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Skagit River Flood Risk Management General Investigation

Skagit County, Washington

Draft Feasibility Report and Environmental Impact Statement

Appendix D – Environmental Appendix

May 2014

ENVIRONMENTAL APPENDICES

- 1. Clean Water Act Section 404(b)(1) analysis
- 2. Fish and Wildlife Coordination Act
- 3. Endangered Species Act Consultation (Biological Opinion will be included in the Final FR/EIS)

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1) Clean Water Act Section 404(b)(1) analysis

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Clean Water Act Section 404(b)(1) Analysis

Skagit River General Investigation

Skagit County, Washington

Prepared by:

U.S. Army Corps of Engineers

Seattle District

Environmental and Cultural Resources Branch

April 2014

US Army Corps of Engineers ®
Seattle District

1. Introduction

The purpose of this document is to record the U.S. Army Corps of Engineers (USACE) compliance evaluation of the proposed actions within the Skagit River General Investigation in Skagit County, Washington, pursuant to the Clean Water Act (CWA), and the General Regulatory Policies of USACE. Specifically, Section 404 of the CWA requires an evaluation of impacts for work involving discharge of fill material into the waters of the U.S., and evaluation guidance can be found in the CWA 404(b)(1) Guidelines [40 CFR §230.12(a)]. The General Regulatory Policies of the Corps of Engineers [33 CFR §320.4(a)] provide measures for evaluating permit applications for activities undertaken in navigable waters.

Attachment A provides USACE analysis of compliance with the CWA Section 404(b)(1) and the General Regulatory Policy requirements.

1.1 Project Background

The purpose of the Skagit River Flood Risk Management General Investigation (Skagit River GI) is to evaluate flooding problems in the Skagit River Basin (Basin); to formulate, evaluate, and screen potential solutions to these problems; and to recommend a plan for addressing flooding problems in the Basin. The recommended plan must accomplish flood risk management within the Basin; must be technically viable, economically sound; and must be supported by the local jurisdictions and local sponsor. This report, the draft Skagit River General Investigation Feasibility Report and Environmental Impact Statement (FR/EIS) documents alternatives formulation process and the National Environmental Policy Act (NEPA) evaluation of alternatives associated with this study.

This report uses the term "annual chance of exceedence" (ACE) to describe the likelihood associated with individual storm and flood events. ACE is the probability that the specified discharge, or flood event, could be equaled or exceeded during any given year. A "1% ACE flood" was previously referred to as a "100-yr flood".

The broad outwash plain between Sedro-Woolley and Skagit bay is mostly agricultural lands. Main population centers in this plain are along the Skagit River, Sedro-Woolley at river mile (RM) 24, Burlington (RM 17), and Mount Vernon (RM13) (Figure 1). The levee system that protects this area has a 4-5% annual chance of exceeding the systems protection. If a levee fails, flood depths could be up to 8 feet for a 1% annual chance exceedance (ACE) event with flood durations of 2-3 days. High hazard areas in a 1% ACE event are the urban areas of Mount Vernon and Burlington. These areas contain the highest density of infrastructure, such as roads, hospitals and water treatment plants in the basin.

1.2 Project Need

The need of the study is that the Skagit Basin experiences frequent flooding resulting in damages to both rural and urban areas throughout the Basin.

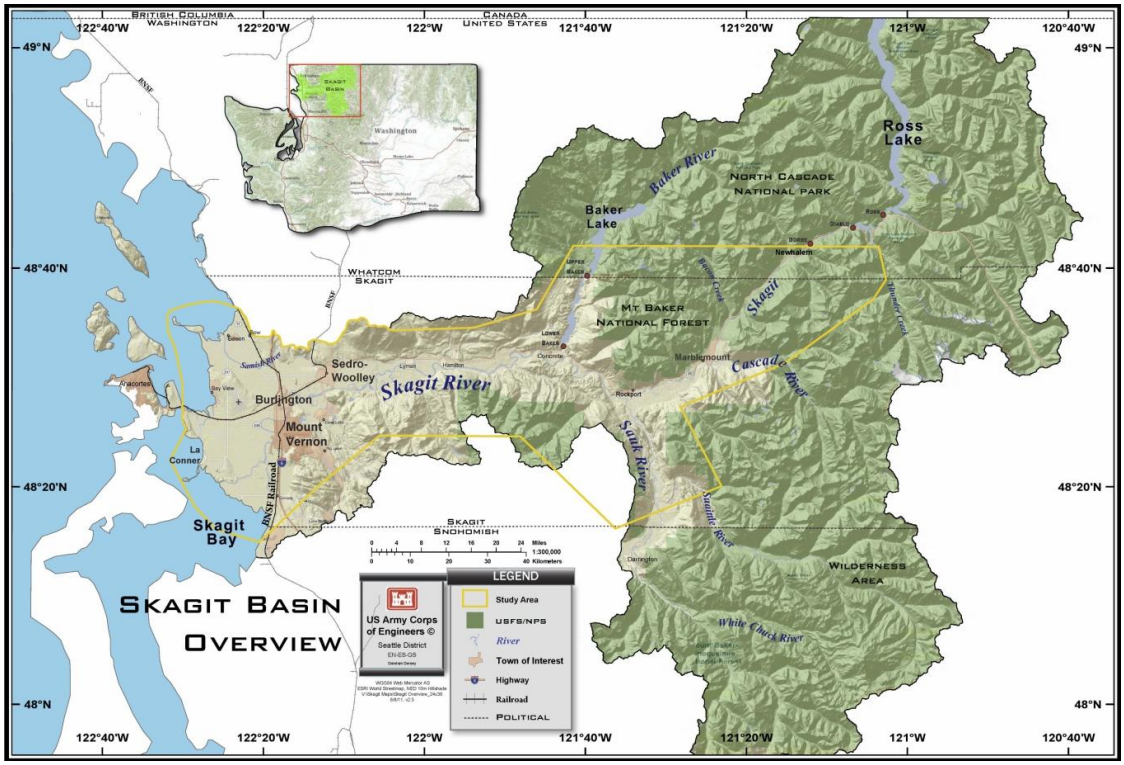

Figure 1: Overview map showing the Skagit Basin

1.3 Project Purpose

The purpose of the federal action is to reduce flood risks, life safety threats, and damages in the Skagit River Basin as a result of flooding.

