SKOKOMISH RIVER BASIN
MASON COUNTY, WASHINGTON
ECOSYSTEM RESTORATION

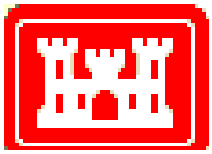
APPENDIX J

REAL ESTATE PLAN

DRAFT Integrated Feasibility Report and Environmental Impact Statement

US Army Corps
of Engineers
Seattle District

This page was intentionally left blank to facilitate double sided copying.



US Army Corps of Engineers
Seattle District

REAL ESTATE PLAN

SKOKOMISH RIVER BASIN ECOSYSTEM RESTORATION GENERAL INVESTIGATION

Mason County, Washington

Project Partners:

U.S. Army Corps of Engineers
Mason County
Skokomish Indian Tribe

Diane B. Jordan
Real Estate Division
Seattle District
U.S. Army Corps of Engineers

January 2014

REAL ESTATE PLAN

SKOKOMISH RIVER BASIN ECOSYSTEM RESTORATION GENERALINVESTIGATION

Mason County, Washington

Table of Contents

Attachments:
Exhibit A: Project Real Estate Maps
Exhibit B: Assessment of NFS Real Estate Acquisition Capability
Exhibit C: Draft Certification of Lands, Attorney's Certificate, Third Party Risk Analysis

REAL ESTATE PLAN

SKOKOMISH RIVER BASIN ECOSYSTEM RESTORATION GENERAL INVESTIGATION

Mason County, Washington

1.0 INTRODUCTION

1.1 Real Estate Plan Purpose

This Real Estate Plan (REP) is presented in support of the Skokomish River Basin Ecosystem Restoration General Investigation (Skokomish GI). The purpose of the REP is to identify lands, easements, rights-of-way, relocations and disposal sites (LERRD) necessary to support construction, operation and maintenance of the proposed project and to assess the Non-Federal Sponsor's (NFS) capability for LERRD acquisition. The Feasibility Study for the Skokomish River Basin is being conducted under the Authority of Section 209 of the River and Harbor Act of 1962, Public Law 87-874 (Puget Sound and Adjacent Waters).

The information contained herein is tentative in nature for planning purposes only. At the time the REP was prepared, the Project Delivery Team (PDT) had identified the Tentatively Selected Plan (TSP) alternative and feasibility level analysis was just beginning. Footprint maps which identify locations of access, staging, borrow and other project features were not available. The information contained within this REP is based on assumptions made by the PDT, and estimated acreages of project features. This REP does not fully conform to the requirements of ER 405-1-12, paragraph 12-16. Once feasibility level analysis is complete, the REP will be revised to conform with ER 405-1-12.

The NFSs for this project are Mason County and the Skokomish Indian Tribe. The project sponsors entered into a Feasibility Cost Sharing Agreement (FCSA) with the U.S. Army Corps of Engineers, Seattle District on June 28, 2006.

There are no prior written real estate plans for this project.

1.2 General Project Background and Description

The Skokomish River system is the primary drainage basin for the southeast region of the Olympic Peninsula, carrying flow from its headwaters in the Olympic Mountains to its outlet in Hood Canal. The River consists of 80 river-miles, including the main-stem, North and South Forks and Vance Creek, and 260 miles of tributaries. The river collects drainage from an approximate 240 square mile drainage basin and eventually flows into southern Hood Canal, an arm of Puget Sound. Construction of Cushman Dam on the North Fork in the early 1900's has

nearly eliminated flows in the North Fork. As a result the ecosystem has degraded and sedimentation in the river system has contributed to frequent flood events. The purpose of the feasibility study is to investigate and formulate a solution or solutions to address ecosystem restoration in the Skokomish River Basin.

A recommended restoration plan was selected that includes a car body levee removal, three side channel or tributary restorations, placement of large woody debris in the upstream reaches of the river, construction of two setback levees, and setting back a section of a rural road to improve habitat connectivity in the floodplain. This alternative primarily addresses the project objective of restoring a continuous low flow channel as mainstem flows would naturally divert into the current North Fork channel. A portion of flood flows would continue to flow in the existing channel.

Specifically, the recommended plan includes the following activities as depicted Exhibit A:

- Remove Car Body Levee and reconnect channel on North Fork of Skokomish River
- Improve the connection of an existing abandoned channel at River Mile (RM) #4
- Establish setback levees to provide access to additional habitats
- Upstream Large Woody Debris (LWD) installation from RM #9-11
- Excavate mouth of Hunter Creek to provide year-round access between the creek and the mainstem river.
- Excavate remnant side channels of Hunter Creek and Weaver Creek to provide improved side channel habitat

1.3 Project Location

The Skokomish River Valley is located in northwest Washington, in Mason County and the Skokomish Indian Reservation along the southeast portion of the Olympic Peninsula.

2.0 Access to Project Site

Access has not been determined at this time, however, this will be accomplished during the feasibility level design and included in the final REP.

3.0 Description of Lands, Easements, and Rights-of-Way (LER)

The TSP features impact a combination of both private and public lands. An estimated 100 parcels (private, Tribal, County, or conservancy) will be affected either fully or partially by this project. These parcels represent approximately 55 landowners in the study area. In addition, based on discussions with the Department of Natural Resources (DNR), associated with the river bed below the Ordinary High Water (OHW) level, it is assumed state aquatic lands fall under the jurisdiction and control of DNR. One project feature, Increment #35 (Upstream Large Woody Debris Installation), is assumed to lie within DNR lands. The Corps may ask DNR to become a co-sponsor to the project in order to certify fee ownership of the aquatic lands associated with this Increment. If DNR does not become a co-sponsor, the NFS will be expected to acquire and certify a perpetual, non-standard easement for the state aquatic lands.

A detailed evaluation of the features entailed in the TSP features will be accomplished during feasibility level design. At that time appropriate real estate interests to be acquired will be determined, and the real estate costs will be refined and included within the final REP. Full coordination will take place with the vertical team.

Table 1 below demonstrates the acreages, affected ownerships, current assessed parcel acreages and proposed estate for each project feature. This information is tentative in nature and will be revised following feasibility level design:

Table 1

Project Feature	Parcel Acreage	Number/Type of Ownerships	Assessed Value	Proposed Estate
Car Body Levee Removal Base #3 (ID #31)	327	16 Private	$616,680	Fee Acquisition Perpetual Channel Improvement Easement Perpetual Flowage Easement
Side Channel Reconnection, RM 4 – 5.6 (ID #9)	519	14 Tribal 5 Private	$1,723,940	Perpetual Channel Improvement Easement Perpetual Flowage Easement
River Mile 9 Setback Levee (ID #28)	176	13 Private 4 County	$917,885	Perpetual Flowage Easement Perpetual Levee Easement
Upstream LWD Installation (ID #35)	See Note #1	See Note #1	Assume $0 value	Perpetual Channel Improvement Easement (*or Fee if DNR agrees to being co-sponsor to project)*
Grange Levee Setback (ID #37	118	8 Private 1 County	$448,670	Perpetual Flood Protection Levee Easement Perpetual Flowage Easement
Hunter Creek Mouth Restoration (ID #39)	45	2 Private	$160,745	Perpetual Channel Improvement Easement Perpetual Flowage Easement
Hunter Creek Tributary Restoration (ID #40)	268	13 Private	$782,230	Perpetual Channel Improvement Easement Perpetual Flowage Easement
Weaver Creek Tributary Restoration (ID #43)	343	21 Private 3 County	$1,883,940	Perpetual Channel Improvement Easement Perpetual Flowage Easement
Access	TBD	TBD	NA	Temporary Work Area Easement
Staging	TBD	TBD	NA	Temporary Work Area Easement
Borrow	TBD	TBD	NA	Temporary Work Area Easement
Disposal	TBD	TBD	NA	Temporary Work Area Easement

NOTE #1: Assume all LWD placement will occur within Riverbed owned by DNR
NOTE #2: Assume adjacent landowner owns any affected creek beds.

3.1 Staging

Whenever possible, the staging will be performed within the project footprint. Any additional staging areas outside of the project footprint will be identified during final feasibility level design. A standard Temporary Work Area Easement will be acquired for the additional right-of-way required for this portion of the project.

3.2 Borrow

Borrow material area(s) have not yet been identified. A borrow analysis will be prepared to identify potential borrow sources. The NFS will be required to acquire all LER for borrow and Temporary Work Area Easements.

3.3 Disposal

The removal of the various levees, in part or in whole, will result in a minimum of 30,000 CY of existing material. Some of this material may be suitable for reuse in other project features. However, some excess material may need to be hauled away. The method and location for disposal will be identified during final feasibility level design. The NFS will be required to acquire all LER for borrow. *(NOTE: Assume commercial disposal for unsuitable materials (No LERRD).*

3.4 Proposed Standard Estates to be Acquired

The proposed Standard Estates listed below are possible assumptions based on similar estates acquired in other ecosystem restoration projects. The actual estates to be obtained will be determined during the final feasibility level design phase.

Fee Excluding Minerals ***(With Restriction on Use of the Surface and Subordination to the Right to Flood)*** **--** The fee simple title to (the land described in Schedule A) (Tracts Nos. ___, ___, and ___), subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines; excepting and excluding from the taking all (coal) (oil and gas) in and under said land and all appurtenant rights for the exploration, development, production and removal of said (coal) (oil and gas), but without the right to enter upon or over the surface of said land for the purpose of exploration, development, production and removal therefrom said (coal) (oil and gas); provided, however, that the said (coal) (oil and gas) and appurtenant rights so excepted and excluded are subordinated to the prior right of the United States to flood and submerge the land in connection with the operation and maintenance of the _____ project.

Perpetual Flood Protection Levee Easement -- A perpetual and assignable right and easement in the land delineated on the attached location map, Exhibit A, by this reference made a part hereof, to construct, maintain, repair, operate, patrol and replace a flood protection levee,

including all appurtenances thereto; reserving, however, to the owners, their heirs and assigns, all such rights and privileges in the land as may be used without interfering with or abridging the rights and easement hereby acquired.

Perpetual Road Easement -- A perpetual exclusive easement and right-of-way in, on, over and across the land described in Exhibit A for the location, construction, operation, maintenance, alteration, replacement of roads and appurtenances thereto; together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions and other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the owners, their heirs and assigns, the right to cross over or under the right-of-way as access to their adjoining land at the locations indicated in Exhibit A subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines

Perpetual Flowage Easement *(Occasional Flooding)* -- The perpetual right, power, privilege, and easement occasionally to overflow, flood, and submerge (the land described in Schedule A) (Tracts Nos. ___, ___, and ___) (and to maintain mosquito control) in connection with the operation and maintenance of the _____ project as authorized by the Act of Congress approved _____, together with all right, title, and interest in and to the structures and improvements now situate on the land, except fencing (and also excepting _____ (here identify those structures not designed for human habitation which the District Engineer determines may remain on the land)) 4/; provided that no structures for human habitation shall be constructed or maintained on the land, that no other structures shall be constructed or maintained on the land except as may be approved in writing by the representative of the United States in charge of the project, and that no excavation shall be conducted and no landfill placed on the land without such approval as to the location and method of excavation and/or placement of landfill; 3/ the above estate is taken subject to existing easements for public roads and highways, public utilities, railroads, and pipelines; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used and enjoyed without interfering with the use of the project for the purposes authorized by Congress or abridging the rights and easement hereby acquired; provided further that any use of the land shall be subject to Federal and State laws with respect to pollution.

3/ If sand and gravel or other quarriable material is in the easement area and the excavation thereof will not interfere with the operation of the project, the following clause will be added: "excepting that excavation for the purpose of quarrying (sand) (gravel) (etc.) shall be permitted, subject only to such approval as to the placement of overburden, if any, in connection with such excavation;"

4/ Where substantial residential structures exist in areas subject to very infrequent flooding, and will not interfere with project operations, the following clause may be substituted "(and also excepting the structure(s) now existing on the land, described as _____, which may be maintained on the land provided that no portion of the structure(s) located below elevation _____ feet, mean sea level, shall be utilized for human habitation to the extent that sleeping accommodations will be maintained therein)." The next clause would then be modified to read "provided that no other structures for . . . . . ."

Temporary Work Area Easement -- A temporary easement and right-of-way in, on, over and across the land described in Exhibit A for a period not to exceed _____(___) years, beginning with date of possession of the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a work area, including the right to borrow and/or deposit fill, spoil and waste material thereon, move store and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the _____, together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

Perpetual Channel Improvement Easement -- A perpetual and assignable right and easement to construct, operate, and maintain channel improvement works on, over, and across (the land described in Schedule A) (Tracts Nos. ____, _____, and _____) for the purposes as authorized by the Act of Congress approved _____, including the right to clear, cut, fell, remove, and dispose of any and all timber, trees, underbrush, buildings, improvements, and/or other obstructions therefrom; to excavate, dredge, cut away, and remove any or all of said land and to place thereon dredge or spoil material; and for such other purposes as may be required in connection with said work of improvement; reserving, however, to the owners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads, and pipelines. *(NOTE: Assumes sponsor performs O&M on channels upon completion of project.)*

4.0 Non-Standard Estates

If DNR is one of the co-sponsors to the project, they will be able to certify fee in the affected state aquatic lands associated with Increment #35. If DNR is NOT a co-sponsor, it is anticipated that a non-standard environmental easement estate for state aquatic lands will need to be drafted and routed through NWD to HQ for approval in the next project phase. In addition, some of the restored finger channels may have a buffer easement, restricting what could be done within that easement, resulting in a non-standard estate, which would also require approval from HQ in the next project phase.

5.0 Existing Federal Projects Within the LERRD Required for the Project

No existing Federal projects lie fully or partially within the LERRD required for the project.

6.0 Non-Federal Sponsor Owned LER

Portions of the current project footprint lie within lands already owned by the NFS. The NFS has been notified in writing of the risks of acquiring LERRDS for the project prior to the execution of the PPA.

7.0 Navigational Servitude

The Seattle District Regulatory Division has confirmed the Federal Government does not consider anything past the Skokomish River Mile #3 to be navigable. As a result, the TSP alternative for this project is not applicable to Navigational Servitude.

8.0 Maps

A map showing the project overview, as well as affected parcel information for each project feature is attached as Exhibit A. Detailed Real Estate footprint maps are not available at this time, but will be developed as part of the final feasibility level design.

9.0 Induced Flooding

Induced flooding is anticipated as a result of the Skokomish GI project. Modeling is currently underway as part of feasibility level design, which will define the extent of induced flooding. Once the modeling information has been completed, a takings analysis will be prepared for the affected lands and the real interests that need to be acquired will be determined.

10.0 Baseline Cost Estimate for Lands, Easements, Rights-of-Way and Relocations

Refer to Table 1 in Section 3.0 for assessed values of affected lands. The values in Table 1 reflect the entire assessed value of the affected parcel. The Baseline Cost Estimate will be developed as project acreages for the various features are identified and as Real Estate maps are defined. The Draft Feasibility Report/Environmental Impact Statement, as well as the Cost Engineering Appendix present LERRD cost estimates, is tied to the assessed values of affected lands. The formal LERRD cost estimate will be addressed during part of feasibility level design.

11.0 Relocation Benefits Per P.L. 91-646 for Displaced Residences, Businesses and Farms

The NFS has been advised of Public Law 91-646, as amended. The NFS has land acquisition experience and is fully capable of acquiring any lands necessary for the project. Exhibit B reflects the form used to assess the NFS' real estate acquisition capability.

All lands necessary for project implementation shall be made available by the NFS to the Corps by a Certification of Lands and Authorization for Entry, Attorney's Certificate of Authority, and Outstanding Third Party Risk Analysis documents (See, Exhibit C). Within 180 days after certifying project lands available, the NFS shall provide to the Corps all LER crediting documentation necessary to support their claim for credit

12.0 Mineral Activity

There are no known outstanding mineral interests or active mining operations in the project area that may affect implementation of the project.

13.0 Non-Federal Sponsor Assessment

The NFS assessment for each sponsor will be completed during the final feasibility level design phase after the real estate requirements are more defined.

14.0 Zoning Ordinances in Lieu of Acquisition

No zoning ordinances are currently proposed in lieu of, or to facilitate LERR acquisition in connection with this project.

15.0 Schedule

Project design phase will continue into FY14; the NFS will not be obligated to acquire project LERRD until after PPA is signed.

16.0 Facility and Utility Relocation/Alteration

There have not been any specific facility and utility relocations identified at this phase of the project. An Attorney's Opinion of Compensability would be required before the impacts can be fully researched and reliably measured.

ANY CONCLUSION OR CATEGORIZATION CONTAINED IN THIS REAL ESTATE PLAN, OR ELSEWHERE IN THIS PROJECT REPORT, THAT AN ITEM IS A UTILITY OR FACILITY RELOCATION TO BE PERFORMED BY THE NON-FEDERAL SPONSOR AS PART OF ITS LERD RESPONSIBILITIES IS PRELIMINARY ONLY. THE GOVERNMENT WILL MAKE A FINAL DETERMINATION OF THE RELOCATIONS NECESSARY FOR THE CONSTRUCTION, OPERATION, OR MAINTENANCE OF THE PROJECT AFTER FURTHER ANALYSIS AND COMPLETION AND APPROVAL OF FINAL ATTORNEY'S OPINIONS OF COMPENSABILITY FOR EACH OF THE IMPACTED UTILITIES AND FACILITIES.

17.0 HTRW and other Environmental Considerations

A preliminary Hazardous, Toxic, and Radiological Waste (HTRW) assessment document was completed as part of the Preliminary Phase I Environmental Site Assessment in February 2011. There does not appear to be any significant or ongoing point sources of HTRW contamination. Non-point sources may include agricultural runoff to surface waters and residual contamination from at least two car levees. The car levees are composed of junked automobiles placed alongside the river in the study area. The first is located in the mainstem approximately a half-mile east of Highway 101 and the second is located in the North Fork near the confluence with the mainstem. Corps staff conducted a site visit of the second car body levee on October 25, 2013. Approximately five car bodies were observed at the base of the western section of the levee. No distressed vegetation, stained soils, or odors were noted at the site. The levee is heavily vegetated and access is limited. Based on available information there do not appear to be HTRW concerns at the car body levee. There does not appear to be any information indicating an impact from non-point sources on soil, surface water, or sediment. *(Taken from HTRW section of DFR-EIS).*

18.0 Land Owner Attitude

There have not been any recent public meetings since identification of the final array of alternatives or TSP. The next public meetings are scheduled for December, 2013 and January, 2014; in the meantime, the County will be completing informal landowner outreach. In general, the public is supportive of the project but has not been informed of specific private property impacts.

19.0 Risks Associated with Advanced Land Acquisition

The NFS has been notified in writing of the risks associated with acquiring properties/real estate interests prior to the agreement and full execution of the Project Partnership Agreement.

20.0 Outstanding Third Party Interests

All property interests acquired in support of the proposed project must take priority over any competing third party interests that could defeat or impair title to property held by the NFS, or interfere with construction, operation and maintenance of the project. Such third party interests should be cleared from title, or subordinated to the interests being made available to the project by the NFS. Outstanding third party interests are unknown at this time.

21.0 Other Real Estate Issues Relevant to the Project

Real Estate tasks to be completed during 35% design phase:

- Determine DNR's role in project (co-sponsor?)
- Determine river bed ownership (DNR/Tribal)
- Develop real estate maps
- Perform Rights-of-Entry, as applicable
- Perform Appraisal/Land Cost Estimates
- Determination of appropriate Real Estate Interests and Estates to acquire
- Perform Opinions of Compensability
- Perform Takings Analysis
- Develop final baseline cost estimate for real estate

EXHIBIT A

REAL ESTATE MAPS

EXHIBIT B

ASSESSMENT OF NON-FEDERAL SPONSOR REAL ESTATE ACQUISITION CAPABILITY

(PROJECT TITLE)

ASSESSMENT OF NON-FEDERAL SPONSOR'S

REAL ESTATE ACQUISITION CAPABILITY

I. **Legal Authority:**

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? **YES/NO**

b. Does the sponsor have the power of eminent domain for this project? **YES/NO**

c. Does the sponsor have "quick-take" authority for this project? **YES/NO**

d. Are any of the lands /interests in land required for the project located outside the sponsor's political boundary? **YES/NO**

e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? **YES/NO**

II. **Human Resource Requirements:**

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended? **YES/NO**

b. If the answer to II.a. is “yes," has a reasonable plan been developed to provide such training? **YES/NO**

c. Does the sponsor’s in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? **YES/NO**

d. Is the sponsor’s projected in-house staff level sufficient considering its other work load, if any, and the project schedule? **YES/NO**

e. Can the sponsor obtain contractor support, if required, in a timely fashion? **YES/NO**

f. Will the sponsor likely request USACE assistance in acquiring real estate? **YES/NO** (If “yes," provide description).

III. **Other Project Variables:**

a. Will the sponsor's staff be located within reasonable proximity to the project site? **YES/NO**

b. Has the sponsor approved the project/real estate schedule/milestones? **YES/NO**

IV. **Overall Assessment:**

a. Has the sponsor performed satisfactorily on other USACE projects? **YES/NO**

b. With regard to this project, the sponsor is anticipated to be:

___ highly capable
___ fully capable
___ moderately capable
___ marginally capable
___ insufficiently capable. (If sponsor is believed to be "insufficiently capable:, provide explanation).

V. **Coordination:**

a. Has this assessment been coordinated with the sponsor? (YES/NO)

b. Does the sponsor concur with this assessment? (YES/NO)
(If "no," provide explanation).

Prepared by:

_____

Diane B. Jordan
Realty Specialist

Reviewed and approved by:

_____

Christopher A. Borton
Chief, Real Estate Division

EXHIBIT C

DRAFT CERTIFICATION OF LANDS, ATTORNEY'S CERTIFICATE AND THIRD PARTY RISK ANALYSIS

CERTIFICATION OF LANDS

DATE

Department of the Army
Seattle District, Corps of Engineers
ATTN: Real Estate Division
Post Office Box 3755
Seattle, Washington 98124-3755

RE: Certification of Lands and Authorization for Entry for _____Project

Dear Sir:

By Project Cooperation Agreement dated the _____ day of _____ 201__, _____assumed full responsibility to fulfill the requirements of non-federal cooperation as specified therein and in accordance with the Water Resources Development Act of 1986, as amended.

This is to certify that _____has sufficient title and interest in the lands hereinafter shown on Exhibit A, attached, in order to enable _____ comply with the aforesaid requirements of non-federal cooperation.

Said lands and/or interest therein are owned or have been acquired by_____ _____, and are to be used for the construction, maintenance and operation of the above referenced project and include but are not limited to the following specifically enumerated rights and uses, except as hereinafter noted:

Fee Excluding Minerals *(With Restriction on Use of the Surface and Subordination to the Right to Flood)* -- The fee simple title to (the land described in Schedule A) (Tracts Nos. ___, ___, and ___), subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines; excepting and excluding from the taking all (coal) (oil and gas) in and under said land and all appurtenant rights for the exploration, development, production and removal of said (coal) (oil and gas), but without the right to enter upon or over the surface of said land for the purpose of exploration, development, production and removal therefrom said (coal) (oil and gas); provided, however, that the said (coal) (oil and gas) and appurtenant rights so excepted and excluded are subordinated to the prior right of the United States to flood and submerge the land in connection with the operation and maintenance of the _____ project.

Perpetual Flood Protection Levee Easement -- A perpetual and assignable right and easement in the land delineated on the attached location map, Exhibit A, by this reference made a part hereof, to construct, maintain, repair, operate, patrol and replace a flood protection levee, including all appurtenances thereto; reserving, however, to the owners, their heirs and assigns, all such rights and privileges in the land as may be used without interfering with or abridging the rights and easement hereby acquired.

Perpetual Road Easement -- A perpetual exclusive easement and right-of-way in, on, over and across the land described in Exhibit A for the location, construction, operation, maintenance, alteration, replacement of roads and appurtenances thereto; together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions and other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the owners, their heirs and assigns, the right to cross over or under the right-of-way as access to their adjoining land at the locations indicated in Exhibit A subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines

Perpetual Flowage Easement *(Occasional Flooding)* -- The perpetual right, power, privilege, and easement occasionally to overflow, flood, and submerge (the land described in Schedule A) (Tracts Nos. ___, ___, and ___) (and to maintain mosquito control) in connection with the operation and maintenance of the _____ project as authorized by the Act of Congress approved _____, together with all right, title, and interest in and to the structures and improvements now situate on the land, except fencing (and also excepting _____ (here identify those structures not designed for human habitation which the District Engineer determines may remain on the land)) 4/; provided that no structures for human habitation shall be constructed or maintained on the land, that no other structures shall be constructed or maintained on the land except as may be approved in writing by the representative of the United States in charge of the project, and that no excavation shall be conducted and no landfill placed on the land without such approval as to the location and method of excavation and/or placement of landfill; 3/ the above estate is taken subject to existing easements for public roads and highways, public utilities, railroads, and pipelines; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used and enjoyed without interfering with the use of the project for the purposes authorized by Congress or abridging the rights and easement hereby acquired; provided further that any use of the land shall be subject to Federal and State laws with respect to pollution.

3/ If sand and gravel or other quarriable material is in the easement area and the excavation thereof will not interfere with the operation of the project, the following clause will be added: "excepting that excavation for the purpose of quarrying (sand) (gravel) (etc.) shall be permitted, subject only to such approval as to the placement of overburden, if any, in connection with such excavation;"

4/ Where substantial residential structures exist in areas subject to very infrequent flooding, and will not interfere with project operations, the following clause may be substituted "(and also excepting the structure(s) now existing on the land, described as _____, which may be maintained on the land provided that no portion of the structure(s) located below elevation _____ feet, mean sea level, shall be utilized for

human habitation to the extent that sleeping accommodations will be maintained therein)." The next clause would then be modified to read "provided that no other structures for . . . . . ."

Temporary Work Area Easement -- A temporary easement and right-of-way in, on, over and across the land described in Exhibit A for a period not to exceed _____(___) years, beginning with date of possession of the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a work area, including the right to borrow and/or deposit fill, spoil and waste material thereon, move store and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the _____, together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

Perpetual Channel Improvement Easement -- A perpetual and assignable right and easement to construct, operate, and maintain channel improvement works on, over, and across (the land described in Schedule A) (Tracts Nos. ____, _____, and _____) for the purposes as authorized by the Act of Congress approved _____, including the right to clear, cut, fell, remove, and dispose of any and all timber, trees, underbrush, buildings, improvements, and/or other obstructions therefrom; to excavate, dredge, cut away, and remove any or all of said land and to place thereon dredge or spoil material; and for such other purposes as may be required in connection with said work of improvement; reserving, however, to the owners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads, and pipelines.

_____does hereby grant to the United States of America, its representatives, agents and contractors, an irrevocable right, privilege and permission to enter upon the lands hereinbefore mentioned for project purposes.

_____certifies to the United States of America that any lands acquired subsequent to the execution of the Project Cooperation Agreement that are necessary for this project have been accomplished in compliance with the 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.

NFS

By: _____ DATE: _____

*****

ATTORNEY'S CERTIFICATE

I, _____, an attorney admitted to practice law in the State of Washington, certify that:

I am the attorney for the _____.

I have examined the title to _____[Parcel #] of land identified by the U.S. Army Corps of Engineers as needed for the _____ _____Project and included in the Certification of Lands and Authorization For Entry document to which this Certificate is appended.

_____is vested with sufficient title and interest in the described lands required by the United States of America to support the construction, operation, and maintenance of the _____ _____ Project.

There [ ] are (see attached risk analysis) [ ] are no outstanding third party interests of record that could defeat or impair the title and interests of _____in and to the lands described, or interfere with construction, operation, and maintenance of the Project. Such interests include, but are not limited to, public roads and highways, public utilities, railroads, pipelines, other public and private rights of way, liens and judgments. To the extent such interests existed prior to acquisition of the described lands by _____such interests have either been cleared or subordinated to the title and interests so acquired.

_____has authority to grant the Certification of Lands and Authorization For Entry to which this Certificate is appended; that said Certification of Lands and authorization for entry is executed by the proper duly authorized authority; and that the authorization for entry is in sufficient form to grant the authorization therein stated.

DATED AND SIGNED at _____, this ____ day of _____ 201__.

_____
NAME
TITLE

*****

RISK ANALYSIS FOR OUTSTANDING THIRD PARTY INTERESTS

RE: Certification of Lands and Authorization for Entry for _____Project

There are outstanding third party interests of record in and to the lands required for the Project. An evaluation of those interests is as follows:

1. **IDENTIFICATION OF THIRD PARTY INTERESTS**:

2. **ASSESSMENT:** (Discuss whether the exercise of that interest is likely to physically impair the Project. Discuss the legal implications if the interest is not cleared or subordinated. Discuss the practical impediments to the exercise of the interest such as any required permits, land use restrictions, or compensation.)

3. **PLAN TO RESOLVE:** (Discuss recourse available to protect the Project in the event the outstanding interest is exercised).

Signed:

_____ DATE _____
NAME
TITLE

SKOKOMISH RIVER BASIN
MASON COUNTY, WASHINGTON
ECOSYSTEM RESTORATION

APPENDIX K

COST ENGINEERING

DRAFT Integrated Feasibility Report and Environmental Impact Statement

US Army Corps
of Engineers
Seattle District

This page was intentionally left blank to facilitate double sided copying.

APPENDX K – COST ENGINEERING

Skokomish River Basin feasibility study
Skokomish River Basin, WA

INTRODUCTION

The purpose of this appendix is to document and present the detailed cost estimate prepared in support of the Skokomish River Basin Feasibility Study. The Skokomish River Basin is located on Hood Canal, a natural fjord-like arm of the Puget Sound and water of national significance. The Skokomish River is the largest source of freshwater to Hood Canal as it flows into Annas Bay and of critical importance in the overall health of Hood Canal. The Skokomish Tribe and Mason County are the local sponsors partnering with the U.S. Army Corps of Engineers for this project.

SCOPE

A detailed description of each Alternative can be found in the Draft Feasibility Report. Included in the Engineering Appendix is an overview of the construction methodology that was assumed for the project Alternatives. The following is a very brief overview of the project Alternatives provided as context for this appendix…

Alternative #1

The main feature of Alternative #1 is the complete dredge of the river channel from River Mile (RM) 0.0 to RM 9.0. The dredging of the river channel is estimated to be accomplished with a combination of two different dredging methods. From RM 0.0 to 1.0 a pipeline dredge was estimated with all dredging further up river to RM 9.0 to be accomplished with dragline dredging. Alternative #1 included all of the project increments with the exception of the Hunter Creek Mouth increment.

Alternative #2

The main feature of Alternative #2 is a targeted river channel excavation from RM 7.3 to RM 8.8 for approximately 7,000 LF of river channel excavation. This targeted excavation effort is estimated to be performed using standard hydraulic excavators in the river channel. Alternative #2 also included every project increment.

Alternative #3

The main feature of Alternative #3 is the removal of the Car Body Levee. The composition of the levee remains unknown. Assumptions were made regarding the level of contamination, suitability of excavated levee material for reuse, and number of actual car bodies within the levee prism. Assumptions were based on discussions with the PDT and appropriate risks were included in the Cost Risk Analysis to capture unknowns were appropriate. This Alternative also included all project increments.

Alternative #5

Like Alternative #1 the main feature of Alternative #5 is large scale river dredging. The dredging proposed for Alternative #5 is from RM 3.5 to 9.0. This dredging is estimated to be accomplished using hydraulic drag lines. With the exception of the Hunter Creek Mouth increment, all project increments are included under this Alternative.

Cost Risks

A cost risks analysis was performed for each individual increment and base outlined in the project scope. These individual contingencies were compiled to develop each Alternative's contingency. There were numerous risks evaluated for each increment. The full risk analysis register for the TSP is included as an attachment to this appendix. The following is a brief discussion of some of the major cost risk drivers for each Alternative.

Alternative #1 & Alternative #5

Both of the large scale river dredging alternatives, Alternative #1 and Alternative #5, shared the same focused cost risk driver. The single largest cost driver was the uncertainty with material hauling and disposal. With the extremely large quantity of material that needed to be disposed of, the most cost effective method was off shore disposal via barge. Identifying a disposal site and disposal cost at this early stage carried a lot of uncertainty. If the travel distance or disposal cost increased that could have a significant impact on the overall cost of the Alternative. This risk was also directly influenced by the risk of the overall dredged quantities increasing.

Alternative #2

Alternative #2 shares the same cost risk driver as the large scale river dredging alternatives: material hauling. This alternative has, comparatively, a much smaller quantity of material to dispose of. It was estimated that local disposal sites could be found for this quantity of material. However, this is still a large cost risk driver with a high level of uncertainty at this phase of design. It was assumed that a disposal site would be located within 10 miles of the project site. If the haul distance doubled or tripled this would have a drastic impact on the overall project cost of this alternative. Again, as with the dredging alternatives, this volatile risk is also directly influenced by the uncertainty in the excavation quantities.

Alternative #3

Alternative #3 is similar to Alternative #2; the main cost risk driver is the assumed trucking haul distance for disposal of excavated material. The PDT plans to mitigate this risk by clearly identifying the most likely disposal location at the feasibility phase of design. Alternative #3 also includes the lowest cost base increment. With the base increment being comparatively less expensive than the other base alternatives this also caused the uncertainty with the total quantities of LWD and assumed planting requirements to become secondary cost risk drivers behind the material hauling.

PRICE LEVEL

The three categories of cost contained in the Total Project Cost Summary (TPCS) are "Estimated Cost," "Project First Cost," and "Total Project Cost." The estimated cost, which is the cost calculated in MCACES (MII), is based on a price level of April 2013. The Project First Cost, or in other words the value the project is actually authorized at, is set at October 2015. Lastly, the date point of the Total Project Cost which is the cost the government will pay at the midpoint of construction for each alternative.

Escalation is based on the March 2012 Civil Works Construction Cost Index System (CWCCIS), EM 1110-2-1304.

The cost of the selected plan is considered fair and reasonable, provided the construction is done by a prudent and well equipped contractor.

COST ESTIMATE STRUCTURE

The cost estimate for the selected plan was prepared by the Cost Engineering Section within Seattle District. The overall structure of the cost estimate is dictated by the Civil Works – Work Breakdown Structure. This structure is followed down to the sub-feature level (e.g. feature 11 Levees and Floodwalls, followed by sub-feature 1101 Levees.) The remainder of the estimate structure is based on the expected construction methodology and phasing techniques as determined by the PDT.

Project features in the total project cost summary (TPCS) are in accordance with the CWWBS.

Contingencies are added to the cost estimates in the TPCS based on the results of the cost and schedule risk analysis performed on March 15, 2013. The contingencies for each increment and base were calculated separately and are included as an attachment to this appendix.

Escalation factors to the Effective Price Level Date and the Fully Funded Project Estimate Amount through the end of construction have also been included as part of the TPCS. The inflation was based on an assumed authorization date of October 2015. The mid-point of construction varies between the Alternative packages from October 2016 to October 2021.

CONTRACTOR AND INDIRECT COST CONSIDERATIONS

The cost estimator assumed the work is done by a sub contractor which performs the major features of project work. Administration and general work will be accomplished by the prime contractor. This arrangement makes for two levels of contracting and two levels of markup costs (job office overhead, home office overhead, profit, bond, and B&O tax) for most features of the project.

The mark ups used for the Prime and Sub contractor are included as an attachment to this appendix.

PLANNING, ENGINEERING, AND DESIGN

The Planning, Engineering and Design (PED) costs are costs to develop the project from the point the project is approved, to when solicitation is completed. This work includes detailed surveys, soil

investigations and preparation of the plans and specifications to guide the contractor to construct the project. These costs for each Alternative were developed in coordination with the PDT as percentages of the project cost based on administration and design costs typically seen for projects of similar dollar value; these percentages are included in the TPCS reports for each Alternative.

CONSTRUCTION MANAGEMENT

The Construction Management (CM) costs are determined as a percent of the estimated construction costs. As with the PED costs this percentage was determined through discussions with the PDT and are included in the TPCS reports for each Alternative.

CONTINGENCY

Current regulations require formal analyses of schedule and costs risks for projects over $40 million. Because half of the alternatives are over the $40 million marker and half are below a formal risk analysis was only required for two of the alternatives. However, in order to fairly evaluate the Alternatives it was determined that the same method of contingency development should be used for all of the alternatives. For the purposes of SMART planning an informal cost risk analysis (CRA) method was selected. This method is an abbreviated form of the formal Cost and Schedule Risk Analysis (C&SRA). This method is typically less intensive, resulting in time and labor savings. If an alternative over $40 million was selected as the TSP a formal C&SRA would then be performed at the Feasibility phase. See the CRA Attachment for the results of the informal Cost Risk Analysis Study that was performed. Contingency for 01 Real Estate costs was determined by Real Estate personnel and contingency for PED and CM costs was determined in consultation with the Project Manager.

The purpose of contingencies is an added cost included in the cost estimate to cover unknowns. Unknowns could include:

- Contractor efficiency
- The exact nature of the work environment
- Uncertainty with design quantities.
- Disposal locations.
- Construction methodology changes at Feasibility.

PROJECT SCHEDULE

The project schedule for each base and each increment was developed by the cost engineer based on MII calculated durations. Sequencing for the project was based on discussions with the PDT. The initial project schedule for each base and increment is included as an attachment to this appendix. Per discussions with the team biologist there is a presumed construction window of 15 Jul to 15 Sep for all in water work based on an estimated fish window for the river basin. This scheduling consideration was applied to the construction schedules for each Alternative to provide the most accurate project duration prediction possible at this level of design.

Contract Summary

WBS	SPENT	ESTIMATED COST				PROJECT FIRST COST *CONSTANT DOLLAR BASIS*				TOTAL PROJECT COST (FULLY FUNDED)				
Contract: Alternative 5: RM 3.5 - 9.0 Dred **District: NWS -Seattle District** **Location: Skokomish River Basin**	as of: 09-Apr-13	Est Preparation Date: 09-Apr-13 Est Price Level: 2013 - 1Q Risk Based				Program Yr: 2016 Prog Level Date: 2016 - 1Q								
	SPENT ($K)	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	MID-PT (DATE)	INFLATED (%)	COST ($K)	CNTG ($K)	TOTAL ($K)
06 FISH & WILDLIFE FACILITIES Upstream LWD Installation		723	147	20.3%	870	5.3%	761	155	916	2019 - 1Q	11.1%	803	163	966
06 FISH & WILDLIFE FACILITIES LWD Placement Base #5		1,198	243	20.3%	1,441	5.3%	1,261	256	1,518	2019 - 1Q	11.1%	1,331	270	1,601
09 CHANNELS & CANALS River Channel Dredging		767	257	33.5%	1,024	5.3%	808	270	1,078	2019 - 1Q	11.1%	852	285	1,137
09 CHANNELS & CANALS Hunter Creek Side Channel Restoration		2,866	1,324	46.2%	4,190	5.3%	3,018	1,395	4,412	2019 - 1Q	11.1%	3,184	1,471	4,655
09 CHANNELS & CANALS Base #5 3.5 - 9.0 Dredge		77,303	25,332	32.8%	102,635	5.3%	81,398	26,674	108,072	2019 - 1Q	11.1%	85,874	28,141	114,014
09 CHANNELS & CANALS Adaptive Management & Monitoring		575			575	5.3%	605		605	2021 - 1Q	15.1%	662		662
09 CHANNELS & CANALS Weaver Creek Side Channel Restoration		3,632	1,686	46.4%	5,318	5.3%	3,824	1,775	5,599	2019 - 1Q	11.1%	4,035	1,872	5,907
11 LEVEES & FLOODWALLS Grange Dike Setback		1,969	752	38.2%	2,721	5.3%	2,073	792	2,866	2019 - 1Q	11.1%	2,187	836	3,023
11 LEVEES & FLOODWALLS Large Levee Setback		1,626	624	38.4%	2,250	5.3%	1,712	657	2,369	2019 - 1Q	11.1%	1,806	693	2,499
Construction Activities *Total*		90,659	30,365		121,024		95,462	31,974	127,435			100,734	33,732	134,465
01 LANDS AND DAMAGES River Channel		1,724	431	25.0%	2,155	5.3%	1,815	454	2,269	2019 - 1Q	11.1%	1,915	479	2,394
01 LANDS AND DAMAGES Upstream LWD														
01 LANDS AND DAMAGES Grange Dike Setback		449	112	25.0%	561	5.3%	473	118	591	2019 - 1Q	11.1%	499	125	623
01 LANDS AND DAMAGES Large Levee Setback		918	230	25.0%	1,148	5.3%	967	242	1,208	2019 - 1Q	11.1%	1,020	255	1,275
01 LANDS AND DAMAGES Hunter Creek Channel		917	229	25.0%	1,146	5.3%	966	241	1,207	2019 - 1Q	11.1%	1,019	255	1,273
01 LANDS AND DAMAGES Base #5														
01 LANDS AND DAMAGES Weaver Creek Channel		1,884	471	25.0%	2,355	5.3%	1,984	496	2,480	2019 - 1Q	11.1%	2,093	523	2,616
Lands and Damages *Total*		5,892	1,473		7,365		6,204	1,551	7,755			6,545	1,636	8,182
Project Management *2.5%*		2,315	889	38.4%	3,203	11.1%	2,570	987	3,557	2019 - 1Q	23.7%	2,862	1,099	3,962
Planning & Environmental Compliance *1.0%*		926	356	38.4%	1,281	11.1%	1,028	395	1,423	2019 - 1Q	23.7%	1,145	440	1,585

Contract Summary

WBS		SPENT	ESTIMATED COST				PROJECT FIRST COST *CONSTANT DOLLAR BASIS*				TOTAL PROJECT COST (FULLY FUNDED)				
Contract: Alternative 5: RM 3.5 - 9.0 Dred **District: NWS -Seattle District** **Location: Skokomish River Basin**		as of: 09-Apr-13	Est Preparation Date: 09-Apr-13 Est Price Level: 2013 - 1Q Risk Based				Program Yr: 2016 Prog Level Date: 2016 - 1Q								
		SPENT ($K)	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	MID-PT (DATE)	INFLATED (%)	COST ($K)	CNTG ($K)	TOTAL ($K)
Engineering & Design	*15.0%*		13,887	5,333	38.4%	19,220	11.1%	15,422	5,922	21,344	2019 - 1Q	23.7%	17,175	6,595	23,770
Engineering Tech Review ITR & VE	*1.0%*		926	356	38.4%	1,281	11.1%	1,028	395	1,423	2019 - 1Q	23.7%	1,145	440	1,585
Contracting & Reprographics	*1.0%*		926	356	38.4%	1,281	11.1%	1,028	395	1,423	2019 - 1Q	23.7%	1,145	440	1,585
Engineering During Construction	*3.0%*		2,777	1,067	38.4%	3,844	11.1%	3,084	1,184	4,269	2019 - 1Q	23.7%	3,435	1,319	4,754
Planning During Construction	*2.0%*		1,852	711	38.4%	2,563	11.1%	2,056	790	2,846	2019 - 1Q	23.7%	2,290	879	3,169
Project Operations	*1.0%*		926	356	38.4%	1,281	11.1%	1,028	395	1,423	2019 - 1Q	23.7%	1,145	440	1,585
Real Estate Labor	*1.0%*		926	356	38.4%	1,281	11.1%	1,028	395	1,423	2019 - 1Q	23.7%	1,145	440	1,585
Planning Engineering and Design	*Total*		25,460	9,776		35,236		28,274	10,857	39,131			31,487	12,091	43,577
Construction Management	*10.2%*		9,477	3,639	38.4%	13,116	11.1%	10,525	4,041	14,566	2019 - 1Q	23.7%	11,721	4,501	16,221
Project Operation:	*2.0%*		1,895	728	38.4%	2,623	11.1%	2,104	808	2,913	2019 - 1Q	23.7%	2,344	900	3,244
Project Management	*2.6%*		2,369	910	38.4%	3,279	11.1%	2,631	1,010	3,641	2019 - 1Q	23.7%	2,930	1,125	4,055
Construction Management	*Total*		13,741	5,277		19,018		15,260	5,860	21,120			16,994	6,526	23,520
Alternative 5: RM 3.5 - 9.0 Dredge	*Total*		135,752	46,891		182,643		145,200	50,242	195,441			155,759	53,985	209,744

Contract Summary

WBS	SPENT	ESTIMATED COST				PROJECT FIRST COST *CONSTANT DOLLAR BASIS*				TOTAL PROJECT COST (FULLY FUNDED)				
Contract: Alternative 2: Confluence Chan District: NWS -Seattle District Location: Skokomish River Basin	as of: 09-Apr-13	Est Preparation Date: 09-Apr-13 Est Price Level: 2013 - 1Q Risk Based				Program Yr: 2016 Prog Level Date: 2016 - 1Q								
	SPENT ($K)	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	MID-PT (DATE)	INFLATED (%)	COST ($K)	CNTG ($K)	TOTAL ($K)
06 FISH & WILDLIFE FACILITIES LWD Placement Base #2		132	27	20.3%	159	5.3%	139	28	167	2017 - 1Q	7.2%	141	29	170
06 FISH & WILDLIFE FACILITIES Upstream LWD Installation		723	147	20.3%	870	5.3%	761	155	916	2017 - 1Q	7.2%	775	157	932
09 CHANNELS & CANALS Hunter Creek Side Channel Restoration		2,866	1,324	46.2%	4,190	5.3%	3,018	1,395	4,412	2017 - 1Q	7.2%	3,072	1,420	4,492
09 CHANNELS & CANALS Hunter Creek - Mouth		7	3	46.2%	10	5.3%	7	3	11	2017 - 1Q	7.2%	8	3	11
09 CHANNELS & CANALS Weaver Creek Side Channel Restoration		3,632	1,686	46.4%	5,318	5.3%	3,824	1,775	5,599	2017 - 1Q	7.2%	3,893	1,807	5,700
09 CHANNELS & CANALS Base #2 Confluence Channel Excavation		8,736	3,416	39.1%	12,152	5.3%	9,199	3,597	12,796	2017 - 1Q	7.2%	9,364	3,661	13,026
09 CHANNELS & CANALS Adaptive Management & Monitoring		575			575	5.3%	605		605	2021 - 1Q	15.1%	662		662
09 CHANNELS & CANALS River Channel Dredging		448	150	33.5%	598	5.3%	472	158	630	2017 - 1Q	7.2%	480	161	641
11 LEVEES & FLOODWALLS Large Levee Setback		1,626	624	38.4%	2,250	5.3%	1,712	657	2,369	2017 - 1Q	7.2%	1,743	668	2,411
11 LEVEES & FLOODWALLS Grange Dike Setback		1,969	752	38.2%	2,721	5.3%	2,073	792	2,866	2017 - 1Q	7.2%	2,111	806	2,917
Construction Activities *Total*		20,714	8,129		28,843		21,811	8,559	30,371			22,250	8,713	30,963
01 LANDS AND DAMAGES Weaver Creek Channel		1,884	471	25.0%	2,355	5.3%	1,984	496	2,480	2017 - 1Q	7.2%	2,020	505	2,524
01 LANDS AND DAMAGES Large Levee Setback		918	230	25.0%	1,148	5.3%	967	242	1,208	2017 - 1Q	7.2%	984	246	1,230
01 LANDS AND DAMAGES Hunter Creek Channel		917	229	25.0%	1,146	5.3%	966	241	1,207	2017 - 1Q	7.2%	983	246	1,229
01 LANDS AND DAMAGES Upstream LWD														
01 LANDS AND DAMAGES Grange Dike Setback		449	112	25.0%	561	5.3%	473	118	591	2017 - 1Q	7.2%	481	120	602
01 LANDS AND DAMAGES River Channel		1,724	431	25.0%	2,155	5.3%	1,815	454	2,269	2017 - 1Q	7.2%	1,848	462	2,310
01 LANDS AND DAMAGES Base #2														
01 LANDS AND DAMAGES Hunter Creek - Mouth		161	40	25.0%	201	5.3%	170	42	212	2017 - 1Q	7.2%	173	43	216
Lands and Damages *Total*		6,053	1,513		7,566		6,374	1,593	7,967			6,488	1,622	8,111

Contract Summary

WBS		SPENT	ESTIMATED COST				PROJECT FIRST COST *CONSTANT DOLLAR BASIS*				TOTAL PROJECT COST (FULLY FUNDED)				
Contract: Alternative 2: Confluence Chan **District: NWS -Seattle District** **Location: Skokomish River Basin**		as of: 09-Apr-13	Est Preparation Date: 09-Apr-13 Est Price Level: 2013 - 1Q Risk Based				Program Yr: 2016 Prog Level Date: 2016 - 1Q								
		SPENT ($K)	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	MID-PT (DATE)	INFLATED (%)	COST ($K)	CNTG ($K)	TOTAL ($K)
Project Management	*5.0%*		1,078	421	39.0%	1,499	11.1%	1,198	467	1,665	2017 - 1Q	15.3%	1,243	485	1,728
Planning & Environmental Compliance	*1.0%*		216	84	39.0%	300	11.1%	240	93	333	2017 - 1Q	15.3%	249	97	346
Engineering & Design	*15.0%*		3,235	1,262	39.0%	4,497	11.1%	3,593	1,401	4,994	2017 - 1Q	15.3%	3,729	1,454	5,183
Engineering Tech Review ITR & VE	*1.0%*		216	84	39.0%	300	11.1%	240	93	333	2017 - 1Q	15.3%	249	97	346
Contracting & Reprographics	*1.0%*		216	84	39.0%	300	11.1%	240	93	333	2017 - 1Q	15.3%	249	97	346
Engineering During Construction	*3.0%*		647	252	39.0%	899	11.1%	719	280	999	2017 - 1Q	15.3%	746	291	1,037
Planning During Construction	*2.0%*		431	168	39.0%	600	11.1%	479	187	666	2017 - 1Q	15.3%	497	194	691
Project Operations	*1.0%*		216	84	39.0%	300	11.1%	240	93	333	2017 - 1Q	15.3%	249	97	346
Real Estate Labor	*1.0%*		216	84	39.0%	300	11.1%	240	93	333	2017 - 1Q	15.3%	249	97	346
Planning Engineering and Design	*Total*		6,471	2,524		8,994		7,186	2,803	9,989			7,458	2,909	10,367
Construction Management	*11.7%*		2,514	980	39.0%	3,494	11.1%	2,792	1,089	3,881	2017 - 1Q	15.3%	2,898	1,130	4,028
Project Operation:	*2.3%*		503	196	39.0%	699	11.1%	559	218	776	2017 - 1Q	15.3%	580	226	806
Project Management	*2.9%*		629	245	39.0%	874	11.1%	699	272	971	2017 - 1Q	15.3%	725	283	1,008
Construction Management	*Total*		3,646	1,422		5,068		4,049	1,579	5,628			4,202	1,639	5,841
ernative 2: Confluence Channel Excavati	*Total*		36,884	13,587		50,471		39,420	14,534	53,954			40,399	14,883	55,282

