dungeness River project area as generally described in this report be approved for implementation as a Federal project. The estimated total project cost of the recommended plan is $6,689,000. Minimal (less than $5,000 per year) operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) expenses are expected at this time. The Federal portion of the estimated total project cost is $4,348,000. The non-Federal sponsors' required 35 percent cost share of total project costs is $2,341,000. The non-Federal partners shall, prior to implementation, agree to perform the following items of local cooperation:

Provide 35 percent of total project costs as further specified below:

1. Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocations determined by the Government to be necessary for the construction, operation, and maintenance of the project;
2. Provide, during the implementation phase, any additional costs as necessary to make its total contribution equal to 35 percent of the total project costs allocated to the project;
    a. Provide the non-Federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project;
    b. Not use funds provided by a Federal agency under any other Federal program to satisfy, in whole or in part, the non-Federal share of the cost of the project unless the Federal agency that provides the funds determines that the funds are authorized to be used to carry out the study or project;
    c. Not use project or lands, easements, and rights-of-way required for the project as a wetlands bank or mitigation credit for any other project;
    d. For as long as the project remains authorized, operate, maintain, repair, replace, and rehabilitate the project, or functional portion of the project, including mitigation, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;
    e. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor, now or hereafter, owns or controls for access to the project for the purpose of inspecting, operating, maintaining, repairing, replacing, rehabilitating, or completing the project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Federal Government shall relieve the non-Federal sponsor of responsibility to meet the non-Federal sponsor's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance;
    f. Hold and save the Government free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project and any

project-related betterments, except for damages due to the fault or negligence of the Government or the Government's contractors.

g. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements or rights-of-way necessary for the construction, operation, and maintenance of the project; except that the non-Federal partner shall not perform such investigations on lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude without prior specific written direction by the Government;

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

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

j. Prevent obstructions of or encroachment on the project (including prescribing and enforcing regulations to prevent such obstruction or encroachments) that might reduce ecosystem restoration benefits, hinder operation and maintenance, or interfere with the project's proper function, such as any new developments on project lands or the addition of facilities that would degrade the benefits of the project;

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

l. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal partner has entered into a written agreement to furnish its required cooperation for the project or separable element.

m. Comply with all applicable Federal and State laws and regulations, including Section 601 of the Civil Rights Act of 1964, Public Law 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the

Army," and all applicable Federal labor standards and requirements, including but not limited to 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying, and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.) and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c et seq.); and

n. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public law 91-646, as amended by title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR part 24, in acquiring lands, easements, and rights-of-way, and performing relocations for construction, operation, and maintenance of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

John G. Buck
Colonel, Corps of Engineers
District Commander

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