1.4 Proposed Action and Alternatives

Multiple alternatives were considered including the No Action Alternative, Comprehensive Urban Levee Improvement (CULI) Alternative, Joe Leary Slough (JLS) Bypass Alternative, and the Swinomish Bypass Alternative. A preliminary evaluation has been performed on the followings alternatives:

1.4.1 No Action Alternative

This alternative would leave the levee system in its current condition and make no attempt to improve flood protection. The No Action Alternative was considered but not pursued due to the potential of unacceptable flood damage to property and life in the watershed. This alternative will not be discussed further in this document.

1.4.2 Comprehensive Urban Levee Improvement Alternative (Recommended Alternative)

The Comprehensive Urban Levee Improvement (CULI) Alternative would provide flood risk reduction for the urban areas of Burlington and Mount Vernon by raising existing levees along the Skagit River and constructing a new Burlington Hill Cross Levee along the eastern and northern edges of Burlington (Figure 2). This is a conceptual design and will be further refined during feasibility design analysis as the feasibility study progresses. The CULI Alternative contains the features listed below.

Structural Components

- Burlington Hill Cross Levee: A new levee would be constructed along the northern and eastern edges of Burlington to prevent floodwaters from Sterling (RM 21.6) from entering the Burlington urban area. This new levee would be in two segments; one starting at the upstream terminus of Skagit County Diking District (SCDD) #12 (RM 20.9) and running mostle to the west, away from the river, and tying into the eastern side of Burlington Hill. One additional levee segment would then extend from the north end of Burlington Hill, then run west to I-5, and terminate at Hwy 99. The following elements would be required as part of the Burlington Hill Cross Levee:
    - Gages Slough Culvert: A culvert structure would need to be constructed to accommodate daily flows into and out of Gages Slough but to restrict floodwaters from flowing into the Burlington area.
    - Burlington Hill Floodgate: A mechanical floodgate would be constructed in the Burlington Hill Cross Levee to provide throughway for SR20 and the BNSF railroad (near RM 21).
- Riverbend Cutoff Levee: This levee would bisect the Riverbend area in a north-south direction along the urban growth boundary/city limits boundary and would prevent Riverbend floodwaters from flowing east into Mount Vernon's west side. The existing levees in the Riverbend area would not be raised, therefore allowing some floodwaters to fill the Riverbend area before reaching the new cutoff levee.
    - Lions Park Connector (Floodwall): This new structure would connect SCDD #17 South Riverbend Road to SCDD #3 Mount Vernon Floodwall.
    - SCDD #17 South Riverbend Road: Construction of the Lion's Park Connector would require raising of the existing levee system between the new Riverbend Cutoff Levee and the new Lion's Park Connector (RM 13.6 to 13.3).
- Raise Existing Urban Levees: The CULI Alternative would require that sections of existing urban levees be raised to provide increased flood risk management. In regard to levee reliability, all raising of urban levees and improvements to existing levees would need to address existing levee reliability issues. Levees that would be raised include:
    - SCDD #12 Upstream: the existing right bank levee system from RM 18.0 to the start of the new Burlington Hill Cross Levee system (RM 20.9).
    - SCDD #12 BNSF Embankment: the right bank levee system along the BNSF embankment (RM 18.0 to 17.5).
    - SCDD #12 Three-Bridge Corridor: the existing right bank levee system between RM 17.5 and 16.5.
    - SCDD #17 3-Bridge Corridor: the existing left bank levee system between RM 17.5 and 16.5.
    - SCDD #1 West Mount Vernon: the existing right bank levee system between RM 14.0 to 11.7.

- SCDD #3 South Mount Vernon: the existing left bank levee system downstream of the Mount Vernon Waste Water Treatment Plant (MVWWTP) (RM 11.7 to 10.6).

- Improve Bank Protection: Bank protection is necessary to protect the levees from erosion. A critical component of that is toe protection to prevent undercutting that otherwise occurs in levees. Toe protection would be installed along 2.7 miles of the right bank and 1 mile of the left bank between RM 16.5 and 20.9, and along 1 mile of the left bank between RM 12 and 13. Note that this protection should be applied to all three alternatives and is not exclusive to the CULI Alternative. Note that various reaches of the existing urban levees would need additional toe protection.
- Improve Rural Levees: The CULI Alternative requires improvements of rural levees on both sides of the Skagit River starting from the southern end of Mount Vernon (RM 11.7 on the left bank and RM 10.6 on the right bank) as well as along both banks of the North Fork and South Fork to Skagit Bay. The typical levee profile would remain unchanged riverward of the crown; levee improvements would be completed on the landward side of the levees. Improving rural levees would predominantly consist of raising irregular low spots in the system, as well as addressing levee reliability issues. Irregular low spots would be raised to be consistent with the adjacent levees and to build out the landward slope at the existing grade or gentler. The two main reliability concerns are the potential for under-seepage and the landside slope stability.
- Baker Dam Operations: Dam operational modifications of the Upper and Lower Baker Dam per Article 107a and b (FERC 2008).
- Major Road Crossings: Several roads may need to be shifted or relocated due to expanded levee profiles where levees are raised or improved. A permanent mechanical floodgate that can be opened and closed would be installed for closure of Division Street in West Mount Vernon (RM 12.9). No new crossing would be needed for I-5.
- BNSF Railroad Crossing: The CULI Alternative requires construction of railroad crossings at Burlington Hill Cross Levee and SCDD #12 Levee.
- Utilities: Major gas, electrical transmission, and water lines lie outside the project footprint. It is expected that relocation of minor utilities that cross the footprint will be required as it typically is for large construction projects.
- Real Estate: Preliminary real estate evaluations estimate that approximately 142 acres would be impacted at a cost of approximately $28 million, including utility relocations and all contingencies. Note that this cost does not include the real estate associated with the ring dikes for the WWTP and Hospital in Sedro Woolley; those costs will be determined during the next phase of design.
- General Operation and Maintenance (O&M): O&M of the levees would be unchanged from current activities including regular mowing (2-3 times annually), regular vegetation maintenance, replacement of displaced riprap, replacement of gravel and regarding (observation/inspection) of the driving surface (as required), video-inspection of culverts every 5 years, continual maintenance of an active animal control program, and additional tasks as required.