Contract Summary

WBS	SPENT	ESTIMATED COST				PROJECT FIRST COST *CONSTANT DOLLAR BASIS*				TOTAL PROJECT COST (FULLY FUNDED)				
Contract: Alternative 3: North Fork/South	as of:	Est Preparation Date: 09-Apr-13				Program Yr: 2016								
District: NWS -Seattle District	09-Apr-13	Est Price Level: 2013 - 1Q				Prog Level Date: 2016 - 1Q								
Location: Skokomish River Basin		Risk Based												
	SPENT ($K)	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	MID-PT (DATE)	INFLATED (%)	COST ($K)	CNTG ($K)	TOTAL ($K)
06 FISH & WILDLIFE FACILITIES LWD Placement Base #3		132	27	20.3%	159	5.3%	139	28	167	2017 - 1Q	7.2%	141	29	170
06 FISH & WILDLIFE FACILITIES Upstream LWD Installation		723	147	20.3%	870	5.3%	761	155	916	2017 - 1Q	7.2%	775	157	932
09 CHANNELS & CANALS Base #3 Car Body Levee Removal		3,560	1,062	29.8%	4,622	5.3%	3,749	1,118	4,867	2017 - 1Q	7.2%	3,816	1,138	4,954
09 CHANNELS & CANALS Hunter Creek - Mouth		7	3	46.2%	10	5.3%	7	3	11	2017 - 1Q	7.2%	8	3	11
09 CHANNELS & CANALS Adaptive Management & Monitoring		575			575	5.3%	605		605	2021 - 1Q	15.1%	662		662
09 CHANNELS & CANALS Hunter Creek Side Channel Restoration		2,866	1,324	46.2%	4,190	5.3%	3,018	1,395	4,412	2017 - 1Q	7.2%	3,072	1,420	4,492
09 CHANNELS & CANALS River Channel Dredging		448	150	33.5%	598	5.3%	472	158	630	2017 - 1Q	7.2%	480	161	641
09 CHANNELS & CANALS Weaver Creek Side Channel Restoration		3,632	1,686	46.4%	5,318	5.3%	3,824	1,775	5,599	2017 - 1Q	7.2%	3,893	1,807	5,700
11 LEVEES & FLOODWALLS Grange Dike Setback		1,969	752	38.2%	2,721	5.3%	2,073	792	2,866	2017 - 1Q	7.2%	2,111	806	2,917
11 LEVEES & FLOODWALLS Large Levee Setback		1,626	624	38.4%	2,250	5.3%	1,712	657	2,369	2017 - 1Q	7.2%	1,743	668	2,411
Construction Activities *Total*		15,538	5,775		21,313		16,361	6,081	22,442			16,701	6,190	22,891
01 LANDS AND DAMAGES Upstream LWD														
01 LANDS AND DAMAGES River Channel		1,724	431	25.0%	2,155	5.3%	1,815	454	2,269	2017 - 1Q	7.2%	1,848	462	2,310
01 LANDS AND DAMAGES Base #3		618	155	25.0%	773	5.3%	651	163	813	2017 - 1Q	7.2%	662	166	828
01 LANDS AND DAMAGES Weaver Creek Channel		1,884	471	25.0%	2,355	5.3%	1,984	496	2,480	2017 - 1Q	7.2%	2,020	505	2,524
01 LANDS AND DAMAGES Grange Dike Setback		449	112	25.0%	561	5.3%	473	118	591	2017 - 1Q	7.2%	481	120	602
01 LANDS AND DAMAGES Hunter Creek - Mouth		161	40	25.0%	201	5.3%	170	42	212	2017 - 1Q	7.2%	173	43	216
01 LANDS AND DAMAGES Large Levee Setback		918	230	25.0%	1,148	5.3%	967	242	1,208	2017 - 1Q	7.2%	984	246	1,230
Lands and Damages *Total*		5,754	1,439		7,193		6,059	1,515	7,574			6,168	1,542	7,710
Project Management *2.5%*		410	159	38.9%	569	11.1%	455	177	632	2017 - 1Q	15.3%	472	184	656

Contract Summary

WBS		SPENT	ESTIMATED COST				PROJECT FIRST COST *CONSTANT DOLLAR BASIS*				TOTAL PROJECT COST (FULLY FUNDED)				
Contract: Alternative 3: North Fork/South		as of:	Est Preparation Date: 09-Apr-13				Program Yr: 2016								
District: NWS -Seattle District		09-Apr-13	Est Price Level: 2013 - 1Q				Prog Level Date: 2016 - 1Q								
Location: Skokomish River Basin			Risk Based												
		SPENT	COST	CNTG	CNTG	TOTAL	ESC	COST	CNTG	TOTAL	MID-PT	INFLATED	COST	CNTG	TOTAL
		($K)	($K)	($K)	(%)	($K)	(%)	($K)	($K)	($K)	(DATE)	(%)	($K)	($K)	($K)
Planning & Environmental Compliance	*1.0%*		164	64	38.9%	228	11.1%	182	71	253	2017 - 1Q	15.3%	189	74	262
Engineering & Design	*15.0%*		2,459	957	38.9%	3,415	11.1%	2,731	1,062	3,793	2017 - 1Q	15.3%	2,834	1,103	3,937
Engineering Tech Review ITR & VE	*1.0%*		164	64	38.9%	228	11.1%	182	71	253	2017 - 1Q	15.3%	189	74	262
Contracting & Reprographics	*1.0%*		164	64	38.9%	228	11.1%	182	71	253	2017 - 1Q	15.3%	189	74	262
Engineering During Construction	*3.0%*		492	191	38.9%	683	11.1%	546	212	759	2017 - 1Q	15.3%	567	221	787
Planning During Construction	*2.0%*		328	128	38.9%	455	11.1%	364	142	506	2017 - 1Q	15.3%	378	147	525
Project Operations	*1.0%*		164	64	38.9%	228	11.1%	182	71	253	2017 - 1Q	15.3%	189	74	262
Real Estate Labor	*1.0%*		164	64	38.9%	228	11.1%	182	71	253	2017 - 1Q	15.3%	189	74	262
Planning Engineering and Design	*Total*		4,508	1,754		6,262		5,006	1,947	6,954			5,196	2,021	7,217
Construction Management	*10.3%*		1,692	658	38.9%	2,350	11.1%	1,879	731	2,610	2017 - 1Q	15.3%	1,950	759	2,709
Project Operation:	*2.1%*		338	131	38.9%	469	11.1%	375	146	521	2017 - 1Q	15.3%	390	152	541
Project Management	*2.6%*		423	165	38.9%	588	11.1%	470	183	652	2017 - 1Q	15.3%	488	190	677
Construction Management	*Total*		2,453	954		3,407		2,724	1,060	3,784			2,827	1,100	3,927
rnative 3: North Fork/South Fork Conflue	*Total*		28,253	9,921		38,174		30,151	10,603	40,753			30,893	10,853	41,746

Contract Summary

WBS	SPENT	ESTIMATED COST				PROJECT FIRST COST *CONSTANT DOLLAR BASIS*				TOTAL PROJECT COST (FULLY FUNDED)				
Contract: Alternative 1: Complete Channe District: NWS -Seattle District Location: Skokomish River Basin	as of: 09-Apr-13	Est Preparation Date: 09-Apr-13 Est Price Level: 2013 - 1Q Risk Based				Program Yr: 2016 Prog Level Date: 2016 - 1Q								
	SPENT ($K)	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	MID-PT (DATE)	INFLATED (%)	COST ($K)	CNTG ($K)	TOTAL ($K)
06 FISH & WILDLIFE FACILITIES LWD Placement Base #1		1,777	361	20.3%	2,138	5.3%	1,871	380	2,251	2021 - 1Q	15.1%	2,046	416	2,461
06 FISH & WILDLIFE FACILITIES Upstream LWD Installation		723	147	20.3%	870	5.3%	761	155	916	2021 - 1Q	15.1%	832	169	1,001
09 CHANNELS & CANALS River Channel Dredging		767	257	33.5%	1,024	5.3%	808	270	1,078	2021 - 1Q	15.1%	883	295	1,178
09 CHANNELS & CANALS Weaver Creek Side Channel Restoration		3,632	1,686	46.4%	5,318	5.3%	3,824	1,775	5,599	2021 - 1Q	15.1%	4,181	1,941	6,122
09 CHANNELS & CANALS Hunter Creek Side Channel Restoration		2,866	1,324	46.2%	4,190	5.3%	3,018	1,395	4,412	2021 - 1Q	15.1%	3,299	1,525	4,824
09 CHANNELS & CANALS Adaptive Management & Monitoring		575			575	5.3%	605		605	2021 - 1Q	15.1%	662		662
09 CHANNELS & CANALS Base #1 Complete Channel Capacity Dredging		105,043	34,213	32.6%	139,256	5.3%	110,608	36,025	146,632	2021 - 1Q	15.1%	120,927	39,386	160,313
11 LEVEES & FLOODWALLS Grange Dike Setback		1,969	752	38.2%	2,721	5.3%	2,073	792	2,866	2021 - 1Q	15.1%	2,267	866	3,133
11 LEVEES & FLOODWALLS Large Levee Setback		1,626	624	38.4%	2,250	5.3%	1,712	657	2,369	2021 - 1Q	15.1%	1,872	718	2,590
Construction Activities *Total*		118,978	39,363		158,341		125,281	41,448	166,729			136,970	45,315	182,285
01 LANDS AND DAMAGES Large Levee Setback		918	230	25.0%	1,148	5.3%	967	242	1,208	2021 - 1Q	15.1%	1,057	264	1,321
01 LANDS AND DAMAGES Base #1														
01 LANDS AND DAMAGES Upstream LWD														
01 LANDS AND DAMAGES Hunter Creek Channel		917	229	25.0%	1,146	5.3%	966	241	1,207	2021 - 1Q	15.1%	1,056	264	1,320
01 LANDS AND DAMAGES Weaver Creek Channel		1,884	471	25.0%	2,355	5.3%	1,984	496	2,480	2021 - 1Q	15.1%	2,169	542	2,711
01 LANDS AND DAMAGES Grange Dike Setback		449	112	25.0%	561	5.3%	473	118	591	2021 - 1Q	15.1%	517	129	646
01 LANDS AND DAMAGES River Channel		1,724	431	25.0%	2,155	5.3%	1,815	454	2,269	2021 - 1Q	15.1%	1,985	496	2,481
Lands and Damages *Total*		5,892	1,473		7,365		6,204	1,551	7,755			6,783	1,696	8,479
Project Management *2.1%*		2,500	940	37.6%	3,440	11.1%	2,776	1,044	3,820	2021 - 1Q	32.3%	3,306	1,243	4,550
Planning & Environmental Compliance *0.8%*		1,000	376	37.6%	1,376	11.1%	1,111	418	1,528	2021 - 1Q	32.3%	1,323	497	1,820

Contract Summary

WBS		SPENT	ESTIMATED COST				PROJECT FIRST COST *CONSTANT DOLLAR BASIS*				TOTAL PROJECT COST (FULLY FUNDED)				
Contract: Alternative 1: Complete Channe **District: NWS -Seattle District** **Location: Skokomish River Basin**		as of: 09-Apr-13	Est Preparation Date: 09-Apr-13 Est Price Level: 2013 - 1Q Risk Based				Program Yr: 2016 Prog Level Date: 2016 - 1Q								
		SPENT ($K)	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	MID-PT (DATE)	INFLATED (%)	COST ($K)	CNTG ($K)	TOTAL ($K)
Engineering & Design	*12.3%*		15,000	5,640	37.6%	20,640	11.1%	16,658	6,263	22,922	2021 - 1Q	32.3%	19,839	7,459	27,298
Engineering Tech Review ITR & VE	*0.8%*		1,000	376	37.6%	1,376	11.1%	1,111	418	1,528	2021 - 1Q	32.3%	1,323	497	1,820
Contracting & Reprographics	*0.8%*		1,000	376	37.6%	1,376	11.1%	1,111	418	1,528	2021 - 1Q	32.3%	1,323	497	1,820
Engineering During Construction	*2.5%*		3,000	1,128	37.6%	4,128	11.1%	3,332	1,253	4,584	2021 - 1Q	32.3%	3,968	1,492	5,460
Planning During Construction	*1.6%*		2,000	752	37.6%	2,752	11.1%	2,221	835	3,056	2021 - 1Q	32.3%	2,645	995	3,640
Project Operations	*0.8%*		1,000	376	37.6%	1,376	11.1%	1,111	418	1,528	2021 - 1Q	32.3%	1,323	497	1,820
Real Estate Labor	*0.8%*		1,000	376	37.6%	1,376	11.1%	1,111	418	1,528	2021 - 1Q	32.3%	1,323	497	1,820
Planning Engineering and Design	*Total*		27,500	10,340		37,840		30,540	11,483	42,023			36,371	13,675	50,046
Construction Management	*12.9%*		15,716	5,909	37.6%	21,625	11.1%	17,453	6,562	24,016	2021 - 1Q	32.3%	20,786	7,815	28,601
Project Operation:	*2.6%*		3,143	1,182	37.6%	4,325	11.1%	3,490	1,312	4,803	2021 - 1Q	32.3%	4,157	1,563	5,720
Project Management	*3.2%*		3,929	1,477	37.6%	5,406	11.1%	4,363	1,641	6,004	2021 - 1Q	32.3%	5,196	1,954	7,150
Construction Management	*Total*		22,788	8,568		31,356		25,307	9,515	34,822			30,139	11,332	41,471
ıative 1: Complete Channel Capacity Dre	*Total*		175,158	59,744		234,902		187,332	63,998	251,330			210,262	72,019	282,281

Skokomish River GI

Estimated by	CENWS
Designed by	CENWS
Prepared by	CENWS
Preparation Date	12/16/2013
Effective Date of Pricing	2/25/2013
Estimated Construction Time	Days

Description	Quantity	UOM	DirectCost	ContractCost	ProjectCost
Project Cost Summary			143,079,232	245,892,026	245,892,026
[Alternative 1] Complete Channel Capacity Dredging	1.00	EA	69,403,376	118,979,558	118,979,558
[Alternative 2] Confluence Channel Excavation	1.00	EA	11,799,127	20,714,568	20,714,568
[Alternative 3] North Fork/South Fork Confluence - Car Body Levee Removal	1.00	EA	9,075,999	15,538,994	15,538,994
[Alternative 5] Dredging 3.5 - 9.0 RM	1.00	EA	52,800,730	90,658,906	90,658,906

Labor ID: NLS2010 EQ ID: EP11R08 Currency in US dollars TRACES MII Version 4.2

Contractor Markups Report

Prime

Markup	Own Work	Sub Work
JOOH [Running %]	15.00%	10.00%
HOOH [Running %]	10.00%	10.00%
Profit [Running %]	8.00%	8.00%
Bond [Running %]	1.00%	1.00%
Insurance [Running %]	1.00%	1.00%
Excise Tax [Running %]	0.48%	0.48%

Sub

Markup	Own Work	Sub Work
JOOH [Running %]	10.00%	10.00%
HOOH [Running %]	10.00%	10.00%
Profit [Running %]	8.00%	8.00%
Bond [Running %]	1.00%	1.00%
Insurance [Running %]	1.00%	1.00%
Excise Tax [Running %]	0.48%	0.48%

ALTERNATIVE #3 Brief Schedule

10-Jan-14 13:44

Qtr 3, 2015		Qtr 4, 2015			Qtr 1, 2016			Qtr 2, 2016			Qtr 3, 2016			Qtr 4, 2016			Qtr 1, 2017			Qtr 2, 2017			Qtr 3, 2017			tr 4, 2017
Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct

505	01-Oct-15		07-Sep-17
Base #3, 505	01-Oct-15		07-Sep-17
Grange Dike Setback-3, 258	01-Oct-15		27-Sep-16
Hunter Creek Mouth-2, 7	05-Sep-16		14-Sep-16
Hunter Creek Side Ch-3, 242	01-Oct-15		05-Sep-16
Large Levee Setback,-3, 251	01-Oct-15		16-Sep-16
River Channel-3, 222	01-Oct-15		08-Aug-16
Upstream LWD-3, 232	01-Oct-15		22-Aug-16
Weaver Creek Side Ch-3, 250	01-Oct-15		15-Sep-16

All EPS Elements Summary

All Projects

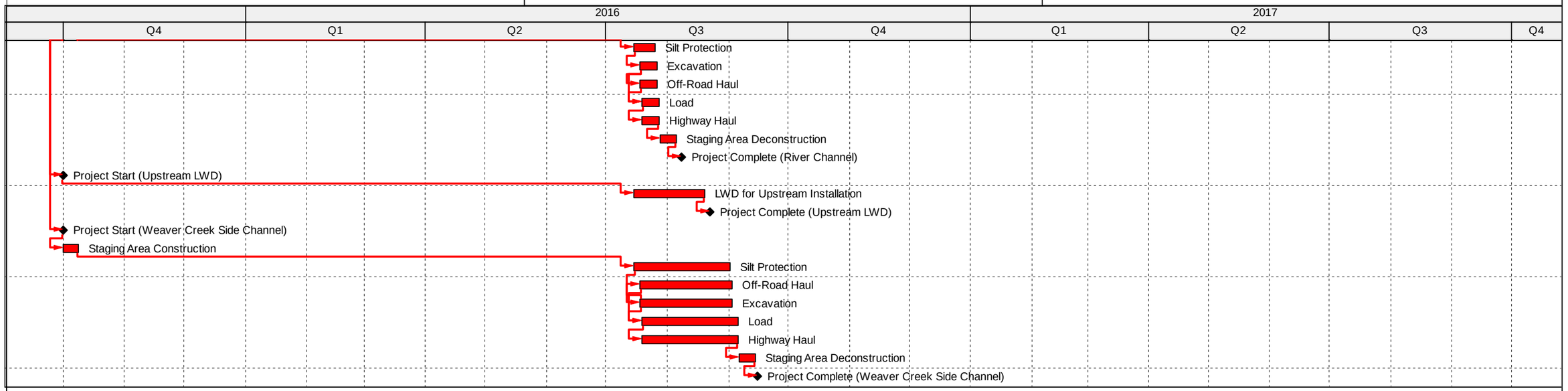
2016 | 2017

Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4

- Temporary Road Construction
- Project Award (Base #3)
- Staging Area Construction
- Clearing and Grubbing
- Degrade Levee
- Silt Fencing Protection
- LWD for Base #3
- Tree Planting
- Staging Area Deconst
- Temporary Road
- Project Complete
- Project Start (Grange Dike Setback)
- Staging Area Construction
- Clear and Grub
- Degrade Levee
- Roadway Demolition
- Construct Setback Levee
- Roadway Construction
- Staging Area Deconstruction
- Project Complete (Grange Dike Setback)
- Project Start (Hunter Creek Mouth)
- Staging Area Construction
- Silt Protection
- Excavation
- Off-Road Haul
- Load
- Highway Haul
- Staging Area Deconstruction
- Project Complete (Hunter Creek Mouth)
- Project Start (Hunter Creek Side Channel)
- Staging Area Construction
- Silt Protection
- Excavation
- Off-Road Haul
- Load
- Highway Haul
- Staging Area Deconstruction
- Project Complete (Hunter Creek Side Channel)
- Project Start (Large Levee Setback)
- Staging Area Construction
- Clear and Grub
- Degrade Levee
- Construct Setback Levee
- Staging Area Deconstruction
- Project Complete (Large Levee Setback)
- Project Start (River Channel)
- Staging Area Construction

Actual Work | Critical Remaining Work | Summary
Remaining Work | Milestone

TASK filter: All Activities



US Army Corps
of Engineers®

RISK MANAGEMENT PLAN (RMP) FOR SKOKOMISH RIVER BASIN, WASHINGTON ECOSYSTEM RESTORATION

U.S. Army Corps of Engineers
Seattle District

6 February 2014

Table of Contents

Table of Contents (Continued)

List of Tables

List of Figures

List of Appendices

1. INTRODUCTION

1.1 Purpose: This Risk Management Plan (RMP) presents the process for implementing the comprehensive and proactive management of risk as part of the overall management of the Skokomish River Basin, Washington, General Investigation Study. Risk management is a project management tool to handle events that might adversely impact the program, thereby increasing the probability/likelihood of success. This RMP describes a management tool that will:

- Serve as a basis for identifying alternatives to achieve cost, schedule, and performance goals,
- Assist in making decisions on budget and funding priorities,
- Provide risk information for Milestone decisions, and
- Allow monitoring the health of the program as it proceeds.

The RMP describes methods for assessing (identifying and analyzing), prioritizing, and monitoring risk drivers; developing risk-handling approaches, and applying adequate resources to handle risk. It assigns specific responsibilities for these functions, and prescribes the documenting, monitoring, and reporting processes to be followed.

The four main building blocks of the risk management process are identification, assessment, response, and documentation. The CSRA process addresses the "identification" and "assessment" portions of the risk management process. The activities of "response" and "documentation" are PM and PDT management efforts to mitigate, monitor, and manage the risks throughout the life cycle of the project.

If necessary, this RMP will be updated at the following milestones: (1) following approval of the FCSA; (2) Congressional authorization for construction; (3) receipt of Construction General funding; or (4) concurrent with the review and update of other program plans.

1.2 Objectives: The objectives of the risk management plan are:

- To focus attention on minimizing threats to achievement of the project objectives.
- To provide an approach for:
    - Identifying and assessing risks.
    - Determining cost-effective risk reduction actions.
    - Monitoring and reporting progress in reducing risk.

The overall goal of this process is to progressively reduce the project's exposure to events that threaten the accomplishment of its objectives by:

- Incorporating approaches into the project plans that minimize or avoid identified risks,
- Developing proactive, contingent risk response actions, and
- Rapidly implementing risk responses based on timely identification of risk occurrence.

2. PROJECT SUMMARY

2.1 Project Area Description

The Skokomish River Basin is located on Hood Canal, a natural fjord-like arm of the Puget Sound and water of national significance. The Skokomish River is the largest source of freshwater to Hood Canal as it flows into Annas Bay and of critical importance in the overall health of Hood Canal. Environmental degradation can be seen throughout the Skokomish River Basin including a loss of natural ecosystem structures, functions, and processes necessary to support critical fish and wildlife habitat. Four anadromous fish species (Chinook salmon, chum salmon, steelhead, and bull trout) that use the river as their primary habitat are listed under the Endangered Species Act (ESA) and have experienced population declines. The impaired ecosystem has adversely affected riverine, wetland, and estuarine habitats that are critical to these and other listed species. The underlying need for development of a plan for ecosystem restoration in the Basin has arisen from recognition and analysis of these problems.

2.2 Project Scope

The purpose of the Skokomish River Basin feasibility study is to evaluate significant ecosystem degradation in the Skokomish River Basin; to formulate, evaluate, and screen potential solutions to these problems; and to recommend a series of actions and projects that have a Federal interest and are supported by a local entity willing to provide the necessary items of local cooperation.

A recommended restoration plan was selected that includes a levee removal, three side channel or tributary restorations, placement of large woody debris in the upstream reaches of the river, and construction of two setback levees to improve habitat connectivity in the floodplain. The total area of the proposed sites included in this TSP is approximately 330 acres, the average annual habitat units are estimated at 226, and the total estimated first cost of the TSP is $41 million.

3. RISK-RELATED DEFINITIONS

The U.S. Army Corps of Engineers Cost Engineering Directory of Expertise for Civil Works (Cost Dx) recommends the following definitions for risk, as contained in current project and risk management guidance and literature, as noted.

3.1 Risk: An uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives (source: *PMBoK® Guide*, p. 373).

3.1.1 Technical Risk: Risks having to do with product, process, or "technique" issues involved with designing and producing the deliverable (source: *Project Risk Management*, p. 78).

3.1.2 Cost Risk: The risk associated with the ability of the program to achieve its life cycle cost objectives (source: *Defense Acquisition Deskbook*).

3.1.3 Schedule Risk: Events or conditions that may have a negative influence on the project's timing (source: *Risk Management Concepts and Guidance*, p. 376).

3.1.4 Life-Safety Risk: Risk relating to the safety and/or security of human interests.

3.1.5 Reliability Risk: Risk relating to the performance and/or reliability of the system, product, or project feature being acquired.

3.1.6 Non-Technical Risk: Any risk that is not technical in nature and does not directly influence cost growth. Such risks would include organizational risks, political exposure, public relations issues, or potential loss of "goodwill" (public trust).

3.1.7 Internal Risk: An item or activity upon which the PDT has control or influence.

3.1.8 External Risk: An item or activity upon which the PDT has no control or influence.

3.2 Risk Management: Project Risk Management includes the processes concerned with conducting risk management planning, identification, analysis, responses, and monitoring and control on a project; most of these processes are updated throughout the project (source: *PMBoK® Guide*, 3rd edition, p. 237).

3.3 Risk Analysis: Qualitative or quantitative evaluations of the potential impact and probability of project risk events (source: *Risk Management Concepts and Guidance*, p. 373).

3.3.1 Qualitative Risk Analysis: Prioritizing risks for subsequent further analysis or action by assessing and combining their probability of occurrence and impact (source: *PMBoK® Guide*, 3rd edition, p. 237).

3.3.2 Quantitative Risk Analysis: Numerically analyzing the effect on overall project objectives of identified risks (source: *PMBoK® Guide*, 3rd edition, p. 237).

3.3.3 Cost and Schedule Risk Analysis (CSRA): Technique used to improve the development of contingencies by studying the variance of project cost caused by the effects of cost and schedule risk events. This process relies on qualitative and quantitative (e.g. Monte Carlo simulation) risk analysis techniques. CSRA is required on projects costs anticipated to be $40 Million or higher.

3.4 Risk Communication: Exchange or sharing of information about risk between the decision-maker, often the project manager, and other stakeholders (source: *Project Risk Management Guidelines*, p. 372).

3.5 Risk Response Planning/Mitigation: Developing options and actions to enhance opportunities, and to reduce threats to project objectives (source: *PMBoK® Guide*, 3rd edition, p. 237).

3.6 Risk Monitoring and Control: Tracking identified risks, monitoring residual risks, identifying new risks, executing risk response plans, and evaluating their effectiveness throughout the project life cycle (source: *PMBoK® Guide*, 3rd edition, p. 237).

3.7 Risk Register: The document containing the results of the qualitative risk analysis, quantitative risk analysis and risk response planning. The risk register details all identified risks, including description, category, cause, probability of occurring, impact(s) on objectives, proposed responses, owners, and current status (source: *PMBoK® Guide*, 4th edition, p. 439).

3.8 Risk Trigger: An indicator of the imminent occurrence of a given risk event that serves as an immediate precursor to the occurrence of the risk. Often used to initiate specific actions, behaviors, or responses (source: *Risk Management Concepts and Guidance*, p. 376).

3.9 Watch List: A list of major risks examined at each project risk review meeting (source: *Project Risk Management Guidelines*, p. 372).

4. RISK MANAGEMENT STRATEGY

The *[ENTER PROJECT NAME HERE]* risk management strategy is to handle program risks, both technical and non-technical, before they become problems, causing serious cost, schedule, or performance impacts. This strategy is an integral part of project success, and will be executed primarily through the Government Project Delivery Team (PDT). The PDT will continuously and proactively assess critical areas to identify and analyze specific risks and will develop options to mitigate all risks designated as moderate and high.

The PDT will keep risk information current by maintaining the risk register described in paragraph 6.2.4. Risk status will be reported at all project milestone reviews.

5. RESPONSIBILITIES AND ASSIGNMENTS

Over the course of the project, the Project manager may make specific assignments to individual members of the PDT, within their functional areas, to provide updates or input to the risk register. Table 1 below lists the general assignments and responsibilities:

Table 1-Risk Management Responsibilities

Task	Lead	Support
Risk Management Planning	**PM**	**Cost Dx**
Risk Identification	**PM**	**PDT**
Risk Analysis and Quantification	**Cost Dx**	**PDT**
Risk Response/Mitigation Plan	**PM**	**PDT**
Risk Monitoring and Control	**PM**	**PDT**
Risk Communication	**PM**	**PDT**
Risk Documentation/Closeout	**PM**	**PDT**

6. RISK MANAGEMENT PROCESS AND PROCEDURES

Led by the project manager, the PDT will conduct risk management activities to address those risks that are pertinent to the project. The project manager will employ the assistance of members of the PDT, project sponsors/customers and other subject matter experts as appropriate.

Overview of Project Risk Management Activities

- Risk Management Planning
- Risk Identification
- Risk Analysis and Quantification
- Risk Response Planning and Mitigation
- Risk Monitoring and Control
- Risk Communication
- Risk Documentation/Closeout

6.1 Risk Management Planning

Risk Management Planning will occur in conjunction with the development of the Project Management Plan (PMP) and will culminate with the approval of the Risk Management Plan (RMP). The RMP will present the strategy for procedures for identifying, analyzing, responding to, and monitoring risk throughout the project life cycle. The RMP will include treatment for both technical and non-technical risks, as well as risks that affect the project cost and schedule performance. Per ER 1110-2-1302 and ETL 1110-2-573, this project is anticipated to require and will undergo a formal Cost and Schedule Risk Analysis (CSRA).

6.2 Risk Identification

6.2.1 Initial Risk Discussions

Identification of risks will be accomplished through brainstorming sessions held with the PDT and project stakeholders. The PDT brainstorming session is the initial attempt to develop the risk register that serves as the basis for both the risk register development and the CSRA.

6.2.2 PDT Coordination

The PM will coordinate an initial risk discussion meeting, also referred to as a PDT brainstorming session. This is the first meeting where the PDT attempts to collectively capture the project risks and place them into the risk register. The brainstorming session will include the major PDT members.

6.2.3 PDT Brainstorming Session

The PDT brainstorming session is the opportunity to bring the PDT together to qualitatively define the risk concerns as well as potential opportunities. As the concerns are discussed, the facilitator or risk analyst begins developing the initial risk register, capturing the PDT's concerns and discussions.

6.2.4 Risk Level

Each identified risk will be assigned a risk rating based on the joint consideration of event probability/likelihood and consequence/impact (see the Probability vs. Impact Risk Matrix below in Figure 1). This rating is a reflection of the severity of the risk and provides a starting point for the development of options to handle the risk. Probabilities are described as, VERY UNLIKELY, UNLIKELY, LIKELY, or VERY LIKELY. Impacts are described as, NEGLIGIBLE, MARGINAL SIGNIFICANT, CRITICAL, or CRISIS. Risk levels are described as, LOW, MODERATE, or HIGH.

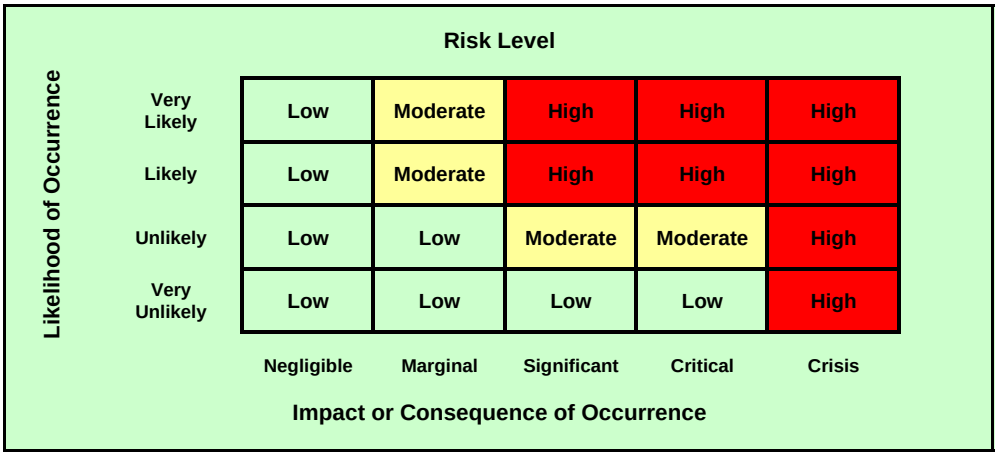
It is important to consider both the probability/likelihood and consequences/impacts in establishing the rating, as there may be risk events that have a low probability/likelihood, but whose consequences/impacts are so severe that the occurrence of the event would be disastrous to the project.

6.2.5 Completing Initial Risk Register

The risk register will serve as the basis for risk management, including the CSRA process. When referring to the risk register, the PDT should focus on the following:

- Risk/Opportunity – *Event.*
- PDT Event Concerns – *Describe the risk event.*
- PDT Discussions – *List the implications or any relevant background for this risk.*
- Responsibility/POC – *List who should have the action on the status of this risk.*
- Likelihood – *Describe the likelihood of this risk occurring, using VERY UNLIKELY, UNLIKELY, LIKELY, or VERY LIKELY.*
- Impact – *Describe the impact of this risk if it occurs, using NEGLIGIBLE, MARGINAL SIGNIFICANT, CRITICAL, or CRISIS.*
- Risk Level – *Determine the risk level according to the matrix below, using LOW, MODERATE, or HIGH.*

Figure 1-Probability vs. Impact Risk Matrix



The PDT should capture all concerns for all project features even if the risk level is considered low. The register serves as an archive of discussions and there is potential

that low-level risks may become higher following market studies, more information being made available, or over time during the risk management and mitigation processes.

Within the risk register, the PDT concerns and discussions must be adequately and clearly captured, because the logic presented in those discussions must support the "likelihood" and "impact" decisions reflected within the risk register. While this product is the initial risk register, it has already captured the PDT's greatest concerns. The PDT can begin using this data to prepare for project risk management.

6.3 Risk Analysis

Risk analysis includes both qualitative and quantitative techniques to determine the key drivers of risk. Qualitative risk analysis shall occur on all risks, both technical and non-technical. The Project Risk "Watch List" will incorporate all risks identified as "Moderate" or "High" by qualitative analysis. All risks determined to have cost and/or schedule impacts and rated as "Moderate" or "High" will be quantitatively studied through the CSRA process. The PDT will enlist the support of the Cost Engineering Dx for completion of the CSRA process.

6.3.1 Qualitative Risk Analysis

Qualitative risk analysis will be conducted on all project risks, utilizing the collective judgment of the PDT and project stakeholders. Qualitative analysis will occur simultaneously to the completion of the initial risk register. Additionally, the qualitative analysis will be updated as the risks change throughout the project life cycle. Changes to the status of risks shall be captured by the project risk register at each monthly risk review meeting.

6.3.2 Quantitative Risk Analysis

Quantitative analysis will be conducted on all risks qualitatively rated as MODERATE or HIGH that affect cost and/or schedule performance. Quantitative analysis shall be conducted using the Monte Carlo technique with the support of the Cost Engineering Dx. Other risks may also be studied quantitatively, as directed. The results of the quantitative analysis will be presented in a final report and will include identification of the key drivers of risk for cost and schedule. The results of the quantitative analysis will include recommended levels for contingency and management reserve for completion of the project through implementation.

6.3.3 Cost and Schedule Risk Analysis (CSRA)

The CSRA will be performed in accordance with ER 1110-2-1302, ETL 1110-2-573, and Cost and Schedule Risk Analysis Guidance published by the Cost Engineering Dx. The project will utilize the Cost Engineering Dx for performance of the CSRA, using Crystal Ball software. At a minimum, the CSRA will include but not be limited to:

- Review of planning, design and/or construction contract documents:
  - Deliverables and work processes
  - Milestones and schedule dates
  - Resource estimates/needs/sources
  - Performance requirements

- Discussions and brainstorming activities with PDT members, appropriate stakeholders/sponsor representatives and other qualified/knowledgeable individuals to develop a comprehensive list of risks for this project, referred to as the Risk Register.

- Investigation of the various sources and symptoms of risks to aid in subsequent determination of risk controllability and selection of appropriate risk response actions.

The guidance and processes recommended to perform an acceptable cost and schedule risk analysis (CSRA) that meets Headquarters (HQ), U.S. Army Corps of Engineers (USACE) requirements and successfully passes an agency technical review (ATR) can be found at *http://www.nww.usace.army.mil/Missions/CostEngineering.aspx*.

6.3.4 Risk Prioritization

The PM and the PDT will prioritize the MODERATE and HIGH risks in their disciplines or functional areas. This prioritization will provide the basis for the development of risk handling plans and the allocation of risk management resources. Prioritization will be accomplished using expert opinion within the PDT, and will be based on the following criteria:

- Risk Rating – MODERATE to HIGH
- Consequence/Impact – Within each rating, the highest value of consequence/impact
- Urgency – How much time is available before risk-handling actions must be initiated
- Probability/Likelihood – Within each rating, the highest value

The PDT will review the prioritized list of developed risks, and integrate them into a single list of prioritized project risks, using the same criteria.

6.4 Risk Response Planning and Mitigation

Following initial identification and analysis of risks, the PDT will develop an approach for risk handling for all key drivers of risk, including each MODERATE and HIGH risk. For all such risks, the various handling techniques should be evaluated in terms of

feasibility, expected effectiveness, cost and schedule implications, and the effect on the project's performance. Risk responses will also include an accompanying "fallback" plan if the primary treatment strategy is not effective at mitigating the impact of risk. Reducing requirements as a risk avoidance technique will be used only as a last resort, and then only with the participation and approval of District and Division Management.

In addition to developing approaches for handling each MODERATE and HIGH risk, the following will act as risk triggers requiring an immediate response and mitigation plan:

- Cost growth greater than 1% of the estimated project cost
- Schedule delays greater than 3 months
- Potential for significant damage to private or public property
- Potential for injury or loss of life
- Potential to generate media coverage (either positive or negative)
- Potential environmental degradation or release of deleterious substances
- Potential to alter political or stakeholder support

The results of the evaluation and selection will be included and documented. This documentation will include the following elements:

- What must be done,
- List of all assumptions,
- Level of effort and resources required,
- Resources needed that are outside the expertise of the PDT,
- Estimated cost to implement the plan,
- Proposed schedule showing the proposed start date, the time phasing of significant risk reduction activities, the completion date, and their relationship to significant project activities/milestones,
- Recommended metrics for tracking risk-handling activity,
- Considerations for secondary or residual risks implications, and
- Person responsible for implementing and tracking the selected option.

6.5 Risk Monitoring and Control

Risk monitoring is the systematic tracking and evaluation of the progress and effectiveness of risk-handling actions by the comparison of predicted results of planned actions with the results actually achieved to determine status and the need for any change in risk-handling actions. The Project Manager and the PDT will monitor all identified risks in their disciplines or areas, with particular attention to those risks rated as MODERATE OR HIGH.

6.5.1 Monitor Risk Status

As work is performed on the project, the PDT will monitor and assess:

- Progress in reducing risk,
- Occurrence of risks that call for initiation of contingent risk responses,
- Effectiveness of implemented risk reduction actions and any needs to modify these actions.

Risk status will be updated immediately when risks change and upon the completion of a project milestone. The status of the risks and the effectiveness of the risk-handling actions will be agenda items for all design and program reviews, and will be reported to the PM on the following occasions:

- Monthly,
- When the PDT determines that the status of the risk area has changed significantly (as a minimum when the risk changes from high to moderate to low, or vice versa),
- When requested by Management.

There are a number of techniques and tools available for monitoring the effectiveness of risk-handling actions. At a minimum, the PM and PDT will use the Risk Register and Watch List for day-to-day management and monitoring of risks.

MODERATE or HIGH risks will be monitored by the PM until the risk is considered LOW and recommended for "Close Out." Functional area leads will continue to monitor LOW risk events in their areas to ensure that appropriate risk-handling action can be initiated if there are indications that the rating may change.

6.5.2 Maintenance of Project Risk Register

Throughout the life cycle of the project, the PDT will update the Risk Register to reflect the results of monitoring risk status. This list will also reflect the effect of any project re-planning changes and/or change controls. Updates shall be made monthly to the risk register. Any changes to risk status upon event occurrence or completion of a project milestone will also be captured immediately on the risk register.

The Risk Register will be discussed at project team meetings and specific risks of concern should be elevated to the Pre-PRB, PRB and/or project sponsors as appropriate.

6.5.3 Maintenance of Project Watch List

Throughout the life cycle of the project, the PM and the PDT will maintain a project watch list to reflect the results of monitoring risk status. The watch list, at a minimum, will contain the:

- Potential Risk Event,
- Planned Risk Reduction Actions,

- Point of Contact/Assignment,
- Due Date, and
- Status.

6.6 Risk Communication

Risk communication is essential to actively managing risks throughout the project life cycle. Communication begins with the preparation of the Risk Management Plan and continues through project closeout. Subsequently, the preparation of the project risk register facilitates communication of risks at all levels. The Cost Engineering Dx will also prepare a report regarding the formal CSRA process to be incorporated within the Cost Appendix to the Engineering Appendix of the Feasibility Report.

The PDT will review the risk register monthly to provide visibility of risks and progress in mitigating them. If necessary, risk occurrences will be elevated to the Pre-PRB, PRB and/or project sponsors for their attention (note “internal” vs. “external” risks).

The following risk triggers, as contained in paragraph 6.4 above, shall prompt the immediate communication of risks to Management:

- Cost growth greater than 1% of the estimated project cost
- Schedule delays greater than 3 months
- Potential for significant damage to private or public property
- Potential for injury or loss of life
- Potential to generate media coverage (either positive or negative)
- Potential environmental degradation or release of deleterious substances
- Potential to alter political or stakeholder support

6.7 Risk Documentation and Closeout

When the project reaches the closeout phase, the PM and the PDT will document the final results of the execution of the Risk Management Plan for inclusion in the final project records and the District and/or Enterprise Lessons Learned database. At a minimum, this information will include risk assessment documents (including the risk register), risk-handling plans (including the project watch list), contract deliverables, if appropriate, and any other risk-related reports.

Appendix A – Cost and Schedule Risk Analysis

NOTE: PROJECT RISK REGISTER IS PROVIDED IN A SEPARATE DOCUMENT

Abbreviated Risk Analysis

Project (less than $40M): **Skokomish River GI Alternative 3**
Project Development Stage: **Feasibility (Alternatives)**
Risk Category: **Moderate Risk: Typical Project or Possible Life Safety**

Total Construction Contract Cost = **$ 3,692,112**

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ -		0.00%	$ -	$ -
1	11 01 LEVEES	Temporary Access	$ 542,487		38.38%	$ 208,196	$ 750,682.91
2	11 01 LEVEES	Material Disposal	$ 123,440		24.21%	$ 29,880	$ 153,320.29
3	11 01 LEVEES	Material Hauling	$ 518,620		28.60%	$ 148,349	$ 666,968.59
4	11 01 LEVEES	Care & Diversion of Water	$ 7,527		67.00%	$ 5,043	$ 12,570.25
5	11 01 LEVEES	Staging Areas	$ 72,820		10.90%	$ 7,936	$ 80,755.97
6	06 FISH AND WILDLIFE FACILITIES	Large Woody Debris	$ 131,803		65.48%	$ 86,303	$ 218,106.45
7	06 FISH AND WILDLIFE FACILITIES	Tree Planting	$ 1,374,101		22.19%	$ 304,980	$ 1,679,080.94
8	11 01 LEVEES	Levee Degrade	$ 288,718		50.44%	$ 145,635	$ 434,352.68
9					0.00%	$ -	$ -
10					0.00%	$ -	$ -
11					0.00%	$ -	$ -
12		Remaining Construction Items	$ 632,596	*20.7%*	26.08%	$ 164,983	$ 797,578.64
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ -		0.00%	$ -	$ -
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ -		0.00%	$ -	$ -

Totals					
Real Estate	$ -		0.00%	$ -	$ -
Total Construction Estimate	$ 3,692,112		29.83%	$ 1,101,305	$ 4,793,417
Total Planning, Engineering & Design	$ -		0.00%	$ -	$ -
Total Construction Management	$ -		0.00%	$ -	$ -
Total	$ 3,692,112			$ 1,101,305	$ 4,793,417

Skokomish River GI Alternative 3
Feasibility (Alternatives)
Abbreviated Risk Analysis

Meeting Date: 27-Mar-13

Risk Level

Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significant	Critical	Crisis

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth							
						Max Potential Cost Growth	**75%**
PS-1	Temporary Access	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	0
PS-2	Material Disposal	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	0
PS-3	Material Hauling	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	0
PS-4	Care & Diversion of Water	• Potential for scope growth, added features and quantities?	Currently the estimate assumes minimal water protection - silt fencing for in water work. If coffer dams or additional requirements are required this would increase the cost.	It's very likely that some level of additional work could be required. Most likely this would include a slight slow down in productivity to move silt curtains and sequence work. Team believes this could approach a 10% decrease. This corresponds to increase in project cost of $100,000.	Very LIKELY	Significant	4
PS-5	Staging Areas	• Potential for scope growth, added features and quantities?	Staging area issues are not expected to have issues.	N/A	Unlikely	Negligible	0
PS-6	Large Woody Debris	• Potential for scope growth, added features and quantities?	This feature is based largely on engineering assumptions by the design team.	Resource agencies may desire to increase the number LWD placements. This would likely be approximately a 10% increase.	Possible	Significant	2
PS-7	Tree Planting	• Potential for scope growth, added features and quantities?	Tree plantings requirements do not		Unlikely	Negligible	0
PS-8	Levee Degrade	• Potential for scope growth, added features and quantities?	Excavation footprint is conceptual, could design change as analysis progresses?	PDT believes that there will be changes, but that these would not substantially change quantities. Mostly they will be adjustments to accomadate natural changes in the river's flow.	Very LIKELY	Negligible	2
PS-9	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	0

PS-10	0	• Investigations sufficient to support design assumptions?			Unlikely	Negligible	**0**
PS-11	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-12	Remaining Construction Items	• Potential for scope growth, added features and quantities?	Design scope is conceptual, could changes occur that increase project cost farther along the design process?	It is very likely that this will occur but, the overall impacts should be negligible.	Very LIKELY	Negligible	**2**
PS-13	Planning, Engineering, & Design	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-14	Construction Management	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**

Acquisition Strategy

						Max Potential Cost Growth	30%
AS-1	Temporary Access	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-2	Material Disposal	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	2
AS-3	Material Hauling	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Significant	4
AS-4	Care & Diversion of Water	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	2
AS-5	Staging Areas	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	2
AS-6	Large Woody Debris	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Significant	4
AS-7	Tree Planting	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Significant	4
AS-8	Levee Degrade	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-9	0	• Contracting plan firmly established?			Unlikely	Negligible	0

AS-10	0	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-11	0	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-12	Remaining Construction Items	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	**3**
AS-13	Planning, Engineering, & Design	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-14	Construction Management	• Contracting plan firmly established?			Unlikely	Negligible	**0**

Construction Elements

							Max Potential Cost Growth	25%
CE-1	Temporary Access	• Accelerated schedule or harsh weather schedule?	Construction during periods of harsh weather may require additional effort to keep site in a workable condition. This has not been evaluated in the estimate.	Most construction is during the summer months, but unexpected storms or work that occurs outside of the windows increases the projects vulnerability to this. Contractor's may increase prices to allow for this.	Possible	Marginal		1
CE-2	Material Disposal	• Accelerated schedule or harsh weather schedule?	No investigations at the site have been done, could hazardous materials be found during excavation.	It's quite likely as the levee includes car bodies that will have contaminants within them. More than likely these will be point sources, but specialized disposal would be required.	Very LIKELY	Marginal		3
CE-3	Material Hauling	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible		0
CE-4	Care & Diversion of Water	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible		0
CE-5	Staging Areas	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible		0
CE-6	Large Woody Debris	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible		0
CE-7	Tree Planting	• Accelerated schedule or harsh weather schedule?	Harsh weather could cause plant death and require replantings	Multiple plantings per tree removed are likely to be required. It's not believed that additional replants will be needed.	Unlikely	Negligible		0
CE-8	Levee Degrade	• Accelerated schedule or harsh weather schedule?	N/A		Very LIKELY	Marginal		3
CE-9	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-10	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0

CE-11	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	0
CE-12	Remaining Construction Items	• Accelerated schedule or harsh weather schedule?	No construction element has been fully scoped. Further analysis may increase quantities.	Estimating was done conservatively and it is not believed that quantities could increase much past 10%. Some level of increase is likely however.	Likely	Negligible	1
CE-13	Planning, Engineering, & Design	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	0
CE-14	Construction Management	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	0

Quantities for Current Scope

					Max Potential Cost Growth		20%
Q-1	Temporary Access	• Level of confidence based on design and assumptions?	N/A		Unlikely	Negligible	0
Q-2	Material Disposal	• Level of confidence based on design and assumptions?	Quantities: talk to Rosa		Unlikely	Negligible	0
Q-3	Material Hauling	• Level of confidence based on design and assumptions?	Quantities: talk to Rosa		Unlikely	Negligible	0
Q-4	Care & Diversion of Water	• Possibility for increased quantities due to loss, waste, or subsidence?	Care and diversion of water elements may be prone to breakage during construction requiring their replacement.	Likely some level of damage would occur, but it's unlikely damage would be major.	Very LIKELY	Negligible	2
Q-5	Staging Areas	• Level of confidence based on design and assumptions?	Quantities for this are based on estimator assumptions.	Three 100'x100' staging areas are provided in the estimate. It is unlikely that these would need to be substantiall increased.	Unlikely	Marginal	0
Q-6	Large Woody Debris	• Level of confidence based on design and assumptions?	The need for additional placements of LWD jams are evaluated elsewhere, but the number of logs and boulders per jam is based off design team assumptions and typical sections.	These may vary at different design levels after evaluation. Even adding one additional log to each jam could substantially increase costs. The potential for some sort of variance is likely.	Likely	Significant	3
Q-7	Tree Planting	• Level of confidence based on design and assumptions?	Discussed elsewhere.		Unlikely	Negligible	0
Q-8	Levee Degrade	• Level of confidence based on design and assumptions?	The design quantities were based off of LIDAR data with 6 FT resolution, the profiles assumed could be underestimated.	The PDT believes there is a likely chance the quantities could be up to 15% higher than LIDAR data shows.	Likely	Significant	3
Q-9	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-10	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-11	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-12	Remaining Construction Items	• Level of confidence based on design and assumptions?	No construction element has been fully scoped. Further analysis may increase quantities.	Estimating was done conservatively and it is not believed that quantities could increase much past 10%. Some level of increase is likely however.	Likely	Negligible	1
Q-13	Planning, Engineering, & Design	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0

Q-14	Construction Management	• Level of confidence based on design and assumptions?			Unlikely	Negligible	**0**

Specialty Fabrication or Equipment

					Max Potential Cost Growth		75%
FE-1	Temporary Access	• Confidence in contractor's ability to install?	Site access assumes a temporary bridge will be placed across the North Fork. No design details are known, nor is an installation process well defined.	The bridge was estimated conservatively, based on standard features for a bridge capable of supporting truck traffic. However, there are risks that the bridge foundation may require additional effort. It is likely that some changes would be made, and the impacts at most would be 50% of the total bridge cost.	Likely	Significant	3
FE-2	Material Disposal	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-3	Material Hauling	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-4	Care & Diversion of Water	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-5	Staging Areas	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-6	Large Woody Debris	• Confidence in suppliers' ability?	A large number of LWDs and five to six man boulders are needed. It is not known how able local suppliers are to accomodate these needs.	If local vendors are not capable of supplying the required quantity of items, these will have to be imported from more distant sources potentially dramatically increasing costs.	Possible	Crisis	4
FE-7	Tree Planting	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-8	Levee Degrade	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-9	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-10	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-11	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-12	Remaining Construction Items	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-13	Planning, Engineering, & Design	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0

FE-14	Construction Management	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	**0**

Cost Estimate Assumptions

						Max Potential Cost Growth	35%
CT-1	Temporary Access	• Assumptions regarding crew, productivity, overtime?	Access is based almost entirely on estimator assumptions as design information was not available.	Conservative assumptions were made and it is likely that costs could both increase and decrease depending on later analysis. Assume costs do not increase more than 25% for this feature.	Likely	Significant	3
CT-2	Material Disposal	• Reliability and number of key quotes?	Local quotes were not obtained from immediately adjacent vendors for disposal.	While local quotes were not solicited, recently updated quotes for disposal rates were obtained for multiple regions within Western Washington. These were used in there place. Because of this costs increases are unlikely. However, an increase could have critical impacts due to the amount of soil being disposed of.	Unlikely	Significant	1
CT-3	Material Hauling	• Reliability and number of key quotes?	Haul routes have not been scoped by Civil Design and the estimator made a convervative assumption that there would be disposal within ten miles of the project site.	The team believes this is reasonable and identified a large potential disposal point within this range. Only issue may be a slight increase due to haul routes that have yet to be determined.	Unlikely	Significant	1
CT-4	Care & Diversion of Water	• Lack confidence on critical cost items?	It's not known exactly what requirements will be in place for Care and Diversion of Water.	Care and Diversion of Water costs have been critical on other projects, however, they are not expected to be a driving factor for this project given the nature of the work.	Possible	Marginal	1
CT-5	Staging Areas	• Reliability and number of key quotes?	Access is based almost entirely on estimator assumptions as design information was not available.	Conservative assumptions were made and it is possible that costs could both increase and decrease depending on later analysis. Assume costs do not increase more than 25% for this feature.	Possible	Negligible	0
CT-6	Large Woody Debris	• Reliability and number of key quotes?	N/A		Unlikely	Negligible	0
CT-7	Tree Planting	• Reliability and number of key quotes?	N/A		Unlikely	Negligible	0
CT-8	Levee Degrade	• Reliability and number of key quotes?	Current in-water work duration is 55 days. It is unknown if work permits can be secured for this duration.	It is very likely that the current duration is too long and that an additional shift or overtime will be required for this feature to insure project completion in allowed windows.	Very LIKELY	Significant	4
CT-9	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-10	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-11	0	• Reliability and number of key quotes?			Unlikely	Negligible	0

CT-12	Remaining Construction Items	• Reliability and number of key quotes?	A number of assumption were made regarding project elements.	Large increases are unlikely but some variation in costs are possible.	Possible	Marginal	1
CT-13	Planning, Engineering, & Design	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-14	Construction Management	• Reliability and number of key quotes?			Unlikely	Negligible	0

External Project Risks

						Max Potential Cost Growth	40%
EX-1	Temporary Access	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-2	Material Disposal	• Potential for market volatility impacting competition, pricing?	Other projects occuring in the area could impact availability of disposal areas.	Unlikely to occur in this area. If it did occur, cost would increase due to longer haul routes. Increases would be substantial due to large volume of soil being hauled.	Unlikely	Critical	2
EX-3	Material Hauling	• Unanticipated inflations in fuel, key materials?	Due to heavy usage of diesel trucks, moderate spikes in fuel prices may have large impacts to project cost.	A $0.50 increase in fuel prices causes a $30,000 feature cost increase.	Likely	Marginal	2
EX-4	Care & Diversion of Water	• Political influences, lack of support, obstacles?	Permits are often require for projects with in-water work. It is unclear what the scope of these might be.	PDT believes that these are very likely and could have significant ($100K) consequences. Permits must be sought from WA DOE and for ESA impacts.	Very LIKELY	Significant	4
EX-5	Staging Areas	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-6	Large Woody Debris	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-7	Tree Planting	• Potential for severe adverse weather?	Tree plantings do not account for replanting requirements that agencies may add as part of their review of the project.	Team feels that the amount of tree plantings included in the project are more than sufficient to account for trees required by resource agencies. If anything the number of trees may be too many.	Unlikely	Negligible	0
EX-8	Levee Degrade	• Political influences, lack of support, obstacles?	Cultural Resources were not evaluated as part of the estimate. Could sites of archaelogical significance be found? If so, what are the consequences?		Unlikely	Negligible	0
EX-9	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-10	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-11	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-12	Remaining Construction Items	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-13	Planning, Engineering, & Design	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-14	Construction Management	• Potential for severe adverse weather?			Unlikely	Negligible	0

Abbreviated Risk Analysis

Project (less than $40M): **Grange Dike Setback**
Project Development Stage: **Feasibility (Alternatives)**
Risk Category: **Moderate Risk: Typical Project or Possible Life Safety**

Total Construction Contract Cost = **$ 1,951,748**

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ -		25.00%	$ -	$ -
1	11 01 LEVEES	Overexcavation	$ 104,169		14.70%	$ 15,309	$ 119,477.82
2	11 01 LEVEES	Material Disposal	$ 51,665		30.31%	$ 15,658	$ 67,322.92
3	11 01 LEVEES	Material Hauling	$ 648,056		53.37%	$ 345,875	$ 993,931.30
4	11 01 LEVEES	Levee Degrade	$ 87,345		23.63%	$ 20,643	$ 107,988.40
5	11 01 LEVEES	Staging Areas	$ 87,156		14.70%	$ 12,809	$ 99,964.56
6	11 01 LEVEES	Levee Construction	$ 698,301		36.26%	$ 253,208	$ 951,508.53
7	08 01 ROADS	Construct New Roadway	$ 145,144		50.47%	$ 73,252	$ 218,395.94
8					0.00%	$ -	$ -
9					0.00%	$ -	$ -
10					0.00%	$ -	$ -
11					0.00%	$ -	$ -
12		**Remaining Construction Items**	**$ 129,912**	*7.1%*	7.00%	$ 9,094	$ 139,005.84
13	30 PLANNING, ENGINEERING, AND DESIGN	**Planning, Engineering, & Design**	$ -		0.00%	$ -	$ -
14	31 CONSTRUCTION MANAGEMENT	**Construction Management**	$ -		0.00%	$ -	$ -

Totals					
Real Estate	$ -	0.00%	$ -	$ -	
Total Construction Estimate	$ 1,951,748	38.21%	$ 745,847	$ 2,697,595	
Total Planning, Engineering & Design	$ -	0.00%	$ -	$ -	
Total Construction Management	$ -	0.00%	$ -	$ -	
Total	$ 1,951,748		$ 745,847	$ 2,697,595	

Grange Dike Setback
Feasibility (Alternatives)
Abbreviated Risk Analysis

Meeting Date: 27-Mar-13

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth							
						Max Potential Cost Growth	**75%**
PS-1	Overexcavation	• Potential for scope growth, added features and quantities?	Overexacavation is conceptual based on the levee prism and without any boring log data available. The scope of this feature is not expected to change based on current information.	N/A	Unlikely	Negligible	0
PS-2	Material Disposal	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	0
PS-3	Material Hauling	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	0
PS-4	Levee Degrade	• Potential for scope growth, added features and quantities?	Excavation footprint is conceptual, could design change as analysis progresses?	PDT believes that there will be changes, but that these would not substantially change quantities. The levee profile was based off of LIDAR data and the alignment might change but the total quantities should remain relatively unchanged.	Very LIKELY	Negligible	2
PS-5	Staging Areas	• Potential for scope growth, added features and quantities?	Staging area assumptions are assumed to be conservative for this feature of work.	N/A	Unlikely	Negligible	0
PS-6	Levee Construction	• Potential for scope growth, added features and quantities?	Excavation footprint is conceptual, could design change as analysis progresses?	PDT believes that there will be changes to the alignment but that the total LF of levee construction should remain close to the total in the feasability drawings.	Very LIKELY	Negligible	2
PS-7	Construct New Roadway	• Potential for scope growth, added features and quantities?	Could the alignment of the levee change to include greater road demolition	The alignment of the levee is likely to change from the feasibility conceptual layout. There is a possible chance this will include increased roadway demolition; however it is not expected to be any greater than double the LF of demolition.	Likely	Critical	4
PS-8	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	0
PS-9	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	0

PS-10	0	• Investigations sufficient to support design assumptions?			Unlikely	Negligible	**0**
PS-11	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-12	Remaining Construction Items	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	**0**
PS-13	Planning, Engineering, & Design	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-14	Construction Management	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**

Acquisition Strategy

							Max Potential Cost Growth	30%
AS-1	Overexcavation	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal		3
AS-2	Material Disposal	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible		2
AS-3	Material Hauling	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Significant		4
AS-4	Levee Degrade	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal		3
AS-5	Staging Areas	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal		3
AS-6	Levee Construction	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Significant		4
AS-7	Construct New Roadway	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal		3
AS-8	0	• Contracting plan firmly established?			Unlikely	Negligible		0
AS-9	0	• Contracting plan firmly established?			Unlikely	Negligible		0

AS-10	0	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-11	0	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-12	Remaining Construction Items	• Contracting plan firmly established?	N/A		Unlikely	Negligible	**0**
AS-13	Planning, Engineering, & Design	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-14	Construction Management	• Contracting plan firmly established?			Unlikely	Negligible	**0**

Construction Elements

							Max Potential Cost Growth	25%
CE-1	Overexcavation	• Accelerated schedule or harsh weather schedule?	See CE-2		Unlikely	Negligible		0
CE-2	Material Disposal	• Accelerated schedule or harsh weather schedule?	No investigations at the site have been done, could hazardous materials be found during excavation.	An HTRW study of the levee has not been conducted but based on the location of the current levee and the proposed setback levee construction placement the PDT estimates there is an unlikely chance of encountering contaminats. Estimating a 25% increased cost for disposal of contaminated materials	Unlikely	Marginal		0
CE-3	Material Hauling	• Accelerated schedule or harsh weather schedule?	No investigations at the site have been done, could hazardous materials be found during excavation.	An HTRW study of the levee has not been conducted but based on the location of the current levee and the proposed setback levee construction placement the PDT estimates there is an unlikely chance of encountering contaminats. Estimating the hauling distance could double to find a suitable disposal site as a result of the rural project location.	Unlikely	Crisis		3
CE-4	Levee Degrade	• Accelerated schedule or harsh weather schedule?	See CE-2		Unlikely	Negligible		0
CE-5	Staging Areas	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible		0
CE-6	Levee Construction	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible		0
CE-7	Construct New Roadway	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible		0
CE-8	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-9	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-10	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0

CE-11	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**
CE-12	Remaining Construction Items	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible	**0**
CE-13	Planning, Engineering, & Design	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**
CE-14	Construction Management	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**

Quantities for Current Scope

					Max Potential Cost Growth		20%
Q-1	Overexcavation	• Level of confidence based on design and assumptions?	N/A	The overexcavation quantities are conservative based on the available information.	Unlikely	Marginal	0
Q-2	Material Disposal	• Level of confidence based on design and assumptions?	The design quantities were based off of LIDAR data with 6 FT resolution, the profiles assumed could be underestimated.	The PDT believes there is a likely chance the quantities could be up to 15% higher than LIDAR data shows.	Likely	Negligible	1
Q-3	Material Hauling	• Level of confidence based on design and assumptions?	The design quantities were based off of LIDAR data with 6 FT resolution, the profiles assumed could be underestimated.	The PDT believes there is a likely chance the quantities could be up to 15% higher than LIDAR data shows.	Likely	Critical	4
Q-4	Levee Degrade	• Level of confidence based on design and assumptions?	The design quantities were based off of LIDAR data with 6 FT resolution, the profiles assumed could be underestimated.	The PDT believes there is a likely chance the quantities could be up to 15% higher than LIDAR data shows.	Likely	Marginal	2
Q-5	Staging Areas	• Level of confidence based on design and assumptions?	Quantities for this are based on estimator assumptions.	100'x100' staging area are provided in the estimate. It is unlikely that this would need to be substantially increased.	Unlikely	Marginal	0
Q-6	Levee Construction	• Level of confidence based on design and assumptions?	N/A	The levee prism size is conservative based on available information.	Unlikely	Negligible	0
Q-7	Construct New Roadway	• Level of confidence based on design and assumptions?	See PS-7		Unlikely	Negligible	0
Q-8	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-9	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-10	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-11	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-12	Remaining Construction Items	• Level of confidence based on design and assumptions?	N/A		Unlikely	Negligible	0
Q-13	Planning, Engineering, & Design	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0

Q-14	Construction Management	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0

Specialty Fabrication or Equipment

					Max Potential Cost Growth		75%
FE-1	Overexcavation	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-2	Material Disposal	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-3	Material Hauling	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-4	Levee Degrade	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-5	Staging Areas	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-6	Levee Construction	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-7	Construct New Roadway	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-8	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-9	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-10	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-11	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-12	Remaining Construction Items	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-13	Planning, Engineering, & Design	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0

FE-14	Construction Management	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0

Cost Estimate Assumptions

						Max Potential Cost Growth	35%
CT-1	Overexcavation	• Reliability and number of key quotes?	N/A		Unlikely	Negligible	0
CT-2	Material Disposal	• Reliability and number of key quotes?	Haul routes have not been scoped by Civil Design and the estimator made a convervative assumption that there would be disposal within ten miles of the project site.	The team believes this is reasonable and identified a large potential disposal point within this range. If the adjacent quarry is not able to take the material the hauling distance could reach up to 20 miles.	Unlikely	Crisis	3
CT-3	Material Hauling	• Reliability and number of key quotes?	Local quotes were not obtained from immediately adjacent vendors for disposal.	While local quotes were not solicited, recently updated quotes for disposal rates were obtained for multiple regions within Western Washington. These were used in there place. Because of this costs increases are unlikely. It is not expected that the costs would exceed an increase of 100%	Unlikely	Critical	2
CT-4	Levee Degrade	• Reliability and number of key quotes?	No concerns. Crews are custom built and productivity rates are based on calculated, conservative values.		Unlikely	Negligible	0
CT-5	Staging Areas	• Reliability and number of key quotes?	Estimator assumed that the site was accessible to LGP equipment without issue. Changes may decrease productivity.	Based on the location of the existing levee and the proposed setback levee additional access impacts are expected to be marginal.	Unlikely	Marginal	0
CT-6	Levee Construction	• Reliability and number of key quotes?	Would this levee require the inclusion of geotextiles and geogrid stabilization.	The size of this levee prism is not expected to require the use of geotextiles or geogrids.	Possible	Critical	3
CT-7	Construct New Roadway	• Reliability and number of key quotes?	Local quotes were not obtained from immediately adjacent vendors for asphalt and fill material.	While local quotes were not solicited, recent quotes for asphalt and fill for multiple regions within Western Washington were obtained. These were used in there place. Because of this costs increases are unlikely. It is not expected that the costs would exceed an increase of 25%	Possible	Significant	2
CT-8	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-9	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-10	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-11	0	• Reliability and number of key quotes?			Unlikely	Negligible	0

CT-12	Remaining Construction Items	• Reliability and number of key quotes?	N/A		Unlikely	Negligible	0
CT-13	Planning, Engineering, & Design	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-14	Construction Management	• Reliability and number of key quotes?			Unlikely	Negligible	0

External Project Risks

							Max Potential Cost Growth	40%
EX-1	Overexcavation	• Potential for severe adverse weather?			Unlikely	Negligible		0
EX-2	Material Disposal	• Potential for severe adverse weather?	Other projects occuring in the area could impact availability of disposal areas.	Unlikely to occur in this area. If it did occur, cost would increase due to longer haul routes. Assume the haul distance could possibly double.	Unlikely	Crisis		3
EX-3	Material Hauling	• Potential for severe adverse weather?	Due to heavy usage of diesel trucks, moderate spikes in fuel prices may have large impacts to project cost.	A $0.50 increase in fuel prices causes a $33.6K feature cost increase.	Likely	Significant		3
EX-4	Levee Degrade	• Potential for severe adverse weather?	N/A		Unlikely	Negligible		0
EX-5	Staging Areas	• Potential for severe adverse weather?	N/A		Unlikely	Negligible		0
EX-6	Levee Construction	• Potential for severe adverse weather?	N/A		Unlikely	Negligible		0
EX-7	Construct New Roadway	• Potential for severe adverse weather?	N/A		Unlikely	Negligible		0
EX-8	0	• Potential for severe adverse weather?			Unlikely	Negligible		0
EX-9	0	• Potential for severe adverse weather?			Unlikely	Negligible		0
EX-10	0	• Potential for severe adverse weather?			Unlikely	Negligible		0
EX-11	0	• Potential for severe adverse weather?			Unlikely	Negligible		0
EX-12	Remaining Construction Items	• Potential for severe adverse weather?	N/A		Unlikely	Negligible		0
EX-13	Planning, Engineering, & Design	• Potential for severe adverse weather?			Unlikely	Negligible		0
EX-14	Construction Management	• Potential for severe adverse weather?			Unlikely	Negligible		0

Abbreviated Risk Analysis

Project (less than $40M): **Skokomish River GI - Hunter Creek**
Project Development Stage: **Feasibility (Alternatives)**
Risk Category: **Moderate Risk: Typical Project or Possible Life Safety**

Total Construction Contract Cost = **$ 2,865,849**

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ -		0.00%	$ -	$ -
1	09 01 CHANNELS	Material Hauling	$ 1,393,592		66.68%	$ 929,268	$ 2,322,860.50
2	09 01 CHANNELS	Material Disposal	$ 279,600		34.28%	$ 95,858	$ 375,458.13
3	09 01 CHANNELS	Channel Excavation	$ 397,302		29.88%	$ 118,700	$ 516,001.59
4	09 01 CHANNELS	Care & Diversion of Water	$ 22,255		34.30%	$ 7,634	$ 29,888.51
5	09 01 CHANNELS	Staging Areas	$ 87,156		14.75%	$ 12,860	$ 100,015.69
6	09 01 CHANNELS	Off-Road Haul	$ 533,727		22.63%	$ 120,804	$ 654,530.59
7					0.00%	$ -	$ -
8					0.00%	$ -	$ -
9					0.00%	$ -	$ -
10					0.00%	$ -	$ -
11					0.00%	$ -	$ -
12		Remaining Construction Items	$ 152,217	*5.6%*	25.67%	$ 39,075	$ 191,291.85
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ -		0.00%	$ -	$ -
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ -		0.00%	$ -	$ -

Totals					
Real Estate	$ -		0.00%	$ -	$ -
Total Construction Estimate	$ 2,865,849		46.21%	$ 1,324,198	$ 4,190,047
Total Planning, Engineering & Design	$ -		0.00%	$ -	$ -
Total Construction Management	$ -		0.00%	$ -	$ -
Total	$ 2,865,849			$ 1,324,198	$ 4,190,047

Skokomish River GI - Hunter Creek
Feasibility (Alternatives)
Abbreviated Risk Analysis

Meeting Date: 28-Mar-13

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth							
					Max Potential Cost Growth		**75%**
PS-1	Material Hauling	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	0
PS-2	Material Disposal	• Potential for scope growth, added features and quantities?	The presences of HAZMAT has not been accounted for in the estimate. If found it could dramatically incrase disposal costs.	It's possible the could be found. If they did exist, the team expects that only point sources would be found (buried paint cans, etc) requiring only a marginal cost increase.	Possible	Marginal	1
PS-3	Channel Excavation	• Potential for scope growth, added features and quantities?	Excavation footprint is conceptual, could design change as analysis progresses?	The footprint of the creek channels is not expected to differ greatly from what is proposed in the conceptual phase. Any changes would be in alignment and should not impact the quantities or scope of work.	Unlikely	Negligible	0
PS-4	Care & Diversion of Water	• Water care and diversion fully understood, planned?	Currently the estimate assumes minimal water protection - silt fencing for in water work. If coffer dams or additional requirements are required this would increase the cost.	Most of the side channels are in the dry, it is not expected at additional care and diversion of water will be required beyond silt fencing at the reconnection point to the main river.	Possible	Marginal	1
PS-5	Staging Areas	• Potential for scope growth, added features and quantities?	Staging area issues are not expected to have issues.	N/A	Unlikely	Negligible	0
PS-6	Off-Road Haul	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	0
PS-7	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	0
PS-8	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	0
PS-9	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	0

PS-10	0	• Investigations sufficient to support design assumptions?			Unlikely	Negligible	**0**
PS-11	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-12	Remaining Construction Items	• Potential for scope growth, added features and quantities?	Design scope is conceptual, could changes occur that increase project cost farther along the design process?	It is very likely that this will occur but, the overall impacts should be negligible.	Very LIKELY	Negligible	**2**
PS-13	Planning, Engineering, & Design	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-14	Construction Management	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**

Acquisition Strategy

					Max Potential Cost Growth		30%
AS-1	Material Hauling	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Significant	4
AS-2	Material Disposal	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-3	Channel Excavation	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-4	Care & Diversion of Water	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	2
AS-5	Staging Areas	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	2
AS-6	Off-Road Haul	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-7	0	• Contracting plan firmly established?			Unlikely	Negligible	0
AS-8	0	• Contracting plan firmly established?			Unlikely	Negligible	0
AS-9	0	• Contracting plan firmly established?			Unlikely	Negligible	0

AS-10	0	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-11	0	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-12	Remaining Construction Items	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	**3**
AS-13	Planning, Engineering, & Design	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-14	Construction Management	• Contracting plan firmly established?			Unlikely	Negligible	**0**

Construction Elements

							Max Potential Cost Growth	25%
CE-1	Material Hauling	• Accelerated schedule or harsh weather schedule?	No investigations at the site have been done, could hazardous materials be found during excavation.	An HTRW study of the levee has not been conducted but based on the location of the current levee and the proposed setback levee construction placement the PDT estimates there is an unlikely chance of encountering contaminats. Estimating the hauling distance could double to find a suitable disposal site as a result of the rural project location.	Unlikely	Crisis		3
CE-2	Material Disposal	• Unique construction methods?	No investigations at the site have been done, could hazardous materials be found during excavation.	An HTRW study of the levee has not been conducted but based on the location of the current levee and the proposed setback levee construction placement the PDT estimates there is an unlikely chance of encountering contaminats. Estimating a 25% increased cost for disposal of contaminated materials	Unlikely	Negligible		0
CE-3	Channel Excavation	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible		0
CE-4	Care & Diversion of Water	• Accelerated schedule or harsh weather schedule?	If a flood occurs, emergency demobilization may be required.	Possible to occur, and could have marginal cost impacts.	Possible	Marginal		1
CE-5	Staging Areas	• Accelerated schedule or harsh weather schedule?	Staging areas assume tree replanting post project. Could additional tree plantings be required?	Assumed requirements are sufficiently conservative.	Unlikely	Negligible		0
CE-6	Off-Road Haul	• Accelerated schedule or harsh weather schedule?	What if the staging area can not be located adajacent to the work site?	Additional access roads would need to be constructed in order to connect the highway trucks with the off road dump trucks.	Possible	Marginal		1
CE-7	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-8	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-9	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-10	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0

CE-11	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**
CE-12	Remaining Construction Items	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible	**0**
CE-13	Planning, Engineering, & Design	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**
CE-14	Construction Management	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**

Quantities for Current Scope

					Max Potential Cost Growth		20%
Q-1	Material Hauling	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is a likely chance of the quantities increasing from conceptual design stage, up to an increase of 25% greater.	Likely	Crisis	5
Q-2	Material Disposal	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is a likely chance of the quantities increasing from conceptual design stage, up to an increase of 25% greater.	Likely	Significant	3
Q-3	Channel Excavation	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is a likely chance of the quantities increasing from conceptual design stage, up to an increase of 25% greater.	Likely	Significant	3
Q-4	Care & Diversion of Water	• Level of confidence based on design and assumptions?	N/A		Unlikely	Negligible	0
Q-5	Staging Areas	• Sufficient investigations to develop quantities?	Staging area sizing is based on estimator assumptions. No construction personnel have provided input for this item.	While a conservative approach was taken, it is possible that there could be increases. A 25% increase in staging area requirements would have a marginal impact on overall cost ($60K).	Possible	Marginal	1
Q-6	Off-Road Haul	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is a likely chance of the quantities increasing from conceptual design stage, up to an increase of 25% greater.	Likely	Significant	3
Q-7	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-8	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-9	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-10	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-11	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-12	Remaining Construction Items	• Level of confidence based on design and assumptions?	No construction element has been fully scoped. Further analysis may increase quantities.	Estimating was done conservatively and it is not believed that quantities could increase much past 10%. Some level of increase is likely however.	Likely	Marginal	2

Q-13	Planning, Engineering, & Design	• Level of confidence based on design and assumptions?			Unlikely	Negligible	**0**
Q-14	Construction Management	• Level of confidence based on design and assumptions?			Unlikely	Negligible	**0**

Specialty Fabrication or Equipment

					Max Potential Cost Growth		75%
FE-1	Material Hauling	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-2	Material Disposal	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-3	Channel Excavation	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-4	Care & Diversion of Water	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-5	Staging Areas	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-6	Off-Road Haul	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-7	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-8	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-9	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-10	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-11	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-12	Remaining Construction Items	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-13	Planning, Engineering, & Design	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0

FE-14	Construction Management	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	**0**

Cost Estimate Assumptions

						Max Potential Cost Growth	35%
CT-1	Material Hauling	• Site accessibility, transport delays, congestion?	Haul routes have not been scoped by Civil Design and the estimator made a convervative assumption that there would be disposal within ten miles of the project site.	The team believes this is reasonable and identified a large potential disposal point within this range. If the proposed disposal site is not avaialbe the hauling distance could increase by 100%	Unlikely	Crisis	3
CT-2	Material Disposal	• Reliability and number of key quotes?	Local quotes were not obtained from immediately adjacent vendors for disposal.	While local quotes were not solicited, recently updated quotes for disposal rates were obtained for multiple regions within Western Washington. These were used in there place. Because of this costs increases are unlikely an increase of up to 50% could be encountered.	Unlikely	Significant	1
CT-3	Channel Excavation	• Reliability and number of key quotes?	No concerns. Crews are custom built and productivity rates are based on calculated, conservative values.	N/A	Unlikely	Negligible	0
CT-4	Care & Diversion of Water	• Reliability and number of key quotes?	N/A		Unlikely	Negligible	0
CT-5	Staging Areas	• Site accessibility, transport delays, congestion?	Estimator assumed that the site was accessible to LGP equipment without issue. Changes may decrease productivity. Also assumed that equipment would use the creek channels to access work locations without the need for access road construction.	Team agrees that there will be no issues with overall access. There may potentially be a need to build additional access roads.	Possible	Marginal	1
CT-6	Off-Road Haul	• Reliability and number of key quotes?	See CE-6		Unlikely	Negligible	0
CT-7	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-8	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-9	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-10	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-11	0	• Reliability and number of key quotes?			Unlikely	Negligible	0

CT-12	Remaining Construction Items	• Assumptions regarding crew, productivity, overtime?	A number of assumption were made regarding project elements.	Large increases are unlikely but some variation in costs are possible.	Possible	Marginal	1
CT-13	Planning, Engineering, & Design	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-14	Construction Management	• Reliability and number of key quotes?			Unlikely	Negligible	0

External Project Risks

					Max Potential Cost Growth		40%
EX-1	Material Hauling	• Unanticipated inflations in fuel, key materials?	Due to heavy usage of diesel trucks, moderate spikes in fuel prices may have large impacts to project cost.	A $0.50 increase in fuel prices causes a $79,000 feature cost increase.	Likely	Significant	3
EX-2	Material Disposal	• Potential for market volatility impacting competition, pricing?	Other projects occuring in the area could impact availability of disposal areas.	Unlikely to occur in this area. If it did occur, cost would increase due to longer haul routes. Increases would be substantial due to large volume of soil being hauled.	Unlikely	Crisis	3
EX-3	Channel Excavation	• Unanticipated inflations in fuel, key materials?	The water table might be too high during the winter season	This feature of work is expected to take less than 30 days to complete. With proper construction sequencing it is unlikely that the water table will impact construction. If the construction did take place in the winter months the impact would be a reduce productivity and perhaps the need for swamp mats on the site.	Likely	Significant	3
EX-4	Care & Diversion of Water	• Political influences, lack of support, obstacles?	Permits are often require for projects with in-water work. It is unclear what the scope of these might be.	PDT believes that these are very likely and could have significant ($100K) consequences. Permits must be sought from WA DOE and for ESA impacts.	Very LIKELY	Significant	4
EX-5	Staging Areas	• Potential for severe adverse weather?	N/A		Unlikely	Negligible	0
EX-6	Off-Road Haul	• Potential for severe adverse weather?	N/A		Unlikely	Negligible	0
EX-7	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-8	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-9	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-10	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-11	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-12	Remaining Construction Items	• Potential for severe adverse weather?	N/A		Unlikely	Negligible	0
EX-13	Planning, Engineering, & Design	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-14	Construction Management	• Potential for severe adverse weather?			Unlikely	Negligible	0

Abbreviated Risk Analysis

Project (less than $40M): **Large Levee Setback**
Project Development Stage: **Feasibility (Alternatives)**
Risk Category: **Moderate Risk: Typical Project or Possible Life Safety**

Total Construction Contract Cost = **$ 1,606,703**

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ -		25.00%	$ -	$ -
1	11 01 LEVEES	Overexcavation	$ 113,275		22.19%	$ 25,141	$ 138,416.24
2	11 01 LEVEES	Material Disposal	$ 40,114		31.80%	$ 12,756	$ 52,870.46
3	11 01 LEVEES	Material Hauling	$ 572,145		48.42%	$ 277,031	$ 849,176.33
4	11 01 LEVEES	Levee Degrade	$ 31,274		19.84%	$ 6,204	$ 37,477.59
5	11 01 LEVEES	Staging Areas	$ 87,156		14.70%	$ 12,809	$ 99,964.56
6	11 01 LEVEES	Levee Construction	$ 417,441		37.91%	$ 158,243	$ 575,684.03
7					0.00%	$ -	$ -
8					0.00%	$ -	$ -
9					0.00%	$ -	$ -
10					0.00%	$ -	$ -
11					0.00%	$ -	$ -
12		**Remaining Construction Items**	$ **345,298**	*27.4%*	35.89%	$ 123,924	$ 469,221.81
13	30 PLANNING, ENGINEERING, AND DESIGN	**Planning, Engineering, & Design**	$ -		0.00%	$ -	$ -
14	31 CONSTRUCTION MANAGEMENT	**Construction Management**	$ -		0.00%	$ -	$ -

Totals					
Real Estate	$ -		0.00%	$ -	$ -
Total Construction Estimate	$ 1,606,703		38.35%	$ 616,108	$ 2,222,811
Total Planning, Engineering & Design	$ -		0.00%	$ -	$ -
Total Construction Management	$ -		0.00%	$ -	$ -
Total	$ 1,606,703			$ 616,108	$ 2,222,811

Large Levee Setback
Feasibility (Alternatives)
Abbreviated Risk Analysis

Meeting Date: 27-Mar-13

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth							
						Max Potential Cost Growth	**75%**
PS-1	Overexcavation	• Potential for scope growth, added features and quantities?	Overexacavation is conceptual based on the levee prism and without any boring log data available. The scope of this feature is not expected to change based on current information.	N/A	Unlikely	Negligible	0
PS-2	Material Disposal	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	0
PS-3	Material Hauling	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	0
PS-4	Levee Degrade	• Potential for scope growth, added features and quantities?	Excavation footprint is conceptual, could design change as analysis progresses?	PDT believes that there will be changes, but that these would not substantially change quantities. The levee profile was based off of LIDAR data and the alignment might change but the total quantities should remain relatively unchanged.	Very LIKELY	Negligible	2
PS-5	Staging Areas	• Potential for scope growth, added features and quantities?	Staging area assumptions are assumed to be conservative for this feature of work.	N/A	Unlikely	Negligible	0
PS-6	Levee Construction	• Potential for scope growth, added features and quantities?	Excavation footprint is conceptual, could design change as analysis progresses?	PDT believes that there will be changes to the alignment but that the total LF of levee construction should remain close to the total in the feasability drawings.	Very LIKELY	Negligible	2
PS-7	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	0
PS-8	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	0
PS-9	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	0

PS-10	0	• Investigations sufficient to support design assumptions?			Unlikely	Negligible	**0**
PS-11	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-12	Remaining Construction Items	• Potential for scope growth, added features and quantities?	Design scope is conceptual, could changes occur that increase project cost farther along the design process?	It is very likely that this will occur but, the overall impacts should be negligible.	Very LIKELY	Negligible	**2**
PS-13	Planning, Engineering, & Design	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-14	Construction Management	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**

Acquisition Strategy

						Max Potential Cost Growth	30%
AS-1	Overexcavation	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Significant	4
AS-2	Material Disposal	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	2
AS-3	Material Hauling	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Significant	4
AS-4	Levee Degrade	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	2
AS-5	Staging Areas	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-6	Levee Construction	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-7	0	• Contracting plan firmly established?			Unlikely	Negligible	0
AS-8	0	• Contracting plan firmly established?			Unlikely	Negligible	0
AS-9	0	• Contracting plan firmly established?			Unlikely	Negligible	0

AS-10	0	• Contracting plan firmly established?			Unlikely	Negligible	0
AS-11	0	• Contracting plan firmly established?			Unlikely	Negligible	0
AS-12	Remaining Construction Items	• Contracting plan firmly established?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Significant	4
AS-13	Planning, Engineering, & Design	• Contracting plan firmly established?			Unlikely	Negligible	0
AS-14	Construction Management	• Contracting plan firmly established?			Unlikely	Negligible	0

Construction Elements

						Max Potential Cost Growth	25%
CE-1	Overexcavation	• Accelerated schedule or harsh weather schedule?	See CE-2		Unlikely	Negligible	0
CE-2	Material Disposal	• Accelerated schedule or harsh weather schedule?	No investigations at the site have been done, could hazardous materials be found during excavation.	An HTRW study of the levee has not been conducted but based on the location of the current levee and the proposed setback levee construction placement the PDT estimates there is an unlikely chance of encountering contaminats. Estimating a 25% increased cost for disposal of contaminated materials	Unlikely	Marginal	0
CE-3	Material Hauling	• Accelerated schedule or harsh weather schedule?	No investigations at the site have been done, could hazardous materials be found during excavation.	An HTRW study of the levee has not been conducted but based on the location of the current levee and the proposed setback levee construction placement the PDT estimates there is an unlikely chance of encountering contaminats. Estimating the hauling distance could double to find a suitable disposal site as a result of the rural project location.	Unlikely	Crisis	3
CE-4	Levee Degrade	• Accelerated schedule or harsh weather schedule?	See CE-2		Unlikely	Negligible	0
CE-5	Staging Areas	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible	0
CE-6	Levee Construction	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible	0
CE-7	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	0
CE-8	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	0
CE-9	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	0
CE-10	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	0

CE-11	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**
CE-12	Remaining Construction Items	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible	**0**
CE-13	Planning, Engineering, & Design	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**
CE-14	Construction Management	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**

Quantities for Current Scope

					Max Potential Cost Growth		20%
Q-1	Overexcavation	• Level of confidence based on design and assumptions?	N/A	The overexcavation quantities are conservative based on the available information.	Unlikely	Marginal	0
Q-2	Material Disposal	• Level of confidence based on design and assumptions?	The design quantities were based off of LIDAR data with 6 FT resolution, the profiles assumed could be underestimated.	The PDT believes there is a likely chance the quantities could be up to 15% higher than LIDAR data shows.	Likely	Marginal	2
Q-3	Material Hauling	• Level of confidence based on design and assumptions?	The design quantities were based off of LIDAR data with 6 FT resolution, the profiles assumed could be underestimated.	The PDT believes there is a likely chance the quantities could be up to 15% higher than LIDAR data shows.	Likely	Significant	3
Q-4	Levee Degrade	• Level of confidence based on design and assumptions?	The design quantities were based off of LIDAR data with 6 FT resolution, the profiles assumed could be underestimated.	The PDT believes there is a likely chance the quantities could be up to 15% higher than LIDAR data shows.	Likely	Marginal	2
Q-5	Staging Areas	• Level of confidence based on design and assumptions?	Quantities for this are based on estimator assumptions.	100'x100' staging area are provided in the estimate. It is unlikely that this would need to be substantially increased.	Unlikely	Marginal	0
Q-6	Levee Construction	• Level of confidence based on design and assumptions?	N/A	The levee prism size is conservative based on available information.	Unlikely	Negligible	0
Q-7	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-8	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-9	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-10	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-11	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-12	Remaining Construction Items	• Level of confidence based on design and assumptions?	No construction element has been fully scoped. Further analysis may increase quantities.	Estimating was done conservatively and it is not believed that quantities could increase much past 10%. Some level of increase is likely however.	Likely	Significant	3
Q-13	Planning, Engineering, & Design	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0

Q-14	Construction Management	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0

Specialty Fabrication or Equipment

					Max Potential Cost Growth		75%
FE-1	Overexcavation	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-2	Material Disposal	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-3	Material Hauling	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-4	Levee Degrade	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-5	Staging Areas	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-6	Levee Construction	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-7	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-8	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-9	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-10	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-11	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-12	Remaining Construction Items	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-13	Planning, Engineering, & Design	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0

FE-14	Construction Management	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0

Cost Estimate Assumptions

						Max Potential Cost Growth	35%
CT-1	Overexcavation	• Reliability and number of key quotes?	N/A		Unlikely	Negligible	0
CT-2	Material Disposal	• Reliability and number of key quotes?	Haul routes have not been scoped by Civil Design and the estimator made a convervative assumption that there would be disposal within ten miles of the project site.	The team believes this is reasonable and identified a large potential disposal point within this range. If the adjacent quarry is not able to take the material the hauling distance could reach up to 20 miles.	Unlikely	Crisis	3
CT-3	Material Hauling	• Reliability and number of key quotes?	Local quotes were not obtained from immediately adjacent vendors for disposal.	While local quotes were not solicited, recently updated quotes for disposal rates were obtained for multiple regions within Western Washington. These were used in there place. Because of this costs increases are unlikely. It is not expected that the costs would exceed an increase of 100%	Unlikely	Critical	2
CT-4	Levee Degrade	• Reliability and number of key quotes?	No concerns. Crews are custom built and productivity rates are based on calculated, conservative values.		Unlikely	Negligible	0
CT-5	Staging Areas	• Reliability and number of key quotes?	Estimator assumed that the site was accessible to LGP equipment without issue. Changes may decrease productivity.	Based on the location of the existing levee and the proposed setback levee additional access impacts are expected to be marginal.	Unlikely	Marginal	0
CT-6	Levee Construction	• Reliability and number of key quotes?	Would this levee require the inclusion of geotextiles and geogrid stabilization.	The size of this levee prism is not expected to require the use of geotextiles or geogrids.	Possible	Critical	3
CT-7	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-8	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-9	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-10	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-11	0	• Reliability and number of key quotes?			Unlikely	Negligible	0

CT-12	Remaining Construction Items	• Reliability and number of key quotes?	A number of assumption were made regarding project elements.	Large increases are unlikely but some variation in costs are possible.	Possible	Marginal	1
CT-13	Planning, Engineering, & Design	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-14	Construction Management	• Reliability and number of key quotes?			Unlikely	Negligible	0

External Project Risks

					Max Potential Cost Growth		40%
EX-1	Overexcavation	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-2	Material Disposal	• Potential for severe adverse weather?	Other projects occuring in the area could impact availability of disposal areas.	Unlikely to occur in this area. If it did occur, cost would increase due to longer haul routes. Assume the haul distance could possibly double.	Unlikely	Crisis	3
EX-3	Material Hauling	• Potential for severe adverse weather?	Due to heavy usage of diesel trucks, moderate spikes in fuel prices may have large impacts to project cost.	A $0.50 increase in fuel prices causes a $28K feature cost increase.	Likely	Significant	3
EX-4	Levee Degrade	• Potential for severe adverse weather?	N/A		Unlikely	Negligible	0
EX-5	Staging Areas	• Potential for severe adverse weather?	N/A		Unlikely	Negligible	0
EX-6	Levee Construction	• Unanticipated inflations in fuel, key materials?	A quote for fill material was used for western washington, local prices could vary.	Fill material is not a specialized gradation and should be readily available. It is possible that the unit price would be higher than the quote used in the estimate; a cost increase of up to 10% could be encountered.	Possible	Critical	3
EX-7	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-8	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-9	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-10	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-11	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-12	Remaining Construction Items	• Unanticipated inflations in fuel, key materials?			Unlikely	Negligible	0
EX-13	Planning, Engineering, & Design	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-14	Construction Management	• Potential for severe adverse weather?			Unlikely	Negligible	0

Abbreviated Risk Analysis

Project (less than $40M): **Skokomish River GI - River Channel**
Project Development Stage: **Feasibility (Alternatives)**
Risk Category: **Moderate Risk: Typical Project or Possible Life Safety**

Total Construction Contract Cost = **$ 767,056**

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ -		0.00%	$ -	$ -
1	09 01 CHANNELS	Material Hauling	$ 342,777		48.50%	$ 166,254	$ 509,031.03
2	09 01 CHANNELS	Material Disposal	$ 68,772		29.60%	$ 20,358	$ 89,130.32
3	09 01 CHANNELS	Channel Excavation	$ 97,723		25.66%	$ 25,078	$ 122,801.46
4	09 01 CHANNELS	Care & Diversion of Water	$ 1,908		52.80%	$ 1,007	$ 2,915.46
5	09 01 CHANNELS	Staging Areas	$ 87,156		14.75%	$ 12,860	$ 100,015.69
6	09 01 CHANNELS	Off-Road Haul	$ 131,279		18.42%	$ 24,182	$ 155,461.06
7					0.00%	$ -	$ -
8					0.00%	$ -	$ -
9					0.00%	$ -	$ -
10					0.00%	$ -	$ -
11					0.00%	$ -	$ -
12		Remaining Construction Items	$ 37,441	*5.1%*	18.56%	$ 6,948	$ 44,389.29
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ -		0.00%	$ -	$ -
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ -		0.00%	$ -	$ -

Totals					
Real Estate	$ -		0.00%	$ -	$ -
Total Construction Estimate	$ 767,056		33.46%	$ 256,688	$ 1,023,744
Total Planning, Engineering & Design	$ -		0.00%	$ -	$ -
Total Construction Management	$ -		0.00%	$ -	$ -
Total	$ 767,056			$ 256,688	$ 1,023,744

Skokomish River GI - River Channel
Feasibility (Alternatives)
Abbreviated Risk Analysis

Meeting Date: 28-Mar-13

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth							
					Max Potential Cost Growth		**75%**
PS-1	Material Hauling	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	**0**
PS-2	Material Disposal	• Potential for scope growth, added features and quantities?	The presences of HAZMAT has not been accounted for in the estimate. If found it could dramatically incrase disposal costs.	It's possible the could be found. If they did exist, the team expects that only point sources would be found (buried paint cans, etc) requiring only a marginal cost increase.	Possible	Negligible	**0**
PS-3	Channel Excavation	• Potential for scope growth, added features and quantities?	Excavation footprint is conceptual, could design change as analysis progresses?	The footprint of the creek channels is not expected to differ greatly from what is proposed in the conceptual phase. Any changes would be in alignment and should not impact the quantities or scope of work.	Unlikely	Negligible	**0**
PS-4	Care & Diversion of Water	• Water care and diversion fully understood, planned?	Currently the estimate assumes minimal water protection - silt fencing for in water work. If coffer dams or additional requirements are required this would increase the cost.	Most of the side channels are in the dry, it is not expected at additional care and diversion of water will be required beyond silt fencing at the reconnection point to the main river.	Possible	Negligible	**0**
PS-5	Staging Areas	• Potential for scope growth, added features and quantities?	Staging area issues are not expected to have issues.	N/A	Unlikely	Negligible	**0**
PS-6	Off-Road Haul	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	**0**
PS-7	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-8	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-9	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**

PS-10	0	• Investigations sufficient to support design assumptions?			Unlikely	Negligible	**0**
PS-11	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-12	Remaining Construction Items	• Potential for scope growth, added features and quantities?	Design scope is conceptual, could changes occur that increase project cost farther along the design process?	It is very likely that this will occur but, the overall impacts should be negligible.	Very LIKELY	Negligible	**2**
PS-13	Planning, Engineering, & Design	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-14	Construction Management	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**

Acquisition Strategy

						Max Potential Cost Growth	30%
AS-1	Material Hauling	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Significant	4
AS-2	Material Disposal	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-3	Channel Excavation	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-4	Care & Diversion of Water	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	2
AS-5	Staging Areas	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	2
AS-6	Off-Road Haul	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-7	0	• Contracting plan firmly established?			Unlikely	Negligible	0
AS-8	0	• Contracting plan firmly established?			Unlikely	Negligible	0
AS-9	0	• Contracting plan firmly established?			Unlikely	Negligible	0

AS-10	0	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-11	0	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-12	Remaining Construction Items	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	**2**
AS-13	Planning, Engineering, & Design	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-14	Construction Management	• Contracting plan firmly established?			Unlikely	Negligible	**0**

Construction Elements

							Max Potential Cost Growth	25%
CE-1	Material Hauling	• Accelerated schedule or harsh weather schedule?	No investigations at the site have been done, could hazardous materials be found during excavation.	An HTRW study of the levee has not been conducted but based on the location of the current levee and the proposed setback levee construction placement the PDT estimates there is an unlikely chance of encountering contaminats. Estimating the hauling distance could double to find a suitable disposal site as a result of the rural project location.	Unlikely	Crisis		3
CE-2	Material Disposal	• Unique construction methods?	No investigations at the site have been done, could hazardous materials be found during excavation.	An HTRW study of the levee has not been conducted but based on the location of the current levee and the proposed setback levee construction placement the PDT estimates there is an unlikely chance of encountering contaminats. Estimating a 25% increased cost for disposal of contaminated materials	Unlikely	Significant		1
CE-3	Channel Excavation	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible		0
CE-4	Care & Diversion of Water	• Accelerated schedule or harsh weather schedule?	If a flood occurs, emergency demobilization may be required.	Possible to occur, and could have marginal cost impacts.	Possible	Marginal		1
CE-5	Staging Areas	• Accelerated schedule or harsh weather schedule?	Staging areas assume tree replanting post project. Could additional tree plantings be required?	Assumed requirements are sufficiently conservative.	Unlikely	Negligible		0
CE-6	Off-Road Haul	• Accelerated schedule or harsh weather schedule?	What if the staging area can not be located adajacent to the work site?	Additional access roads would need to be constructed in order to connect the highway trucks with the off road dump trucks.	Possible	Marginal		1
CE-7	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-8	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-9	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-10	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0

CE-11	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**
CE-12	Remaining Construction Items	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible	**0**
CE-13	Planning, Engineering, & Design	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**
CE-14	Construction Management	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**