- Non-Structural Components: A combination of the following non-structural components would be implemented:
    - Ring dikes would be constructed around the Sedro-Woolley Wastewater Treatment Plant and the United General Hospital.
    - Debris Management for River Bridges: Debris buildup against the bridge piers would have to be managed during floods. Implementation of a final design would require continuation of existing debris management.
    - Education and outreach, evacuation routes, outlet structures in sea dikes, installation of additional gages, flood warning systems, real estate acquisition, relocation of structures, elevation of structures, and flood-proofing of buildings.

1.4.3 Joe Leary Slough Bypass Alternative

This alternative would divert floodwater upstream of the urban damage areas (Burlington and Mount Vernon) to lower flood risks to an acceptable level without major modifications to the urban levees (Figure 3). The design goal was to lower the 1% ACE flood elevations in the urban areas to below the 15% probability of failure elevations on the existing levees. The JLS Bypass Alternative would comprise several separate structural features that are described below.

- Joe Leary Slough Bypass: The JLS Bypass would be a confined channel approximately 2,000 feet wide and approximately 9 miles long that would extend from an intake structure on the Skagit River to Padilla Bay, following the historic path of the Joe Leary Slough. New levees would be constructed on both sides of the bypass to form a confined channel. The average levee heights would be 10-17 feet. No excavation would be expected within the channel except near the intake and outlet structures. Other bypass design features include:
    - Intake/Outlet Structures: The intake structure consisting of a series of gates would be placed at the entrance of the bypass channel on the River. One or more mechanical gates would be placed at the intake to regulate the initial release of floodwater flows from the river into the bypass channel. Some excavation would occur for construction of the intake and outlet structures. Excavation is required near the intake because there is high ground at the JLS bypass entrance that needs to be removed from the bypass channel to provide adequate discharge capacity.
    - A fish screen was considered, at the intake, to prevent fish from entering the bypass. To meet National Marine Fisheries Service fish screen criteria for the 75,000-cfs design flow, the screen would have had to be approximately 3 miles long and been able to handle a large amount of floating debris. A screen of this size and complexity is considered infeasible and is not included in the final conceptual design of the bypass alternative. See section 4 for more details.
    - For the outlet at Padilla Bay, the sea dikes would be modified to allow overtopping flow to discharge most of the floodwaters. New larger tide gates would be required to drain ponded floodwaters after the flood has receded.

- Intake Embankment: An additional levee would be constructed along the southern edge of Sedro Woolley and SR20 to accommodate the bypass intake structure.
- Stilling basin and channel protection: A stilling basin and erosion protection would be required immediately downstream of spillway at bypass channel entrance.
- Drainage during flood and after flood: Drainage will be provided for properties that lie within the bypass channel and Nookachamps.

- New Levees
  - Riverbend Cutoff Levee: The same as in the CULI Alternative.
  - Lions Park Connector: The same as in the CULI Alternative.
- The following existing urban levees would be raised :
  - SCDD #17 Three-Bridge Corridor: The same as in the CULI Alternative.
  - SCDD #17 South Riverbend Road: The same as in the CULI Alternative.
- Improve bank protection and toe protection for levees: The same as in the CULI Alternative.
- Interstate 5 Highway Crossing: The JLS bypass channel will cross I-5. Types of highway crossing needed will be determined if this alternative is selected as the TSP.
- Railroad Crossing: The same as in the CULI Alternative.
- Major Road Crossing: The JLS Bypass crosses several roads and will have significant impacts to the road infrastructure. The JLS bypass channel will cross SR 20, Old Hwy 99 North Road, Chuckanut Drive (SR 9), Farm to Market Road, Bayview Edison Road. It is likely that Hwy 99 would need to be closed during flood event or raised.
- Utilities: JLS bypass channel will cross several utilities natural gas and major petroleum pipelines.
- Real Estate: 1,285 acres
- General O&M: The same as in the CULI Alternative.
- Non-Structural: The same as in the CULI Alternative.

1.4.4 Swinomish Bypass Alternative

The Swinomish Bypass would divert floodwaters from the Skagit River to the Swinomish Channel and out to Skagit Bay, through a confined bypass channel approximately 2,000 feet wide (Figure 4). The design goal was to lower the 1% ACE flood elevations in the urban areas on the existing levees and provide 4-5% ACE to rural areas. The Swinomish Bypass would not be able to lower flood elevations upstream of the BNSF Bridge enough to meet the 1% ACE goal in urban areas. Therefore, levee improvements between RM 17.5 and 20.9, construction of a new Burlington Hill Cross Levee, and some minor levee reliability improvements in the urban areas would also be necessary. The confined bypass would only be used during flood events; it would have a 4% chance of being used in any given year. This alternative does not include structural modifications of river bridges or setting back of levees.