Quantities for Current Scope

						Max Potential Cost Growth	20%
Q-1	Material Hauling	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is an unlikely chance of the quantities increasing from conceptual design stage, up to an increase of 10% greater.	Unlikely	Significant	1
Q-2	Material Disposal	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is a likely chance of the quantities increasing from conceptual design stage, up to an increase of 25% greater.	Unlikely	Significant	1
Q-3	Channel Excavation	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is a likely chance of the quantities increasing from conceptual design stage, up to an increase of 25% greater.	Unlikely	Significant	1
Q-4	Care & Diversion of Water	• Level of confidence based on design and assumptions?	N/A		Unlikely	Negligible	0
Q-5	Staging Areas	• Sufficient investigations to develop quantities?	Staging area sizing is based on estimator assumptions. No construction personnel have provided input for this item.	While a conservative approach was taken, it is possible that there could be increases. A 25% increase in staging area requirements would have a marginal impact on overall cost ($60K).	Possible	Marginal	1
Q-6	Off-Road Haul	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is a likely chance of the quantities increasing from conceptual design stage, up to an increase of 25% greater.	Unlikely	Significant	1
Q-7	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-8	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-9	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-10	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-11	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-12	Remaining Construction Items	• Level of confidence based on design and assumptions?	No construction element has been fully scoped. Further analysis may increase quantities.	Estimating was done conservatively and it is not believed that quantities could increase much past 10%. Some level of increase is likely however.	Unlikely	Marginal	0

Q-13	Planning, Engineering, & Design	• Level of confidence based on design and assumptions?			Unlikely	Negligible	**0**
Q-14	Construction Management	• Level of confidence based on design and assumptions?			Unlikely	Negligible	**0**

Specialty Fabrication or Equipment

					Max Potential Cost Growth		75%
FE-1	Material Hauling	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-2	Material Disposal	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-3	Channel Excavation	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-4	Care & Diversion of Water	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-5	Staging Areas	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-6	Off-Road Haul	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-7	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-8	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-9	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-10	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-11	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-12	Remaining Construction Items	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-13	Planning, Engineering, & Design	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0

FE-14	Construction Management	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	**0**

Cost Estimate Assumptions

						Max Potential Cost Growth	35%
CT-1	Material Hauling	• Site accessibility, transport delays, congestion?	Haul routes have not been scoped by Civil Design and the estimator made a convervative assumption that there would be disposal within ten miles of the project site.	The team believes this is reasonable and identified a large potential disposal point within this range. If the proposed disposal site is not avaialbe the hauling distance could increase by 100%	Unlikely	Crisis	3
CT-2	Material Disposal	• Reliability and number of key quotes?	Local quotes were not obtained from immediately adjacent vendors for disposal.	While local quotes were not solicited, recently updated quotes for disposal rates were obtained for multiple regions within Western Washington. These were used in there place. Because of this costs increases are unlikely an increase of up to 50% could be encountered.	Unlikely	Significant	1
CT-3	Channel Excavation	• Reliability and number of key quotes?	No concerns. Crews are custom built and productivity rates are based on calculated, conservative values.	N/A	Unlikely	Negligible	0
CT-4	Care & Diversion of Water	• Reliability and number of key quotes?	N/A		Unlikely	Negligible	0
CT-5	Staging Areas	• Site accessibility, transport delays, congestion?	Estimator assumed that the site was accessible to LGP equipment without issue. Changes may decrease productivity. Also assumed that equipment would use the creek channels to access work locations without the need for access road construction.	Team agrees that there will be no issues with overall access. There may potentially be a need to build additional access roads.	Possible	Marginal	1
CT-6	Off-Road Haul	• Reliability and number of key quotes?	See CE-6		Unlikely	Negligible	0
CT-7	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-8	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-9	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-10	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-11	0	• Reliability and number of key quotes?			Unlikely	Negligible	0

CT-12	Remaining Construction Items	• Assumptions regarding crew, productivity, overtime?	A number of assumption were made regarding project elements.	Large increases are unlikely but some variation in costs are possible.	Possible	Marginal	1
CT-13	Planning, Engineering, & Design	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-14	Construction Management	• Reliability and number of key quotes?			Unlikely	Negligible	0

External Project Risks

					Max Potential Cost Growth		40%
EX-1	Material Hauling	• Unanticipated inflations in fuel, key materials?	Due to heavy usage of diesel trucks, moderate spikes in fuel prices may have large impacts to project cost.	A $0.50 increase in fuel prices causes a $79,000 feature cost increase.	Likely	Significant	3
EX-2	Material Disposal	• Potential for market volatility impacting competition, pricing?	Other projects occuring in the area could impact availability of disposal areas.	Unlikely to occur in this area. If it did occur, cost would increase due to longer haul routes. Increases would be substantial due to large volume of soil being hauled.	Unlikely	Crisis	3
EX-3	Channel Excavation	• Unanticipated inflations in fuel, key materials?	The water table might be too high during the winter season	This feature of work is expected to take less than 30 days to complete. With proper construction sequencing it is unlikely that the water table will impact construction. If the construction did take place in the winter months the impact would be a reduce productivity and perhaps the need for swamp mats on the site.	Likely	Significant	3
EX-4	Care & Diversion of Water	• Political influences, lack of support, obstacles?	Permits are often require for projects with in-water work. It is unclear what the scope of these might be.	PDT believes that these are very likely and could have significant ($100K) consequences. Permits must be sought from WA DOE and for ESA impacts.	Very LIKELY	Crisis	5
EX-5	Staging Areas	• Potential for severe adverse weather?	N/A		Unlikely	Negligible	0
EX-6	Off-Road Haul	• Potential for severe adverse weather?	N/A		Unlikely	Negligible	0
EX-7	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-8	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-9	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-10	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-11	0	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-12	Remaining Construction Items	• Potential for severe adverse weather?	N/A		Unlikely	Negligible	0
EX-13	Planning, Engineering, & Design	• Potential for severe adverse weather?			Unlikely	Negligible	0
EX-14	Construction Management	• Potential for severe adverse weather?			Unlikely	Negligible	0

Abbreviated Risk Analysis

Project (less than $40M): **Skokomish River GI - Weaver Creek**
Project Development Stage: **Feasibility (Alternatives)**
Risk Category: **Moderate Risk: Typical Project or Possible Life Safety**

Total Construction Contract Cost = **$ 3,632,218**

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ -		0.00%	$ -	$ -
1	09 01 CHANNELS	Material Hauling	$ 1,777,783		66.68%	$ 1,185,453	$ 2,963,235.94
2	09 01 CHANNELS	Material Disposal	$ 356,681		34.28%	$ 122,285	$ 478,965.59
3	09 01 CHANNELS	Channel Excavation	$ 506,831		29.88%	$ 151,423	$ 658,253.93
4	09 01 CHANNELS	Care & Diversion of Water	$ 28,720		34.30%	$ 9,851	$ 38,571.02
5	09 01 CHANNELS	Staging Areas	$ 87,156		14.75%	$ 12,860	$ 100,015.69
6	09 01 CHANNELS	Off-Road Haul	$ 680,867		22.63%	$ 154,107	$ 834,974.21
7					0.00%	$ -	$ -
8					0.00%	$ -	$ -
9					0.00%	$ -	$ -
10					0.00%	$ -	$ -
11					0.00%	$ -	$ -
12		**Remaining Construction Items**	$ 194,180	*5.6%*	25.67%	$ 49,847	$ 244,026.96
13	30 PLANNING, ENGINEERING, AND DESIGN	**Planning, Engineering, & Design**	$ -		0.00%	$ -	$ -
14	31 CONSTRUCTION MANAGEMENT	**Construction Management**	$ -		0.00%	$ -	$ -

Totals					
Real Estate	$ -		0.00%	$ -	$ -
Total Construction Estimate	$ 3,632,218		46.41%	$ 1,685,825	$ 5,318,043
Total Planning, Engineering & Design	$ -		0.00%	$ -	$ -
Total Construction Management	$ -		0.00%	$ -	$ -
Total	$ 3,632,218			$ 1,685,825	$ 5,318,043

Skokomish River GI - Weaver Creek
Feasibility (Alternatives)
Abbreviated Risk Analysis

Meeting Date: 28-Mar-13

Risk Level

Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significant	Critical	Crisis

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth							
					Max Potential Cost Growth		**75%**
PS-1	Material Hauling	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	**0**
PS-2	Material Disposal	• Potential for scope growth, added features and quantities?	The presences of HAZMAT has not been accounted for in the estimate. If found it could dramatically incrase disposal costs.	It's possible the could be found. If they did exist, the team expects that only point sources would be found (buried paint cans, etc) requiring only a marginal cost increase.	Possible	Marginal	**1**
PS-3	Channel Excavation	• Potential for scope growth, added features and quantities?	Excavation footprint is conceptual, could design change as analysis progresses?	The footprint of the creek channels is not expected to differ greatly from what is proposed in the conceptual phase. Any changes would be in alignment and should not impact the quantities or scope of work.	Unlikely	Negligible	**0**
PS-4	Care & Diversion of Water	• Water care and diversion fully understood, planned?	Currently the estimate assumes minimal water protection - silt fencing for in water work. If coffer dams or additional requirements are required this would increase the cost.	Most of the side channels are in the dry, it is not expected at additional care and diversion of water will be required beyond silt fencing at the reconnection point to the main river.	Possible	Marginal	**1**
PS-5	Staging Areas	• Potential for scope growth, added features and quantities?	Staging area issues are not expected to have issues.	N/A	Unlikely	Negligible	**0**
PS-6	Off-Road Haul	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	**0**
PS-7	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-8	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-9	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**

PS-10	0	• Investigations sufficient to support design assumptions?			Unlikely	Negligible	**0**
PS-11	0	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-12	Remaining Construction Items	• Potential for scope growth, added features and quantities?	Design scope is conceptual, could changes occur that increase project cost farther along the design process?	It is very likely that this will occur but, the overall impacts should be negligible.	Very LIKELY	Negligible	**2**
PS-13	Planning, Engineering, & Design	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**
PS-14	Construction Management	• Potential for scope growth, added features and quantities?			Unlikely	Negligible	**0**

Acquisition Strategy

					Max Potential Cost Growth		30%
AS-1	Material Hauling	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Significant	4
AS-2	Material Disposal	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-3	Channel Excavation	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-4	Care & Diversion of Water	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	2
AS-5	Staging Areas	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Negligible	2
AS-6	Off-Road Haul	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	3
AS-7	0	• Contracting plan firmly established?			Unlikely	Negligible	0
AS-8	0	• Contracting plan firmly established?			Unlikely	Negligible	0
AS-9	0	• Contracting plan firmly established?			Unlikely	Negligible	0

AS-10	0	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-11	0	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-12	Remaining Construction Items	• 8a or small business likely?	Estimate assumes that the contract will be bid by a small business, but could an even more restrictive bid environment occur.	PDT feels this is very likely. Given the nature of this work and it's relatively low contract cost, it is possible this project could be solicited exclusively to HUBZone or SDVOSB. If this occurs, increased use of subcontracting and higher overheads and profit are likely. A 5-10% increase in feature cost would be expected.	Very LIKELY	Marginal	**3**
AS-13	Planning, Engineering, & Design	• Contracting plan firmly established?			Unlikely	Negligible	**0**
AS-14	Construction Management	• Contracting plan firmly established?			Unlikely	Negligible	**0**

Construction Elements

							Max Potential Cost Growth	25%
CE-1	Material Hauling	• Accelerated schedule or harsh weather schedule?	No investigations at the site have been done, could hazardous materials be found during excavation.	An HTRW study of the levee has not been conducted but based on the location of the current levee and the proposed setback levee construction placement the PDT estimates there is an unlikely chance of encountering contaminats. Estimating the hauling distance could double to find a suitable disposal site as a result of the rural project location.	Unlikely	Crisis		3
CE-2	Material Disposal	• Unique construction methods?	No investigations at the site have been done, could hazardous materials be found during excavation.	An HTRW study of the levee has not been conducted but based on the location of the current levee and the proposed setback levee construction placement the PDT estimates there is an unlikely chance of encountering contaminats. Estimating a 25% increased cost for disposal of contaminated materials	Unlikely	Negligible		0
CE-3	Channel Excavation	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible		0
CE-4	Care & Diversion of Water	• Accelerated schedule or harsh weather schedule?	If a flood occurs, emergency demobilization may be required.	Possible to occur, and could have marginal cost impacts.	Possible	Marginal		1
CE-5	Staging Areas	• Accelerated schedule or harsh weather schedule?	Staging areas assume tree replanting post project. Could additional tree plantings be required?	Assumed requirements are sufficiently conservative.	Unlikely	Negligible		0
CE-6	Off-Road Haul	• Accelerated schedule or harsh weather schedule?	What if the staging area can not be located adajacent to the work site?	Additional access roads would need to be constructed in order to connect the highway trucks with the off road dump trucks.	Possible	Marginal		1
CE-7	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-8	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-9	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0
CE-10	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible		0

CE-11	0	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**
CE-12	Remaining Construction Items	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible	**0**
CE-13	Planning, Engineering, & Design	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**
CE-14	Construction Management	• Accelerated schedule or harsh weather schedule?			Unlikely	Negligible	**0**

Quantities for Current Scope

					Max Potential Cost Growth		20%
Q-1	Material Hauling	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is a likely chance of the quantities increasing from conceptual design stage, up to an increase of 25% greater.	Likely	Crisis	5
Q-2	Material Disposal	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is a likely chance of the quantities increasing from conceptual design stage, up to an increase of 25% greater.	Likely	Significant	3
Q-3	Channel Excavation	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is a likely chance of the quantities increasing from conceptual design stage, up to an increase of 25% greater.	Likely	Significant	3
Q-4	Care & Diversion of Water	• Level of confidence based on design and assumptions?	N/A		Unlikely	Negligible	0
Q-5	Staging Areas	• Sufficient investigations to develop quantities?	Staging area sizing is based on estimator assumptions. No construction personnel have provided input for this item.	While a conservative approach was taken, it is possible that there could be increases. A 25% increase in staging area requirements would have a marginal impact on overall cost ($60K).	Possible	Marginal	1
Q-6	Off-Road Haul	• Level of confidence based on design and assumptions?	All information for soil haul quantities is based on relatively uncertain data. What are the consequences of this?	The PDT believesthere is a likely chance of the quantities increasing from conceptual design stage, up to an increase of 25% greater.	Likely	Significant	3
Q-7	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-8	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-9	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-10	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-11	0	• Level of confidence based on design and assumptions?			Unlikely	Negligible	0
Q-12	Remaining Construction Items	• Level of confidence based on design and assumptions?	No construction element has been fully scoped. Further analysis may increase quantities.	Estimating was done conservatively and it is not believed that quantities could increase much past 10%. Some level of increase is likely however.	Likely	Marginal	2

Q-13	Planning, Engineering, & Design	• Level of confidence based on design and assumptions?			Unlikely	Negligible	**0**
Q-14	Construction Management	• Level of confidence based on design and assumptions?			Unlikely	Negligible	**0**

Specialty Fabrication or Equipment

					Max Potential Cost Growth		75%
FE-1	Material Hauling	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-2	Material Disposal	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-3	Channel Excavation	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-4	Care & Diversion of Water	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-5	Staging Areas	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-6	Off-Road Haul	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-7	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-8	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-9	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-10	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-11	0	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0
FE-12	Remaining Construction Items	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-13	Planning, Engineering, & Design	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	0

FE-14	Construction Management	• Unusual parts, material or equipment manufactured or installed?			Unlikely	Negligible	**0**

Cost Estimate Assumptions

						Max Potential Cost Growth	35%
CT-1	Material Hauling	• Site accessibility, transport delays, congestion?	Haul routes have not been scoped by Civil Design and the estimator made a convervative assumption that there would be disposal within ten miles of the project site.	The team believes this is reasonable and identified a large potential disposal point within this range. If the proposed disposal site is not avaialbe the hauling distance could increase by 100%	Unlikely	Crisis	3
CT-2	Material Disposal	• Reliability and number of key quotes?	Local quotes were not obtained from immediately adjacent vendors for disposal.	While local quotes were not solicited, recently updated quotes for disposal rates were obtained for multiple regions within Western Washington. These were used in there place. Because of this costs increases are unlikely an increase of up to 50% could be encountered.	Unlikely	Significant	1
CT-3	Channel Excavation	• Reliability and number of key quotes?	No concerns. Crews are custom built and productivity rates are based on calculated, conservative values.	N/A	Unlikely	Negligible	0
CT-4	Care & Diversion of Water	• Reliability and number of key quotes?	N/A		Unlikely	Negligible	0
CT-5	Staging Areas	• Site accessibility, transport delays, congestion?	Estimator assumed that the site was accessible to LGP equipment without issue. Changes may decrease productivity. Also assumed that equipment would use the creek channels to access work locations without the need for access road construction.	Team agrees that there will be no issues with overall access. There may potentially be a need to build additional access roads.	Possible	Marginal	1
CT-6	Off-Road Haul	• Reliability and number of key quotes?	See CE-6		Unlikely	Negligible	0
CT-7	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-8	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-9	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-10	0	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-11	0	• Reliability and number of key quotes?			Unlikely	Negligible	0

CT-12	Remaining Construction Items	• Assumptions regarding crew, productivity, overtime?	A number of assumption were made regarding project elements.	Large increases are unlikely but some variation in costs are possible.	Possible	Marginal	1
CT-13	Planning, Engineering, & Design	• Reliability and number of key quotes?			Unlikely	Negligible	0
CT-14	Construction Management	• Reliability and number of key quotes?			Unlikely	Negligible	0

SKOKOMISH RIVER BASIN
MASON COUNTY, WASHINGTON
ECOSYSTEM RESTORATION

APPENDIX L

COMPLIANCE DOCUMENTS

DRAFT Integrated Feasibility Report and Environmental Impact Statement

US Army Corps
of Engineers
Seattle District

This page was intentionally left blank to facilitate double sided copying.

COMPLIANCE DOCUMENTS

FISH AND WILDLIFE COORDINATION ACT REPORT

This page was intentionally left blank to facilitate double sided copying.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

JAN 16 2014

Evan R. Lewis, Chief
Environmental & Cultural Resources Branch
U.S. Army Corps of Engineers, Seattle District
PO Box 3755
Seattle, Washington 98124-3755

Dear Mr. Lewis,

Enclosed is the draft Fish and Wildlife Coordination Act Report for the Skokomish River Basin Ecosystem Restoration Project authorized by the River and Harbor Act of 1962 (Public Law 87-874), Section 209, Puget Sound and Adjacent Waters. Our comments and recommendations have been prepared under the authority of and according to the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*)(Act), and constitutes the report of the Secretary of the Interior required under Section 2(b) of that Act.

We appreciate and support the U.S. Army Corps of Engineers restoration efforts in the Skokomish River watershed. We look forward to continued coordination as the project moves forward. Should you or your staff have any questions regarding the enclosed draft report, please contact Mark Celedonia (360-534-9327; mark_celedonia@fws.gov, of this office.

Sincerely,

FOR Ken S. Berg, Manager
Washington Fish and Wildlife Office

Fish and Wildlife Coordination Act
Draft Section 2(b) Report

ASSESSMENT OF THE SKOKOMISH RIVER BASIN ECOSYSTEM RESTORATION FEASIBILITY STUDY, MASON COUNTY, WASHINGTON

Submitted to:
Seattle District
U.S. Army Corps of Engineers
Seattle, Washington

Prepared by: Mark T. Celedonia
Reviewed by: Martha L. Jensen
Approved by: Bridget Moran

U.S. Fish and Wildlife Service
Washington Fish and Wildlife Office
Lacey, Washington

January 2014

TABLE OF CONTENTS

LIST OF ACRONYMS

cfs	cubic feet per second
DPS	Distinct Population Segment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FAA	Final Array of Alternatives
FWCA	Fish and Wildlife Coordination Act
GI	General Investigation
LWD	large woody debris
PA	Preferred Alternative
NEPA	National Environmental Policy Act
PAL	Planning Aid Letter
PMP	Project Management Plan
RA	Range of Alternatives
SRBER	Skokomish River Basin Ecosystem Restoration
SWAT	Skokomish Watershed Action Team
TSP	Tentatively Selected Plan
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USACE	United State Army Corps of Engineers
WFDW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation

I. INTRODUCTION

The United States Army Corps of Engineers (the Corps), Seattle District is proposing to conduct the Skokomish River Basin Ecosystem Restoration (SRBER) project in the lower Skokomish River watershed. This watershed, including the study area, is severely degraded and has been the focus of significant attention by federal, state, local, tribal, and private entities. Significant, widespread, and persistent anthropogenic disturbances throughout the watershed from the late 1800's to the early 1990's have resulted in degraded conditions for many aquatic species. The river is believed to have once supported the most abundant salmon and steelhead trout (*Oncorhynchus* spp.) populations in all of Hood Canal, one of the four major Puget Sound basins. Now, however, two endemic populations are locally extirpated and several others are severely depressed. Recovery plans for two species specifically cite a need for significant restoration in the lower watershed before recovery can begin. The SRBER project proposes a suite of actions intended to restore natural watershed and ecosystem structure, function, and processes to the lower watershed for the benefit of native salmonids and other aquatic species.

The Corps, in coordination with local cost-sharing sponsors, stakeholders, and the Service, identified a multitude of possible restoration-oriented activities across the General Investigation (GI) study area. The study area is a fairly broad area encompassing the entirety of the lower watershed, including floodplains and the river delta (see Section II.B. for more detail). The Corps analyzed the proposed restoration activities and issued a Final Array of Alternatives intended to represent the Range of Alternatives of a National Environmental Policy Act (NEPA) assessment. From this Range of Alternatives / Final Array of Alternatives (RA/FAA)[1], the Corps, in conjunction with local sponsors and with input from the Service, identified a Tentatively Selected Plan intended to represent the Preferred Alternative of a NEPA assessment. The area affected by the Preferred Alternative / Tentatively Selected Plan (PA/TSP) is located in the upstream part of the study area. The area affected by the PA/TSP will be referred to as the "action area" in this report.

The purpose of this report is to evaluate possible effects to fish and wildlife of the proposed SRBER project, and recommend actions for minimizing deleterious consequences and maximizing benefits. In doing so, this report broadly evaluates effects within the study area of each alternative in the RA/FAA in order to concur with or dispute selection of the PA/TSP. A greater level of detail is provided in the evaluation of PA/TSP effects in the action area.

This report is provided under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*), and constitutes the report of the Secretary of the Interior required under Section 2(b) of that Act. The National Marine Fisheries Service (NMFS) and the Washington Department of Fish and Wildlife were invited to provide input and participate in developing recommendations. The NMFS opted to provide input directly to the USACE. The WDFW opted to not participate.

[1] "Final Array of Alternatives" and "Tentatively Selected Plan" are Corps terms related to internal Corps process. As noted, each term represents a specific corresponding element in a NEPA assessment. The Corps and NEPA terms will be used together in this report to facilitate ease of understanding.

A. Project authority, purpose, and scope

The proposed SRBER project is the outcome of the Skokomish River Basin Feasibility Study, which the Corps is conducting under the authority of the River and Harbor Act of 1962 (Public Law 87-874), Section 209, Puget Sound and Adjacent Waters. The Corps concluded the reconnaissance phase in March 2000 and determined that there was sufficient federal interest to advance to the next stage of conducting a feasibility study. The study was postponed from 2002 to 2006 due to unresolved issues associated with Cushman Dam operations and lack of local sponsor funding. The feasibility study was resumed on July 3, 2006, with Mason County and the Skokomish Tribal Nation as the local sponsors and non-federal funding partners.

The project was dual purpose - flood hazard reduction and ecosystem restoration - throughout much of the feasibility phase. However, preliminary economic analyses indicated low expected annual flood damages due in part to recent flood mitigation projects spearheaded by Mason County. These developments have led the Corps and project sponsors to focus solely on ecosystem restoration (USACE 2012).

The Corps (USACE 2012) identified a three-part purpose to the Skokomish River Basin feasibility study:

1. evaluate significant ecosystem degradation in the Skokomish River Basin;
2. formulate, evaluate, and screen potential solutions to these problems; and,
3. recommend a series of actions and projects that have federal interest and are supported by a local entity willing to provide the requisite local cooperation.

B. Prior efforts and coordination with the Service

Prior to 1998. A variety of entities - including the Corps, Mason County, the Skokomish Tribal Nation, and Washington State Department of Transportation - identify flooding problems in the study area. The Corps determines that flood control and/or flood hazard reduction efforts would not be cost effective.

1998-1999. The Corps proposes a combined Flood Hazard Reduction and Ecosystem Restoration. Entities involved in formulating and discussing proposals include the Corps, the Service, Mason County, and the Skokomish Tribal Nation

January 1999. The Corps issues the document “Project Management Plan: Skokomish River Flood Hazard Reduction and Ecosystem Restoration.”

July 1999. The Corps issues for comments the document “Skokomish River Flood Hazard Reduction and Ecosystem Restoration Study, Preliminary 905(b) Analysis.”

October 1999. The Service provides written comments on the July 1999 Preliminary 905(b) Analysis.

February 2000. The Corps issues the document "Skokomish River General Investigation (GI) Reconnaissance Study, 905(b) Analysis." The analysis determined that there is a Federal interest in proceeding with a project in the area.

July 2006. The Corps issues the document "Final Project Management Plan (PMP) for Feasibility Phase Study of Skokomish River Basin, Mason County, Washington."

November 2006. Several meetings were held, with Service participation, to discuss and develop GI studies and evaluations.

June 2008 - September 2009. The Service conducts comprehensive ecological field surveys in the Skokomish River watershed as part of the GI. Final report is issued June 2011 (Peters et al. 2011).

September 2008. The Service provides a written Planning Aid Letter commenting on the July 2006 PMP.

January 2011 - May 2012. A series of meetings are held with the Corps, the Service, Mason County, and the Skokomish Tribal Nation to develop ecosystem restoration project ideas.

June 2012. The Corps issues the document "Integrated Feasibility Report and Environmental Impact Statement Feasibility Scoping Meeting Read-Ahead."

June 2013. The Corps meets with the Service to provide update on planning process and discuss Fish and Wildlife Coordination Act (FWCA) reporting needs.

June 2013 - September 2013. Ongoing communications between the Corps and the Service to discuss and refine the Final Array of Alternatives.

September 16, 2013. The Corps, the Service, NMFS, the local sponsors, and other stakeholders (e.g., Mason Conservation District) meet to discuss the PA/TSP. WDFW was invited but was not in attendance.

C. Prior studies and reports

A multitude of studies and reports have been issued on Skokomish River basin hydrology and ecology, the causes and consequences of watershed and aquatic ecosystem degradation, and recommendations for improvement. The most pertinent ones are cited throughout this report.

II. DESCRIPTION OF STUDY AREA AND ACTION AREA

A. Watershed context

The Skokomish River is located in the southeastern portion of Washington State's Olympic Peninsula (Figure 1). It flows southeast out of the Olympic Mountains and empties into Annas Bay at the southern end of Hood Canal, a natural waterway and one of Puget Sound's four major basins. The Skokomish watershed is the largest in Hood Canal. Measuring 240 mi^2, it is twice as large as the next largest watershed in the basin. Similarly, the Skokomish subestuary[2] is the largest and most complex in Hood Canal, measuring 2,175 acres with a perimeter of 11. 2 miles (Todd et al. 2006). The Skokomish River system is believed to have supported some of the largest runs of Pacific salmon and steelhead trout (*Oncorhynchus* spp.) in Hood Canal (Correa 2003). However, many of these endemic Skokomish River salmon populations are either locally

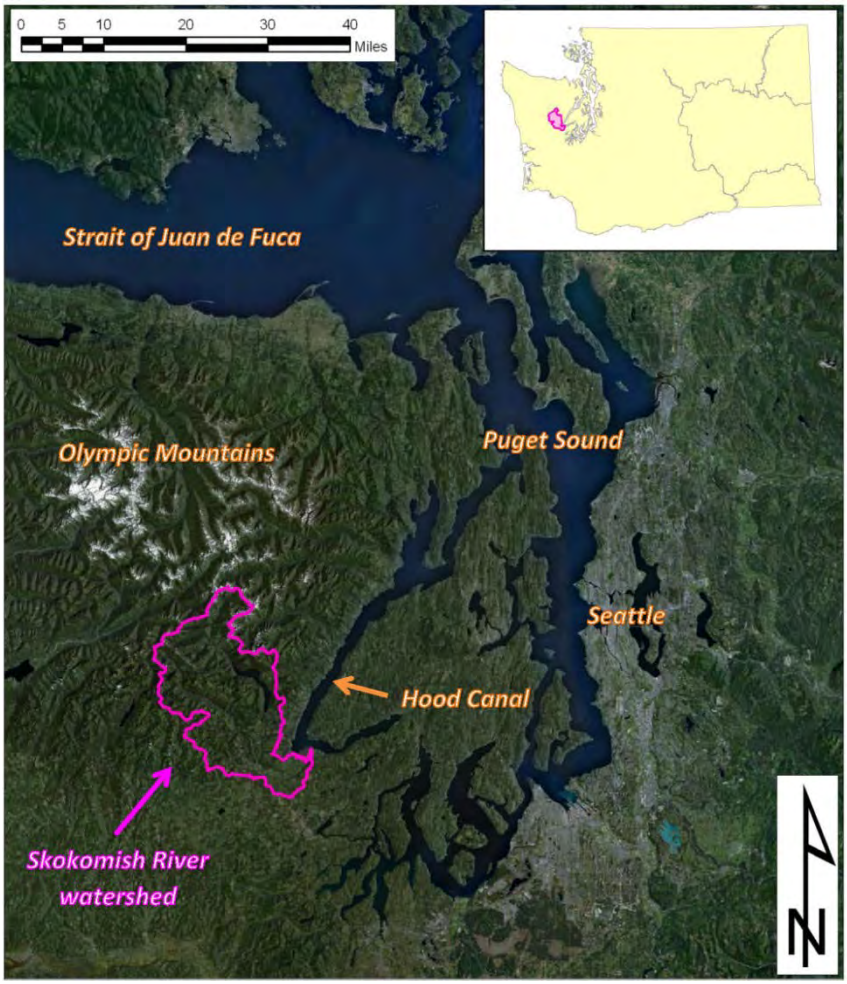


Figure 1. Map showing location of the Skokomish River watershed.

[2] Following Simenstad (2000), the term "subestuary" describes the estuarine delta at the river mouth. This area is physically and ecologically distinct from Hood Canal proper.

extirpated or severely depressed due in large part to past human activities throughout the watershed (Correa 2003; WDFW 2013b). Excellent detailed descriptions of the Skokomish watershed and it's geology, hydrology, climate, geomorphology, ecology, human impacts, and the interactions between these factors can be found in several reports (e.g., SIT and WDFW 2010; Peters et al. 2011; USACE 2011; USACE 2012). A very brief summary of the most pertinent elements is presented below.

The Skokomish basin consists of three primary sub-basins and the mainstem[3]. The three sub-basins include the North Fork Skokomish (33 mi), the South Fork Skokomish (28 mi), and Vance Creek (11 mi). The mainstem flows 8 miles from the confluence of the North and South Forks to the river's mouth in Hood Canal (Figure 2). Vance Creek enters the South Fork two miles upstream from the confluence of the North and South Forks. These three primary tributaries originate in steep mountainous and foothill terrain and transition to shallower gradients as they converge and enter the flat alluvial[4] mainstem valley (Figure 2). The Skokomish watershed has variable terrain ranging from alluvial and glacial valley bottoms with relatively gentle slopes, to rugged and steep terrain with near vertical side slopes in the headwaters. Soil depths in the watershed are shallow except in the river valleys, where sediment may be hundreds of feet deep. The climate is a temperate marine climate with wet winters and dry summers. Annual rainfall varies from 60 inches in the lower valley to 120 inches in the headwaters. Federal ownership accounts for 66 percent of the watershed, including 48 percent in Olympic National Forest and 18 percent in Olympic National Park (Figure 3).

B. Study area and action area

The study area lies in the lowest part of the watershed where gradients are relatively shallow and the three main branches of the river system come together and flow across the broad alluvial Skokomish Valley floodplain (Figure 2). This area measures 11 square miles and includes the mainstem, the lower 4 miles of the South Fork, the lower 2 miles of the North Fork, the lower 2 miles of Vance Creek, and the subestuary. The upper portion of the study area is mostly agriculture and rural residential intermixed with areas of commercial timberland and undeveloped lands (Figure 3). The lower portion of the study area lies in the Skokomish Tribal Nation reservation, which is largely undeveloped with some rural residences and other uses.

The primary action area is located in the upstream part of the study area (Figure 2). Secondary, or ancillary, action areas include: 1) as yet unidentified source areas for large woody debris (LWD); and, 2) disposal site(s) for excavated materials and/or removed levee materials.

[3] The term "mainstem" can have two meanings: 1) From a river system perspective, the mainstem of a river is usually the largest channel. There are inconsistencies among some Skokomish River reports in how the term "mainstem" is used. Some use the term to describe only areas below the North and South Fork confluence. Others extend use of the term to apply to areas in the South Fork, while others the North Fork. For this report, the mainstem Skokomish River is defined as only that part of the river downstream from the confluence of the North and South Forks. 2) From a habitat perspective, relatively large river channels provide what is commonly termed "mainstem habitat." To avoid confusion, this report will use the term "main channel" instead of "mainstem" to describe this type of habitat. In the Skokomish watershed, main channel habitat is defined in the South Fork (approximately 25 miles), the North Fork (approximately 23 miles), and below the confluence (8 miles).

[4] The term "alluvial" means that alluvium, or loose, non-compacted sand and gravel, is the dominant inorganic material comprising the valley floor.

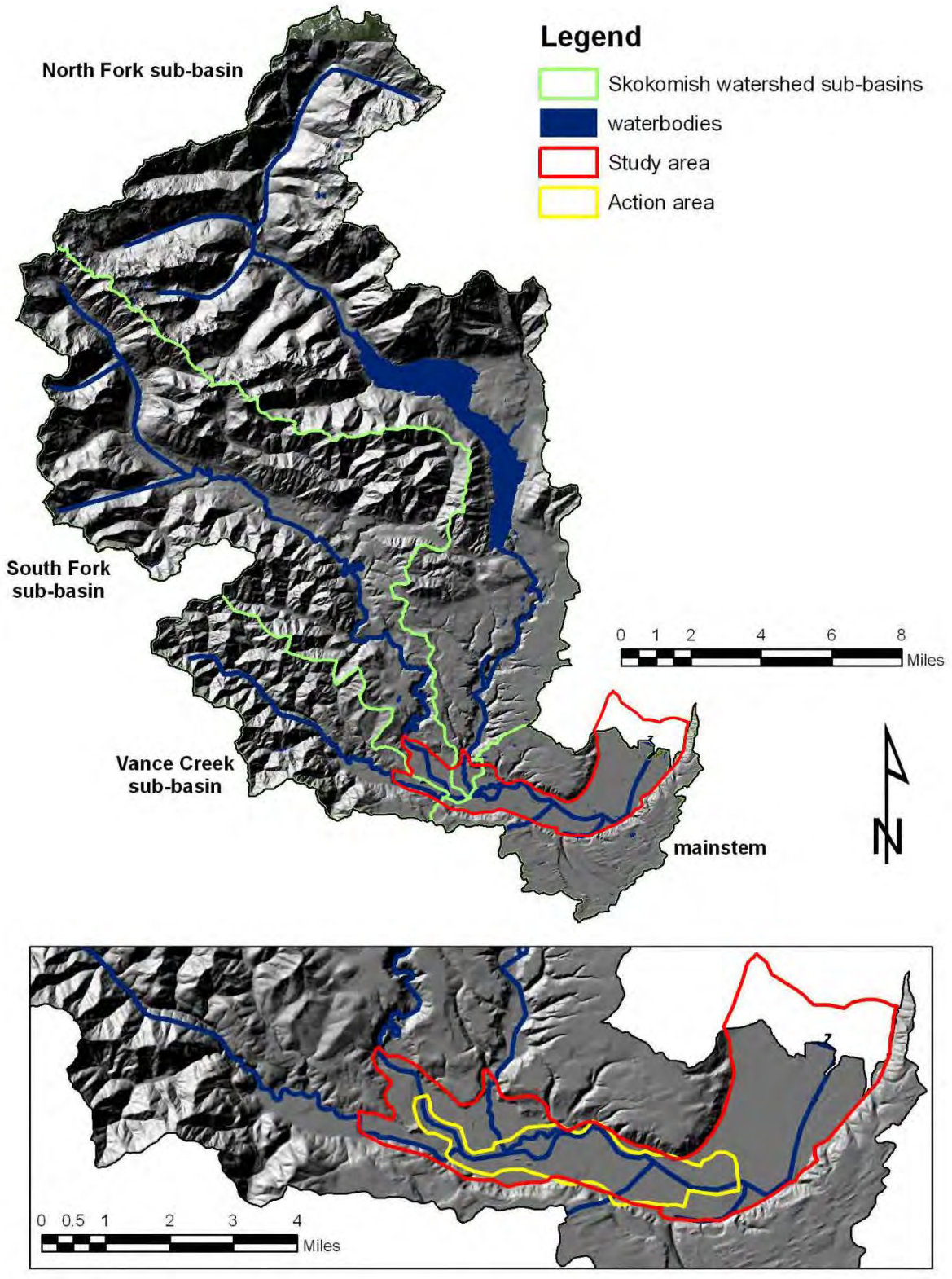


Figure 2. Map showing Skokomish River watershed shaded relief across the watershed (top) and within the study area and primary action area (bottom).

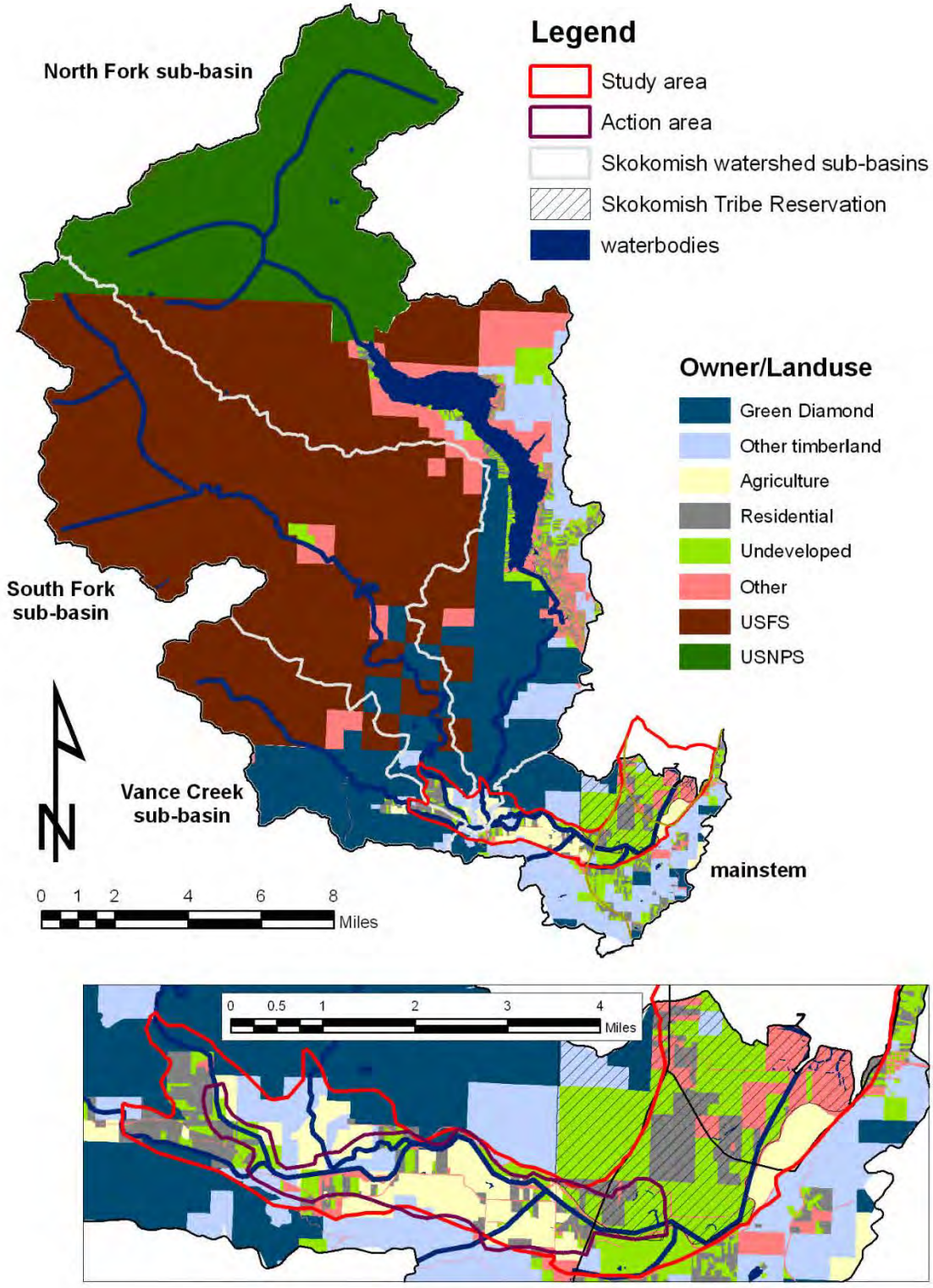


Figure 3. Map showing land use and land ownership in the Skokomish River watershed (top) and in the study area and primary action area (bottom).

The current state of the Skokomish River in the study area is the product of many decades of anthropogenic impacts throughout the watershed. These impacts have been substantial, widespread, and persistent. The migration of Euro-American settlers to the watershed in the late 1800's marked the onset of watershed transformation. During the next century, the watershed and the river experienced a variety of impacts, including: intense logging and widespread deforestation of riparian, floodplain, and upland areas throughout the basin; removal of nearly all LWD from the river and tributaries; river straightening and channelization with levees; additional hydraulic constrictions caused by roadway bridges (US101 and SR106); and, installation of two dams on the North Fork and subsequent withdrawal of nearly all its water. Many of these actions took place entirely or partially within the study area. Others occurred outside of the study area (e.g., North Fork impoundment and water withdrawal), but directly or indirectly shaped the physical and biological conditions observed today.

Cumulatively, these actions have resulted in a severely impaired system: the channel is highly aggraded and very unstable; sediment routing is highly impaired; and characteristics of quality salmon and trout habitat are lacking, including LWD, pools, side-channels, and off-channel habitat. Increased sediment supplies, reduced flows, and levees have also had a significant effect on estuarine habitat. The delta has become steeper, resulting in: 1) loss of important intertidal and eelgrass habitat; and, 2) a reduced mesohaline mixing zone, which is an important transition area for juvenile and adult salmonids as they move between freshwater and seawater. Several reports provide fairly thorough documentation and discussion of how human alterations have shaped the river and aquatic ecosystem in the study area (e.g., SIT and WDFW 2010; Peters et al. 2011).

In order to understand how the proposed SRBER project may affect fish and wildlife resources, it is important to understand the natural and human history of the watershed and the study area, and how these have interacted to create the physical and biological conditions observable today. These histories and interaction can be summed up as follows: 1) the physical forms, functions, and processes within the watershed and the study area are inherently very sensitive to disturbance and alterations; 2) the biological character of the watershed and the study area - including survival and productivity of fish and aquatic species of interest - are intimately linked to these physical forms, functions, and processes; and, 3) the watershed and the study area have been heavily disturbed and altered by diverse human activities since the late-1800's, substantially altering their physical and biological character. This context is a primary driver influencing project success at restoring more natural physical and biological characteristics and ultimate effect on fish and wildlife resources. A brief summary of pertinent study area characteristics and how they've been shaped by humans is presented below.

1. Geology

The study area's geologic history and setting suggest that it is highly sensitive to disturbance. Recently deglaciated landscapes such as the Skokomish basin experience an unstable "paraglacial" (or immediate post-glacial) period until glacial sediments are either removed from the system or become stable (Ballantyne 2002). Low-gradient alluvial reaches such as that within the study area are particularly sensitive and highly responsive to disturbance (Skidmore et al. 2011). In the Pacific Northwest, significant stabilization is achieved by abundant in-channel

LWD and mature conifer-dominated forests that blanket riparian, floodplain, and upland areas. Disruption to such stabilization mechanisms can destabilize the entire system by re-activating paraglacial sediment transport, creating unstable channel conditions, and re-mobilizing floodplain sediment sources (Ballantyne 2002; Skidmore et al. 2011).

2. Channel pattern

Channel pattern is important to river restoration because it has a direct bearing on aquatic ecosystem diversity and productivity. The term "channel pattern" is used to describe two basic aspects of a river: 1) the migratory behavior of a river; that is, the degree to which the channel migrates laterally across the floodplain; and, 2) whether the river has a single thread or multiple threads. Researchers generally recognize four primary channel patterns in rivers such as the Skokomish[5]: straight, meandering, island-braided (or anabranching), and braided (Figure 4; Leopold and Wolman 1957; Beechie et al. 2006; Huang and Nanson 2007; Eaton et al. 2010; Beechie and Imaki 2013).

Meandering channels are single-thread channels that migrate laterally across the floodplain (Leopold and Wolman 1957; Beechie et al. 2006). They are often found at low gradients, and thus are usually lowest in the watershed. The meandering pattern is evident in the lower Skokomish River mainstem. Evidence suggests that the meandering pattern was present in this part of the river prior to anthropogenic disturbance (Bountry et al. 2009; SIT and WDFW 2010)

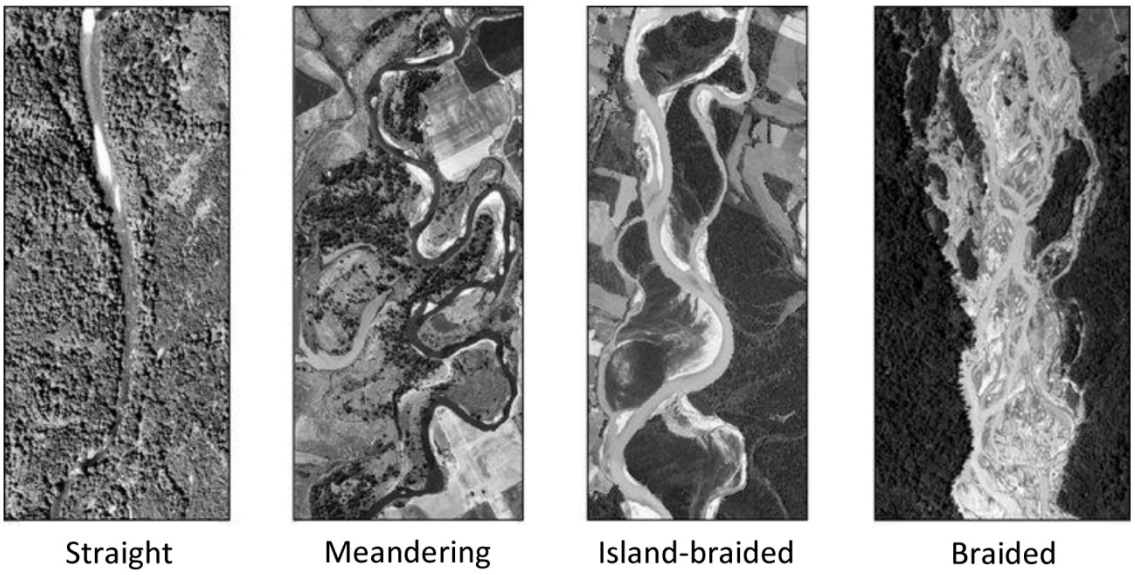


Figure 4. Examples of the four channel patterns found in western Washington rivers similar to the Skokomish. Image from Beechie and Imaki (2013).

[5] Authors have used different terms and definitions for similar patterns, and these terms have sometimes overlapped or contradicted one another. Beechie et al. (2006) provides a summary of these.

Braided channels have multiple threads that migrate laterally across the floodplain (Leopold and Wolman 1957; Beechie et al. 2006). They are usually found high in watersheds where steep headwater streams deposit abundant sediment into more moderately sloped main channels (Beechie et al. 2006; Beechie and Imaki 2013). Braided channels are symptomatic of large sediment inputs that exceed transport capacity of the channel. Braided channels are highly unstable. Of the three migrating channel patterns, meandering channels migrate the quickest and thus have the most disturbed floodplains (Beechie et al. 2006). Individual threads are separated by non- or sparsely-vegetated islands. Locations of channel threads and islands are in a constant state of change.

Within the study area, the South Fork and much of the mainstem currently exhibit a braided channel pattern (Peters et al. 2011). Braided morphologies are highly unstable, homogenous, and inhospitable to many fish species including salmonids. In the study area, the lack of LWD in the braided channel has yielded a largely featureless plane-bed channel type with a general paucity of pools (WDFW and PNPTT 2000). This provides poor habitat for fish spawning, rearing, and overwintering. The current braided channel pattern is not believed to have existed in this location prior to anthropogenic disturbance (SIT and WDFW 2010; Peters et al. 2011). Instead, anthropogenic disturbances to the system, including but not limited to removal of most LWD from the system and widespread deforestation of riparian, floodplain, and upland areas, are responsible for the current braided pattern. Conversion to the braided pattern is believed to have had substantial deleterious consequences to many fish species (Peters et al. 2011).

The third cannel pattern, island-braided, also has multiple threads that migrate laterally across the floodplain (Beechie et al. 2006; Huang and Nanson 2007; Eaton et al. 2010; Beachie and Imaki 2013). This channel pattern existed in part or most of the study area prior to anthropogenic disturbance (SIT and WDFW 2010; Peters et al. 2011). Island-braided channels are much more stable than braided channels because individual threads of the island-braided pattern are separated by stable vegetated islands. In contrast, the non-vegetated islands of the braided pattern are unstable and constantly shifting. Island-braided channels are considered intermediate between meandering and braided channels (Eaton et al. 2010). They are often found downstream of braided channels and upstream of meandering channels in the watershed (Beechie et al. 2006; Beechie and Imaki 2013). They also show a migration rate and floodplain disturbance level that are intermediate between the braided and meandering patterns (Beechie et al. 2006).

The island-braided pattern is common in undisturbed transport-limited depositional reaches of western Washington alluvial rivers (Beechie et al. 2006). This pattern provides channel stability and allows for both sediment storage and sediment transport (Beechie et al. 2006; Burge 2006; Huang and Nanson 2007; Jansen and Nanson 2010). It is a physically and hydraulically diverse pattern with abundant side channels, LWD, riffles, and complex pool habitats. Side channels are often markedly different from main channels in terms of hydrology, gradient, substrate, and habitat.

Ecological theory suggests that the island-braided channel pattern produces the most diverse and productive aquatic and floodplain habitats, which in turn supports the most productive fish populations (Ward et al. 1999; Gurnell and Petts 2002; Ward et al. 2002; Beechie et al. 2006;

Francis et al. 2009). Empirically, the island-braided pattern has been found to contain the highest quantity, quality, and diversity of aquatic habitats (Arscott et al. 2000), and thus the greatest biological diversity (Gurnell et al. 2005). Side channels and other off-channel habitat typically associated with the island-braided pattern (Ward et al. 1999; Ward et al. 2002; Beechie et al. 2006) have well-documented superior value to salmonids in the Pacific Northwest (e.g., Murphy et al. 1989; Beechie et al. 1994; Morley et al. 2005; Jeffres et al. 2008; Bellmore et al. 2013).

There are three primary lines of evidence supporting the contention that most of the river in the study area exhibited an island-braided channel pattern prior to human disturbance:

1. Maps and survey records made during the late 1800's and early 1900's indicate historic vegetated islands between RM 4.5 and 11, as well as in the lower North Fork. These data are presented in SIT and WDFW (2010) and Peters et al. (2011) and will not be duplicated here. The maps and survey records clearly show islands between RM 9 and 11, between RM 7.7 and RM 8, between RM 4.5 and 6, and on the North Fork between RM 0 and 1. A slough mapped between RM 6.8 and 7.6 suggests another likely island in this location.

2. Geomorphic theory suggests that the island-braided pattern develops in transitional areas where steeper, more mountainous gradients transition to shallower gradients in valley bottoms (Beechie et al. 2006, and references therein; Beechie and Imaki 2013). The study area matches the idealized setting where the island-braided pattern would be expected.

3. Preliminary application of a predictive model (Beechie et al. 2006) to the Skokomish River[6] predicts the island-braided pattern starting at about RM 11.5, and extending downriver to RM 3.2 to 5 (Figure 5). This matches very closely with the early maps and survey records discussed above.

Both SIT and WDFW (2010) and Peters et al. (2011) relied on historic land surveys and maps (line of evidence 1) to support the contention that the Skokomish River had an island-braided pattern prior to human disturbance. Neither report considered geomorphic theory (line of evidence 2) or channel pattern predictive models (line of evidence 3). These two additional lines of evidence have not been reported or considered elsewhere. The brief presentations above are not intended as comprehensive or sufficient applications of geomorphic theory or channel pattern predictive modeling to the Skokomish River. Such evaluations are beyond the scope of this report. Rather, they are included to highlight heretofore neglected information and approaches

[6] The Beechie et al. (2006) model uses river discharge and channel slope to predict channel pattern in western Washington watersheds. Variations of this methodology are common (e.g., Leopold and Wolman 1957; Desloges and Church 1989; Beechie and Imaki 2013). The preliminary Skokomish assessment used slope data from Bountry et al. (2009). Estimates of two-year flood discharge (approximating bankfull discharge) were obtained from two sources: a) LP-III Model estimates calculated by the Bureau of Reclamation (England 2007; USBOR 2009, cited in USACE 2011); and, b) the regression equation proposed by Sumioka et al. (1998) using watershed area and mean annual precipitation. Mean annual precipitation for the Sumioka et al. (1998) method was represented by climatological period 1961-1990 and was obtained from the United States Department of Agriculture Natural Resource Conservation Service.

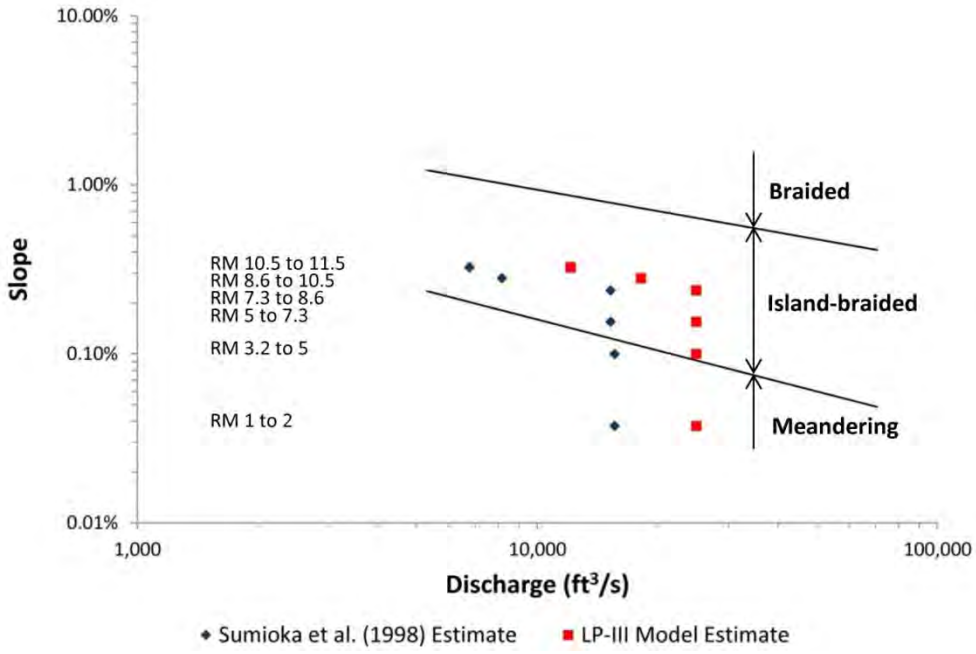


Figure 5. Results of preliminary predictive modeling (Beechie et al. 2006) for predicting natural channel pattern in the Skokomish River. The black lines represent thresholds that separate channel patterns: meandering from island-braided (lower line); island-braided from braided (upper line). Two methods for estimating two-year flood discharge in the Skokomish River are shown (Sumioka et al. 1998 and LP-III Model). See text for explanation. River miles on the left correspond with each pair of data points to the right. Results indicate that the island-braided pattern is predicted from RM 11.5 to about RM 3.2.

vital to understanding the geomorphic and ecological history of the Skokomish River, and thus informing restoration efforts for maximizing benefits.

3. Aggradation

Rapid and substantial riverbed aggradation[7] in the study area has been one of the most notable and agreed upon consequences of human impacts in the watershed. For example, the U.S. Geological Survey (USGS) gaging station at the US101 bridge has experienced over 4 feet of aggradation over the 32 year period from 1965 to 1997, a rate of 1.3 feet per decade (Stover and Montgomery 2001). As a result of aggradation, channel capacity in this location has steadily decreased from 13,000 cfs in 1943 to about 4,000 cfs in recent years (USACE 2011). Aggradation is so severe that the South Fork often goes completely dry between RM 8 and 9 during late-summer and early-fall[8] (SIT and WDFW 2010). It is thought that the Skokomish River in the study area has been naturally aggrading for the past 2,000 years (Bountry et al. 2009). However, the rate of aggradation experienced during the 20th and early 21st century is believed to be well above natural.

[7] Aggradation is the build-up of sediment in the river channel. It occurs when sediment inputs from upstream exceed transport capacity. The result is an increase in the elevation of the river bed.
[8] Late-summer and early-fall is the normal seasonal low-flow period for unimpounded western Washington rivers.

Reviewers commonly cite six factors believed to have contributed to the current state of aggradation (Bountry et al. 2009; SIT and WDFW 2010; Peters et al. 2011):

1. Clearcut logging and rapid deforestation throughout the watershed resulting in an increased sediment load from unstable slopes, mass wasting, and bank erosion.

2. Removal of logjams and large wood pieces and clearing of riparian zone old-growth forest throughout the study area resulting in release of stored floodplain sediments and subsequent conversion of an island-braided channel pattern to a less stable braided one.

3. Reduction in flow from the North Fork Skokomish River due to the operation of Cushman dam, resulting in reduced sediment transport capacity in the mainstem Skokomish River.

4. Channelization and straightening of the river channel using riprap, crib structures, cabled logs, and removal of large wood, resulting in reduced sediment transport efficiency.

5. Confinement of the channel by levees, resulting in backwatering of some areas, translation of depositional zones in a downstream direction, in-channel deposition of suspended sediments in low gradient areas, and loss of storage of coarse sediments in secondary channels.

6. Hydraulic flow constrictions at US101 and SR106 bridge crossings, causing back watering and loss of sediment transport capacity.

Each of these mechanisms is physically plausible and has likely contributed to the aggradation problem to varying degrees. However, there is no professional consensus among the various experts who have studied physical processes in the Skokomish River as to which are most important (Bountry et al. 2009). Without a clear understanding of which mechanisms are driving or most responsible for aggradation in the study area, agreement on the most effective restoration actions in the study area will remain elusive.

Severe aggradation in the study area may impact fish populations by: 1) blocking migration; 2) inducing channel instability which can scour and bury redds (egg nests); 3) reducing habitat quantity and quality by filling in pools and diminishing pool frequency and depth; and, 4) increased incidence of fish stranding and mortality in the floodplain due to increased frequency and severity of flooding.

4. Large woody debris

Large woody debris is severely lacking throughout the study area (Correa 2003; Peters et al. 2011), a result of direct channel clearing of LWD in the early 1900's as well as removal of source LWD areas via deforestation. LWD is a primary structural factor affecting general channel stability, hydraulics, sediment routing and retention, bank erosion, and channel pattern. It is vital in both: 1) creating and maintaining channel characteristics that constitute high quality

fish habitat; and, 2) providing a direct source of complexity, hydraulic cover, and cover from predators, which together increase salmonid rearing densities and survival.

5. Channelization and floodplain connectivity

Residents of the valley and various government agencies have over the years implemented various uncoordinated diking, channelization, and bank stabilization efforts throughout the study area (Bountry et al. 2009). The result has been an extensive albeit discontinuous network of levees, dikes, and associated structures through the length of the study area. The Corps (USACE 2000) noted that these levees may mitigate low-level and site-specific flooding but are of little benefit during large magnitude flood events. These levees have likely contributed to the current state of aggradation and fish habitat loss through the complex interactions that levees can have with channel hydraulics and sediment transport and deposition. Although not entirely conclusive, the construction of levees coincides with the beginning of aggradation in the study area (Stover and Montgomery 2001). Three levee sites have severely constrained the river and are believed to have had the most influence in shaping the study area: the Nalley Island levees[9]; the Car Body and River Mile 9 Levees near the pre-2004 North Fork confluence; and the Grange Levee (Peters et al. 2011). These and other levees in the study area isolate the channel from the floodplain, and inhibit natural physical processes and formation of natural river morphologies. They also inhibit formation, maintenance, and use of off-channel habitat that is important for many salmonid species.

Channel straightening in the Skokomish River began in the 1930's. Channelization in the study area was not well documented, although at least four sections along the South Fork and the mainstem are believed to have been straightened (Bountry et al. 2009): an area below RM 12, another area just downstream of RM 9.6, and sections from RM 8 to 9, and RM 4 to 5.3. Channelization results in a temporary increase in hydraulic capacity, but reduced sediment transport efficiency over the long-term. Channels that are straightened to increase flood conveyance are usually widened as well. This tends to improve hydraulic capacity, but reduces the sediment transport capacity relative to a more sinuous channel with a deep thalweg[10], a lower width-to-depth ratio, and the presence of secondary currents along the bed and banks that keep sediment mobilized. Channelization thus shortens the length of the channel and by extension available habitat, and may also contribute to aggradation.

C. Other restoration efforts

There is strong interest by a variety of federal, state, local, tribal, private entities, and affiliated collaborative groups (e.g., the Skokomish Watershed Action Team), to restore the Skokomish River watershed. These groups have implemented numerous restoration projects of varying scales throughout the watershed. In the absence of any overarching, comprehensive, watershed-scale organization, early restoration efforts were generally ad-hoc, small, and localized. Collaboration within groups such as the Skokomish Watershed Action Team (SWAT) and the Hood Canal Coordinating Council appears to be facilitating a more holistic, comprehensive, and systematic approach to developing and prioritizing restoration projects within the watershed.

[9] Most of the Nalley Island levees were removed between 2007 and 2010.
[10] The thalweg is the deepest part of the channel.

A brief summary of the larger, more pertinent completed or ongoing restoration efforts in the watershed is outlined below. Additional restoration projects are underway and/or planned. Many of these are either upstream from the study area or in and near the subestuary. Large-scale restoration in the study area has generally been avoided. Restoration leaders (e.g., SWAT) have recognized the complexities and magnitude of the issues and restoration needs here, and are thus relying on the Corps and the GI for direction and funding (SWAT 2007). Organizations such as the Mason County Conservation District are facilitating smaller-scale efforts throughout the study area.

South Fork Skokomish River watershed restoration on USFS lands (1990 - 2004). The U.S. Forest Service and various partners implemented various restoration projects in the South Fork, including road, in-stream, riparian, and vegetative work totaling $10.6 million. See USFS (2004) for more details. These efforts marked a turning point in that resource extraction was deemphasized in favor of watershed restoration.

Skokomish Estuary Restoration, Phase 1 (2007). This effort removed 0.69 miles of dike on the west side of Nalley Slough, restoring 108 acres of intertidal wetlands.

Cushman Project Federal Energy Regulatory Commission (FERC) Project No. 460, Settlement Agreement for the Cushman Project (January 2009). This settlement provided a variety of beneficial actions for fish and fish habitat in the North Fork Skokomish River. Among the most important was restoration of flows to the North Fork, which has widely been viewed as critical to restoring natural sediment transport rates through the study area. Flow restoration was implemented in March 2008, prior to signing of the settlement agreement. Other notable actions agreed to in the settlement include fish population supplementation plans, construction and operation of fish passage facilities at the Cushman project, fish and habitat monitoring, and enhanced fish habitat plans.

US 101 Purdy Creek Bridge Replacement (September 2009). The old 110-foot-long US101 Purdy Creek Bridge was replaced with a 350-foot-long, taller bridge primarily to reduce flood-related road closures in this location. Flooding from the Skokomish River was common here. The bridge replacement had the added benefit of reducing one of the four hydraulic constrictions in this section of the river system. These four constrictions are distributed laterally across the floodplain at essentially the same longitudinal point in the valley (i.e., along US 101). Thus, backwatering upstream of all four US 101 bridges is expected to decrease (WEST Consultants, Inc. 2006).

South Fork Skokomish River Large Wood Project (Summer 2010). Thirty engineered log jams (ELJs), consisting of over 2,000 logs, were installed in a one-mile stretch of the South Fork Skokomish River located approximately 10 miles upstream from the study area. In addition, approximately 12 acres of floodplain were restored and stabilized with tree and shrub plantings. These actions are expected to stabilize and retain sediments in the area immediately around the ELJs, and thus restore more natural sediment transport rates to downstream areas. Other benefits include enhancement of fish spawning and rearing habitat in the immediate ELJ installation area.

Skokomish Estuary Restoration, Phase 2 (2010). This effort removed 2.49 miles of dikes, removed roads and culverts, and filled ditches, restoring 200 acres of subestuary habitat. The implementation of Phases 1 and 2 were widely regarded as critical to alleviating flooding in the lower mainstem and to restoring critical subestuary structure and function for the benefit of fish, shellfish, and shorebirds.

Green Diamond Resource Company watershed restoration (mid-1990's to present). The Green Diamond Resource Company owns and manages 15% of the Skokomish River watershed for commercial timber production. Green Diamond has upgraded and decommissioned roads to decrease sediment inputs from their road systems, and has restored fish passage in some areas by replacing inadequate culverts.

South Fork Skokomish River watershed restoration on USFS lands (2005 - present). The U.S. Forest Service, in conjunction with the SWAT, the Skokomish Tribe, and other partners, have completed over $11.5 million in restoration work, including road closures and decommissioning, road stabilization, trail conversion, and commercial and pre-commercial thinning for expediting development of characteristics similar to mature forest. Among other results, efforts since 1990 have decreased road density in the upper South Fork watershed from 3.3 miles per square mile to less than 1.9 miles per square mile.

III. FISH AND WILDLIFE RESOURCES AND PLANNING OBJECTIVES

A. General fish and wildlife concerns

The SRBER project is intended to restore some degree of watershed and aquatic ecosystem structure, function, and processes for the benefit of numerous aquatic species, with a particular emphasis on salmonids. Ecological restoration invariably involves some degree of disturbance, risk, and uncertainty, and also often involves trade-offs that favor some species and habitats over others. Watershed-scale restoration, such as that proposed by the SRBER project, involves complex physical and biological interactions that often times are not fully understood. Because of the scale and scope of this project, and the complexity of the physical and biological processes involved, primary fish and wildlife concerns include:

1. How likely are the intended benefits of the proposed actions to be realized?

2. Will all pertinent factors that may influence success be adequately considered?

3. What short- and long-term negative impacts to target and non-target species and habitats may arise?

4. Will the intended benefits outweigh the negative impacts?

5. Will unintended consequences and level of risk associated with those consequences be adequately considered and managed?

6. What is the potential for the proposed actions to result in a net negative impact to target and non-target fish and wildlife resources?

7. What will negative impacts be to non-target species and will benefits to target species outweigh these?

B. Planning objectives

The Corps has identified four planning objectives of the proposed SRBER project for a 50-year period of analysis:

1. Provide year-round passage for fish species around the confluence of the North and South Forks.

2. Reconnect and restore the side channel and tributary networks in the study area.

3. Improve the quantity, quality, and complexity of native in-channel and floodplain habitats in the study area.

4. Increase the channel capacity of the Skokomish River to allow for restoration of rearing habitat as well as reduce stranding of salmonid species listed under the Endangered Species Act (ESA).

C. Current status of fish and wildlife resource

1. Federally listed, proposed, and candidate Species

Federal ESA-listed species and/or the habitat suitable to support these species which occur or may occur in the study area include the following:

- Puget Sound Chinook salmon (*Ocnorhynchus tshawytscha*)
- Hood Canal summer chum salmon (*O. keta*)
- Puget Sound steelhead trout (*O. mykiss*)
- bull trout (*Salvelinus confluentus*)
- northern spotted owl (*Strix occidentalis caurina*)
- marbled murrelet (*Brachyramphus marmoratus*)
- streaked horned lark (*Eremophila alpestris strigata*)

These species are all listed as threatened. In addition, the yellow-billed cuckoo (*Coccyzus americanus*) has been proposed for listing as threatened, and the fisher (*Martes pennanti*) is a candidate species currently scheduled for proposed listing in 2014. Federal species of concern are addressed in Section III.A.3.

Of these species, the northern spotted owl, marbled murrelet, streaked horned lark, and yellow-billed cuckoo are not expected to occur in the study area. The northern spotted owl and marbled murrelet are found in mature and old growth conifer forests, and the yellow-billed cuckoo is strongly associated with large stands of mature riparian cottonwood forests. While there are

small patches of large conifer stands in portions of the study area, there is not sufficient habitat to support these three bird species in the study area. The streaked horned lark requires large areas of bare ground in an open flat landscape, such as that found in native prairies and in developed areas like airfields. Such habitat is lacking in the study area. The other species listed above are either known to occur or may occur in the study area. These are discussed more fully below.

a. Puget Sound Chinook Salmon ESU and Designated Critical Habitat

Chinook salmon in the Skokomish River belong to the Puget Sound Chinook salmon ESU which was listed as threatened under the Endangered Species Act in March of 1999. This listing was recently upheld in a 5-year review (NMFS 2011). Despite recent negative trends in abundance, the NMFS concluded that extinction risk of the ESU had not significantly increased. The NMFS noted that the ESU "is relatively well distributed over 22 populations in 5 geographic areas." Critical habitat was designated in 2005 to include the Skokomish River subestuary, the mainstem Skokomish River, the South Fork to approximately RM 12, the North Fork to just above Lake Cushman, the lower three miles of Vance Creek, and lower parts of several major tributaries (NMFS 2005). This generally overlaps with what is believed to be the historical spawning distribution in the basin (SIT and WDFW 2010).

The Skokomish River Chinook salmon population is severely depressed at best. In 2002, WDFW rated this stock as "depressed" due to "chronically low natural escapement" (WDFW 2002). Natural spawner escapement has been relatively stable since about 1990, averaging a little under 1,250 spawners per year (WDFW 2013b). Preliminary evidence suggests that hatchery strays account for considerable proportions of these naturally spawning fish (WDFW 2002; WDFW and PSIT 2007, cited in SIT and WDFW 2010; WDFW and PSTIT 2010). Juvenile production is also substantially lower than other Puget Sound river basins (Peters et al. 2011). The existence of a self-sustaining naturally-reproducing population is therefore questionable.

Chinook salmon are one of the most variable of the salmonid species in terms of life history diversity and habitat requirements. Puget Sound Chinook are no exception. Adult spawners enter natal watersheds during much of the year. "Early returning" fish typically migrate into freshwater during spring and summer; "late returning" fish typically enter during fall. Regardless of entry timing, spawning usually occurs from early August through late October. In the Skokomish River, spawning occurs in the mainstem, in the lower portions of the North and South Forks, and in Purdy, Vance, and Hunter Creeks. Fry emerge from redds between December and April. Juvenile Puget Sound Chinook salmon may spend as little as a few days to as many as 12 months or more rearing in freshwater habitats (SSPS 2007). Most, however, spend 6 months or less in freshwater, and enter estuary habitats by mid-July (Fresh 2006). Main channel, tributary, and off-channel pond areas in and near the study area all provide important freshwater rearing habitat for Skokomish River Chinook salmon (Peters et al. 2011). Natal delta and subestuary areas are vital for rearing and migration (Fresh 2006; Peters et al. 2011). Juveniles may spend up to 10 months rearing in natal delta/subestuary habitats.

Historically, the Skokomish River had both an early and a late run of Chinook salmon. However, the early run is considered extirpated (Nehlson et al. 1991; Ruckelshaus et al. 2006)

and the late run is largely if not entirely non-native (Ruckelshaus et al. 2006; SIT and WDFW 2010). The late-timed run is much more dependent upon conditions in the lower watershed than the early-timed run. For this reason, the Skokomish River Chinook salmon recovery plan emphasizes reintroduction and recovery of an early-timed run at this time (SIT and WDFW 2010). The authors note that substantial improvement in lower watershed conditions is critical to recovery of the late-timed run. The existing late run population arose from widespread use of Green River (southeast Puget Sound) hatchery-origin fish at many Hood Canal hatcheries, including two in and near the Skokomish River basin. Nonetheless, the existing late run Skokomish River Chinook are considered part of the ESA-listed Puget Sound ESU.

Spawning historically peaked in October and often extended into November in the Skokomish River (SIT and WDFW 2010). However, past hatchery practices unintentionally advanced river return and spawn timing in Skokomish River naturally-reproducing stock by as much as 6 weeks or more (SIT and WDFW 2010). Thus, the existing run enters the river and spawns during the lowest river flows of the year. In contrast, the endemic run was more closely timed with the end of the summer drought season, the onset of fall rains, and rising river flows. This loss of environmentally-adapted behavior compounds already complicated recovery needs. First, access to spawning habitats in Vance Creek and the South Fork is frequently blocked at low flows by aggraded sediments above the North Fork confluence. In addition, spawning habitat is restricted to the central portion of the channel during low flows. This leaves eggs particularly susceptible to potential effects of peak fall and winter discharges, such as scouring, fill, and channel migration. These concerns would be ameliorated at historical run timing.

b. Hood Canal Summer-run Chum Salmon ESU and Designated Critical Habitat

Hood Canal summer chum salmon were listed as threatened under the Endangered Species Act in March of 1999. This listing was recently upheld in a 5-year review, which found that "the overall trend in spawning abundance is generally stable" and determined that the ESU "remains at a moderate risk of extinction" (NMFS 2011). Critical habitat was designated in 2005 to include the Skokomish River subestuary and the mainstem Skokomish River from the vicinity of the old (pre-2004) confluence of the North and South Forks to the mouth (NMFS 2005).

Hood Canal summer chum adults typically spawn in the lower portions of rivers and streams from late August through late October (WDFW and PNPTT 2000). This timing corresponds with the lowest river and stream flows of the year. Spawning habitat is thus restricted to the central portion of the channel. This leaves the eggs particularly susceptible to potential effects of peak fall and winter discharges, such as scouring, fill, and channel migration. Fry emerge from gravel substrates between February and late May, and migrate downstream to estuary habitats shortly thereafter. There is little to no freshwater rearing. Dense bands of eelgrass in nearshore estuary areas are believed to provide important rearing habitat and safe migratory corridors for juvenile summer chum (Simenstad 2000). Eelgrass thrives in shallow, gentle-gradient areas with clear water and sandy substrate (Gayaldo 2002; Berry et al. 2003), and is present in the Skokomish subestuary albeit at a 17 percent reduction from historical levels (Jay and Simenstad 1996).

The Skokomish River stock has been considered extirpated since the late-1960's or early 1970's (WDFW and PNPTT 2000; NMFS 2007). A small handful of adult spawners are periodically observed in the river, but these are believed to be strays and not indicative of a self-sustaining population. Anthropogenic impacts described in Section II - particularly channel instability, scour, and fill - are believed to be the primary cause for this populations demise. Prior to degradation, the Skokomish River may have once supported the largest summer chum population in Hood Canal (WDFW and PNPTT 2000). Based on historical observations and habitat similarities, summer chum are believed to have spawned in the North and South Forks, Vance Creek, the mainstem, and several tributaries. The Skokomish River has been identified as a potential future target for reintroduction of summer chum, provided appropriate restoration actions are taken and are successful at improving habitat conditions (WDFW and PNPTT 2000).

c. Puget Sound Steelhead DPS and Designated Critical Habitat

Puget Sound steelhead were listed as threatened under the Endangered Species Act in 2007. This listing was recently upheld in a 5-year review (NMFS 2011). Despite recent negative trends in abundance, the NMFS concluded that extinction risk of the DPS had not significantly increased. Critical habitat has recently been proposed and includes the mainstem Skokomish River, the North Fork to just below Lake Cushman, the entire South Fork and Vance Creek mainstems, and lower parts of several major tributaries (NMFS 2013). This generally overlaps with current and historical spawning distribution within the basin (WDFW 2002).

Similar to Chinook salmon, Puget Sound steelhead exhibit both an early- ("summer") and a late- ("winter") returning form. Summer steelhead enter freshwater from May to October, hold for several months in deep, low-velocity areas, and spawn from January to April. Winter-run fish enter freshwater from November to April, and spawn shortly thereafter from February through June. The winter-run form is the more predominant form throughout Puget Sound. Regardless of spawning strategy, steelhead juveniles rear in freshwater habitats for up to three years prior to seaward migration making them one of the most dependent anadromous[11] salmonids on freshwater habitat. Juvenile steelhead use riffles and fast-flowing pool habitats during the summer and prefer pool and side channel habitats in winter. Mainstem and tributary habitats in and near the study area provide year-round rearing habitat for juvenile *O. mykiss* (Peters et al. 2011). Smolt outmigration has been observed from February through September, with the peak occurring in May (Peters et al. 2011). Outmigrating smolts spend little time in the estuary, choosing instead to migrate rapidly toward the ocean.

The Skokomish River supports a winter-run of steelhead; the current or historical existence of a summer-run is uncertain (PSSTRT 2013). In 2002, WDFW considered the Skokomish River winter steelhead "depressed" citing "chronically low escapements and long-term negative trend escapement" (WDFW 2002). Since then, spawner numbers have been trending upward, although annual returns are still low. Spawners averaged about 390 per year between 2004 and 2012 (WDFW 2013b). Most spawning is observed in the mainstem and South Fork in and near

[11] Anadromous means that individuals of the species migrate from freshwater to saltwater to feed and grow, and return to freshwater to spawn. Some anadromous species migrate to saltwater immediately after hatching and return only to spawn (e.g., pink salmon). Others are more dependent on freshwater, rearing in freshwater for a few months (e.g., some Chinook salmon populations) to several years (e.g., steelhead trout) prior to migrating to saltwater.

the study area, although the North Fork and Vance Creek also support spawning steelhead. Juvenile trout (*O. mykiss* and cutthroat combined) have been observed rearing throughout the Skokomish basin, including the mainstem, the North Fork to the first dam (Cushman Dam No. 2), the South Fork to RM 19, and Vance Creek to RM 5 (Peters et al. 2011).

d. Bull Trout and Designated Critical Habitat

Bull trout were listed as threatened under the Endangered Species Act in 1999. This listing was upheld in a 2008 5-year review (USFWS 2008). A current 5-year review is pending in which the listing status is not expected to change. The Skokomish River is one of fourteen core areas belonging to the Coastal-Puget Sound DPS[12] of bull trout, and supports the only known bull trout population in Hood Canal. The Coastal-Puget Sound DPS is the only DPS to exhibit a diadromous life history form, meaning that individuals migrate between marine and freshwater habitats. Diadromous bull trout spawn in freshwater, and feed and grow in both marine and freshwater habitats. The Coastal-Puget Sound DPS also exhibits the more common adfluvial and fluvial[13] forms. Critical habitat for bull trout was designated in 2010 and includes parts of the mainstem, South Fork, and North Fork Skokomish River, Vance Creek, Purdy Creek, and Lake Cushman. Bull trout have been observed throughout the mainstem and the North and South Forks (Peters et al. 2011)

There are at least two and possibly three local populations of bull trout in the Skokomish River. One is an adfluvial population that inhabits Lake Cushman and the North Fork above the lake. This population is separated from the study area by the two Cushman dams, both of which lack fish passage facilities. The South Fork Skokomish River supports a depressed but stable fluvial population (Peters et al. 2011). Brown Creek - a tributary to the South Fork - contains suitable habitat for bull trout spawning and rearing, and may support a local population (USFWS 2004).

The bull trout population in the Skokomish River core area is one of the most depressed in the Olympic Peninsula Management Unit. The population is at risk of genetic drift due to low population levels (less than 1,000 adults). Also, because there are fewer than five local populations, bull trout in this core area are at elevated risk of extirpation and adverse effects from random naturally occurring events (USFWS 2004).

Bull trout are present in freshwater habitats all year, typically utilizing pools with suitable cover in main channels and side channels (USFWS 2004). Peters et al. (2011) observed bull trout in and near the study area year-round. Complex habitat including large woody debris, undercut banks, boulders, and pools are important for bull trout. In the Skokomish River, bull trout generally spawn from mid-September through the end of November in areas upstream from the study area. Bull trout fry typically emerge from April through May in other systems (USFWS 2004). Exact emergence timing in the Skokomish River is unknown. Diadromy has not been

[12] Bull trout within the coterminous United States are considered one DPS in the ESA listing despite sufficient scientific basis for segregating into multiple DPS's. The Service has continued to refer to multiple specific DPS's for purposes of consultation and recovery planning. Recent scientific evidence supports the multiple DPS approach (USFWS 2008; Ardren et al. 2011)

[13] Adfluvial means that the fish feed and rear in a lake and migrate to flowing water (a river or stream) to spawn. Fluvial means that spawning, feeding, and rearing all occur within flowing water, although the fish may migrate long distances through the river system.

documented in the Skokomish River population, although some juveniles have been captured in a screw trap in the lower river near the estuary (Matthew Kowalski, Skokomish Tribal Nation, personal communication), possibly indicating the existence of diadromy. Because bull trout are highly dependent on clean, cold water, and because they have one of the longest incubation periods (four to six months) of any native fish in the Pacific Northwest, bull trout are extremely dependent on good water quality and intact habitats (Fraley and Shepard 1989; Rieman and McIntyre 1993).

e. West Coast Fisher DPS

The West Coast DPS of the fisher is a candidate species for ESA listing (USFWS 2013). The fisher historically occurred on the Olympic Peninsula and in the Cascade Mountains, but were extirpated from Washington State in the mid-1900s due to over-trapping, predator control measures, and habitat fragmentation. Extensive surveys to detect wide-ranging carnivores in the 1990s and early 2000s failed to detect fishers in Washington. Because of the lack of fisher detections and concern about fisher population declines, a status review was performed in 1997 and the species was listed as state endangered in 1998. Following the listing, conservation efforts for the species increased, including development of a recovery plan and a feasibility study for reintroduction.

The Olympic Peninsula was identified as the highest priority for reintroduction. Animals were captured in British Columbia and released over a three year period between 2008 and 2010. In 2009, several fishers were released in the Skokomish River watershed immediately upstream of Lake Cushman in Olympic National Park. All of the released animals were fitted with radio-transmitters and tracking data revealed that animals both dispersed widely across the Olympic Peninsula and were reproducing. Although batteries in the radio-collars of the founder populations have since expired, fishers have been detected at bait and camera stations across the Olympic Peninsula, with recent (2012-2013) confirmed reports in the lower Hoh River watershed, near Lake Ozette, the upper Bogachiel River watershed, Lake Crescent, the foothills between Port Angeles and Sequim, the Buckhorn Wilderness, and the Duckabush River watershed. Given their large home ranges, huge dispersal distances, and data indicating that translocated fishers are using a variety of habitat types, it is likely that they could move through or be present in the study area.

2. State-listed Species

Washington State species of interest that may be affected by the project include:

- State Candidate Species: bull trout, Puget Sound Chinook salmon, Hood Canal summer chum, and river lamprey (*Lampetra ayresi*).
- State Monitored Species[14]: Pacific lamprey (*L. tridentata*), reticulate sculpin (*Cottus perplexus*), and riffle sculpin (*C. gulosus*).

[14] From WDFW (http://wdfw.wa.gov/conservation/endangered/status/SM/): "Washington State Monitored Species are not considered Species of Concern, but are monitored for status and distribution. They are managed by [WDFW], as needed, to prevent them from becoming endangered, threatened, or sensitive."

Information on the abundance, distribution, and status of lamprey and sculpin species in western Washington is extremely limited and largely anecdotal. River lamprey have been found in several Puget Sound rivers (Wydoski and Whitney 2003). Three occurrences have been documented within the Skokomish River watershed between 1931 and 1993 (USFWS undated; WDFW 2013a), one of which was in the study area (WDFW 2013a). Larvae (ammocoetes) rear in freshwater for several years in backwaters and quiet eddies with fine silt and mud substrate (Wydoski and Whitney 2003). Seaward migration generally occurs from April to June. Adults begin returning to freshwater by September, spawning several months later from April through June.

Pacific lamprey are found in most Puget Sound rivers (Wydoski and Whitney 2003). Peters et al. (2011) captured several Pacific lampreys emigrating from the Skokomish River. Similar to river lamprey, Pacific lamprey ammocoetes rear in freshwater for 4 to 7 years in depositional areas, backwaters, and quiet eddies with fine silt and mud substrate. Seaward migration generally occurs from March to July, although some fall migration has been observed. Adult Pacific lamprey return to freshwater between March and October, overwinter in deep pools, then spawn from April through July. Spawning occurs in similar habitats to salmon: in gravel-bottomed streams, at the upstream end of riffles, and at pool tailouts, typically upstream from suitable juvenile rearing habitat. Riffles and side channels are important Pacific lamprey spawning habitats.

Riffle sculpin and reticulate sculpin often occur in the same Puget Sound streams (Wydoski and Whitney 2003), and have been observed in the Skokomish River (Mongillo and Hallock 1998; Peters et al. 2011). Backwater pools (riffle sculpin), in-channel pools (reticulate sculpin), and similar quiet areas are favored habitats, although both species have also been observed in riffles. Both species spawn in the spring and spend their entire lives in freshwater.

3. Federal species of concern

Federal species of concern known to use or that may use areas in and near the study area include coho salmon (*O. kisutch*) Puget Sound/Strait of Georgia ESU, Pacific lamprey, river lamprey, bald eagle (*Haliaeetus leucoephalus*), the olive-sided flycatcher (*Contopus borealis*), the northern goshawk (*Accipiter gentilis*), and the peregrine falcon (*Falco peregrinus*).

Skokomish River coho were identified as an individual stock based on their distinct spawning distribution. They were labeled as healthy in the 2002 SASSI (WDFW 2002). It is a mixed stock with natural spawning occurring in most accessible tributaries to the Skokomish River with the most significant area being the lower North Fork and Vance Creek. Coho salmon are widely distributed throughout the Skokomish Basin. They have been observed in tributary, main channel, and pond habitats (Peters et al. 2011). Juvenile coho salmon were observed up to the lower dam in the North Fork, up to RM 27 in the South Fork, and up to RM 3.7 in Vance Creek.

Coho salmon generally do not migrate to sea until the spring of their second year of life and therefore rely heavily on freshwater habitat as juveniles. Although they are typically spawned in higher gradient streams, they generally rear in the middle reaches of watersheds and prefer slower velocities than most other juvenile salmonids (Quinn 2005). Coho juveniles generally

prefer pools over riffles. Their densities are positively correlated with LWD presence (Roni and Quinn 2001), and the importance of wood cover may increase with stream size (Peters 1996). Coho fry may also use the stream-estuary transitional area (ecotone) to rear during the summer, migrating upstream to overwinter in side channel and off-channel habitats located in lower watersheds (Miller and Sadro 2003). During high flow periods throughout the winter months, coho make extensive use of off channel habitat and migrate several kilometers down tributaries and main stem reaches to reach these habitats (Peterson 1982). Coho smolts generally migrate through the estuary rapidly, and thus do not rely as heavily on estuary habitat as some other salmonids.

4. Other fish and wildlife resources

Other fish species known or likely to occur in the study area include (Mongillo and Hallock 1997; Peters et al. 2011):

- Fall chum salmon (*O. keta*)
- Coastal cutthroat trout (*O. clarki*)
- Prickly sculpin (*C. asper*)
- Coast range sculpin (*C. alecticus*)
- Shorthead sculpin (*C. confuses*)
- Western brook lamprey (*L. richardsoni*)
- Threespine stickleback (*Gasterosteus aculeatus*)
- Largemouth bass (*Micropterus salmoides*)
- Brook trout (*S. fontinalis*)

Peters et al. (2011) evaluated aquatic ecosystem condition in the Skokomish River watershed using primary and secondary producers. Primary producers rely directly on sunlight for energy, and consist mostly of algae. Secondary producers acquire energy from sources other than direct sunlight, for example by consuming plants or animals. Secondary producers evaluated by Peters et al. (2011) consisted of benthic macroinvertebrates, stream-dwelling insects that live in the top several inches of the stream bed. Peters et al. (2011) concluded that most main channel and tributary sites sampled in the Skokomish River, including those in the study area, had relatively healthy primary and secondary producer communities. However, the authors noted that some community aspects were possibly indicative of degraded or altered conditions associated with bed instability, lack of woody debris, lack of riparian vegetation, and/or lack of habitat complexity.

Common wildlife species that are adapted to degraded or partially degraded riparian and/or floodplain habitats, to fragmented second-growth forest, and/or to agricultural and light residential environs occur throughout the study area.

D. Conditions affecting fish and wildlife resources

Peters et al. (2011) identified four main factors within the study area inhibiting production and recovery of salmonids: 1) channel instability, 2) habitat availability, 3) habitat connectivity, and 4) habitat quality. Channel instability increases redd scour and burial, and is a direct source of

mortality to incubating eggs and embryos (e.g., DeVries 2000; Schuett-Hames et al. 2000; Gottesfeld 2004). Influence of channel instability has not been empirically evaluated in the Skokomish River, but may affect several species that have low population levels in the system, including summer chum salmon, Chinook salmon, steelhead trout, and bull trout, as well as long-lived macroinvertebrate taxa. Habitat availability is significantly reduced relative to historic levels due to loss of stable side channels and off-channel floodplain habitats, as well as channel straightening and isolation of the floodplain from the main channel. The current braided channel pattern, in addition to lacking stable side channels, also lacks pools and thus provides poor rearing habitat for most salmonids. The pools that are present are shallow and lacking in complexity due to absence of LWD. Finally, habitat connectivity above RM 9 on the South Fork, including Vance Creek, is often blocked during late summer and early fall due to subsurface flow and dry riverbed between RM 8 and 9. This blocks fish migrations and movement. Particularly affected are: 1) potential spawner migrations of Chinook and summer chum salmon at a time of peak migration; 2) possible bull trout spawner migrations; and, 3) downstream migrations of any fall smolt outmigrations, although these have not been evaluated in the Skokomish River.

Aggradation in the study area has increased the frequency and duration of flooding. This, in combination with the network of levees, lack of floodplain connectivity, and lack of floodplain side-channels and off-channel networks, may increase stranding and stranding-related mortality of fish. There are no empirical data on the extent of stranding-related mortality in the study area and how this is influenced by conditions in the lower watershed. However, anecdotal observations and photographs frequently show adult fish stranded in agricultural fields in the study area following flood events. Many of these fish appear to be fall chum salmon, one of the healthy populations in the watershed. Because of the seasonal timing of flood events and peak spawning migrations, adult fall chum salmon and coho salmon are most at risk for becoming stranded. Other species generally peak prior to the onset of large flooding (summer chum salmon, Chinook salmon), or afterward (steelhead trout). Resident species (cutthroat trout, rainbow trout), overwintering juveniles (coho salmon, steelhead trout), and overwintering adults and subadults (bull trout) in the study area may also be susceptible to stranding.

IV. EVALUATION METHODOLOGY

There are no known established models or alternative methodologies that can adequately represent and consider the complexities and dynamics of the physical and biological processes interacting in the study area that affect fish, wildlife, and their habitat. Thus, best professional judgment and available science were used to evaluate benefits and impacts to fish and wildlife resources associated with implementation of the proposed SRBER project. Service staff made observations of aquatic resources, habitats, and existing conditions throughout the watershed and the study area as part of the General Investigation (Peters et al. 2011). The Service also reviewed numerous studies conducted in the watershed and the study area by the Corps and others investigating and documenting fauna, watershed processes, and sources of ecosystem degradation in the Skokomish River.

V. FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

The Skokomish River has been degraded for many decades. Fish species that have persisted during this time generally appear stable, including those populations that are currently depressed. Restoration efforts - some fairly substantial - which have been and continue to be implemented by various entities throughout the watershed will likely benefit most if not all aquatic species in the watershed. These efforts have largely been limited to areas upstream and downstream of the action area. None of these other efforts are expected to directly or indirectly affect the riverbed drying between RM 8 and 9 that blocks fish migration. This blockage is a primary impediment to reestablishment and recovery of Chinook and summer chum salmon (SIT and WDFW 2010; Peters et al. 2011). Thus, despite other restoration efforts throughout the watershed, these species would not be expected to show much improvement without the proposed project.

Other degraded conditions in the study area are expected to continue to affect abundance, productivity, and recovery of most species of interest. That is, even if the blockage problem did not exist, conditions such as channel instability and lack of quality habitat would persist and thus continue to limit productivity of fish species. Riparian, floodplain, and upstream areas are not expected to provide meaningful quantities of LWD to the channel anytime soon. In addition, existing levees will continue to act as hydraulic constrictions, exacerbate aggradation, and disconnect floodplain areas from the main channel. Thus, the unstable braided channel pattern, the lack of side-channel and off-channel habitats, and the lack of complex main channel pools are expected to persist into the foreseeable future. Other watershed restoration efforts not associated with the proposed SRBER project are not expected to sufficiently affect any of these conditions in the study area within the next 50 years. This takes on added significance because of the relative importance of main channel habitats in the Skokomish basin. Relative to other western Washington river systems, the Skokomish watershed has a high main channel-to-tributary ratio (Peters et al. 2011). This means that main channel conditions have a greater effect on overall productivity in the Skokomish River system than in other western Washington rivers.

The river in the study area between RM 6 and 12 is at high risk for avulsion[15] (SCI and SA 1999; GeoEngineers 2006), and this risk will increase as aggradation continues. Avulsions are a natural phenomenon that are part of healthy functioning watersheds. Evidence suggests that avulsions have been common throughout the upper part of study area for at least the last 2,000 years (GeoEngineers 2006; Bountry et al. 2009). Some identified potential avulsion sites are located upstream of the reach that often runs dry each year. Avulsions in this area may result in one or more new channels bypassing the dry area, which may prove beneficial to upriver salmon migration. Avulsions are likely to occur during fall or early winter potentially stranding incubating eggs and fish rearing or overwintering in newly abandoned channels. Any avulsions throughout the high-risk area would likely result in new channels running through existing agricultural fields. Due to the lack of trees and LWD in the existing agricultural fields, the new channels would be unstable and generally inhospitable to rearing salmonids. Because of the existing degraded conditions in the current channel, it is uncertain whether any avulsions would result in substantially detrimental long-term consequences to any of the affected species. However, the exact nature of any long-term impacts would depend largely on human responses.

[15] Avulsion means that the river shifts from one channel to another.

VI. ALTERNATIVES CONSIDERED

A. Formulation of alternatives

The USACE Draft Feasibility Report / Environmental Impact Statement (USACE 2013) provides a detailed description of the processes used to formulate alternatives. In short, the USACE developed a list of potential restoration measures in coordination with local sponsors, interested stakeholders, and the general public. A total of 25 possible management measures and 60 potential restoration sites were identified. Through various Corps screening and selection processes described in the Draft Feasibility Report / Environmental Impact Statement (USACE 2013), the Corps identified a RA/FAA in August 2013. Six alternatives were selected for the final RA/FAA (Table 1). Alternative 1 is the "No Action" alternative required by the NEPA to be considered. The other five alternatives (Alternatives 7, 23, 28, 45, and 60) consist of a base action and an array of additional actions (termed "Increments"). Alternatives 45 and 60 propose to dredge 5.5 to 9 miles, respectively, of the lower river to a depth of 8-10 feet in addition to several Increments. Alternatives 7, 23, and 28 propose to remove a levee near RM 9 (the Car Body Levee), in addition to one or more Increments. Alternative 28 was chosen as the PA/TSP and is described more fully in Section VI.B.

Table 1. Range of Alternatives / Final Array of Alternatives proposed by the USACE for Skokomish River basin ecosystem restoration. Descriptions of the proposed actions are provided in the text.

Alternative ID and name	Base action	Additional actions (Increments)
No Action (Alternative 1)	no action	-
Car Body Levee Removal		
Alternative 7	Car Body Levee removal	Increment 35
Alternative 23	Car Body Levee removal	Increments 35, 9, 37, 28, 39, and 40
Alternative 28	Car Body Levee removal	Increments 35, 9, 37, 28, 39, 40, 43, and 26
Riverbed Excavation (Dredging)		
Alternative 45	Excavation (dredging) from RM 3.5 to 9	Increments 35, 9, 37, 28, 40, 43, and 26
Alternative 60	Excavating (dredging) from the mouth to RM 9	Increments 35, 9, 37, 28, 40, 43, and 26

Increments

35	Upstream LWD installation	39	Hunter Creek mouth restoration
9	Side channel reconnection	40	Hunter Creek side channel restoration
37	Grange Levee setback	43	Weaver Creek side channel restoration
28	River Mile 9 Levee setback	26	Dip Road setback

During the plan formulation process, the FWS maintained that dredging in the manner proposed in Alternatives 45 and 60 had no restoration benefits, was extremely environmentally damaging, and should therefore not be considered. During pre-screening, the Corps screened dredging out in part due to "severe adverse environmental impacts" (USCAE 2012), yet continued to include dredging in the list of alternatives to be considered. The FWS continues to maintain that dredging as proposed in Alternatives 45 and 60 has no restoration value.

B. Preferred Alternative / Tentatively Selected Plan

The PA/TSP (Alternative 28) consists of the base action (Car Body Levee removal) and eight additional actions, or increments (Figure 6). Each of these nine actions (the base and the eight increments) are independent in that implementation of any one action does not depend on implementation of any of the others. Each of the nine proposed actions are described below. Current Corps policy is to advance project proposals through the draft EIS/FWCA phase at only a conceptual level of detail. Thus, few project details were available for inclusion in this evaluation and report. The project proposal's level of detail will be increased as it advances into the final EIS/FWCA phase.

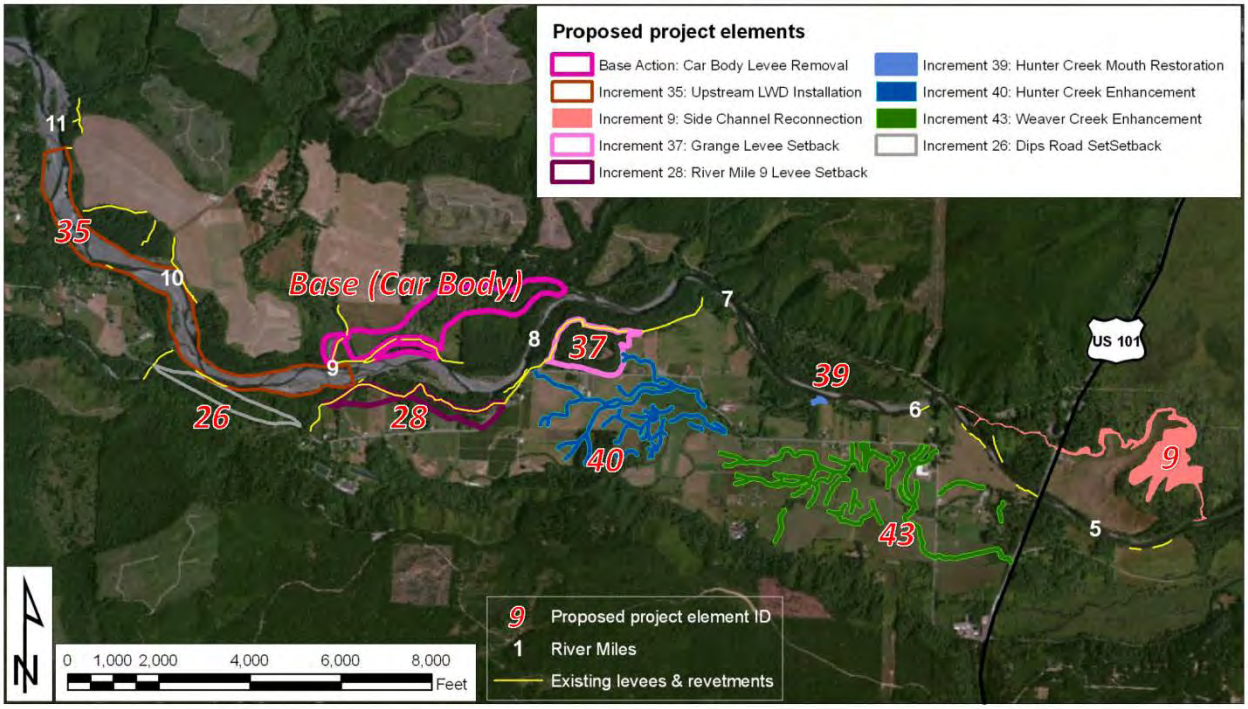


Figure 6. Map showing locations of proposed actions that make up the Preferred Alternative / Tentatively Selected Plan.