The Swinomish Bypass Alternative would comprise several separate structural features that are described below.

- Channel and Associated Levees: The Swinomish Bypass Channel would be an approximately 2,000 ft wide, 7 mile long channel that would extend from the intake structure on the River to the Swinomish Channel (14 miles for both sides). The bypass would have about a 4% chance of being used in any given year. New levees would be constructed to form the bypass channel from the River to Swinomish Channel. The average levee heights would be 10-18 feet. Other bypass design features include:
- Intake And Outlet Structures: The intake structure would consist of series of mechanical and fuse-plug gates. One or more mechanical gates would be placed at the intake to regulate the initial release of floodwater flows into the bypass channel. Construction of these gates would likely require restructuring of the existing levee on the Skagit River. No excavation is expected within the channel or at the intake and outlet structures since the Swinomish Bypass Intake does not have the high ground at the intake unlike the Joe Leary Bypass. Therefore excavation is not needed.
    - Fish screen: The same as in the JLS Bypass Alternative.
    - It is assumed the area between the outlet structure and the Swinomish Channel has been restored via another project separate from the Skagit GI and is in tidal influence. The existing sea dike along Swinomish Channel would be removed via this separate project.
    - Stilling basin and channel protection: The same as in the JLS Bypass Alternative.
    - Drainage Within The Bypass Channel: (during flood/post flood): The same as in the JLS Bypass Alternative.
- New Levees: This alternative would require construction of several new levees.
    - Burlington Hill Cross Levee: The same as in the CULI Alternative.
    - Riverbend Cutoff Levee: The same as in the CULI Alternative.
    - Lions Park Connector: The same as in the CULI Alternative.
- Raise Urban Levee: This alternative would require raising of several new levees.
    - SCDD #12 Upstream: The same as in the CULI Alternative.
    - SCDD #12 BNSF Embankment: The same as in the CULI Alternative.
    - SCDD #17 3-Bridge Corridor: The same as in the CULI Alternative.
    - SCDD #17 South Riverbend Road: The same as in the CULI Alternative.
    - Improve Bank Protection: The same as in the CULI Alternative.
- Major Road Crossing: The Swinomish bypass channel would cross Avon Allen Road, Hwy 536, Best Road, La Conner Whitney Road.
- Utilities: Swinomish bypass channel would cross several utilities.

- Real Estate: 1,027 acres.
- General O&M: See above description.
- Non-Structural: See above description.

1.5 Proposed Actions in Relation to Clean Water Act

As mentioned in the CULI Alternative description, all three alternatives propose toe protection to protect the levees from erosion and is not exclusive to the CULI Alternative. The proposed toe protection would be placed below ordinary high water (OHW). In addition, all three alternatives propose to construct new levees which potentially would fill or affect wetlands. CULI Alternative would construct the Burlington Hill Cross Levee that would cross Gages Slough and associated wetlands. The Bypass Alternatives would construct levees along each side of the bypass and install intake/outlet structures; all these actions would potentially fill wetlands in the bypass alignments.

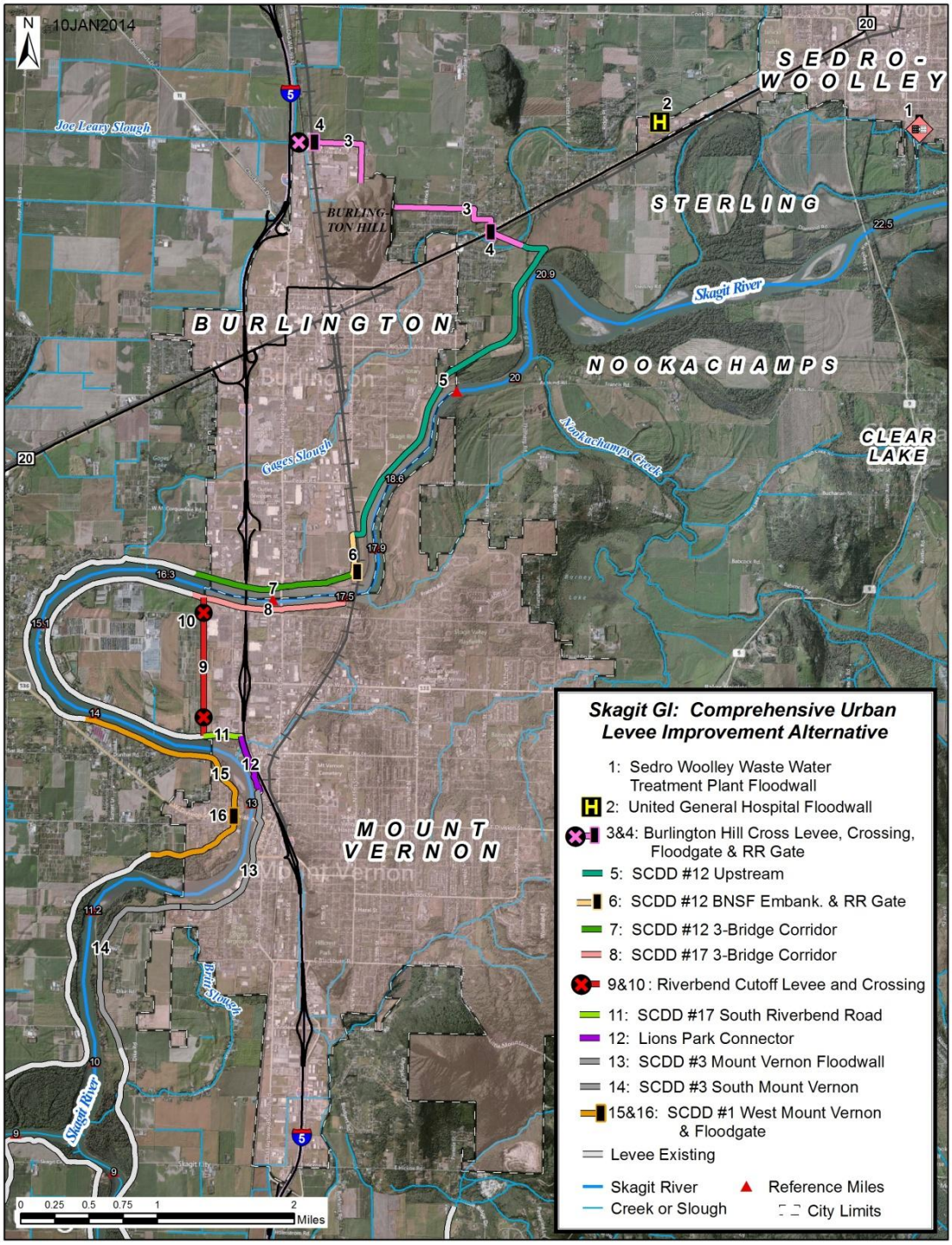

Figure 2: Comprehensive Urban Levee Improvement Alternative (Recommended Alternative).