1. Car Body Levee removal

This action will remove all or part of a 4,670-foot-long levee (termed the "Car Body Levee") located near the pre-2004 North and South Fork confluence (RM 9) on the north side of the channel (Figure 7). The primary purpose of this action is to restore a continuous low flow channel. This will be accomplished by reestablishing the confluence near its pre-2004 location at RM 9 and diverting flows from the South Fork into the North Fork. Thus, the current North Fork channel downstream from RM 9 will become the mainstem and the severely aggraded reach that has run dry in late summer most years since 2004 will be bypassed. Small-scale excavation and strategic LWD placement will help divert flow from the aggraded reach into the North Fork channel. Once bypassed, the aggraded reach will function as an overflow channel during high flow events. Many project details have yet to be proposed, including sections of the levee to be removed, means of material removal, disposal site(s) for removed levee materials, exact locations of excavation and LWD installation for channel diversion, source of LWD, means of LWD transport from source to destination areas, and means of installation.

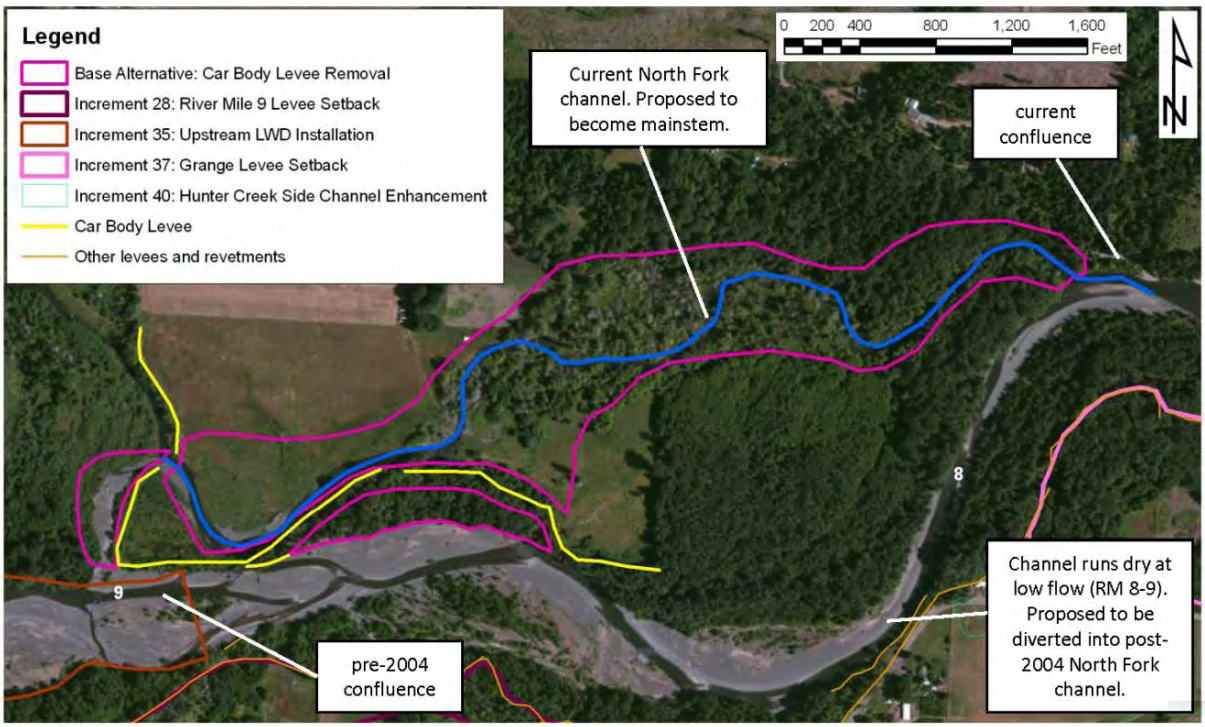


Figure 7. Map showing proposed Car Body Levee removal area, area where South Fork will be diverted into the North Fork, and current and former (pre-2004) confluence of the North and South Forks of the Skokomish River.

2. Increment 35 - upstream LWD installation

This action will install LWD through a combination of small LWD jams and single logs between RM 9 and 11 (Figure 8). This increment proposes to add approximately 30 to 40 new key-size logs per mile to existing LWD in the channel to meet regional reference quantities based on Fox and Bolton (2007). Key-size criteria include 2 to 3 feet diameter, 15 to 30 feet long, and intact rootwad. Small LWD jams may be used to increase meandering and bar formation and provide cover for fish. Up to 6 to 12 small jams per mile could be installed without adversely affecting flooding or increasing risk of erosion. Single logs may be used to induce localized pool formation. Some jams and single logs may remain within the wetted channel at low flows. Others may be activated only at elevated discharges. Currently, details have not been proposed for such items as number of logs to be added, number of jams and logs per jam, locations of jams and single logs, means of attachment if any (e.g., steel cables), source of LWD, means of LWD transport from source to destination areas, and means of installation.

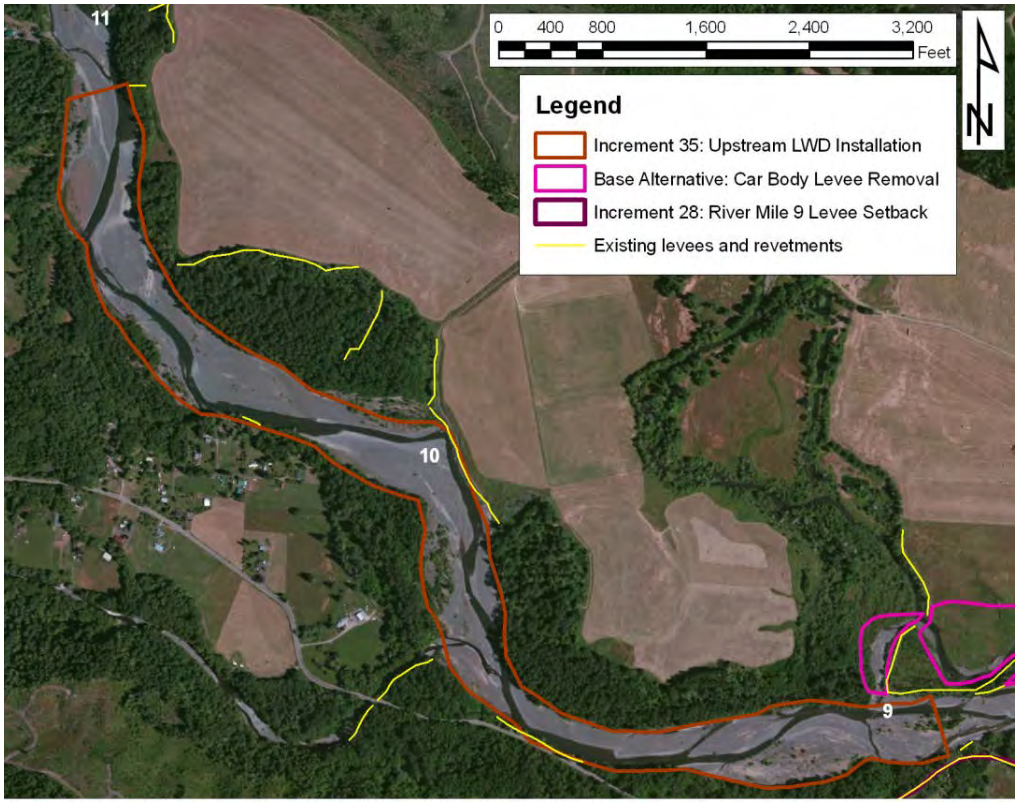


Figure 8. Map showing proposed upstream LWD installation area (Increment 35). LWD jams and single logs will be placed in the channel and along the banks, although exact locations have yet to be proposed.

3. Increment 9 - side channel reconnection

An abandoned side channel that runs between RM 4 and 5.6 would be reconnected to the main channel to provide high flow refuge and rearing habitat for fish (Figure 9). Currently, this channel is a structurally diverse complex of ponds and wetlands with well-vegetated riparian areas that receives river flow only during very high discharge events. The fish population is diverse and abundant, and includes coho salmon, Chinook salmon, trout, and non-native largemouth bass, among other species (Peters et al. 2011). Proposed work includes excavating the channel inlet and outlet; no other work within the channel will occur. The intent is to facilitate fish movement to and from the pond and wetland complex by increasing the amount of time the side channel is connected to the main channel. Excavating the inlet of the side channel would provide flows through the pond and wetland complex at discharges of near bankfull and above, which occurs approximately three to four times per year. The downstream end would be connected more frequently, although an exact connection discharge has yet to be proposed. Reconnecting the channel to the river could provide 45 acres of high quality, low velocity fish habitat that would be accessible much more frequently than is currently the case.

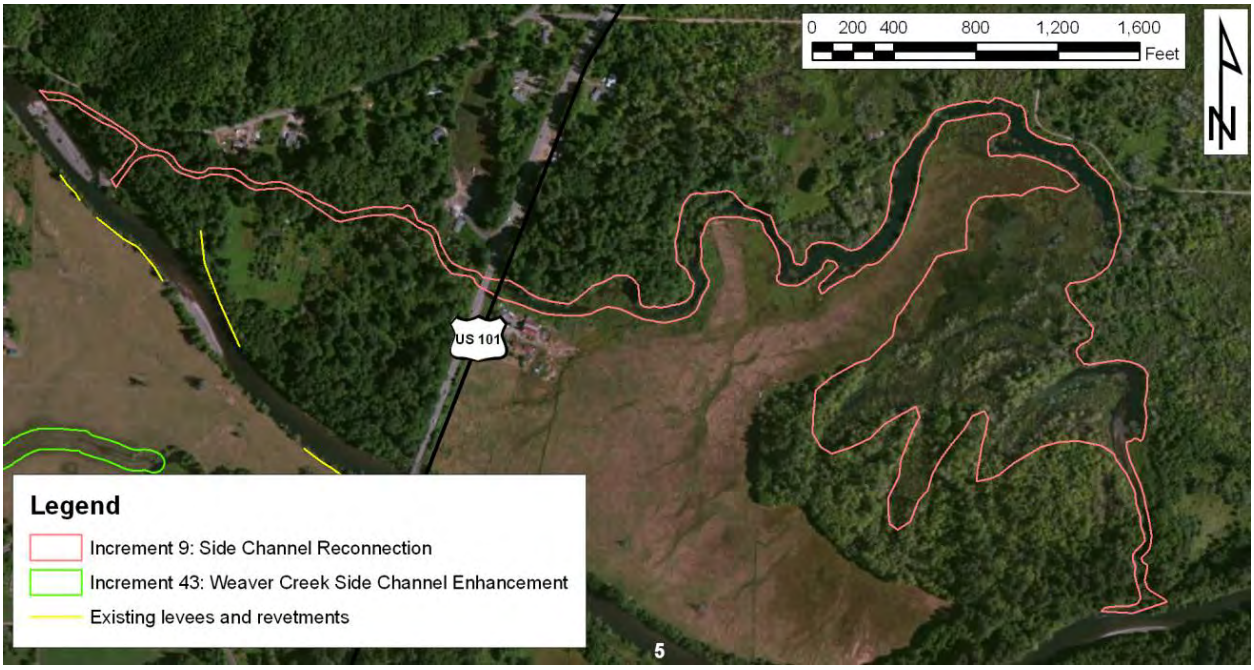


Figure 9. Map showing proposed side channel reconnection (Increment 9).

4. Increments 37 and 28 - Grange Levee and River Mile 9 Levee setbacks

Increment 37 will remove part of a 2,700-foot-long levee (termed the "Grange Levee") located between RM 7.5 and 8 (Figure 10). The intent of this action is to reconnect floodplain habitat. A new setback levee will be constructed approximately 1,200 feet landward (south) of the existing levee. This will provide access to about 34 acres of riparian habitat, forest, and floodplain on the riverward side of the new setback levee. The new setback levee will be about 2,900 feet long and will provide a similar level of flood risk reduction as the existing levee.

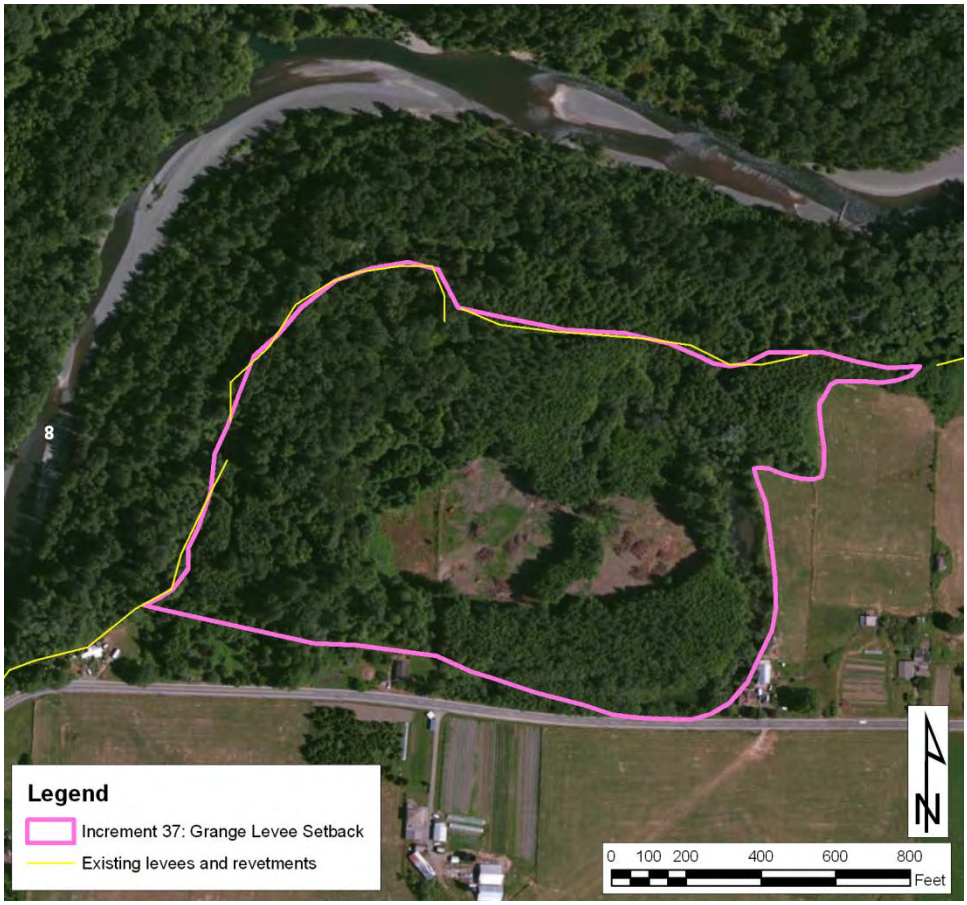


Figure 10. Map showing proposed Grange Levee setback area (Increment 37). Overlapping yellow and pink lines denote existing levee to be removed or breached. Southern-most pink line denotes alignment of proposed setback levee. The white number 8 is the river mile.

Increment 28 will remove part of a 4,450-foot-long levee (termed the "River Mile 9 Levee") located between RM 8.3 and 9.2 (Figure 11). The intent of this action is to reconnect floodplain habitat. A new setback levee will be constructed approximately 200 to 300 feet landward (south) of the existing levee. This will provide access to about 23 acres of riparian habitat, forest, and floodplain on the riverward side of the new setback levee. The new setback levee will be about 4,460 feet long and will provide a similar level of flood risk reduction as the existing levee.

Two strategically located sections of the existing Grange Levee totaling approximately 800 feet will be breached, as will four strategically located sections of the River Mile 9 Levee totaling approximately 950 ft. These breaches will allow flood waters to flow freely within the levee setback area, providing fish access to the riparian habitat. The River Mile 9 setback levee will be designed for shallow overtopping at 2-yr and larger floods. Details have not yet been proposed for exact locations of the sections to be breached and disposal site(s) for the removed materials. Design and installation details for the new setback levee have also yet to be proposed.

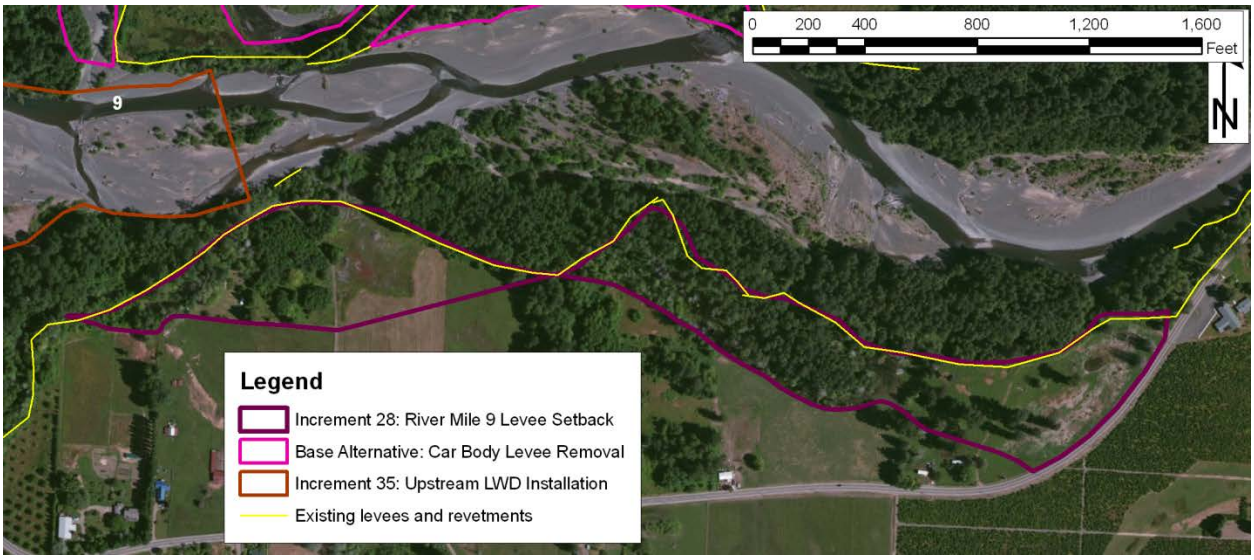


Figure 11. Map showing proposed River Mile 9 setback area (Increment 28). Overlapping yellow and purple lines denote existing levee to be removed or breached. Southern-most purple line denotes alignment of proposed setback levee. The white number 9 is the river mile.

5. Increment 39 - Hunter Creek mouth restoration

This action involves excavating the mouth of Hunter Creek (RM 6.5). The proposal asserts that the outlet of Hunter Creek is relatively high, which may inhibit fish movement between the mainstem and Hunter Creek at low flows. The proposal also asserts that discharge from Hunter Creek into the Skokomish River mainstem may become restricted, particularly after Increment 40 is installed. Design details, including volume of material to be excavated, have yet to be proposed.

6. Increments 40 and 43 - Hunter and Weaver Creek side channel restorations

These increments involve the construction of tributary channels to Hunter Creek (Increment 40; Figure 12) and Weaver Creek (Increment 43; Figure 13) to provide additional fish rearing and refuge habitat. Both creeks are perennial groundwater fed streams. Proposed work consists of excavating small channels along existing swales down to slightly below the water table. Many of these swales are relict channels, formerly active main channel and/or tributary channels that

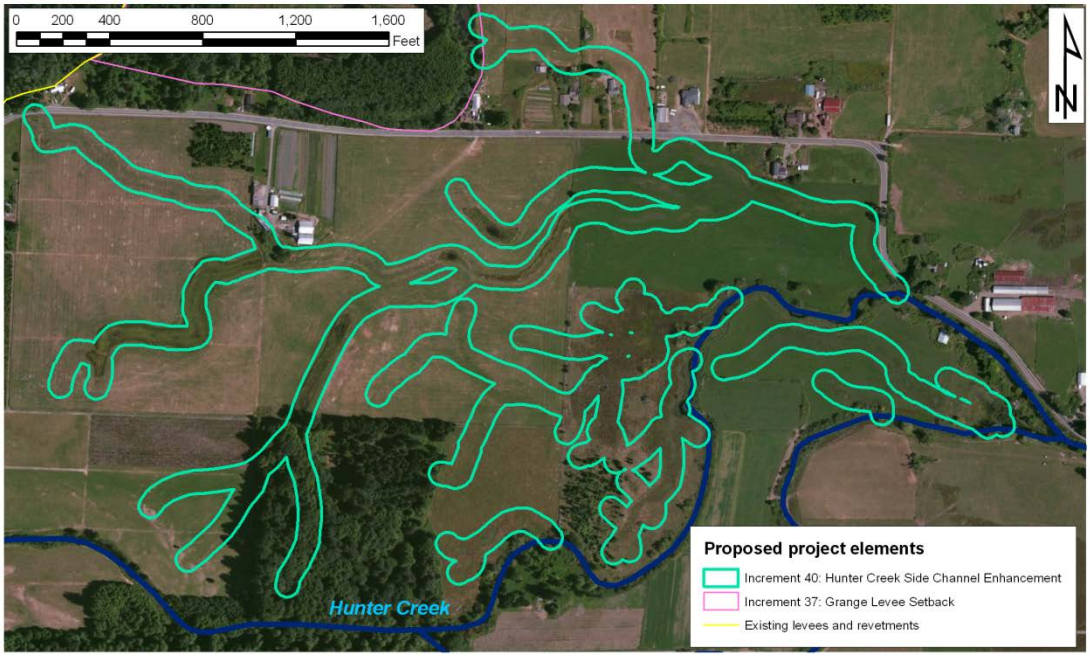


Figure 12. Map showing proposed Hunter Creek side channel enhancement area (Increment 40).

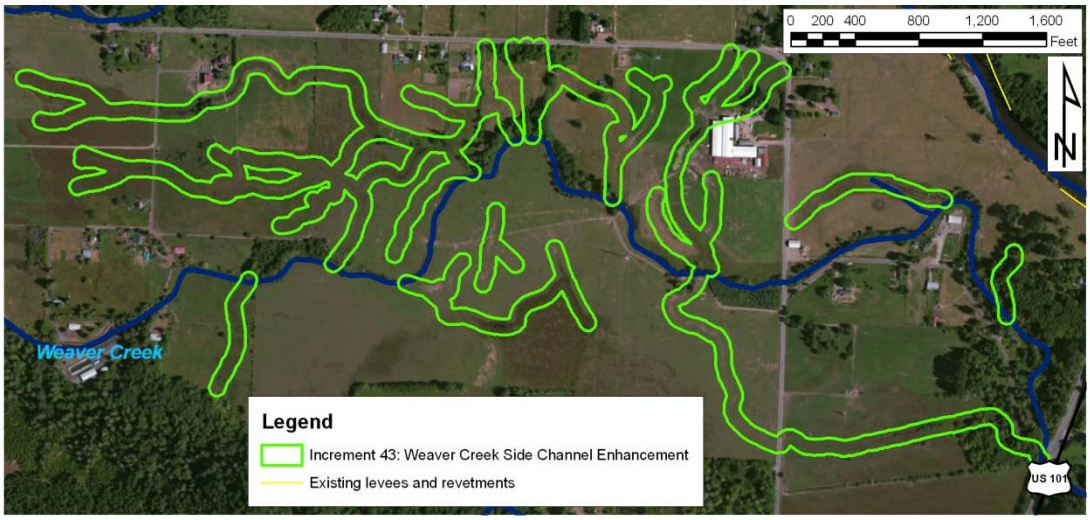


Figure 13. Map showing proposed Weaver Creek side channel enhancement area (Increment 43).

have naturally filled in with sediment over time (Bountry et al. 2009), presumably prior to Euro-American settlement in the region. Thus, although these increments comport with the broader watershed goals of ecosystem and salmon recovery, in and of themselves they are not channel restorations *per se* as much as they are channel enhancements or creations. Swales to be excavated lie predominantly within agricultural fields. Short lengths of each increment - 1,000 feet of the Hunter Creek increment and 1,000 feet of the Weaver Creek increment - lie within second-growth forest adjacent to agricultural lands. Constructed channels will have a 4-foot bottom width and approximately 5-foot depth. The total length of channels proposed for excavation are approximately 21,250 feet for Hunter Creek and 27,110 feet for Weaver Creek.

7. Increment 26: Dips Road setback

The Dips Road relocation, located between RM 9.5 and 9.7, is intended to provide additional floodplain habitat and reduce the stranding potential for fish (Figure 14). A 3,700-foot-long section of the road between the Vance Creek and Swift Creek bridges will be relocated about 400 feet landward (south). Approximately17 acres of riparian forest currently on the landward side of the existing road will be on the riverward side of the new road. The existing roadbed will be partially removed. Where the existing road embankment is higher than the adjacent ground both the asphalt and roadbed fill material will be removed. Where the existing road is lower than the adjacent ground level only the asphalt will be removed. River sediments are expected to deposit in the low areas and provide soil for future vegetation to grow.

The new road will follow the alignment #2 provided by Mason County on November 13, 2012. This alignment generally runs halfway between the river and the bluff to the south. Refinement of the alignment will occur during the feasibility-level design phase. This action is considered to be a road relocation and as such will be entirely funded by non-federal sponsors.

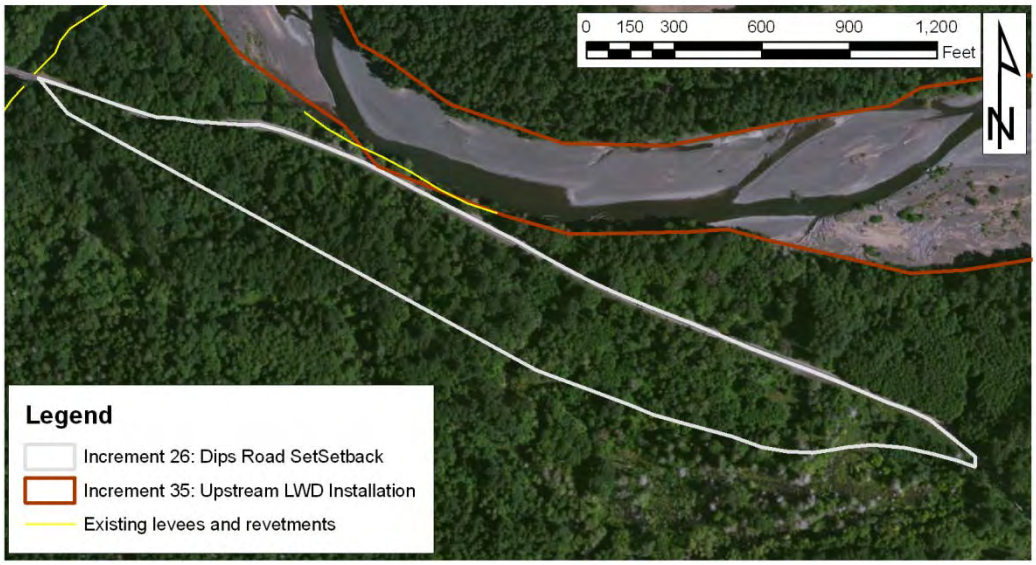


Figure 14. Map showing proposed Dips Road setback area (Increment 26). Gray line closest to river denotes section of road proposed to be removed. Gray line farthest from river denotes proposed new road alignment.

VII.PROJECT IMPACTS

A. Preferred Alternative / Tentatively Selected Plan

A full description and evaluation of project impacts is not possible since the PA/TSP is only at the conceptual stage of development and many project details have yet to be proposed. In general, there will be short-term negative impacts from construction of each action, including diminished water quality (turbidity and suspended sediment), noise disturbance from construction machinery, airborne particulates from soil disturbance, and vegetation removal and disturbance associated with construction of temporary equipment access routes and conducting activities at each work site. These construction-related effects are common to many restoration and conservation projects, and standard conservation measures and best management practices are generally followed to minimize the frequency, intensity, and duration of these impacts.

The intent of the SRBER project is to restore habitat and provide long-term benefits to aquatic habitats and species from implementing the actions identified in the PA/TSP. For some proposed actions, the degree to which beneficial impacts will be realized, and whether benefits will outweigh negative impacts, depends on design aspects that have yet to be proposed. Potential beneficial and negative impacts of each proposed action are discussed below. A more thorough evaluation of effects of implementing the PA/TSP will be possible as the project advances into the design stage.

1. Car Body Levee removal

The Car Body Levee removal's intended benefit is to restore perennial flow between RM 8 and 9 and thus restore year-round fish movement through this area. This action is expected to provide the following benefits:

- Upstream and downstream movement of adult and juvenile fish will no longer be blocked during late-summer low flow, potentially benefitting many species of concern, including Chinook salmon, summer chum salmon, bull trout, and coho salmon. Restoring passage is an important component for Chinook salmon recovery (SIT and WDFW 2010) and summer chum salmon reintroduction and recovery (WDFW and PNPTT 2000; Peters et al. 2011), primarily in terms of providing access to substantial spawning habitat above RM 9.
- The Car Body Levee, in combination with the River Mile 9 Levee, represents the most severe channel constriction in the study area (Peters et al. 2011). Removing these constrictions is expected to increase hydraulic energy and sediment transport capacity, thereby ameliorating the aggradation problem in this area.
- Potential use of this section of the river for main channel spawning and rearing will be restored, representing a net gain in habitat quantity over existing conditions.
- This action may help restore the historic island-braided channel pattern to this section of the river, which would benefit most if not all species of trout and salmon by increasing side channel habitat.

- LWD installed to help redirect the channel is expected to provide additional complex instream habitat features that will create pools and benefit most if not all species of salmon and trout, albeit on a very small scale.

The Corps has indicated that some portions of the existing levee could be left in place provided they do not inhibit the desired hydraulic functions of the project. Leaving remnant sections in place may result in negative unintended consequences. Remnant sections may pose a risk for fish stranding as water levels drop following high water events. Field and laboratory evidence suggests that anthropogenic structures can impede movement of fish back into the main channel and thus increase stranding-related mortality (Bradford 1997; Sommer et al. 2005). In addition, remnant sections may limit restoration of floodplain function. Poorly located remnant sections may diminish potential gains in floodplain flow area, which is critical to alleviating impacts of levee-associated channel constrictions. Other interactions between the river and reconnected floodplain may also be affected by remnant sections, including slowing channel migration, impeding avulsions, limiting LWD recruitment, inhibiting sediment deposition in the floodplain, and restricting organic matter transfers.

The additional flow into the North Fork channel from the redirected South Fork may increase channel size and common river-related impacts in the North Fork channel. The affected North Fork channel runs through agricultural lands and scrub-shrub vegetation with few mature trees, although no formal vegetation surveys have been performed. Historically, the affected North Fork reach was part of the broader active floodplain and channel migration zone, as evidenced by historic 500 to 2,000-year-old relict channels (Bountry et al. 2009) and more recent extensive gravel bars and side channels (Godaire et al. 2007 cited in SIT and WDFW 2010) throughout the affected area. Thus, levee removal will reconnect these historic floodplain lands with the active channel.

The Car Body Levee is suspected to have derelict automobiles incorporated into its construction. Removal of these old automobiles may release automotive-related toxic contaminants from leaking tanks (engine oil, gasoline, etc.) or from already contaminated soils and sediments. The Corps has indicated that they will investigate the extent of derelict automobiles in the levee, existing contamination in the adjoining soils and sediments, and potential for release of contamination associated with removing the automobiles and additional levee materials. The results of the investigation will dictate what measures are appropriate for minimizing potential for release of toxic contaminants into the environment and for removing existing contaminated soils and sediments. Proper implementation of the investigation, cleanup, and removal will minimize adverse impacts associated with toxic contaminants.

2. Increment 35 - upstream LWD installation

The primary stated beneficial impacts of LWD installation are to increase channel meandering and bar formation, and provide cover for fish. If designed and constructed appropriately, these intended benefits as well as other ancillary benefits will be realized. These include:

- Bank stabilization resulting in reduced bank erosion and reduced sediment inputs.
- Channel stabilization resulting in reduced redd stranding and reduced stranding of fish hiding or overwintering in the substrate.
- Sediment and bed stabilization resulting in reduced redd scour and fill, and reduced crushing of fish hiding or overwintering in the substrate.
- Reduced sediment transport resulting in reduced rate of aggradation downstream.
- Increased hydraulic and channel complexity resulting in pool formation and increased quantity and quality of main channel fish rearing habitat. This benefit may be maximized by ensuring that sufficient volumes of wood and root wads are submerged at lower river flows.
- Generally increasing LWD levels in this reach to those more closely approximating historic natural levels. Such high natural levels are widely known to provide numerous functions and benefits including but not limited to those identified above.

Due to the large size of the Skokomish River, these benefits will be maximized by incorporating LWD into engineered log jams as opposed to placement of single logs. Benefits may also be maximized by ensuring that root wads are incorporated as appropriate.

LWD installations have at times been misused, either intentionally or unintentionally, to inhibit meandering, channel migration, and the formation of natural geometries and morphologies. Such misuse can "lock" a channel in place and can force the channel into a morphology that is not natural and/or not what the channel would otherwise tend toward for the given geologic and hydrologic setting. These can have negative impacts to fish habitat, habitat-forming processes, and fish populations. These can also negate or inhibit benefits described above from being realized. Lacking design details for LWD placement, this report cannot assess whether or to what degree these negative impacts may be realized.

Source location(s) for LWD have yet to be identified. The Corps has indicated a preference to use conifer species for LWD installations, but has also suggested that cottonwoods are easily acquired and may be incorporated. Use of LWD may require cutting mature trees if stockpiled wood resources are not available. If mature trees are cut for use in aquatic restoration, this will likely have negative impacts to habitat for terrestrial species. A fuller discussion of impacts will not be possible until source area(s) are identified.

3. Increment 9 - side channel reconnection

The primary beneficial impacts of the side channel reconnection are to increase the amount of time the side channel is connected to the main channel and facilitate fish movement in and out of the pond and wetland complex. This will increase access to, egress from, and usability of the existing high quality rearing and refuge habitat located within the side channel. During high

river discharges the reconnected channel would provide a low velocity refuge. During most of the year the channel would provide pond habitat for fish rearing. A potential negative impact may be increased predation on juvenile salmon and trout by the largemouth bass population that currently exists in the side channel.

4. Increments 37 and 28 - Grange Levee and River Mile 9 Levee setbacks

The primary beneficial impact of these levee setbacks is to reconnect floodplain habitat. Floodplain reconnection is expected to increase connectivity with and/or promote development of lateral habitats such as side channels and off-channel ponds. These types of habitats provide highly productive rearing areas and important slow-water refuge areas during elevated discharges for many fish species. Increased floodplain connectivity also allows for more natural channel migration and channel access to LWD source areas. Finally, the existing River Mile 9 and Grange Levees, in combination with the Car Body Levee, represent the most severe channel constrictions in the study area (Peters et al. 2011). Reducing these constrictions by setting back the levees is expected to increase the river's hydraulic energy and sediment transport capacity, thereby ameliorating the aggradation problem in this area.

Similar to the Car Body Levee removal action, the Corps has indicated that some portions of the existing Grange and River Mile 9 levees could be left in place. Thus, the same concerns over fish stranding risk, hydraulic function, and river-floodplain interactions that were discussed in the Car Body Levee removal section (VII.A.1.) apply here as well.

Vegetation disturbed by notching or removal of the existing levee and installation of the proposed setback levee consists of early- to mid-stage second growth forest, although no formal vegetation surveys have been completed. Some agricultural fields may also be disturbed during installation of the River Mile 9 setback levee and the eastern portion of the Grange setback levee. Land cover in the reconnected floodplain consists largely of early- to mid-stage forest with some smaller areas of cleared land and agricultural fields.

5. Increment 39 - Hunter Creek mouth restoration

The primary stated benefits of this project are to provide year-round access between Hunter Creek and the mainstem Skokomish River, and to minimize backwatering in Hunter Creek. However, there are no data to confirm the necessity of this intervention. Benefits are thus uncertain and cannot be asserted with confidence. Negative impacts would include temporary disturbance and increased suspended sediment and turbidity from material removal, potential injury or harm to species in the immediate vicinity of the excavation work, and potential loss of legacy sediments which may or may not include spawning gravels.

6. Increments 40 and 43 - Hunter and Weaver Creek side channel restorations

The primary stated benefits of these actions are to provide additional fish rearing and refuge habitat. If designed and constructed appropriately, these actions have the potential to provide substantial quantity and quality off-channel rearing and refuge habitat that would benefit numerous species of salmon and trout in the system. The extent to which these benefits may be realized depends in part on diversity and complexity in the constructed channels as well as the

nature and extent of riparian buffers. In-stream structure (LWD) and heterogeneity in flow regime (flowing water channels and blind or "dead end" channels), morphology (varied depths; pools & riffles), and substrate (gravels, cobbles, silt, etc.) would all contribute to net positive impacts. However, the current proposal lacks the necessary information to determine whether or to what extent these may be included. In its current form, the proposal describes seemingly homogenous channels of uniform width and depth lacking in diversity and complexity. The Corps has indicated that this type of featureless channel is not what is intended and that design details have yet to be identified for creating ecologically beneficial channels. The Corps has indicated that riparian buffers will be incorporated, but has not yet provided any additional details. In the absence of such design details, potential negative impacts of various possible scenarios include the following:

- Because the new channels will be constructed almost entirely within existing agricultural fields, negative impacts associated with agricultural runoff may arise. Improperly managed drainage from agricultural fields can create a host of problems for adjacent and downstream waterbodies, including increased sediment loads, increased turbidity, increased nutrient load, eutrophication, and inputs of agricultural chemicals that can be toxic to aquatic organisms (Needelman et al. 2007; Pierce et al. 2012). These may negatively impact the entire aquatic ecosystem, including primary producer, macroinvertebrate, and fish communities, from the point of entry in Hunter Creek downstream to the subestuary and Hood Canal. Negative impacts may be minimized by incorporating riparian buffers, in-channel vegetation, and other measures (e.g., Evans et al. 2007; Needelman et al. 2007; Strock et al. 2010; Messer et al. 2012; Pierce et al. 2012).
- Installation of the proposed channels without adequate riparian shading would likely lead to elevated water temperatures which may propagate into Hunter and Weaver Creeks.
- Open, homogenous channels lacking in complexity and diversity would likely not be used for rearing by juvenile salmon and trout, or would be used at low densities. Such channels would likely also increase predation risk on rearing or refuging juveniles.

7. Increment 26: Dips Road setback

The primary stated benefit is to reconnect 17 acres of floodplain riparian forest and reduce the stranding potential for fish. Benefits of setting back the road and reconnecting the floodplain may include:

- Increase the channel migration zone.
- Increase potential for formation of side channels and off-channel habitats.
- Provide long-term access to LWD supply.
- Improve connectivity between main channel and any existing off-channel riparian habitats. The existence, extent, and quality of existing off-channel habitats is currently unknown.

Approximately 800 feet of riprap separate the channel from the existing road on the western end of the proposed project site. Currently there are no definitive plans to either remove or leave this

material in place. Leaving the material in place would lessen the degree to which the above stated benefits are realized.

B. Other plans

The No Action Alternative (Alternative 1) would allow causes and consequences of degradation to persist and perhaps worsen. See Section V for a fuller discussion of how no action is likely to affect the fish and wildlife resources in the study area.

The Riverbed Excavation Alternative (Alternatives 45 and 60) would result in significant negative impacts, including loss of salmonid and other fish habitat, loss of spawning gravels, sublethal effects on salmon, trout and other aquatic species due to suspended sediments, loss of invertebrate forage base, increased bank and channel instability, isolation of side channels from water sources and fish use due to lowering of the main channel, and dewatering of adjacent wetlands. There is also a high degree of risk and uncertainty associated with dredging in alluvial channels because they can respond in significant and unexpected ways (Skidmore et al. 2011). The need to dispose of large volumes of excavated material would result in additional negative impacts. The significant risk and negative ecological impacts of these alternatives have led the Corps to exclude these alternatives from further consideration.

VIII. EVALUATION OF ALTERNATIVES

The study area is clearly in need of restoration to improve habitat conditions for listed and non-listed fish and other aquatic species, and for general aquatic ecosystem health. The no action alternative (Alternative 1) would allow causes and consequences of degradation to persist and perhaps worsen. The riverbed excavation alternatives (Alternatives 45 and 60) are highly ecologically damaging, highly risky, and carry potentially severe unintended consequences. The Service has consistently opposed these alternatives in their various forms over the course of the GI and plan formulation. Furthermore, the Corps recognized that this alternative would result in unacceptably high economic and social costs, and severe adverse environmental impacts (USACE 2012). For these reasons, this alternative has been excluded from further consideration. The PA/TSP (Alternative 28) has the potential to provide meaningful restoration benefits within the study area, provided that certain design criteria and additional conservation measures are incorporated.

If implemented appropriately, the PA/TSP will address many high priority restoration actions identified by the Service (Peters et al. 2011), the Corps, local sponsors, and other stakeholders (USCAE 2012). However, the PA/TSP does not include actions that address one far-reaching high-priority recommendation identified by the Service during the GI (Peters et al. 2011): re-formation of island-braided channel pattern through use of engineered logjams. This action would help stabilize active channel sediments, facilitate sediment transport, and increase habitat quantity and complexity, all critical needs in the study area (see Section II.B.2). As discussed in Section II.B.2, the island-braided channel pattern existed in part and perhaps most of the study area prior to anthropogenic degradation. The Service believes that, where appropriate, re-forming an island-braided pattern through use of engineered logjams would yield greater restoration benefits than some of the actions currently presented in the PA/TSP.

Despite the aforementioned shortcomings, the PA/TSP is likely to ameliorate and/or reverse some of the causes and consequences of ecosystem degradation. The PA/TSP is anticipated to improve habitat conditions in the lower watershed and benefit many target and non-target species and the aquatic ecosystem as a whole. With proper designs and conservation measures, risks associated with the PA/TSP are low and benefits are expected to outweigh the negative impacts.

IX. RECOMMENDATIONS FOR FISH AND WILDLIFE CONSERVATION

The Service supports the PA/TSP, but is providing the following list of concerns and recommendations to minimize potentially adverse effects and maximize benefits to fish and wildlife resources associated with the various proposed actions. Recommendations are divided into two tiers. Tier 1 recommendations are considered essential for minimizing potential negative impacts of the actions and ensuring that intended benefits are realized. Tier 2 recommendations are those that will enhance overall restoration effectiveness in the study area, and provide additional benefits beyond those currently represented in the PA/TSP.

A. Tier 1 recommendations: Ensuring PA/TSP effectiveness

1. The Service does not support LWD designs that are likely to inhibit channel meandering and migration, and the formation of natural geometries and morphologies. We recommend that the Corps ensure that a proper reach analysis is conducted and that designs for layout and placement of LWD are appropriate, achieve the desired objectives, and do not function in an unintended manner. Such unintended consequences could "lock" the channel in place and force the river into a channel pattern or morphology that is not natural and/or not what the channel would otherwise tend toward for the given geologic and hydrologic setting. These can have negative impacts to fish habitat, habitat-forming processes, and fish populations that may outweigh any benefits.

2. For all three levee breaches and setbacks (Car Body, Grange, and River Mile 9), the Service recommends evaluating impacts on fish stranding risk, hydraulic function, and river-floodplain interactions of leaving remnant levee sections in place. Results of such evaluations should inform and guide decisions on where to strategically locate breaches and remnant sections to minimize negative impacts and maximize hydrologic and ecological benefits. Evaluations may indicate excessive negative consequences of leaving one or more remnant sections in place, in which case the Corps should consider removing these section.

3. The Service does not support tributary side-channel enhancement designs (Increments 40 and 43) that do not include provisions for protecting water quality associated with runoff from the surrounding agricultural fields. This may be accomplished in various ways, including planting riparian buffers and in-channel vegetation, installing water control structures, and other measures (e.g., Evans et al. 2007; Needelman et al. 2007; Strock et al. 2010; Messer et al. 2012; Pierce et al. 2012).

4. The Service does not support designs for restoration and enhancement of tributary side-channels (Increments 40 and 43) that do not include provisions for maintaining or improving water temperatures. Riparian buffers that include native trees and woody shrubs provide shade that help maintain cool summertime temperatures, as well as provide added habitat and water quality protection benefits.

5. The Service does not support designs for restoration and enhancement of tributary side-channels (Increments 40 and 43) that result in homogenous and featureless channel forms that lack complex habitat elements. To the greatest extent practical, tributary side-channels should include abundant in-stream structures (LWD) and be designed in a manner that provide heterogeneity in flow regimes (areas with flowing water channels and blind channels with no flow), morphology (varied depths; pools and riffles), and substrate (gravels, cobbles, silt, etc.). Channels exhibiting such diversity and complexity would maximize fish utilization and rearing densities. Complex and diverse channels and instream habitat features would also minimize predation risk on rearing or refuging juveniles. Failing to incorporate sufficient structure, diversity, and complexity may result in negative impacts and consequences that outweigh any realized benefits.

6. The Service does not support leaving existing riprap associated with the current Dips Road in place after the new road alignment is constructed. Leaving riprap in place would inhibit natural channel meandering and riverine processes. Physical structures necessary for protection of the proposed roadway should be installed as far away from the river as practical.

7. There are no data to support or demonstrate any ecological benefits of the Hunter Creek mouth excavation (Increment 39). The Service recommends either removing this action altogether, or gathering data sufficient to demonstrate an ecological need that will outweigh negative impacts.

8. We recommend the Corps coordinate with the Services, tribes, and permitting agencies throughout the designing of the SRBER project to expedite ESA Section 7 consultation and other permitting needs. Early coordination can: 1) provide opportunities for the Service and pertinent agencies to suggest conservation measures for avoiding, reducing, or minimizing potential adverse effects to listed species; 2) identify design alternatives that can benefit recovery of listed species; and, 3) provide technical assistance on specific species habitat requirements that could be incorporated into the project.

B. Tier 2 recommendations: Generating additional benefits

1. The river reach (RM 9 to 11) proposed to receive LWD additions from Increment 35 historically exhibited an island-braided pattern. This channel pattern generally provides stable sediment routing and superior habitat for a variety of fish species, including some listed species. Loss of this channel pattern throughout the study area has been cited as a primary contributor to habitat loss, stock declines, and general ecosystem degradation (SIT and WDFW 2010; Peters et al. 2011). The Service recommends investigating and

designing engineered LWD jams that will facilitate re-formation of this type of channel pattern. Peters et al. (2011) provides a brief description of how this might be accomplished.

2. It appears highly likely that the river from RM 3.2 to 9 exhibited an island-braided channel pattern. Because of the high value of this channel pattern to fish and fish habitat, the Service recommends considering additional evidence for its possible presence. If the weight of evidence suggests that the island-braided pattern likely existed in this area, the Service further suggests considering measures for restoring this pattern to this part of the river.

3. Proposed actions for the Car Body Levee removal may help facilitate re-formation of an island-braided pattern between RM 7.8 and 9. However, the proposed actions alone may be insufficient to rapidly restore this type of channel pattern. Thus, in coordination with recommendation IX.B.2. above, the Service recommends investigating additional measures that may be incorporated into the proposed action to expedite formation of an island-braided pattern in this location.

4. The Service recommends evaluating whether levee setbacks can be increased by: a) setting back levees between the proposed Grange and River Mile 9 setbacks (RM 8 to 8.3), and to the east of the proposed Grange setback (RM 7 to 7.5); and, b) increasing the setback distance of the proposed River Mile 9 setback and the east and west ends of the proposed Grange setback. Increasing the setback distances in this area will further reduce hydraulic constrictions, provide more floodplain connection to the river, and facilitate natural channel migrations and riverine processes.

5. Benefits of the Car Body Levee removal may be maximized by incorporating enhancements to the North Fork channel between the old and new channel confluences (RM 7.8 to 9). The Service recommends evaluating this area for potential LWD additions, riparian planting, and other such enhancements.

X. SUMMARY AND THE SERVICE POSITION

The Service believes that the PA/TSP is the best alternative of those proposed by the Corps. The PA/TSP will provide meaningful restoration benefits within the study area, provided that certain design criteria and additional conservation measures described in this report are incorporated. Risks associated with the PA/TSP are low and benefits will outweigh negative impacts. The PA/TSP will ameliorate and/or reverse some of the causes and consequences of ecosystem degradation and therefore benefit many target and non-target species, the aquatic ecosystem as a whole, and the broader watershed.

The Corps should consider opportunities for incorporating additional ecological benefits. Evaluating and incorporating actions for restoring an island-braided channel pattern, as appropriate, would be particularly valuable. The high ecological value of the island-braided pattern suggests that this measure would yield significant benefits. Specifically, significant

additional improvements in sediment stabilization, sediment transport, habitat complexity, habitat sustainability, and abundance of fish populations and other aquatic organisms may be realized.

Because the alternatives reviewed in this report were conceptual in nature and included very limited design details, the Service was unable to thoroughly evaluate potential project impacts. Design aspects that would negatively impact fish and wildlife resources and that would not be supported by the Service have been included, as have additional recommendations that would enhance benefits to fish and wildlife resources in the study area. We look forward to working with the Corps in developing more detailed evaluations of project impacts and optimum designs and measures for maximizing benefits and minimizing negative impacts.

XI. REFERENCES

Ardren, W.R., P.W. DeHaan, C.T. Smith, E.B. Taylor, R. Leary, C.C. Kozfkay, L. Godfrey, M. Diggs, W. Fredenberg, J. Chan, C.W. Kilpatrick, M.P. Small, and D.K. Hawkins. 2011. Genetic structure, evolutionary history, and conservation units of bull trout in the coterminous United States. Transactions of the American Fisheries Society 140:506-525.