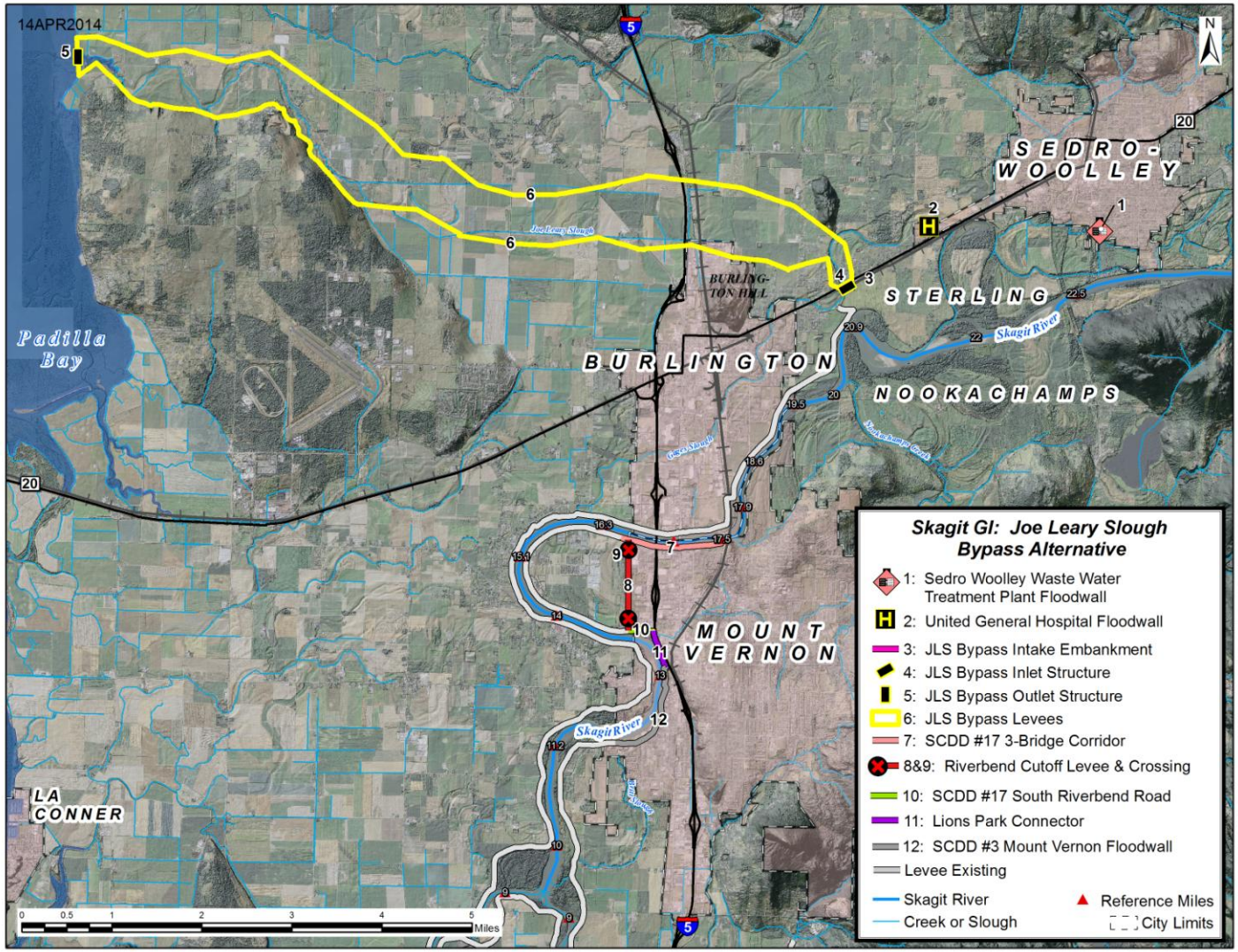

Figure 3: Joe Leary Slough Bypass Alternative

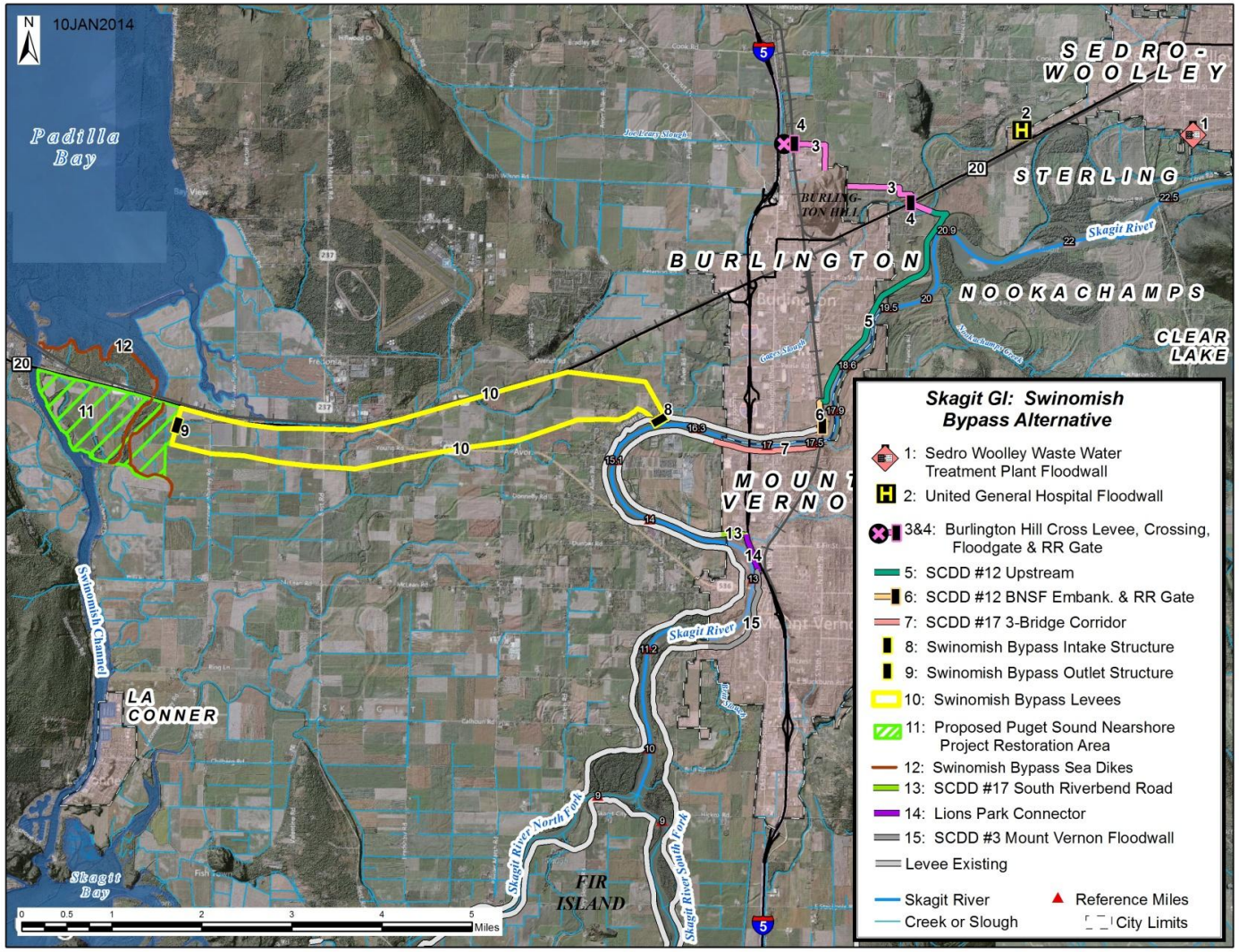

Figure 4: Swinomish Bypass Alternative

2. Potentially Adverse Effects (Individually or Cumulatively) on the Aquatic Environment

2.1 Effects on Physical, Chemical, or Biological Characteristics of the Aquatic Ecosystem

2.1.1 CULI Alternative

The reduction in riparian vegetation and the loss of nearshore roots and undercut banks will reduce fish and wildlife habitat. The use of riprap along the banks such as the proposed toe protection perpetuates a design that is considered detrimental to fish and wildlife habitat, especially ESA-listed salmonids. The existing vegetation along the revetments would be removed where the riprap is placed. Substantial direct effects to riparian habitat would potentially occur. Mitigation for this effect could include planting along a levee bench, planting riparian vegetation, set back levee, construct side channel, install habitat weirs, and/or anchor root wads to restore fish habitat values by providing vegetative cover, hydraulic diversity, nutrient input, and instream cover. Cumulative effects to riparian habitat would slightly contribute to overall loss of riparian habitat in the Skagit Basin.

Lower Skagit salmon species will be affected by loss of riparian habitat through loss of cover and shade as well as reduced nutrient input from overhanging vegetation and the decay of forest litter. Water temperatures could increase locally due to lack of shading. Added more toe protection along the revetments would perpetuate the poor conditions in the urban corridor, limiting refuge habitat for fish and making them vulnerable to predation. The lower Skagit River meets state water quality standards for temperature, and the localized increases in temperature are not expected to result in an overall increase in river temperature; therefore, the effects of temperature increases on fish are likely to be minimal. Cumulative impacts to fish in the Skagit River would derive from the perpetuation of armoring the river banks with rip-rap and strict levee vegetation standards by improving the urban levees combined with the past channelization/modification of the river and future levee repairs and flood fighting. Armor rocks is poor fish habitat, creating harsh conditions that include vulnerability to predators, physical damage, and lack of bank complexity for refuge in higher flows.

During the construction of the 2011 Skagit Levee Rehabilitation Project, turbidity monitoring was conducted and no exceedances of the state standards (Washington State Code 173-201A-200) occurred. Based on this previous monitoring, it is expected that in water rock placement would not exceed state turbidity standards. Typical Best Management Practices (BMPs) as suggested by Washington Department of Ecology (WDOE) for other levee project would be implemented and turbidity monitoring may be conducted during sediment generating activities in order to minimize any turbidity Construction below OHW would be limited to the approved in-water construction period.

The footprint of the CULI Alternative has only a few known wetlands in it, which are at the Burlington Hill Cross Levee and Sedro-Woolley Waste Water Treatment Plant. As most of the widening of the levee would occur landward of the existing levee, within this urban corridor the area behind the levee is well developed. The proposed alignment for the Burlington Hill Cross Levee would cut across Gages Slough. A culvert structure would be constructed to accommodate daily flows into Gages Slough but to restrict

flood flows from flooding Burlington. Although the culvert would allow daily flows into the slough, the footprint for the new levee would impact up to 3 acres of wetland adjacent to the slough. Per National Wetlands Inventory (NWI) map, the adjacent land around Sedro Woolley's waste water treatment plant has 1 forested/shrub wetland (9.22 acres) and 2 freshwater emergent wetland (5.08 acres). The construction of the proposed floodwall at this location would impact approximately 0.30 acres of freshwater forested/shrub wetland.

During future design phase, wetland delineation would be conducted to determine the extent and function of wetlands affected by the CULI Alternative. To offset and mitigate for this potential impact, this alternative would minimize the project footprint to maximum extent possible in later design phase and most likely, purchase wetland mitigation credits from a local mitigation bank.

This alternative, mostly likely, would not cumulatively impact or compromise any of the completed or proposed restoration sites in the Basin. In addition, the amount of possible wetland fill attributed to this alternative would only slightly contribute to overall loss of wetlands in the Basin.

2.1.2 JLS Bypass Alternative

The impacts to riparian habitat and associated fish impacts, and water quality would be the same as the CULI Alternative including cumulative impacts. However, the JLS Bypass Alternative would impact more acres of wetlands than the CULI Alternative. NWI maps show that there are 57 acres of wetland within the JLS Bypass footprint. Impacts to these wetlands would vary in intensity from total loss of wetlands due to filling for the construction of the levees to the more complex impacts to wetlands within the bypass channel. For the purposes of alternative comparison, all wetlands within the bypass footprint are considered to be impacted. These wetlands include 1 forested wetland (0.9 acres), 4 freshwater ponds (4.5 acres), 17 freshwater emergent wetlands (26.3 acres), and 7 estuarine wetlands (25.3 acres).

The estuarine wetlands are a wetland complex associated with Joe Leary Slough at the confluence with Padilla Bay. Existing sea dikes disconnect this lower end of Joe Leary Slough from the surrounding floodplain, limiting the extent of wetlands in the area. The proposed bypass alignment includes an outlet structure at the confluence of Joe Leary Slough and Padilla Bay which would remove salt water and tidal influence to these wetlands. Also, the design includes excavation from just east of Farm to Market Road to the outlet structure. This would include excavation of all the estuarine wetlands as well as three freshwater ponds (1.86 acres). The installation of the outlet structure and the excavation effort is likely to expand the freshwater wetlands in this area while eliminating the estuarine wetlands. The 25.3 acres within the project footprint likely underestimates the extent of impact to estuarine wetlands. Activation of the bypass could have impacts on adjacent and nearby wetlands through the influx of freshwater and sediments. Eelgrass (*Zostrea marina and Z. japonica*) and macroalgae beds exist within Padilla Bay at the mouth of Joe Leary Slough.

The freshwater emergent wetlands noted in the NWI maps appear to be matrix of low quality depressional wetlands in farmed fields. As these do not appear to be fed by a surface water connection, their inclusion within the bypass footprint is expected to be less impactful during construction. One larger emergent wetland would be bisected by the construction of the levee. The wetland is approximately 38 acres, with 18.3 acres inside the proposed JLS Bypass footprint. This wetland, similar to the other freshwater emergent wetlands, appears to be farmed. Activation of the channel could minimally impact the wetlands

within the proposed bypass channel. At its peak, maximum velocities in the channel could reach 3-4 ft/s which would not be sufficient to cause erosion. Vegetation loss and soil loss would not be expected during the highest flows.

The one forested wetland (0.9 acres) within the footprint lies on the edge of the proposed alignment. If the alignment is not shifted, it is likely that this wetland would be largely filled by the levee construction as the wetland is only about 122 feet wide. As project design is finalized, it would potentially be modified to limit impacts to this wetland. Assuming that the levee alignment remains in its current location, the functions of this wetland would likely be lost, with only a small remnant of the wetland remaining.

2.1.3 Swinomish Bypass Alternative

For this alternative, the impacts to riparian habitat and associated fish impacts, and water quality would be the same as the CULI Alternative including cumulative impacts. However, the JLS Bypass Alternative would impact more acres of wetlands than the CULI Alternative. NWI maps show that there are 141.5 acres of wetland within the Swinomish Bypass footprint. These wetlands include 11 forested wetland (18.1 acres), 4 freshwater ponds (28.0 acres), 17 freshwater emergent wetlands (94.0 acres), and 1 estuarine wetlands (1.4 acres). The outlet of the Swinomish Bypass Alternative would flow into Telegraph Slough. The Telegraph Slough area is mapped in NWI as freshwater wetlands as it is largely cut off from tidal influence. The proposed Burlington Hill Cross Levee would have the same impacts to Gages Slough as described under the CULI Alternative.

2.2 Effects on Recreational, Aesthetic, Historical, and Economic Values

2.2.1 CULI Alternative

Direct, indirect, and cumulative effects to recreation and aesthetics are not expected to occur. Significant recreation activities (boating, camping, bicycling, hunting, etc.) occur outside the study area in the upper watershed. Fishing occurs in the study area, but this alternative would not have more than a short term negligible effect on this activity. Farmland and historical impacts are expected be less under the CULI Alternative since most work will be on existing structures.