Arscott, D.B., K. Tockner, and J.V. Ward. 2000. Aquatic habitat diversity along the corridor of an Alpine floodplain river (Fiume Tagliamento, Italy). Archiv für Hydrobiolie 149:679–704.

Ballantyne, C.K. 2002. Paraglacial geomorphology. Quaternary Science Reviews 21:1935-2017.

Beechie, T., E. Beamer, and L.Wasserman. 1994. Estimating coho salmon rearing habitat and smolt production losses in a large river basin, and implications for habitat restoration. North American Journal of Fisheries Management 14:797-811.

Beechie, T., and H. Imaki. 2013. Predicting natural channel patterns based on landscape and geomorphic controls in the Columbia River basin, USA. Water Resources Research, accepted article, doi:10.1002/2013WR013629.

Beechie, T.J., M. Liermann, M.M. Pollock, S. Baker, and J. Davies. 2006. Channel pattern and river-floodplain dynamics in forested mountain river systems. Geomorphology 78:124-141.

Bellmore, J.R., C.V. Baxter, K. Martens, and P.J. Connolly. 2013. The floodplain food web mosaic: a study of its importance to salmon and steelhead with implications for their recovery. Ecological Applications 23:189–207.

Berry, H.D., A.T. Sewell, S. Wyllie-Echeverria, B.R. Reeves, T.F. Mumford, Jr., J.R. Skalski, R.C. Zimmerman, and J. Archer. 2003. Puget Sound Submerged Vegetation Monitoring Project: 2000-2002 Monitoring Report. Nearshore Program, Washington Department of Natural Resources. Olympia, WA. 60 p.

Bountry, J.A., J.E. Godaire, R.E. Klinger, and D. Varyu. 2009. Geomorphic analysis of the Skokomish River, Mason County, Washington. Report No. SRH-2009-02. United States Department of the Interior, Bureau of Reclamation. Denver, CO. 130 p.

Bradford, M.J., 1997. An experimental study of stranding of juvenile salmonids on gravel bars and in sidechannels during rapid flow decreases. Regulated Rivers: Research and management 13:395-401.

Burge, L.M. 2006. Stability, morphology and surface grain size patterns of channel bifurcation in gravel-cobble bedded anabranching rivers. Earth Surface Processes and Landforms 31:1211-1226.

Correa, G. 2003. Salmon and Steelhead Habitat Limiting Factors: Water Resource Inventory Area 16, Dosewallips-Skokomish Basin. Washington State Conservation Commission. 257 p.

Desloges, J.R., and M.A. Church. 1989. Wandering gravel-bed rivers. The Canadian Geographer 33:360-364.

DeVries, P.E. 2000. Scour in low gradient gravel bed rivers: patterns, processes, and implications for the survival of salmonid embryos. Water Resources Series Technical Report No. 160, Department of Civil and Environmental Engineering, University of Washington, Seattle, WA.

Eaton, B.C., R.G. Millar, and S. Davidson. 2010. Channel patterns: braided, anabranching and single thread. Geomorphology, 120: 353-364.

England, J.F. Jr. 2007. Flood Frequency, Flow Duration and Trends: Skokomish Geomorphic Study, Skokomish River, Washington. Final Report. United States Department of the Interior, Bureau of Reclamation. Denver, CO. 30 p.

Evans, R.O., K.L. Bass, M.R. Burchell, R.D. Hinson, R. Johnson, and M. Doxey. 2007. Management alternatives to enhance water quality and ecological function of channelized streams and drainage canals. Journal of Soil and Water Conservation 62: 308-320.

Fox, M. and S. Bolton. 2007. A regional and geomorphic reference for quantities and volumes of instream wood in unmanaged forested basins of Washington state. North American Journal of Fisheries Management 27:342-359.

Fraley, J.J., and B.B. Shepard. 1989. Life history, ecology and population status of migratory bull trout (Salvelinus confluentus) in the Flathead Lake and River system, Montana. Northwest Science 63:133-143.

Francis, R.A., D. Corenblit, and P.J. Edwards. 2009. Perspectives on biogeomorhphology, ecosystem engineering and self-organisation in island-braided fluvial ecosystem. Aquatic Sciences 71:290-304.

Fresh, K.L.2006. Juvenile Pacific Salmon in Puget Sound. Puget Sound Nearshore Partnership Report No. 2006-06. U.S.Army Corps of Engineers, Seattle District Seattle, WA. 21 p.

Gayaldo, P.F. 2002. Eelgrass (Zostera marina) Restoartion Techniques. PhD Dissertation. University of Washington, College of Forest Resources. Seattle, WA. 137 p.

GeoEngineers, Inc. 2006. Chanel Migration and Avulsion Potential Analyses: Skokomish River Valley, Mason County, Washington. File 2221-026-00. Prepared for Mason County Public Works Department.

Godaire, J., J. Bountry, R. Klinger, J. England, and D. Varyu. 2007. Geomorphology of the Skokomish River, Washington. Powerpoint presentation. U.S.Bureau of Reclamation, Technical Service Center, Denver, CO.

Gottesfeld, A.S, M.A. Hassan, J. F. Tunnicliffe, and R.W. Poirier. 2004. Sediment dispersion in salmon spawning streams: the influence of floods and salmon redd construction. Journal of the American Water Resources Association 40(4):1071-1086.

Gurnell, A.M., and G.E. Petts. 2002. Island-dominated landscapes of large floodplain rivers, a European perspective. Freshwater Biology 47:581-600.

Gurnell, A., K. Tockner, P. Edwards, and G. Petts. 2005. Effects of deposited wood on biocomplexity of river corridors. Frontiers in Ecology and the Environment 3:377-382.

Huang, H.Q., and G.C. Nanson. 2007. Why some alluvial rivers develop anabranching patterns. Water Resources Research 43, W07441, doi:10.1029/2006WR005223.

Jansen, J.D., and G.C. Nanson. 2010. Functional relationships between vegetation, channel morphology, and flow efficiency in an alluvial (anabranching) river. Journal of Geophysical Research 115, F04030, doi:10.1029/2010JF001657.

Jay, D.A., and C.A. Simenstad. 1996. Downstream effects of water withdrawal in a small, high-gradient basin: erosion and deposition on the Skokomish River delta. Estuaries 19:501-517.

Jeffres, C.A., J.J. Opperman, and P.B. Moyle. 2008. Ephemeral floodplain habitats provide best growth conditions for juvenile Chinook salmon in a California river. Environmental Biology of Fishes 83:449-458.

Leopold, L.B., and M.G. Wolman. 1957. River Channel Patterns: Braided, Meandering and Straight. Professional Paper 282-B. U.S.Geological Survey, Washington, DC.

Messer, T.L., M.R. Burchell II, G.L. Grabow, D.L. Osmond. 2012. Groundwater nitrate reductions within upstream and downstream sections of a riparian buffer. Ecological Engineering 47:297-307.

Miller, B. A., and S. Sadro. 2003. Residence time and seasonal movements of juvenile coho salmon in the ecotone and lower estuary of Winchester Creek, South Slough, Oregon. Transactions of the American Fisheries Society 132:546–559.

Mongillo, P.E., and M. Hallock. 1997. Distribution and Habitat of Native Nongame Stream Fishes of the Olympic Peninsula. Technical Report FRD 97-05. Washington Department of Fish and Wildlife. Olympia, WA. 45 p.

Morley, S.A., P.S. Garcia, T.R. Bennett, and P. Roni. 2005. Juvenile salmonid (*Oncorhynchus* spp.) use of constructed and natural side channels in Pacific Northwest rivers. Canadian Journal of Fisheries and Aquatic Sciences 62:2811-2821.

Murphy, M. L., J. Heifetz, J.F. Thedinga, S.W. Johnson, and K.V. Koski. 1989. Habitat utilization by juvenile Pacific salmon (*Oncorhynchus*) in the glacial Taku River, southeast Alaska. Canadian Journal of Fisheries and Aquatic Sciences 46: 1677-1685.

Needelman, B.A., P.J.A. Kleinman, J.S. Strock, and A.L. Allen. 2007. Improved management of agricultural drainage ditches for water quality protection: An overview. Journal of Soil and Water Conservation 62:171-178.

Nehlson, W., J.E. Williams, and J.A. Lichatowich. 1991. Pacific salmon at the crossraods: stocks at risk from California, Oregon, Idaho, and Washington. Fisheries 16:4-21.

NMFS (National Marine Fisheries Service). 2005. Critical habitat for 12 Evolutionarily Significant Units (ESUs) of salmon and steelhead (Oncorhynchus spp.) in Washington, Oregon, and Idaho. Federal Register 70 (2 September 2005): 52,630-52,858.

NMFS (National Marine Fisheries Service). 2007. Final Supplement to the Hood Canal and Eastern Strait of Juan de Fuca Summer Chum Salmon Recovery Plan. National Marine Fisheries Service, Northwest Region. Portland, OR. 53 p.

NMFS (National Marine Fisheries Service). 2011. 5-Year Review: Summary and Evaluation of Puget Sound Chinook , Hood Canal Summer Chum, and Puget Sound Steelhead. National Marine Fisheries Service, Northwest Region. Portland, OR. 43 p.

NMFS (National Marine Fisheries Service). 2013. Endangered and Threatened Species: Designation of Critical Habitat for Lower Columbia River Coho Salmon and Puget Sound Steelhead. Federal Register 78 (14 January 2013): 2,725-2,796.

Peters, R. J. 1996. An evaluation of habitat enhancement and wild fry supplementation as a means of increasing coho salmon production of the Clearwater River, Washington. Doctoral dissertation. University of Washington, Seattle, WA.

Peters, R., Z. Li, K. Denton, M. Liermann, S. Sanders, R. Tabor, C. Cook-Tabor, and P. Bakke. 2011. Biological Sampling in the Skokomish River Basin, Washington: Army Corps of Engineers General Investigation. U.S.Fish and Wildlife Service. Lacey, WA. 221 p.

Peterson, N. P. 1982. Immigration of juvenile coho salmon (Oncorhynchus kisutch) into riverine ponds. Canadian Journal of Fisheries and Aquatic Sciences 51:1197-1204.

Pierce, S.C., R. Kröger, and R. Pezeshki. 2012. Managing artificially drained low-gradient agricultural headwaters for enhanced ecosystem functions. Biology 1:794-856.

PSSTRT (Puget Sound Steelhead Technical Recovery Team). 2013. Identifying historical populations of steelhead within the Puget Sound Distinct Population Segment. Final Review Draft. 149 p.

Quinn, T.P. 2005. The behavior and ecology of Pacific salmon and trout. American Fisheries Society, Bethesda, Maryland.

Rieman, B.E., and J.D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. General Technical Report INT-302. United States Forest Service, Intermountain Research Station. Ogden, UT. 37 p.

Roni, P., and T.P. Quinn. 2001. Density and size of juvenile salmonids in response to placement of large woody debris in western Oregon and Washington streams. Canadian Journal of Fisheries and Aquatic Sciences 58:282-292.

Ruckelshaus, M.H., K.P. Currens, W.H. Graeber, R.R. Fuerstenberg, K. Rawson, N.J. Sands, and J.B. Scott. 2006. Independent Populations of Chinook Salmon in Puget Sound. NOAA Technical Memo NMFS-NWFSC-78. National Marine Fisheries Service, Northwest Fisheries Science Center. Seattle, WA. 125 p.

Schuett-Hames, D.E., N.P. Peterson, R. Conrad, and T.P. Quinn. 2000. Patterns of gravel scour and fill after spawning by chum salmon in a western Washington stream. North American Journal of Fisheries Management 20:610-617.

SCI and SA (Skillings-Connolly, Inc. and Simons and Associates). 1999. South Fork of the Skokomish River and Vance Creek: Hydraulic and Geomorphic Analysis and Recommendations for Action. Project S-C 99033. Prepared for Mason County Department of Community Development.

Simenstad, C.A. 2000. Estuarine landscape impacts on Hood Canal and Strait of Juan de Fuca Summer Chum Salmon and Recommended Actions. Appendix Report 3.5. Pages A3. 111-A3. 132 *in* Washington Department of Fish and Wildlife and Point No Point Treaty Tribes. An Implementation Plan to Recover Summer Chum Salmon in the Hood Canal and Strait of Juan de Fuca Region. Washington Department of Fish and Wildlife. Olympia, WA.

SIT (Skokomish Indian Tribe) and WDFW (Washington Department of Fish and Wildlife). 2010. Recovery Plan for Skokomish River Chinook Salmon. Skokomish Indian Tribe, Skokomish, WA; Washington Department of Fish and Wildlife, Olympia, WA. 208 p.

Skidmore, P.B., C.R. Thorne, B.L. Cluer, G.R. Pess, J.M. Castro, T.J. Beechie, and C.C. Shea. 2011. Science Base and Tools for Evaluating Stream Engineering, Management, and Restoration Proposals. NOAA Technical Memorandum NMFS-NWFSC-112. National Marine Fisheries Service, Northwest Fisheries Science Center. Seattle, WA. 255 p.

Sommer, T.R., W.C. Harrell, and M.L. Nobriga. 2005. Habitat use and stranding risk of juvenile Chinook salmon on a seasonal floodplain. North American Journal of Fisheries Management 25:1493-1504.

SSPS (Shared Strategy for Puget Sound). 2007. Puget Sound Salmon Recovery Plan, Volume 1. Shared Strategy for Puget Sound. Seattle, WA. 472 p.

Stover, S.C., and D.R. Montgomery. 2001. Channel change and flooding, Skokomish River, Washington. Journal of Hydrology 243:272-286.

Strock, J.S., P.J.A. Kleinman, K.W. King, and J.A. Delgado. 2010. Drainage water management for water quality protection. Journal of Soil and Water Conservation 65:131A-136A.

Sumioka, S.S., D.L. Kresch, and K.D. Kasnick. 1998. Magnitude and frequency of floods in Washington. U.S.Geological Survey Water Resources Investigations 97-4277.

SWAT (Skokomish Watershed Action Team). 2007. Restoring the Skokomish Watershed: A Three-Year Action Plan. hccc.wa.gov/Downloads/Downloads_GetFile.aspx?id=297866&fd=0

Todd, S., N. Fitzpatrick, A. Carter-Mortimer, and C. Weller. 2006. Historical Changes to Estuaries, Spits, and Associated Tidal Wetland Habitats in the Hood Canal and Strait of Juan de Fuca Regions of Washington State. Technical Report 06-1. Point No Point Treaty Council, Kingston, WA. 91 p.

USACE (United States Army Corps of Engineers). 2000. Skokomish River GI Recon Study: 905(b) Analysis. United States Army Corps of Engineers, Seattle District. Seattle, WA. 27 p.

USACE (United States Army Corps of Engineers). 2011. Skokomish River Basin Flooding and Sedimentation Baseline, Final Draft. United States Army Corps of Engineers, Seattle District. Seattle, WA.

USACE (United States Army Corps of Engineers). 2012. Ecosystem Restoration, Skokomish River Basin, Mason County, Washington: Integrated Feasibility Report and Environmental Impact Statement Feasibility Scoping Meeting Read-Ahead. United States Army Corps of Engineers, Seattle District. Seattle, WA. 245 p.

USACE (United States Army Corps of Engineers). 2013. Skokomish River Basin, Mason County, Washington Ecosystem Restoration: DRAFT Integrated Feasibility Report and Environmental Impact Statement. United States Army Corps of Engineers, Seattle District. Seattle, WA. 120 p.

USBOR (United States Bureau of Reclamation). 2009. Flood Frequency Analysis: Vance Creek, Washington. United States Department of the Interior, Bureau of Reclamation. Denver, CO.

USFS (United States Forest Service). 2004. South Fork Skokomish Watershed restoration Summary. United States Forest Service. Olympia, WA.

USFWS (United States Fish and Wildlife Service). 2004. Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (*Salvelinus confluentus*): Volume 2 of 2, Olympic Peninsula Management Unit. United States Fish and Wildlife Service. Portland, OR.

USFWS (United States Fish and Wildlife Service). 2008. Bull Trout (*Salvelinus confluentus*) 5-Year Review: Summary and Evaluation. United States Fish and Wildlife Service. Portland, OR.

USFWS (United States Fish and Wildlife Service). 2013. Status Review of the West Coast Distinct Population Segment of the Fisher as Endangered or Threatened. Federal Register 78 (19 March 2013): 16,828-16,829.

USFWS (United States Fish and Wildlife Service). undated. Species Fact Sheet: River lamprey *Lampetra ayresii*. United States Fish and Wildlife Service. Lacey, WA. http://www.fws.gov/wafwo/species/Fact%20sheets/Riverlampreyfinal.pdf.

Ward, J.V., K. Tockner, D.B. Arscott, and C. Claret. 2002. Riverine landscape diversity. Freshwater Biology 47:517-539.

Ward, J.V., K. Tockner, and F. Schiemer. 1999. Biodiversity of floodplain river ecosystems: ecotones and connectivity. Regulated Rivers: Research and Management 15:125-139.

WDFW (Washington Department of Fish and Wildlife). 2002. Salmonid Stock Inventory (SaSI). Washington Department of Fish and Wildlife. Olympia, WA. http://wdfw.wa.gov/conservation/fisheries/sasi/.

WDFW (Washington Department of Fish and Wildlife). 2013a. Priority Habitats and Species (PHS). Washington Department of Fish and Wildlife. Olympia, WA. http:// http://wdfw.wa.gov/mapping/phs/.

WDFW (Washington Department of Fish and Wildlife). 2013b. Salmonid Stock Inventory (SaSI). Washington Department of Fish and Wildlife. Olympia, WA. http://wdfw.wa.gov/conservation/fisheries/sasi/.

WDFW (Washington Department of Fish and Wildlife) and PNPTT (Point No Point Treaty Tribes). 2000. An Implementation Plan to Recover Summer Chum Salmon in the Hood Canal and Strait of Juan de Fuca Region. Washington Department of Fish and Wildlife. Olympia, WA. 424 p.

WDFW (Washington Department of Fish and Wildlife) and PSIT (Puget Sound Indian Tribes). 2007. Chinook Management Report 2006-2007. Washington Department of Fish and Wildlife, Olympia, WA. Northwest Indian Fisheries Commission, Lacey, WA.

WDFW (Washington Department of Fish and Wildlife) and PSTIT (Puget Sound Treaty Indian Tribes). 2010. Puget Sound Chinook Comprehensive Harvest Management Plan: Annual Report Covering the 2009-1010 Fishing Season. Washington Department of Fish and Wildlife. Olympia, WA. 41 p.

WEST Consultants, Inc. 2006. Purdy Creek Bridge Replacement Hydraulics and Scour Evaluation. Prepared for the Washington State Department of Transportation. WEST Consultants, Inc. Bellevue, WA.

Wydoski, R.S., and R.R. Whitney. 2003. Inland Fishes of Washington. American Fisheries Society, Bethesda, MD, in association with University of Washington Press, Seattle, WA.

This page was intentionally left blank to facilitate double sided copying.

COMPLIANCE DOCUMENTS

PLANNING AID LETTER

This page was intentionally left blank to facilitate double sided copying.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Western Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

SEP 2 6 2008

Colonel Anthony Wright
U. S. Army Corps of Engineers
Seattle District
P. O. Box 3755
CENWS-PM-CP
Seattle, Washington 98124-3755

Attn: Mamie Bouwer

Subject: Project Management Plan for Feasibility Phase Study of Skokomish River Basin

Dear Colonel Wright:

We have reviewed the Project Management Plan (PMP), finalized on July 6, 2006, for the ecosystem restoration and flood damage reduction project on the Skokomish River in Mason County, Washington. The PMP provides the basis for conducting the feasibility phase of project development. The purpose of the feasibility phase is to investigate and formulate potential alternatives to address flooding reduction measures and environmental restoration actions.

This planning aid letter is provided as technical assistance and does not constitute the final report authorized by Subsection 2(b) of the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*). The following paragraphs contain our comments on the PMP.

General Comments

The PMP identifies the baseline conditions and the studies to be conducted in order to supply the information needed to form and evaluate alternatives for ecosystem restoration and flood damage reduction of the Skokomish River. The Skokomish River GI Recon Study, 905(b) Analysis (Corps 2000) states the "unnatural sediment deposition has been attributed to decreased peak and average flows from the North Fork because of the Cushman Hydropower project and to

increased sediment from the South Fork because of timber harvest activities." The 905(b) Recon Study recognizes "that the influence of the upper watersheds must be addressed in order to fully rectify problems indentified in the lower watershed." Many of the alternatives listed in the PMP provide options for short term flood reduction and habitat restoration measures in the lower watershed. Only a few options are discussed for directly addressing the sources of the problem, increased sediment and decreased flows, or for providing for long term sustainability of a restored watershed. We believe more emphasis should be placed on the following: 1) assisting the current efforts of cooperators to implement road management plans designed to reduce sediment inputs from the upper watershed, 2) increasing riparian forest restoration to supply future large woody debris, and 3) increasing flows from the North Fork.

We think the feasibility phase study should also identify and consider the effects that global warming may have on the alternatives for this project. Several changes have been identified that are occurring now or will occur over the next 50 to 100 years (Mote *et al.* 2005, Glick *et al.* 2007): increases in average air and water temperatures, reductions in summer freshwater inflow to Puget Sound, changing precipitation patterns with more frequent severe weather events, rises in sea level, and reductions in many coastal and wetland habitats. Some of these changes could be of particular concern to this project. Accelerated sea level rise combined with high river flows greatly increases the severity of floods and shoreline erosion events (Mote *et al.* 2005). Changes in the types and locations of tidal wetlands could reduce the ability for these habitats to support salmonids, especially juvenile Chinook and chum salmon. Spawning habitat for forage fish, which make up a critical part of the marine food web, could also be affected by reduction in the area of estuarine beaches (Glick 2007).

A synthesis of the literature and current studies could identify the predicted and potential effects of global warming and the possible vulnerabilities of the alternatives to these effects. This information would be important to consider when evaluating the project alternatives. The effects of global warming are not factors that can be controlled by this project, but the long-term success and benefits of the project can be affected by the predicted and potential effects of global warming, especially rises in sea level.

Specific comments on listed possible actions

Five ecosystem restoration measures were brought forward from the reconnaissance phase study for evaluation during the feasibility phase study: dredging to expedite channel conveyance restoration, dikes and bank protection, natural drainage patterns restoration, selected acquisition of floodplain easements and flood-proofing, and an alternative to include a combination of the listed measures. These restoration measures were used as a base from which to develop more detailed project and implementation studies. The PMP contains a draft list of recovery/flood damage reduction actions for the Skokomish GI feasibility study. The draft list is divided into five main categories of possible actions: 1) mainstem realignment, 2) sediment control, 3) road removal/alteration, 4) Cushman Dam operations, and 5) other actions.

Mainstem realignment

Mainstem realignment includes the possible actions of dike removal and new dikes or setback levees, reconnection of freshwater wetlands and side channels, riparian corridor restoration or enhancement, engineered log jam construction, and floodplain stabilization and enhancement. Dike removal and set back levees may have minimal direct impacts to the aquatic environment depending on location. Set back levees are often recommended as a less damaging alternative to other flood reduction measures. Dike removal and setback levees will allow for a wider river channel migration zone, reconnection with historic floodplain areas, and the opportunity to restore native riparian vegetation along the river.

Other possible actions discussed in the PMP are to construct two new channels (800 ft each) in the estuary to reconnect freshwater wetlands with the floodplain and to reroute Vance Creek (500 ft of new channel) to connect with Swift Creek instead of the South Fork Skokomish River. These actions may provide habitat benefits for fish and wildlife, such as rearing habitat for salmonids, but it is unclear how rerouting Vance Creek will reduce flood impacts. Routing more water to Swift Creek with its smaller bankfull width could cause bank erosion and impacts to fish habitat in Swift Creek. Also, the bridge over Swift Creek will need to be evaluated for suitability with increased water flows. Constructing new channels can cause significant impacts to wetlands and stream habitat through loss of riparian habitat and increased sediment erosion and turbidity. These adverse biological effects need to be addressed and measures taken to minimize or mitigate for those effects.

We support the PMP option of restoring riparian forests in the Skokomish Valley floodplain. Riparian forests can become a source for future recruitment of large wood that is important to maintaining channel complexity, stabilizing banks, and decreasing sediments entering the river. Riparian forests can provide shade to reduce water temperatures and provide habitat for other wildlife including reptiles and amphibians. Constructing engineered log jams and placement of other large woody debris will increase channel complexity and aid in creating important fish habitat features such as pools, side channels, and stable spawning habitat that are lacking in the river. Adding large wood is important to restoring habitat for salmonids in the short term, but even more important is providing riparian forests to make the ecosystem more self sustaining in the long term.

Possible floodplain stabilization and enhancement actions listed in the PMP include construction of 2 or 3 level spreader dikes, surface roughening, precision land forming, subsurface drainage, and a diversion channel. These actions can have potential adverse impacts to fish and their habitat. These actions, especially constructing a diversion channel, can cause increased bank erosion, sublethal effects to fish from increased turbidity, loss of invertebrate prey base, and dewatering of adjacent wetlands. Mitigation measures can be implemented to decrease the impacts to wildlife and habitat, but more information from the current Skokomish River studies will be necessary to evaluate the short term impacts of construction and the potential for long term effects and benefits.

Sediment control

The PMP lists three possible sediment control actions: sediment stabilization, South Fork mainstem stabilization, and dredging. The U.S. Forest Service (USFS) and Green Diamond Timber Company, owners of the majority of upper watershed lands, have completed and still plan to rebuild or decommission forest roads on their properties in the upper watersheds of the South and North Fork Skokomish and Vance Creek. The goal is to eliminate unstable side slopes, disperse storm water runoff from direct flow into streams, and decommission unnecessary roads. The feasibility study should evaluate more options to assist with implementation of those plans. Reducing sediment input from forest roads will address the source of sediments entering the river and provide long term benefits for ecosystem restoration and flood reduction in the floodplain.

The South Fork mainstem stabilization option proposes to stabilize sediments in the first 2 miles of the South Fork by installing fish-passable weirs. The PMP describes the weir design as similar to weirs installed in Goldsborough Creek but on a much larger scale. Construction of concrete weirs on a large scale in the South Fork could result in loss of salmonid spawning habitat and significant riparian habitat. Given the width of the floodplain, the high sediment loads, and high flood flows, construction of weirs in the first 2 miles of the South Fork would be susceptible to weir failures and sedimentation. Also, if continued maintenance of the weirs is necessary due to sediment accumulations or weir failures, then the need for maintaining access roads should be addressed. Reducing the amount of sediment that reaches the lower Skokomish Valley is very important, but possible options must also consider the longevity of the actions taken and feasibility of long term maintenance requirements. This action needs to be more fully evaluated to address the short term and long term requirements and/or effects.

Dredging of 5 miles of mainstem channel upstream of the Highway (Hwy) 101 Bridge, selectively removing gravel at specific locations, and physically creating stream channels, sinuosity, and gradient may expedite channel conveyance and habitat formation but can have adverse impacts to the environment. As discussed above for constructing new channels and installing weirs, the potential impacts of these actions can affect bank stability, spawning habitat, migration corridors, prey base, and water quality and turbidity. Some of the impacts can be reduced through mitigation measures, but some habitat functions could require a year to recover or reestablish. The short term impacts must be evaluated against the potential long term benefits.

Road Removal/Alteration

Possible actions include improving, rerouting, or removing roads in the Skokomish River floodplain. As of September 2008, the Washington Department of Transportation has begun construction to replace the Hwy 101 Purdy Creek Bridge with a longer, three-span pre-cast concrete girder bridge. The bridge project is designed to increase floodplain connectivity and includes wetland mitigation. These improvements can be included in the evaluation of possible actions considered in the PMP. The PMP assumes that the Washington Department of Transportation will design and provide estimates for replacing the Hwy 101 Bridge over the mainstem Skokomish to remove fill or install culverts to improve floodplain connectivity problems associated with the existing bridge. If not already considered, designs for replacing the bridge should also evaluate raising the structure to avoid flooding during 2-year and 5-year flood

events. Another possible action is to reroute Public Utility District power lines to follow existing road alignments so that the power lines and service roadways in the floodplain can be removed. Other road removal actions discussed are removing parts of Bourgalt and Old Skokomish Roads and installing prefabricated 50-foot-long bridges on Reservation Road. The road removal actions would decrease sediment inputs from the roads and would provide for better floodplain connectivity with minimal effects to wildlife and habitat. We suggest evaluating actions to raise and improve the remaining roads to provide access during small flood events and to reduce the potential for erosion of roads during flood events.

Cushman Dam FERC Actions

Low peak and average river flows due to water withdrawal at the Cushman Hydroelectric Dam on the North Fork has been identified as one of the primary reasons for "unnatural sediment deposition" in the Skokomish River and increased flooding (Corps 2000). Restoring flows to the lower Skokomish River is important for sediment conveyance and to achieve long term flood reduction and restoration of the Skokomish Valley floodplain. Many of the potential options within the scope of the GI feasibility study provide for measures that would begin the process of sediment conveyance and provide for immediate needs in the floodplain. The benefit of these actions may be short lived if natural processes can not be gradually restored. Removal of dams or construction of a third dam is not likely to occur in the foreseeable future. Through the licensing process with Tacoma Power, North Fork minimum flows have been increased to 240 cfs as of March 2008. Also, a settlement agreement is underway to discuss gradual recovery of flows from the North Fork, flushing flows of approximately 2,500 acre feet twice a year, and fish passage structures to allow access to habitat in the upper North Fork. The feasibility study should include an assessment of current increased flows from the North Fork Skokomish River in combination with the other actions under consideration.

Other Actions

Other flood reduction and restoration actions, which may be, but are not necessarily, part of the GI, include levee removal around the Hunter Property east of the Skokomish River near Hwy 106, acquisition of floodplain easements along the North Fork and mainstem Skokomish River, and the USFS replacing culverts that block fish passage to streams in the upper watershed. As discussed previously, we agree that dike removal to allow for a wider river channel migration zone and improved connectivity in the floodplain will be beneficial in the long term, and depending on the time of year, have relatively minimal effects (e.g., sediments and turbidity) to federally listed and designated critical habitat from removal activities. We support the options of acquiring riparian and floodplain easements and the USFS upgrading of culverts in the upper watershed streams. We further suggest that more options be developed for assisting other entities, including buying ecologically important areas from willing land owners and assisting the USFS in their culvert upgrades.

Summary

We reiterate that evaluation of the whole watershed is important to addressing the problems in the Skokomish Valley floodplain. We recommend pursuing more actions that address the primary sources of river aggradation: sediment inputs from the South Fork and low flows from the North Fork Skokomish River. If actions addressing these items are outside the direct

jurisdiction of the GI, then the Corps should assist agencies, sponsors, and land owners in implementing the actions where possible. One-time dredging may be necessary to remove sediments in the mainstem channel to expedite channel conveyance and allow the river to begin a more natural process. However, dredging the channel may have significant adverse impacts to federally proposed and listed fish and wildlife. Mitigation measures, such as replenishing spawning gravel, can minimize impacts to instream habitat, but quantification and assurance of long term benefits to fish and other aquatic organisms are needed to compensate for the short term adverse effects. In light of the potential for effects to ESA listed fish and wildlife, we suggest beginning the ESA consultation process soon after the alternative actions have been evaluated and more specific actions have been agreed upon.

We support the Corps' current and continued efforts for open communication and cooperation among the many agencies, entities, and groups involved in various flood reduction and restoration actions in the Skokomish River watershed.

Thank you for the opportunity to review and provide comments on this document. Should you have any questions, please contact Shirley Burgdorf of my staff at (360) 534-9340 or at the above letterhead address.

Sincerely,

Carolyn Scafield

for Ken Berg, Manager
Western Washington Fish and Wildlife Office

LITERATURE CITED

Army Corps of Engineers (Corps). 2000. Skokomish River GI Recon Study, 905(b) Analysis. Seattle District, Seattle, Washington. 27 pages.

Mote, P.W., A.K. Snover, L. Whitely Binder, A.F. Hamlet, and N.J. Mantua. 2005. Uncertain Future: Climate change and its effects on Puget Sound - Foundation Document. Climate Impacts Group, Center for Science in the Earth System, Joint Institute for the Study of the Atmosphere and Oceans, University of Washington. 37 pages.

Glick, P., J. Clough, and B. Nunley. 2007. Sea-level Rise and Coastal Habitats in the Pacific Northwest; *An Analysis for Puget Sound, Southwestern Washington, and Northwestern Oregon.* July 2007. National Wildlife Federation, Seattle, Washington. 104 pages.

+ any USH studies that might be pertinent

Karl Ericksons - H&H analysis

PLACEHOLDER FOR ADDITIONAL COMPLIANCE DOCUMENTS

PERMITS TO BE INCLUDED IN FINAL FEASIBILITY REPORT/ENVIORNMENTAL IMPACT ASSESSMENT

SKOKOMISH RIVER BASIN
MASON COUNTY, WASHINGTON
ECOSYSTEM RESTORATION

APPENDIX M

PUBLIC SCOPING COMMENTS

DRAFT Integrated Feasibility Report and Environmental Impact Statement

US Army Corps
of Engineers
Seattle District

This page was intentionally left blank to facilitate double sided copying.

Skokomish General Investigation Study
Public Scoping Summary Report

December 2010

Prepared By:

EnviroIssues, Inc.

Tetra Tech, Inc.

Table of Contents

Appendices

A. Study Area Map
B. NEPA Notice of Intent
C. Scoping Announcement Postcard
D. Scoping Meeting Display Ad
E. Scoping Meeting Agenda
F. NEPA Fact Sheet
G. Skokomish Project Fact Sheet
H. Scoping Meeting Comment Form
I. Scoping Meeting Sign-in Sheets
J. Scoping Meeting Display Boards
K. Scoping Meeting PowerPoint Presentation
L. Scoping Meeting Transcript
M. Earned Media
N. Scoping Comments Received

Chapter 1. Introduction

Purpose of Report

The US Army Corps of Engineers (Corps); Mason County; and the Skokomish Indian Tribe, the non-Federal Sponsors; are preparing for the preparation of an Environmental Impact Statement (EIS) for the Skokomish General Investigation (GI) Study in Mason County, Washington. This scoping report describes the public scoping process for the Skokomish General Investigation Study and summarizes the comments received through that process. Included in this report are a brief project history, project purpose, description of alternatives being considered, documents related to the scoping process, and verbatim copies of all comments received.

Project Background

The Skokomish River channel has been filling with sediment for several decades, resulting in frequent flooding and decreasing natural ecosystem structures, functions, and processes necessary to support critical fish and wildlife habitat throughout the Skokomish River Basin. Increased sediment load, reduced flows, and encroachment of the floodplain by man-made structures are leading to continued degradation of natural ecosystem functions and habitat. The degraded riverine and estuarine aquatic habitat has caused a decline in the population of critical fish and wildlife species, including multiple Endangered Species Act (ESA) listed species. Additionally, the channel capacity of the Skokomish River varies significantly. Limited channel capacity causes floodwater to leave the banks at various locations, ultimately causing frequent flooding of local roads, two state highways, agricultural fields, residences, and other structures.

The Skokomish River General Investigation is a basin-wide study; however, numerous constraints limit Corps' involvement to actions primarily in the lower Skokomish River Valley. Problems, opportunities, and objectives will be examined within the context of the entire watershed. Recognizing the relationships between the upper and lower watershed will ensure a comprehensive study overview.

The initial project goals are to:

- Identify impairments to the aquatic ecosystem of the Skokomish River Basin
- Identify flood risk
- Identify and evaluate potential solutions
- Determine federal interest in implementing solutions
- Recommend actions to resolve aquatic ecosystem and flood risk management impairments

Project Purpose

The purpose of the EIS and feasibility study is to evaluate if there is a federal interest in aquatic ecosystem restoration and flood risk management in the Skokomish River Basin.

Study Area

The Skokomish River Basin (Basin) is located in northwest Washington, predominantly in Mason County. The project study area is comprised of the entire drainage basin, including the estuary. The river collects drainage from an approximate 240-square mile drainage basin, and eventually flows into southern Hood Canal, an arm of Puget Sound. The river flows out of three sub-basins (South Fork, North Fork, and Vance Creek) into a broad, flat alluvial plain known as the Skokomish Valley. The Skokomish Indian Reservation is located in the valley along the southeast portion of the Olympic Peninsula. The Basin is defined by the Water Resource Inventory Area (WRIA) 16 and is located within US Congressional District #6 of Washington State. See Appendix A for a map of the study area.

Project Alternatives

The EIS will evaluate build alternatives for aquatic ecosystem restoration and flood risk management as well as a No Action Alternative. Build alternatives that will be evaluated under aquatic ecosystem restoration will include an alternative that uses physical actions to restore the Skokomish basins' habitat-forming processes and/or create habitats that have been lost as a result of historic alterations. Example of actions that could occur under this alternative include: increasing floodplain habitat and connectivity, restoring off-channel habitat for juvenile fish, improving estuarine functions and processes, and increasing emergent and riparian vegetation. Another build alternative that will be considered will focus on benefits to the several listed aquatic species under the Endangered Species Act. Actions under this alternative could include creation of spawning and rearing areas, and additional fish supplementation. The No Action alternative will also be evaluated.

One alternative for flood risk management includes evaluation of the current levee system. Actions under this alternative may include setback levees to improve flood containment. Another alternative would study the effects of sediment removal and actions would include: sediment traps, dredging, and selective gravel removal. Another alternative would focus on nonstructural actions such as flood proofing and education. The No Action alternative will also be evaluated in the EIS.

A range of ecosystem restoration and flood risk management actions will be investigated and more than one option may be included in the Preferred Alternative identified in the EIS. Additionally, a number of potential ecosystem restoration projects could meet ancillary flood risk management goals.

National Environmental Policy Act Requirements for Scoping

The National Environmental Policy Act (NEPA) emphasizes public involvement in government actions affecting the environment by requiring that the benefits and risks associated with the proposed actions be assessed and publicly disclosed. In accordance with NEPA public involvement requirements, opportunities were presented for the public to provide oral or written comments on potentially affected resources, environmental issues to be considered, and the agency's approach to the analysis. Efforts to involve the public in preparing and implementing NEPA procedures included holding and providing public notice of a NEPA-related public scoping meeting, soliciting appropriate information from the

public, and explaining procedures of how interested parties can get information on the NEPA process. A summary of the public involvement activities are provided in the document, including comments received and other underlying documents involved in the public scoping period.

Public Involvement Process

The Corps conducted a public outreach effort as part of scoping, including official notifications, display ads, and the mailing of postcards to the project mailing list, including Skokomish basin landowners.

- A federal **Notice of Intent (NOI)** was published in the Federal Register on September 24, 2010.
- A **postcard** announcing the scoping period and public meeting was:
  - Mailed to residents and stakeholders on the Corps project list and Mason County Assessor property owner data. Postcards were received two weeks prior to the meeting.
  - Mailed to relevant agency and tribal contacts.
- **Print display advertisements** were placed in the following publications approximately three weeks prior to the meeting:
  - Daily Journal of Commerce (9/15/10)
  - Kitsap Sun (9/15/10)
  - Shelton-Mason County Journal (9/16/10)
- A **single point of contact** was provided on all communication materials.
- Outreach materials included **Skokomish Project fact sheet, comment form** and **NEPA fact sheet.**
- The **public scoping meeting** was held at an accessible and central location in the project area.

Notice of Intent

NEPA requires that scoping begin with the publication of a Notice of Intent (NOI) to prepare an environmental impact statement. The NOI for the Skokomish General Investigation Study was published in the Federal Register on September 24, 2010 (see Appendix B). The NOI described the project background, project purpose, project alternatives, public involvement effort, scoping meeting details and environmental review coordination efforts. The NOI also started the scoping period that ended on October 25, 2010. A copy of the NOI is included in Appendix B.

Public Scoping Meeting

A public scoping meeting was held on Thursday, October 7, 2010 within the project area at Mason County Public Works, 100 West Public Works Drive, Shelton, Washington. An open house ran from 4:00 p.m. to 7:00 p.m., with a presentation and opportunity for formal public comment at 5:30 p.m. The public scoping meeting aimed to provide an overview of the Skokomish General Investigation Study, identify project purpose and need, identify preliminary measures, and describe the NEPA process.

The public scoping meeting was announced through postcards that were mailed to nearly 300 contacts, including Skokomish residents, businesses, agencies and tribes. A copy of the postcard is included in

Appendix C. In addition, display ads were placed in the Daily Journal of Commerce, Kitsap Sun, and Shelton-Mason County Journal several weeks prior to the meeting. A copy of the display ad is included in Appendix D.

US Army Corps of Engineers, Mason County, and Skokomish Indian Tribe staff were available during the open house portion of the public meeting to discuss the project and answer questions. Several handouts were available for meeting attendees including the meeting agenda (Appendix E), fact sheet on the NEPA process (Appendix F), and Skokomish Project fact sheet (Appendix G). Additionally, a comment form for meeting attendees to provide feedback was available and attendees were encouraged to leave their comments at the meeting or send the comment form by mail to the address provided. A copy of the comment form is provided in Appendix H. Approximately 40 people attended the public scoping meeting. The sign-in sheets are included in Appendix I.

Various display boards were presented at the open house, including an outline of the project phases, a map of the Skokomish General Investigation study area, description of problems and opportunities, potential measures or solutions, 2-year and 100-year flood maps, and a 1938 aerial photo of the Lower Skokomish River. Copies of the display boards are included in Appendix J.

The Corps and Mason County gave a 30-minute presentation on the Skokomish General Investigation Study. Larry Scudder with the Corps began the presentation with an overview of the study area, Skokomish River problems, and the purpose of the study. Larry described the potential project outcomes, including reduced flood risk and flood damage, restoration of productive farm and agricultural usage, restoration of Skokomish Basin processes and habitats, and creation of spawning and rearing areas beneficial to resident and endangered species.

Rich Geiger, Mason County, presented information on the preliminary measures. He said a management measure is defined as “either a structural element that requires construction or assembly on-site, or a non-structural activity.” Rich described the potential management measures the project may have including mainstream measures, sediment measures, infrastructure measures, estuary measures, and non-structural measures. Rich acknowledged other ongoing projects in the basin, including the Skokomish Tribe and Forest Service project to improve salmon habitat and changes in Cushman Dam operations.

Pat Cagney with the Corps explained the NEPA process and its requirements. He said the NEPA process evaluates different project alternatives, presents the analyses of potential environmental effects of the proposed actions, and provides opportunities for public comment during scoping the draft EIS and final EIS. Pat emphasized that meeting attendees’ input is valuable and encouraged them to submit comments by, the end of the public scoping period, October 25. Contact information for submitting comments was provided in the presentation. The PowerPoint presentation given during the meeting is included in Appendix K.

The public hearing portion of the meeting followed the presentation, with nine attendees testifying or asking questions. A court reporter was available to record verbal comments during the public hearing and the transcript of the hearing is included in Appendix L.

Media Coverage

The public involvement effort for the public scoping period spurred media coverage in the region outside of deliberate notification and advertisement by the project team. Earned media for the Skokomish General Investigation Study included newspaper articles published prior to the NEPA public scoping meeting. Articles appeared in the following publications. Screenshots of the articles are included in Appendix M.

- The Bellingham Herald – "*Study to focus on Skokomish flooding"* (10/06/2010)
- The News Tribune – "*Study to focus on Skokomish flooding"* (10/06/2010)
- The Olympian – *"Study to focus on Skokomish flooding"* (10/06/2010)
- DredgingToday.com – *"Skokomish River needs dredging"* (10/07/2010)

Chapter 2. Public Scoping Comments

Summary of Comment Statistics

The public scoping period for the Skokomish General Investigation Study allowed for the public to submit comments in person, through email or by mail. While comments were solicited and received on all aspects of the project during scoping, the comment form posed the following specific questions for consideration:

1. **What are the problems and what are the solutions for flooding in the Skokomish River Basin?**
2. **What are the problems with the aquatic environment and what are some possible solutions?**
3. **Is there anything that should be addressed or considered during this study?**

A total of **28** communications were submitted via the following channels:

- **Three** comment forms and one photo were submitted during the scoping meeting.
- **Nine** verbal comments were given during the scoping meeting and recorded by the court reporter.
- **Eight** letters were mailed to Patrick Cagney, Environmental Resources Section, US Army Corps of Engineers, P.O. Box 3755, Seattle, WA 98124.
- **Eight** email communications were emailed to Patrick Cagney at: patrick.t.cagney@usace.army.mil.

The following organizations submitted comments:

- Lodestone Engineering LLC
- Mason Conservation District
- Northwest Steelhead and Salmon Conservation Society (NWSSCS)
- Stillwater Sciences
- Taylor Shellfish Company
- The Wilderness Society
- United States Environmental Protection Agency (EPA) - Region 10

Comment Categories

Each communication may include several comments regarding different elements of the study. These specific comments were analyzed and categorized into themes listed in the table below. A comment may fit into more than one category, and thus may be repeated in several different categories. In some cases it is indicated that a comment is out of scope of the study. This means that while the comment may have mentioned a common theme, the specific comment addresses an issue that falls out of the scope of the Skokomish General Investigation Study. The table below shows the categories in alphabetical order, and the number of received comments per category.

Category Number	Category	Number of Comments
1	Agriculture	10
2	Alternative analysis/selection	8
3	Aquatic ecosystem restoration/channel restoration	10
4	Climate change	1
5	Community issues/public involvement*	4
6	Cultural significance	2
7	Cumulative and indirect impacts	2
8	Cushman Dam*	10
9	Economic benefits*	5
10	Elevated water table	9
11	Endangered species	9
12	Erosion	3
13	Fecal contamination	3
14	Federal interest	4
15	Flooding*	14
16	Forestry*	7
17	Habitat (and specific organisms or animals)	15
18	Other projects in the basin	4
19	Project area	3
20	Recreation/tourism	3
21	Sediment management	13
22	Socioeconomic impacts	3
23	Transportation*	3
24	Water quality	5

*Includes out of scope comments

Common Comment Categories

The categories chosen for comment analysis are those that appeared in five or more comments. The following analysis is a brief summary of the themes and concerns in each of those commonly occurring categories. All of the categorized comments received during the scoping period can be read verbatim following the category analysis. Written comments, as received verbatim, are included in Appendix N.

Agriculture

Organizations and residents alike mentioned agriculture as a significant concern, specifically the declining agricultural productivity in the Skokomish Valley. Numerous issues, including logging, erosion, flooding, and an elevated water table were identified as related to this decline in productivity. Residents said that their fields and their neighbor's fields are flooding more frequently than in the past, affecting their ability to farm the land.

Alternative analysis/selection

Numerous comments referred to the alternatives to be analyzed in the study. Comments specifically asked that the study include or address in the analysis:

- a cost-benefit analysis for the various activities in the Skokomish Basin,
- high groundwater,
- the value of shellfish resources in the valley,
- impacts to endangered, threatened or candidate species listed under the Endangered Species Act (ESA), and
- gravel removal.

Additionally, the EPA requested the inclusion of maps and tables that compare and contrast alternatives.

Aquatic ecosystem restoration/channel restoration

Restoration was a common theme throughout the comments. Several comments specifically mentioned channel restoration to reduce flooding and restore the natural functions of the river. Comments also referred to aquatic ecosystem restoration or habitat restoration and the importance of this habitat to numerous fish species. Other benefits identified as resulting from restoration included reducing erosion, improving the low dissolved oxygen levels in Hood Canal, improving agricultural lands by reducing flooding, and creating recreational and tourism opportunities.

Cushman Dam

Several comments mentioned the Cushman Dam flow regime as a topic to be addressed in the study. Comments and suggestions varied regarding the Cushman Dam and should be individually addressed according to the respondent.

Economic benefits

Economic benefits comments reflected a range of ideas, from the potential for commercial opportunities if restoration occurs, to remarks about the economic benefits to the government from the

forestry practices in the area. Purchasing land holdings from property owners in the flood-prone area was also mentioned as a potential economic benefit.

Elevated water table

Many comments listed a high or elevated water table as a concern due to its impact on flooding and agricultural production in the valley. Comments indicated that the elevated water table is a result of accumulation of gravel in the river bed and, in turn, is causing more flooding and rendering previously farmable land unusable.

Endangered species

With regard to ecological impairments in the Skokomish River Basin, comments identified endangered species, and specifically endangered salmon, as an essential consideration in the study. Comments ranged from recognizing the harm that has been done to salmon populations in the basin, to mentioning other work being done in the basin regarding endangered species. Comments indicated that poor water quality and frequent flooding have compromised endangered species livelihood and habitat in the basin.

Flooding

Numerous comments referred to flooding in the basin as a serious issue affecting residents, fish and habitat, and agricultural productivity in the valley. Comments indicated that the increase in flooding is due to forestry practices in the upper valley and the resulting erosion and sediment buildup in the river. Comments linked the increase in flooding to decreasing water quality, and voiced concern about the potential impacts of increased flooding on endangered species. Social concerns about flooding included the harm flooding has had on farmers and the overall community in the valley. Many comments cited specific instances of flooding as harmful to their personal livelihood as well as the entire landscape.

Forestry

Several comments suggested that the root cause of the increased flooding in the Skokomish Valley is the logging practices in the upper watershed. Comments asserted that the logging led to an increase in erosion, water run-off and sediment build-up in the river.

Habitat (and specific organisms or animals)

In addition to mentioning endangered species, comments also addressed habitat and other species. Along with opportunities resulting from aquatic habitat restoration, respondents also offered comments on the contributing causes of habitat loss. For example, sediment build-up in the river has led to dry spells in the river, blocking river flow. Poor water quality was frequently mentioned as a cause of aquatic life problems in the basin. Flooding and excess nutrient build-up from runoff are suggested as contributors to the poor water quality and low dissolved oxygen levels in the Hood Canal.

Sediment management

Comments suggested sediment management as a potential alternative for flood-risk management in the Skokomish River Basin. Sediment build-up is seen as a result of poor forestry practices and as

contributing to flooding and the degradation of the aquatic environment. Many comments recognized sediment as a concern and several suggested gravel removal or dredging as alternatives to restore the basin. The EPA offered extensive comments on sediment management, stating that "the EIS should discuss the procedure for evaluating sediment quality and discuss how the Washington State 'sediment management standards' would be applied."

Water quality

Comments addressed water quality issues in the Skokomish River, including its link to the Hood Canal and Puget Sound, and the issue of low dissolved oxygen concentrations. The issue of poor water quality and sediment build-up in the Skokomish River is listed as a contributing factor to poor water quality in Hood Canal. Fecal contamination, although its own category, was also mentioned as an aspect of reduced water quality in the Skokomish River Basin and as something that should be addressed in the study.

Comment Analysis

The Skokomish River Basin has been identified as having problems such as frequent flooding, loss of productive agricultural land, and degradation of natural ecosystem habitat. Based on the project purpose, goals and objectives, the scope of the study is to evaluate whether there is a federal interest in aquatic ecosystem restoration and flood risk management. Comments indicate that the community is interested in both flood risk management and aquatic ecosystem restoration.

A large number of comments received addressed issues directly related to flood risk management, including comments related to the elevated water table, flooding, sediment management and water quality issues. Residents are specifically concerned about the frequent flooding and its impact to their property and livelihood, the high water table and its effect on agricultural productivity, and the sediment buildup in the river that is contributing to these issues. Comments suggest that the reduction of flooding would improve agricultural productivity and ultimately improve the economic condition of the valley. The Skokomish General Investigation Study should focus on implementing solutions designed to alleviate flooding and lower the elevated water table to address the concerns of many comments received.

Ecosystem restoration was also a common theme in comments received during the scoping period. Comments acknowledged that the problems facing the Skokomish River Basin have had negative effects on aquatic habitat and species, including endangered salmon. Comments specifically noted that frequent flooding and sediment buildup contribute to poor water quality, negatively affecting certain fish species. Comments encouraged channel restoration to improve habitat, as well as to alleviate flooding. The Skokomish General Investigation Study should focus on designing ecosystem restoration measures to address water quality, sediment management, and channel restoration to provide benefits to the overall health of the Skokomish River Basin aquatic ecosystem.

Several comments were received regarding the cost-benefit analysis that will be conducted for the project. Comments encouraged that the economic benefits from the federal government's past use of the valley be included, specifically the sale of timber from the upper watershed, as well as the benefits received by City the Tacoma for electricity from the valley. Comments also asked that the potential economic benefits from an improved and restored watershed be included, such as improved fishing, increase in tourism, higher property values and better business opportunities.

A number of comments received were beyond the purpose of the project, or out of scope, as mentioned in the table on page 10. Comments identified as out of scope included comments related to the approval for building Cushman Dam, approval for harvesting timber out of the watershed, potential for Lake Cushman Dam failure, and decommissioning old forest roads. Another comment asked that the local flood board be re-instated to give residents in the valley a voice in this issue.

Categorized Scoping Comments

The categorized comments below were received from September 24 – October 25, 2010, and are presented verbatim as received.

Category	Comment	Author
Agriculture	…the fields that we used to farm down in there -- we ran cattle, we cut hay. We did a lot of different things. And those things, like he says, are all under water. You know, I watch our neighbor's fields -- Joe Rigal's -- it used to be up above ground, and it's all down underwater.	Bill Hunter Jr.
Agriculture	I am sure that many others have noted the Skokomish River watershed as a marine mammal shelter area, a river of cultural significance to the native Twana peoples, a migratory bird corridor, drains a Federal Forest and contains important agricultural land for feeding America's families. It is home to ESA salmonid species and is on 303(d) list of impaired water bodies.	Constance Ibsen
Agriculture	But in the past few years, I just -- every year, we go out and try to plow the fields and work everything. And with the flooding, you can't hardly plow a field for fear that we're going to get a flood in the fall that -- that is going to wash topsoil away.	Curt Hunter
Agriculture	There simply is too much gravel and nowhere for the water to go except underground, which raises the water table, rendering many of our fields unfarmable	Jayni Kamin
Agriculture	It appears obvious that agricultural setback berms will solve 90 percent of the river problems. The berms can be constructed by using NRCS standards and local materials such as dry gravel bars.	Jerry Richert
Agriculture	Recent flow regime changes have been implemented through the Federal Energy Regulatory Commission's Project (FERC) #460, mandated conditions for re-licensing of the city of Tacoma's Cushman hydroelectric project on the North Fork. However, in spite of these successful actions, the mid-floodplain dwellers still have concerns that their landscapes have changed, their agricultural	Keith Dublanica

Category	Comment	Author
	practices warrant altering, and that scant attention is being applied there compared to upper and lower basin areas.	
Agriculture	When completing your cost/benefit analysis, please consider economic benefits for a wide range of ongoing activities that will be improved by successful completion of these identified measures. These include, but are not limited to, commercial, recreational, and tribal fishing in the river and in Hood Canal proper; agricultural production; shellfish production throughout Hood Canal; tourism and recreation that will be improved by improving ecosystem conditions in the river and Hood Canal proper; sustainable forestry that can be recovered if the lower valley is flood-proofed; and safe transportation corridors up the Skokomish Flats Road and State Highway 161 as they are floodproofed.	Richard Brocksmith
Agriculture	Fields are becoming permanently unavailable for production, with wetland indicators suggesting an irrevocable loss of arable land	Stillwater Sciences
Agriculture	If we cannot preserve productive agricultural land-not a consequence of intrinsic limitations or natural change, but simply because of our past mismanagement and present inaction-we will all lose.	Stillwater Sciences
Agriculture	Gravel aggradation is elevating the entire river bed, causing water tables to rise. This higher water table eliminates soil water-holding capacity and causes more frequent flooding during the winter. It also makes the soil too wet to plow during the spring and early summer, reducing the amount of tillable ground in the valley by 90 percent and severely limiting agricultural uses of the land. We urge you to consider alternatives and adopt a plan that will effectively address the problem of elevated water tables in the Skokomish Valley.	The Wilderness Society
Alternative analysis/selection	Question: Why should relocation of residences be a last resort measure-particularly if there are willing participants?	Duane Phinney
Alternative analysis/selection	We recommend including maps and diagrams of the area, each alternative, and any other relevant maps that assist in the understanding of the project area and proposed activities. We also recommend including tables that clearly compare and contrast the alternatives and their potential impacts to each resource and subbasin within the overall geographic area, as well as other tables that clearly compare and contrast the costs, benefits, and practicability of alternatives.	EPA

Category	Comment	Author
Alternative analysis/selection	When completing your cost/benefit analysis, please consider economic benefits for a wide range of ongoing activities that will be improved by successful completion of these identified measures. These include, but are not limited to, commercial, recreational, and tribal fishing in the river and in Hood Canal proper; agricultural production; shellfish production throughout Hood Canal; tourism and recreation that will be improved by improving ecosystem conditions in the river and Hood Canal proper; sustainable forestry that can be recovered if the lower valley is flood-proofed; and safe transportation corridors up the Skokomish Flats Road and State Highway 161 as they are floodproofed.	Richard Brocksmith
Alternative analysis/selection	In reviewing the Purpose and Need Statement in the published NOI, I found no mention of high groundwater. Do you intend to use this as a criteria when developing and evaluating alternatives? It would appear that any action which addresses the high groundwater and minimizes flooding will adversely affect the rapidly expanding wetlands in the valley. Are you prepared to develop, evaluate, and implement alternatives in which wetland impact is not fully mitigated?	Steve Thomas, Lodestone Engineering LLC
Alternative analysis/selection	I urge you to include the value of the Hood Canal's shellfish resources in scope of the EIS for the Skokomish GI. A healthy river system can significantly reduce the fecal bacteria/pathogen loading from the river. A number of the alternatives being considered such as off channel rearing habitat, wetland restoration, setback levees and sediment removal improve the function of the river system. These actions will reduce fecal loading and the public health hazard that occurs particularly during flood events when river waters inundate septic systems and wash manure from pastures.	Taylor Shellfish Company
Alternative analysis/selection	Gravel aggradation is elevating the entire river bed, causing water tables to rise. This higher water table eliminates soil water-holding capacity and causes more frequent flooding during the winter. It also makes the soil too wet to plow during the spring and early summer, reducing the amount of tillable ground in the valley by 90 percent and severely limiting agricultural uses of the land. We urge you to consider alternatives and adopt a plan that will effectively address the problem of elevated water tables in the Skokomish Valley.	The Wilderness Society
Alternative analysis/selection	The EIS should disclose whether or not the various alternatives being considered may impact endangered, threatened or candidate species listed under the Endangered Species Act (ESA), their habitats, and/or any of the three states' sensitive species.	EPA
Alternative analysis/selection	I would like to suggest that gravel removal must be included among the alternatives in this study.	Jason Ragan
Aquatic ecosystem restoration/channel restoration	It appears obvious that agricultural setback berms will solve 90 percent of the river problems. The berms can be constructed by using NRCS standards and local materials such as dry gravel bars.	Jerry Richert

Category	Comment	Author
Aquatic ecosystem restoration/channel restoration	To help the flooding and ground water issues we need to restore channel capacity by what ever we want to call it today, habitat restoration, dredging, bar scalping. We need the floor of the river lowered to the level of the 1950s-1960s at a minimum. In our studies during the 90's we showed 12 feet of gravel fill under the Highway 181 bridge. We need to address all drainage for the farms to lower ground water.	Bill Hunter
Aquatic ecosystem restoration/channel restoration	…and it's all just the aggradation in the river. You know, it's -- it's full of bed load. And the best thing we can do is restore the channel, restore the side channels.	Bill Hunter Jr.
Aquatic ecosystem restoration/channel restoration	Estuary restoration activities should be a high priority as restoration of natural estuarine processes would have upstream benefits and would benefit Skokomish River fishes, anadromous fishes from other areas of Hood Canal, waterfowl, shellfish, and water quality in Hood Canal.	Duane Phinney
Aquatic ecosystem restoration/channel restoration	Fish habitat enhancement measures will be a waste of money if sufficient spawning escapement is not allowed into the river to fully utilize available habitat. Commitment from the Washington Department of Fish and Wildlife and Skokomish Tribe to properly manage fisheries under their respective jurisdictions to assure sufficient fish escape to fully seed presently available and enhanced habitat is mandatory.	Duane Phinney
Aquatic ecosystem restoration/channel restoration	A key component of site restoration involves success of revegetation to reduce erosion and impacts to the surrounding environment.	EPA
Aquatic ecosystem restoration/channel restoration	Responses to habitat degradation are being implemented with a number of watershed restoration projects taking place primarily in the upper basin reaches and at the river mouth within the Skokomish Indian Reservation. These projects are being implemented pro-actively by the US Forest Service and the Skokomish Tribe respectively with varied leveraged support.	Keith Dublanica
Aquatic ecosystem restoration/channel restoration	Restoration of the Skokomish watershed is critical to the health of the Hood Canal shellfish resources which are critical to commercial farmers such as Taylor as well as recreation/tourism and the tribes. Please include this in the scope of the EIS.	Taylor Shellfish Company
Aquatic ecosystem restoration/channel restoration	It is critically important for the Corps to recognize that the recovery of endangered salmon populations in Puget Sound and the reversal of low Hood Canal dissolved oxygen levels depend upon the ecological restoration of the Skokomish watershed.	The Wilderness Society
Aquatic ecosystem restoration/channel restoration	Removal of the dikes to return vitally important, natural functions of the Skokomish River estuary	NWSSCS
Climate Change	The EIS should describe the current conditions related to climate and future predictions of climate shifts in the Northwest. Potential effects of climate change may include changes in hydrology, sea level, weather patterns, precipitation rates, and chemical reaction rates. C02 concentrations also lead to preferential fertilization and growth of specific plant species. The cumulative effects analysis should include a discussion on potential changes in precipitation, stream flow, and changes in vegetation.	EPA

Category	Comment	Author
Community issues/public involvement	Hopefully, they can, you know, give us a little more input, more chances for input outside of your public meetings and more chances for information to flow back and forth, you know, outside of your public forum here, with people in the Valley.	Bill Hunter Jr.
Community issues/public involvement	Lack of notification, no evacuation route or signs, warning system in case of Lake Cushman Dam failure that effects the Skokomish community should be considered during the study.	Joseph Leonard
Community issues/public involvement	And I'd like to ask -- I know Ross is here, and I saw two more Commissioners here, but I don't see them now. I'd like to ask them to re-instate our flood board so that the citizens and the residents of our Valley would have someone to talk to and someone to speak for us, especially with issues like this going on.	Paul Hunter
Community issues/public involvement	I hope that you will maintain a strong focus in the General Investigation on the consequences of past mismanagement that are exacting a profound cost on valley residents, as well as on the once-healthy anadromous fishery of this key river system.	Stillwater Sciences
Cultural significance	I am sure that many others have noted the Skokomish River watershed as a marine mammal shelter area, a river of cultural significance to the native Twana peoples, a migratory bird corridor, drains a Federal Forest and contains important agricultural land for feeding America's families. It is home to ESA salmonid species· and is on 303(d) list of impaired water bodies.	Constance Ibsen
Cultural significance	The larger drainage basin is affected by all its tributaries. Hood Canal suffers from low dissolved oxygen levels as do parts of south Puget Sound. Puget Sound Chinook salmon, the most charismatic and ubiquitous of endangered salmon stocks, has areas supporting life history behaviors throughout the Sound including Hood Canal and the Skokomish. Both transient and resident Orca whales transit the Sound and Canal. These water-borne icons are part of the cultural legacies, tied to the landscape as deep as are all the native tribes that call the Salish Sea part of their historical homeland. Shellfish industries are known regionally, nationally, and internationally depend upon healthy water quality.	Keith Dublanica
Cumulative and indirect impacts	Because sediment delivery occurs from uplands that may be a mix of private, tribal, state, and federally owned areas, the EIS should strive to assess cumulative impacts across jurisdictions to disclose the sum of individual effects of all projects on the local environment. Cumulative effects analysis should also consider appropriate mitigation strategies to minimize adverse and to enhance beneficial cumulative effects. Monitoring and evaluation of the mitigation strategies' effectiveness would also be an important component of the proposed action.	EPA
Cumulative and indirect impacts	EPA has issued guidance on how we are to provide comments on the assessment of cumulative impacts, Consideration of Cumulative Impacts in EPA Review of NEPA Documents, which can be found on EPA web site at: www.epa.govlcompliance/resources/nepa.html. The guidance states that in order to assess the adequacy of the cumulative impacts assessment, five key areas should be considered. EPA tries to assess whether the cumulative effects' analysis:	EPA

Category	Comment	Author
	1. Identifies resources if any, that are being cumulatively impacted; 2. Determines the appropriate geographic (within natural ecological boundaries) area and the time period over which the effects have occurred and will occur; 3. Looks at all past, present, and reasonably foreseeable future actions that have affected, are affecting, or would affect resources of concern; 4. Describes a benchmark or baseline; 5. Includes scientifically defensible threshold levels.	
Cushman Dam	Stabilize the flows above the watershed, release it like a faucet all year long, and get that drainage cleaned up.	Art Tozier
Cushman Dam	Lake Cushman was built -- the dams were built when I was a very small youngster. But who made the approvals for that? It wasn't the people in the Valley, it wasn't the Tribe, it wasn't Skokomish Valley. It was all the federal agencies that gave them permission.	Bill Hunter
Cushman Dam	There should be an inventory and evaluation of potential for water storage facilities in South Fork streams and North Fork streams-particularly below the Cushman dams--to reduce the peak of floods and augment flow during the summer low flow period	Duane Phinney
Cushman Dam	Lack of notification, no evacuation route or signs, warning system in case of Lake Cushman Dam failure that effects the Skokomish community should be considered during the study.	Joseph Leonard
Cushman Dam	Recent flow regime changes have been implemented through the Federal Energy Regulatory Commission's Project (FERC) #460, mandated conditions for re-Licensing of the city of Tacoma's Cushman hydroelectric project on the North Fork. However, in spite of these successful actions, the mid-floodplain dwellers still have concerns that their landscapes have changed, their agricultural practices warrant altering, and that scant attention is being applied there compared to upper and lower basin areas.	Keith Dublanica
Cushman Dam	The MCD has seen positive results from restoring streamside protective buffers with conservation efforts, some of which are the largest projects in the Hood Canal basin. The increased flows coming from the North Fork through the Federal Energy Regulatory Commission's Project (PERC) #460, mandated conditions for re-licensing of the city of Tacoma's Cushman hydroelectric project have also influenced this.	Mason Conservation District
Cushman Dam	Restoration of adequate flows in the North Fork Skokomish River from Lake Cushman to sustain wild runs of steelhead trout and Pacific salmon species	NWSSCS
Cushman Dam	I caution against relying on measures proposed in the recently issued FERC decision on the relicensing of Cushman Dam; I have reviewed them in detail, and I am disappointed to report that they provide no basis to assume that recently implemented changes to the flow regime of the North Fork will alleviate gravel build-up in the mainstem or reduce the frequency of overbank flows that regularly inundate the lower valley.	Stillwater Sciences

Category	Comment	Author
Cushman Dam	The FEIS thus affirms that the presence or absence of the project is ultimately irrelevant to channel aggradation, and so any modification to the flow regime that lies between two extremes (namely, near-total diversion and fully uncontrolled flow) will also have no effect on aggradation. The FEIS also uses a purported channel capacity based on a reference over 20 years old (from the FEIS: "Mainstem aggradation has reduced the channel's conveyance capacity. Historically, the channel could convey about 12,000 cfs without flowing over its banks. Today, flooding occurs at flows of about 4,650 cfs or more [Canning, 1988]."). I recently obtained a rating curve directly from USGS personnel in Tacoma for the gage at the US 101 bridge crossing; it reminds us of the magnitude of channel infilling over the last several decades (over 3 feet in the last 27 years). Alas, this problem will not be resolved with old data and wishful thinking.	Stillwater Sciences
Cushman Dam	The new flow regime from Cushman Dam will increase the frequency and duration of overbank flooding; and the current pace of watershed rehabilitation up the South Fork will likely provide watershed-scale improvements several decades too late for anyone to benefit	Stillwater Sciences
Economic benefits	I say the federal government reaped tremendous economic benefit by selling the timber off the upper watershed, causing ruined farmland, flooded homes and barns, decades-old building moratorium that eliminates any new building, even fixing up buildings, in the Valley; also, a choked-up river system.	Jim Hunter
Economic benefits	If we're talking about the whole river system, why aren't we talking about the income from the Forest Service, who, like I say, took millions of board feet of timber. And the City of Tacoma is going on and on, selling electricity. And that should be brought into this cost/benefit ratio in some way.	Jim Hunter
Economic benefits	Purchase land holdings from willing property owners in the Skokomish River valley	NWSSCS
Economic benefits	When completing your cost/benefit analysis, please consider economic benefits for a wide range of ongoing activities that will be improved by successful completion of these identified measures. These include, but are not limited to, commercial, recreational, and tribal fishing in the river and in Hood Canal proper; agricultural production; shellfish production throughout Hood Canal; tourism and recreation that will be improved by improving ecosystem conditions in the river and Hood Canal proper; sustainable forestry that can be recovered if the lower valley is flood-proofed; and safe transportation corridors up the Skokomish Flats Road and State Highway 161 as they are floodproofed.	Richard Brocksmith
Economic benefits	In particular, the Corps' evaluation of federal interest in aquatic ecosystem restoration and flood risk management in the Skokomish River Basin must include the benefits that will accrue to Hood Canal and Puget Sound through restoration and flood reduction in the Skokomish watershed. These benefits include opportunities for improved commercial and recreational salmon fishing, shellfish production, and tourism, as well as higher property values and the	The Wilderness Society

Category	Comment	Author
	enhanced residential and business opportunities associated with a healthy environment in the Hood Canal/Puget Sound region.	
Elevated water table	The ground water level and flooding are killing ag in the valley.	Bill Hunter
Elevated water table	…because of the river channel being so high that it raises the aquifer. And our water table is just -- you dig a posthole and you hit water.	Curt Hunter
Elevated water table	For those of us who call the Skokomish Valley home, the primary issue, besides the frequent flooding and the decades-old building moratorium, is the ever-increasing water table, which is the result of the immense aggregation of the riverbed. The river is spreading underground, like a cancer, across the Valley floor and at an alarming rate, making much of what was once productive land unfarmable. I am concerned that the rising water table was not listed. There simply is too much gravel and nowhere for the water to go except underground, which raises the water table, rendering many of our fields unfarmable.	Jayni Kamin
Elevated water table	You didn't mention the underground water problems that we have. I'd like to just keep bringing that up and driving it home. That is a main concern we have in the Valley, is rising water table. We have many, many acres that are rendered pretty near useless now because of the water table.	Jim Hunter
Elevated water table	You know, we know about the groundwater; we've seen it. You know, we know about the degradation; we see it.	Joseph Pavel
Elevated water table	the root cause of the chronic Skokomish River flooding issues, low flows much of the year and a higher than usual water table is the federal government's (US Forest Service) irresponsible forestry practices (i.e., clear cut logging on unstable slopes) which resulted in destroying the natural processes of water retention (storm water and snowmelt) and the natural release of this water into the Skokomish River throughout the year.	NWSSCS
Elevated water table	In reviewing the Purpose and Need Statement in the published NOI, I found no mention of high groundwater. Do you intend to use this as a criteria when developing and evaluating alternatives? It would appear that any action which addresses the high groundwater and minimizes flooding will adversely affect the rapidly expanding wetlands in the valley. Are you prepared to develop, evaluate, and implement alternatives in which wetland impact is not fully mitigated?	Steve Thomas, Lodestone Engineering LLC
Elevated water table	Gravel aggradation is elevating the entire river bed, causing water tables to rise. This higher water table eliminates soil water-holding capacity and causes more frequent flooding during the winter. It also makes the soil too wet to plow during the spring and early summer, reducing the amount of tillable ground in the valley by 90 percent and severely limiting agricultural uses of the land. We urge you to consider alternatives and adopt a plan that will effectively	The Wilderness Society

Category	Comment	Author
	address the problem of elevated water tables in the Skokomish Valley.	
Elevated water table	The residents of the lower valley, Tribal members and landowners alike, are slowly but inexorably going under water. Reduced channel capacity, overbank flooding, and rising groundwater levels were all explicitly acknowledged at the October 7th meeting, and I hope you will continue to make them centerpieces of the General Investigation.	Stillwater Sciences
Endangered species	I am sure that many others have noted the Skokomish River watershed as a marine mammal shelter area, a river of cultural significance to the native Twana peoples, a migratory bird corridor, drains a Federal Forest and contains important agricultural land for feeding America's families. It is home to ESA salmonid species· and is on 303(d) list of impaired water bodies.	Constance Ibsen
Endangered species	The EIS should disclose whether or not the various alternatives being considered may impact endangered, threatened or candidate species listed under the Endangered Species Act (ESA), their habitats, and/or any of the three states' sensitive species. The draft EIS should describe the critical habitat for the species; identify any impacts the various alternative actions will have on the species and their critical habitats; and describe how the proposed actions will meet all requirements under ESA, including consultation with the appropriate federal agencies and the biological assessments and opinions of that consultation process. In addition to listed species, the EIS should describe the overall flora and fauna in the area and impacts of the project on the biota. Given the watershed approach of this process, the EIS should provide details on the ecological interactions between species and habitats and the effects of the various alternatives on populations, habitats and ecological interactions.	EPA
Endangered species	I would like to suggest that gravel removal must be included among the alternatives in this study. The endangered fish obviously need quality water and habitat to have any chance of recovery. The water is still in the Skokomish Valley, it is just flowing under a massive amount of sediment.	Jason Ragan
Endangered species	The larger drainage basin is affected by all its tributaries. Hood Canal suffers from low dissolved oxygen levels as do parts of south Puget Sound. Puget Sound Chinook salmon, the most charismatic and ubiquitous of endangered salmon stocks, has areas supporting life history behaviors throughout the Sound including Hood Canal and the Skokomish. Both transient and resident Orca whales transit the Sound and Canal. These water-borne icons are part of the cultural legacies, tied to the landscape as deep as are all the native tribes that call the Salish Sea part of their historical homeland. Shellfish industries are known regionally, nationally, and	Keith Dublanica

Category	Comment	Author
	internationally depend upon healthy water quality.	
Endangered species	Sediment buildup in the Skokomish River not only increases the frequency of flooding during the rainy season, it also blocks the river channel to migration and spawning by endangered Puget Sound salmon and trout populations during the late summer and early fall. The bed of the Skokomish River's South Fork has gone completely dry for a period of weeks or months nearly every year since 2003.	The Wilderness Society
Endangered species	I am no less aware of the range of ecological impairments in the lower river, and I applaud ongoing and future efforts to improve conditions for ESA-listed species as well.	Stillwater Sciences
Endangered species	…the ecosystem damage caused by years of natural resource consumption. We see much of this damage as harm to endangered species and their habitats, specifically those of Puget Sound Chinook, Hood Canal summer chum, coastal steelhead, and coastal bull trout.	Mason Conservation District
Endangered species	It is critically important for the Corps to recognize that the recovery of endangered salmon populations in Puget Sound and the reversal of low Hood Canal dissolved oxygen levels depend upon the ecological restoration of the Skokomish watershed.	The Wilderness Society
Endangered species	The Skokomish River floods more frequently than any other river in Washington State, due to aggradation of the river bottom. This flooding directly harms endangered salmon populations and flushes excess nutrients and harmful bacteria into Hood Canal. The degraded water quality conditions contribute to the low dissolved oxygen levels in Hood Canal, resulting in fish kills.	The Wilderness Society
Erosion	Below Highway 101 (and perhaps elsewhere) are areas where old car bodies have been used for rip rap. These should be removed as they generally add to bank erosion rather than alleviate it and are the source of pollutants.	Duane Phinney
Erosion	Many culverts are too small or improperly placed-adding to stream bed and bank erosion and blocking upstream passage of fishes.	Duane Phinney
Erosion	These recommendations that are now nearly a quarter of a century old include: 1. Stabilize failed or failing slopes to help reduce erosion	NWSSCS
Fecal contamination	When the agricultural lands and septic systems of the Skokomish Valley are frequently flooded, there is an increased nutrient load, as well as fecal coliform, that are carried into Annas Bay. The sources of fecal coliform are human, livestock and wildlife.	Jason Ragan

Category	Comment	Author
Fecal contamination	I urge you to include the value of the Hood Canal's shellfish resources in scope of the EIS for the Skokomish GI. A healthy river system can significantly reduce the fecal bacteria/pathogen loading from the river. A number of the alternatives being considered such as off channel rearing habitat, wetland restoration, setback levees and sediment removal improve the function of the river system. These actions will reduce fecal loading and the public health hazard that occurs particularly during flood events when river waters inundate septic systems and wash manure from pastures.	Taylor Shellfish Company
Fecal contamination	Shellfish are filter feeders and as you are no doubt aware require exceptionally clean water to grow them in. Growing areas are regulated by the State Department of Health based on the presence of fecal coliform bacteria and indicator organism used to detect the presence of human pathogens. The beds at the mouth of the Skokomish River have been plagued with pollution closures for years. A TMDL was recently completed and is being implemented to attempt to address the sources of pollution.	Taylor Shellfish Company
Federal interest	And I really think the government needs to step up and, you know, help us out.	Justin Bays
Federal interest	I strongly believe there is wide-spread federal interest in this General Investigation of the Skokomish River.	Keith Dublanica
Federal interest	The Mason Conservation District believes there is wide-spread federal interest in this General Investigation of the Skokomish River.	Mason Conservation District
Federal interest	The MCD believes this is a project demands Congressional attention and the anticipated support for wide-reaching and a comprehensive watershed restoration initiative.	Mason Conservation District
Flooding	Now we see a deep, deep degradation of the drainage and a soft geology, the softest known to man, that, if I stood there and piled up a bucket of dirt and then I took a five-gallon bucket of water and I dumped it on top of it, it would be right down there in a big, muddy mess. Well, that's what we've got today. We've got degradation of everything.	Art Tozier
Flooding	The increase in flooding not only hurts our ag but water quality too. We now have had flooding in every month of the year not just the storm months, including the growing season, harvest season, and summer too.	Bill Hunter
Flooding	TPU is dumping more water in the valley aggravating the ground water situation and flooding. The ground water level and flooding are killing ag in the valley.	Bill Hunter
Flooding	But in the past few years, I just -- every year, we go out and try to plow the fields and work everything. And with the flooding, you can't hardly plow a field for fear that we're going to get a flood in the fall that -- that is going to wash topsoil away.	Curt Hunter
Flooding	I believe that the increased nutrient loads from frequent flood events contribute to the dissolved oxygen problems in Hood Canal. I strongly suggest that the negative effects of frequent flooding on Annas Bay and Hood Canal should be included in the scope of the investigation.	Jason Ragan

Category	Comment	Author
Flooding	When the agricultural lands and septic systems of the Skokomish Valley are frequently flooded, there is an increased nutrient load, as well as fecal coliform, that are carried into Annas Bay. The sources of fecal coliform are human, livestock and wildlife.	Jason Ragan
Flooding	In addition, I have also developed a keen sense of the social challenges this damaged landscape and flooding has had on the communities and families who have settled here. Whether the community has been here since time immemorial, as the Skokomish Tribe believes, since before statehood for homesteaders and later dwellers, or those recently locating to the area, they all share a concern of the landscape's issues and how their respective communities are negatively impacted.	Keith Dublanica
Flooding	The Tribe has experienced flood impacts the longest. This basin continues to flood at lesser precipitation events more frequently, and the dynamic nature of the hydrograph defines this river as the first to flood in the state.	Keith Dublanica
Flooding	the root cause of the chronic Skokomish River flooding issues, low flows much of the year and a higher than usual water table is the federal government's (US Forest Service) irresponsible forestry practices (i.e., clear cut logging on unstable slopes) which resulted in destroying the natural processes of water retention (storm water and snowmelt) and the natural release of this water into the Skokomish River throughout the year.	NWSSCS
Flooding	And I'd like to ask -- I know Ross is here, and I saw two more Commissioners here, but I don't see them now. I'd like to ask them to reinstate our flood board so that the citizens and the residents of our Valley would have someone to talk to and someone to speak for us, especially with issues like this going on.	Paul Hunter
Flooding	The residents of the lower valley, Tribal members and landowners alike, are slowly but inexorably going under water. Reduced channel capacity, overbank flooding, and rising groundwater levels were all explicitly acknowledged at the October 7th meeting, and I hope you will continue to make them centerpieces of the General Investigation.	Stillwater Sciences
Flooding	Gravel aggradation is elevating the entire river bed, causing water tables to rise. This higher water table eliminates soil water-holding capacity and causes more frequent flooding during the winter. It also makes the soil too wet to plow during the spring and early summer, reducing the amount of tillable ground in the valley by 90 percent and severely limiting agricultural uses of the land. We urge you to consider alternatives and adopt a plan that will effectively address the problem of elevated water tables in the Skokomish Valley.	The Wilderness Society
Flooding	Sediment buildup in the Skokomish River not only increases the frequency of flooding during the rainy season, it also blocks the river channel to migration and spawning by endangered Puget Sound salmon and trout populations during the late summer and early fall. The bed of the Skokomish River's South Fork has gone completely dry for a period of weeks or months nearly every year since 2003.	The Wilderness Society

Category	Comment	Author
Flooding	The Skokomish River floods more frequently than any other river in Washington State, due to aggradation of the river bottom. This flooding directly harms endangered salmon populations and flushes excess nutrients and harmful bacteria into Hood Canal. The degraded water quality conditions contribute to the low dissolved oxygen levels in Hood Canal, resulting in fish kills.	The Wilderness Society
Forestry	The other issue is the US Government logged the watershed and flushed the gravel down at an accelerated rate and then walked away. The ground water level and flooding are killing ag in the valley.	Bill Hunter
Forestry	Who approved this obscene yield that harvests the timber in our watershed faster than any other national forest?	Bill Hunter
Forestry	I am very sad to see the forest dying east of Hwy 101.	Doris Wilson
Forestry	the historic rate of logging is unsustainable, clear cuts are large and environmentally damaging, the watershed is replete with logging roads that send huge loads of silt and other material directly into the streams by virtue of lack of proper consideration for storm water management	Duane Phinney
Forestry	I say the federal government reaped tremendous economic benefit by selling the timber off the upper watershed, causing ruined farmland, flooded homes and barns, decades-old building moratorium that eliminates any new building, even fixing up buildings, in the Valley; also, a choked-up river system.	Jim Hunter
Forestry	the root cause of the chronic Skokomish River flooding issues, low flows much of the year and a higher than usual water table is the federal government's (US Forest Service) irresponsible forestry practices (i.e., clear cut logging on unstable slopes) which resulted in destroying the natural processes of water retention (storm water and snowmelt) and the natural release of this water into the Skokomish River throughout the year.	NWSSCS
Forestry	When completing your cost/benefit analysis, please consider economic benefits for a wide range of ongoing activities that will be improved by successful completion of these identified measures. These include, but are not limited to, commercial, recreational, and tribal fishing in the river and in Hood Canal proper; agricultural production; shellfish production throughout Hood Canal; tourism and recreation that will be improved by improving ecosystem conditions in the river and Hood Canal proper; sustainable forestry that can be recovered if the lower valley is flood-proofed; and safe transportation corridors up the Skokomish Flats Road and State Highway 161 as they are floodproofed.	Richard Brocksmith
Habitat (and specific organisms or animals)	I am sure that many others have noted the Skokomish River watershed as a marine mammal shelter area, a river of cultural significance to the native Twana peoples, a migratory bird corridor, drains a Federal Forest and contains important agricultural land for feeding America's families. It is home to ESA salmonid species and is on 303(d) list of impaired water bodies.	Constance Ibsen
Habitat (and specific organisms or animals)	Commitment from the Washington Department of Fish and Wildlife and Skokomish Tribe to properly manage fisheries under their respective jurisdictions to assure sufficient fish escape to fully seed	Duane Phinney

Category	Comment	Author
	presently available and enhanced habitat is mandatory.	
Habitat (and specific organisms or animals)	Fish habitat enhancement measures will be a waste of money if sufficient spawning escapement is not allowed into the river to fully utilize available habitat. Commitment from the Washington Department of Fish and Wildlife and Skokomish Tribe to properly manage fisheries under their respective jurisdictions to assure sufficient fish escape to fully seed presently available and enhanced habitat is mandatory.	Duane Phinney
Habitat (and specific organisms or animals)	Many culverts are too small or improperly placed-adding to stream bed and bank erosion and blocking upstream passage of fishes.	Duane Phinney
Habitat (and specific organisms or animals)	Sections of the lower South Fork go dry during the summer low flow period, inhibiting movement of certain fish species and reducing rearing area for steelhead trout, coho salmon, and other fish species, There should be an evaluation of potential methods to address this problem (wells, for example).	Duane Phinney
Habitat (and specific organisms or animals)	The EIS should disclose whether or not the various alternatives being considered may impact endangered, threatened or candidate species listed under the Endangered Species Act (ESA), their habitats, and/or any of the three states' sensitive species. The draft EIS should describe the critical habitat for the species; identify any impacts the various alternative actions will have on the species and their critical habitats; and describe how the proposed actions will meet all requirements under ESA, including consultation with the appropriate federal agencies and the biological assessments and opinions of that consultation process. In addition to listed species, the EIS should describe the overall flora and fauna in the area and impacts of the project on the biota. Given the watershed approach of this process, the EIS should provide details on the ecological interactions between species and habitats and the effects of the various alternatives on populations, habitats and ecological interactions.	EPA
Habitat (and specific organisms or animals)	Responses to habitat degradation are being implemented with a number of watershed restoration projects taking place primarily in the upper basin reaches and at the river mouth within the Skokomish Indian Reservation. These projects are being implemented pro-actively by the US Forest Service and the Skokomish Tribe respectively with varied leveraged support	Keith Dublanica
Habitat (and specific organisms or animals)	The larger drainage basin is affected by all its tributaries. Hood Canal suffers from low dissolved oxygen levels as do parts of south Puget Sound. Puget Sound Chinook salmon, the most charismatic and ubiquitous of endangered salmon stocks, has areas supporting life history behaviors throughout the Sound including Hood Canal and the Skokomish. Both transient and resident Orca whales transit the Sound and Canal. These water-borne icons are part of the cultural legacies, tied to the landscape as deep as are all the native tribes that call the Salish Sea part of their historical homeland. Shellfish industries are known regionally, nationally, and internationally depend upon healthy water quality.	Keith Dublanica

Category	Comment	Author
Habitat (and specific organisms or animals)	…the ecosystem damage caused by years of natural resource consumption. We see much of this damage as harm to endangered species and their habitats, specifically those of Puget Sound Chinook, Hood Canal summer chum, coastal steelhead, and coastal bull trout.	Mason Conservation District
Habitat (and specific organisms or animals)	Restoration of adequate flows in the North Fork Skokomish River from Lake Cushman to sustain wild runs of steelhead trout and Pacific salmon species	NWSSCS
Habitat (and specific organisms or animals)	When completing your cost/benefit analysis, please consider economic benefits for a wide range of ongoing activities that will be improved by successful completion of these identified measures. These include, but are not limited to, commercial, recreational, and tribal fishing in the river and in Hood Canal proper; agricultural production; shellfish production throughout Hood Canal; tourism and recreation that will be improved by improving ecosystem conditions in the river and Hood Canal proper; sustainable forestry that can be recovered if the lower valley is flood-proofed; and safe transportation corridors up the Skokomish Flats Road and State Highway 161 as they are floodproofed.	Richard Brocksmith
Habitat (and specific organisms or animals)	I hope that you will maintain a strong focus in the General Investigation on the consequences of past mismanagement that are exacting a profound cost on valley residents, as well as on the once-healthy anadromous fishery of this key river system.	Stillwater Sciences
Habitat (and specific organisms or animals)	In particular, the Corps' evaluation of federal interest in aquatic ecosystem restoration and flood risk management in the Skokomish River Basin must include the benefits that will accrue to Hood Canal and Puget Sound through restoration and flood reduction in the Skokomish watershed. These benefits include opportunities for improved commercial and recreational salmon fishing, shellfish production.	The Wilderness Society
Habitat (and specific organisms or animals)	Sediment buildup in the Skokomish River not only increases the frequency of flooding during the rainy season, it also blocks the river channel to migration and spawning by endangered Puget Sound salmon and trout populations during the late summer and early fall. The bed of the Skokomish River's South Fork has gone completely dry for a period of weeks or months nearly every year since 2003.	The Wilderness Society
Habitat (and specific organisms or animals)	The Skokomish River floods more frequently than any other river in Washington State, due to aggradation of the river bottom. This flooding directly harms endangered salmon populations and flushes excess nutrients and harmful bacteria into Hood Canal. The degraded water quality conditions contribute to the low dissolved oxygen levels in Hood Canal, resulting in fish kills.	The Wilderness Society
Other projects in the basin	We recommend that the EIS discuss the other work occurring in the basin and any road blocks that may affect the analysis. As you may be aware the Walla Walla Corps' district is also working on addressing sediment on a watershed scale and they are in the process of developing a supplemental draft EIS for the Lower Snake River. We have a keen interest in both of these projects and understand that characterizing upland sediment sources is complex and coordinating multiple agencies can be a challenge.	EPA

Category	Comment	Author
Other projects in the basin	Responses to habitat degradation are being implemented with a number of watershed restoration projects taking place primarily in the upper basin reaches and at the river mouth within the Skokomish Indian Reservation. These projects are being implemented pro-actively by the US Forest Service and the Skokomish Tribe respectively with varied leveraged support	Keith Dublanica
Other projects in the basin	The MCD has seen positive results from restoring streamside protective buffers with conservation efforts, some of which are the largest projects in the Hood Canal basin.	Mason Conservation District
Other projects in the basin	I hope that you have now been able to obtain and study a copy of our recently completed final draft of the Skokomish River Chinook Salmon Recovery Plan as I believe you will find insightful information as to the diagnosis of altered conditions that have led to the current state we find the river. I believe this information will be complementary to the Corp's findings	Richard Brocksmith
Project area	I urge you to include the estuary and nearshore marine waters of Hood Canal in the General Investigation.	Constance Ibsen
Project area	We recommend including maps and diagrams of the area, each alternative, and any other relevant maps that assist in the understanding of the project area and proposed activities. We also recommend including tables that clearly compare and contrast the alternatives and their potential impacts to each resource and subbasin within the overall geographic area, as well as other tables that clearly compare and contrast the costs, benefits, and practicability of alternatives.	EPA
Project area	Recent flow regime changes have been implemented through the Federal Energy Regulatory Commission's Project (FERC) #460, mandated conditions for re-licensing of the city of Tacoma's Cushman hydroelectric project on the North Fork. However, in spite of these successful actions, the mid-floodplain dwellers still have concerns that their landscapes have changed, their agricultural practices warrant altering, and that scant attention is being applied there compared to upper and lower basin areas.	Keith Dublanica
Recreation/tourism	When completing your cost/benefit analysis, please consider economic benefits for a wide range of ongoing activities that will be improved by successful completion of these identified measures. These include, but are not limited to, commercial, recreational, and tribal fishing in the river and in Hood Canal proper; agricultural production; shellfish production throughout Hood Canal; tourism and recreation that will be improved by improving ecosystem conditions in the river and Hood Canal proper; sustainable forestry that can be recovered if the lower valley is flood-proofed; and safe transportation corridors up the Skokomish Flats Road and State Highway 161 as they are floodproofed.	Richard Brocksmith
Recreation/tourism	Restoration of the Skokomish watershed is critical to the health of the Hood Canal shellfish resources which are critical to commercial farmers such as Taylor as well as recreation/tourism and the tribes. Please include this in the scope of the EIS.	Taylor Shellfish Company

Category	Comment	Author
Recreation/tourism	In particular, the Corps' evaluation of federal interest in aquatic ecosystem restoration and flood risk management in the Skokomish River Basin must include the benefits that will accrue to Hood Canal and Puget Sound through restoration and flood reduction in the Skokomish watershed. These benefits include opportunities for improved tourism.	The Wilderness Society
Sediment management	To help the flooding and ground water issues we need to restore channel capacity by what ever we want to call it today, habitat restoration, dredging, bar scalping. We need the floor of the river lowered to the level of the 1950s-1960s at a minimum. In our studies during the 90's we showed 12 feet of gravel fill under the Highway 181 bridge. We need to address all drainage for the farms to lower ground water.	Bill Hunter
Sediment management	…and it's all just the aggradation in the river. You know, it's -- it's full of bed load. And the best thing we can do is restore the channel, restore the side channels.	Bill Hunter Jr.
Sediment management	Horses used to be used to scoop and remove gravel deposits from the river channel - no one has been doing that for 70 years! Help make a more adequate channel for the river.	Doris Wilson
Sediment management	EPA strongly supports the Corps' strategy to conduct a comprehensive watershed study for assessing sediment sources and planning for reduction of elevated sediment loads. In addition we promote managing sediment as a resource in the river system, working with natural transport processes wherever possible, and a restorative approach to move toward environmentally protective and ecologically sustainable sediment management in the watershed.	EPA
Sediment management	Of particular interest to EPA is the beneficial reuse of sediment removal from the channel or floodplain. Modeling can help develop a better understanding of locations and quantities of sources of sediment suitable for beneficial use and allow us to match sediment sources with potential use locations in advance of dredging or other active sediment management prescriptions.	EPA
Sediment management	The EIS should discuss the procedure for evaluating sediment quality and discuss how the Washington State sediment management standards' would be applied. The EIS should disclose any past sediment characterization, what sediment analyses would be needed, and the presence of any Chemicals of Concern (COCs) that will be considered in the analysis.	EPA
Sediment management	I would like to suggest that gravel removal must be included among the alternatives in this study. The endangered fish obviously need quality water and habitat to have any chance of recovery. The water is still in the Skokomish Valley, it is just flowing under a massive amount of sediment.	Jason Ragan
Sediment management	And I also believe that the solution to this devastation is simple. We must remove the gravel in the middle of the river, which is clogging up the system, preventing fish passage, and destroying our farms.	Jayni Kamin
Sediment management	There simply is too much gravel and nowhere for the water to go except underground, which raises the water table, rendering many of our fields unfarmable	Jayni Kamin

Category	Comment	Author
Sediment management	The solution is simple. Remove the gravel which is destroying the river -- the river, our farms, and our community.	Jim Hunter
Sediment management	Hundreds of feet of alluvium and sediment have been estimated to be deposited in the Skokomish valley floor and the channel has lost conveyance capacity with a great amount of material still in the storage in the upper basin. Gravity and fluvial dynamics will bring that material downstream.	Keith Dublanica
Sediment management	Limited, ongoing dredging to improve natural functions of Skokomish River and its tributaries	NWSSCS
Sediment management	I caution against relying on measures proposed in the recently issued FERC decision on the relicensing of Cushman Dam; I have reviewed them in detail, and I am disappointed to report that they provide no basis to assume that recently implemented changes to the flow regime of the North Fork will alleviate gravel build-up in the mainstem or reduce the frequency of overbank flows that regularly inundate the lower valley.	Stillwater Sciences
Socioeconomic impacts	I am sure that many others have noted the Skokomish River watershed as a marine mammal shelter area, a river of cultural significance to the native Twana peoples, a migratory bird corridor, drains a Federal Forest and contains important agricultural land for feeding America's families. It is home to ESA salmonid species· and is on 303(d) list of impaired water bodies.	Constance Ibsen
Socioeconomic impacts	In addition, I have also developed a keen sense of the social challenges this damaged landscape and flooding has had on the communities and families who have settled here. Whether the community has been here since time immemorial, as the Skokomish Tribe believes, since before statehood for homesteaders and later dwellers, or those recently locating to the area, they all share a concern of the landscape's issues and how their respective communities are negatively impacted.	Keith Dublanica
Socioeconomic impacts	TWS believes that the Skokomish FR/EIS must take into account the environmental and socioeconomic impacts and benefits of Skokomish River flooding and restoration on the natural resources and people not only in the Skokomish watershed, but also in the Hood Canal and Puget Sound, which was designated as an Estuary of National Significance by the U.S. Environmental Protection Agency in 1988.	The Wilderness Society
Transportation	So I've always thought that it would be a good thing to look into raising that road so that the people in the upper Valley can get out, because we -- right now, I go over the 800 line, and -- but the 800 line isn't stable. I mean, it washes out.	Justin Bays
Transportation	Continue to decommission ineffective, failing forest roads.	NWSSCS

Category	Comment	Author
Transportation	When completing your cost/benefit analysis, please consider economic benefits for a wide range of ongoing activities that will be improved by successful completion of these identified measures. These include, but are not limited to, commercial, recreational, and tribal fishing in the river and in Hood Canal proper; agricultural production; shellfish production throughout Hood Canal; tourism and recreation that will be improved by improving ecosystem conditions in the river and Hood Canal proper; sustainable forestry that can be recovered if the lower valley is flood-proofed; and safe transportation corridors up the Skokomish Flats Road and State Highway 161 as they are floodproofed.	Richard Brocksmith
Water quality	Determine sediment levels and water quality monitoring parameters for baseline evaluation. Also, consider 303 (d) listing for Skok.	Constance Ibsen
Water quality	If Washington State Department of Ecology has developed a water quality restoration plan or Total Maximum Daily Load (TMDL) for 303(d) listed waters, EPA recommends that the Corps coordinate with Ecology as the TMDL is implemented. If a TMDL has not yet been established for a 303(d) water body, then the EIS should demonstrate that there will be no net degradation of water quality to the 303(3) listed waters. Antidegradation provisions of the Clean Water Act apply to those waterbodies where water quality standards are currently being met. This provision prohibits degrading water quality unless an analysis shows that important economic and social development necessitates degrading water quality. The EIS should indicate how the antidegradation provisions would be met.	EPA
Water quality	The EIS should include information on the water quality of the Skokomish basin and which, if any, waters are impaired.	EPA
Water quality	The larger drainage basin is affected by all its tributaries. Hood Canal suffers from low dissolved oxygen levels as do parts of south Puget Sound. Puget Sound Chinook salmon, the most charismatic and ubiquitous of endangered salmon stocks, has areas supporting life history behaviors throughout the Sound including Hood Canal and the Skokomish. Both transient and resident Orca whales transit the Sound and Canal. These water-borne icons are part of the cultural legacies, tied to the landscape as deep as are all the native tribes that call the Salish Sea part of their historical homeland. Shellfish industries are known regionally, nationally, and internationally depend upon healthy water quality.	Keith Dubalnica
Water quality	The Skokomish River floods more frequently than any other river in Washington State, due to aggradation of the river bottom. This flooding directly harms endangered salmon populations and flushes excess nutrients and harmful bacteria into Hood Canal. The degraded water quality conditions contribute to the low dissolved oxygen levels in Hood Canal, resulting in fish kills.	The Wilderness Society

Next Steps

The comments received during the NEPA Scoping period were collected, analyzed, and shared with the Corps, Mason County, and Skokomish Indian Tribe. This scoping summary report will also be posted on the project's website at:
http://www.nws.usace.army.mil/Missions/Environmental/EnvironmentalDocuments.aspx
Pertinent comments will be taken into account as the Skokomish General Investigation Study moves forward.

Public and agency outreach will continue throughout the duration of the project, including information sessions to discuss and present project updates, website updates, and meetings with organizations, agencies and tribal representatives.

There will be a formal review and comment process when the Feasibility Study/Draft Environmental Impact Statement (DEIS) is issued, scheduled for 2014, including an open house and public hearing. Comments made on the Feasibility Study/DEIS will be formally addressed in the Final Environmental Impact Statement. The Feasibility Study/EIS is expected to be completed in 2016.