2.2.2 JLS Bypass Alternative

Under this alternative, effects to recreation and aesthetics would be the same as the CULI Alternative. Impacts to historical sites are unknown at this time. In accordance with the National Historic Preservation Act (16 USC 470), historic properties will be investigated and proper measures taken in accordance with State and Federal law. There would be some economic loss due to permanent conversion of farmland in the bypass levee footprint and potential agricultural restrictions within the bypass, but increased levels of protection to urban areas would increase the stability of employment, business, and industrial activity.

2.2.3 Swinomish Bypass Alternative

Impacts to recreational, aesthetic, historical, and economic conditions would similar those in the JLS Bypass Alternative.

2.3 Findings

Based on the analysis of the alternative actions, the CULI Alternative is the least environmentally damaging practicable alternative. Effects from placing toe protection would be the same for all three alternatives; however the least amount of wetlands would be affected by the CULI Alternative. Under this plan, the proposed action is not exempt from Section 404 of the CWA due to the potential of placing toe protection below OHW along the existing revetments and/or wetland fill activities. At this point in the study, conceptual level of design has been developed for this alternative. This alternative will be refined and more fully developed during future design phases. An Environmental Impact Statement has been prepared.

3. All Appropriate and Practicable Measures To Minimize Potential Harm to the Aquatic Ecosystem

3.1.1 Impact Avoidance Measures

Six project alternatives were initially considered, with three alternatives being further evaluated in order to select the best alternative for minimizing cost and impact to the environment while fully restoring flood protection. The tentatively preferred alternative was chosen because it minimizes the footprint as well the as the negative impact on the environment. The plan may provide flood protection to the urban areas and will include compensatory mitigation for unavoidable impacts, as needed.

Avoidance measures in the design include limiting expansion of the levee to the landward side whenever possible to avoid encroaching on the river (Figure 4); limiting the footprint of the project to the minimum needed; completing surveys of wetlands, cultural resources, important nesting sites, etc prior to final design to avoid impacts where possible; and including the Riverbend Cutoff Levee to avoid work at the river's edge between 13.5RM and 16.5RM, approximately.

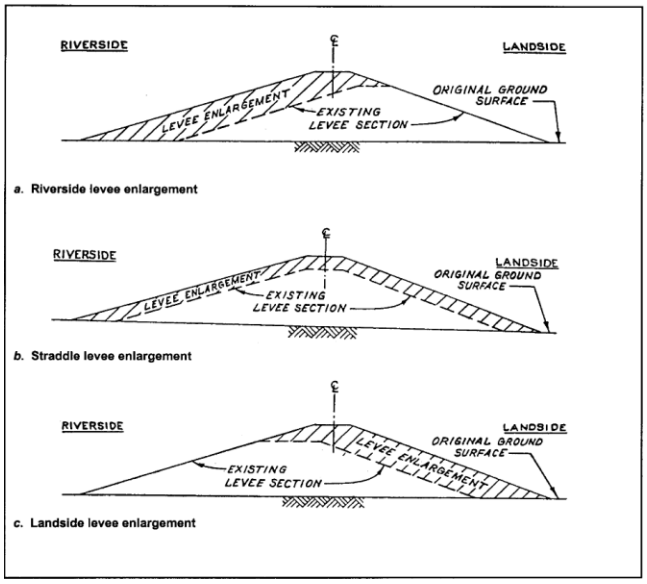

Figure 5: Draft cross section showing increased footprint of the levee. The landside levee enlargement (c.) will be built wherever feasible.

3.1.2 Impact Minimization Measures

In accordance with USACE policy, minimization of ecosystem, cultural, and socio-economic impacts will be a significant project consideration [ER 1105-2-100]. USACE will take all practicable steps during construction of the project to minimize impacts to these resources. Contingencies will be in place if any of the water quality protection measures fail to achieve their intended function. USACE will observe all construction windows to ensure that impacts to sensitive species will be avoided or minimized, to include listed salmonids and bald eagles.

The minimization measures include:

- Project design will incorporate planting of appropriate riparian native species riverward of the proposed levee work to provide riparian habitat and initiate re-establishment of native species;
- The final footprint will be guided by resources surveys to minimize impacts to wetlands, nesting habitat, cultural resources, etc
- Best management practices (BMPs), such as storm water runoff prevention, will be used to ensure that no unnecessary damage to the environment occurs;
- Proposed in-water work would be accomplished only during the approved in-water work window and monitored to meet turbidity standards;
- Only clean rock will be placed on the riverward side of the levee.
- There will be no end dumping of material into the river. Riprap will be individually placed; quarry spalls will be placed in small quantities from the bucket of an excavator;
- Vegetation removal will be limited to the minimum extent needed to complete the repairs; and

- An Environmental Protection Plan will be established to define all BMPs and establish a monitoring and reporting protocol.

3.1.3 Conceptual Mitigation Measures for Effects to Wetlands Habitat

- Wetland delineation would be conducted to determine the extent and function of wetlands affected by the TSP during future design phase; then
- To minimize this potential impact, the project footprint would be reduced to maximum extent possible; and either
- To rectify any remaining effects, onsite wetland habitat would be restored or;
- To compensate for any remaining impacts, wetland mitigation credits would be purchased from a local mitigation bank.

3.1.4 Conceptual Mitigation Measures for Effects to Threatened and Endangered Species, Fish, and Aquatic and Riparian Habitats

- To minimize impacts, the project footprint would be reduced to maximum extent possible; and
- To compensate for any remaining impacts, a combination of some or all of the following options could be implemented:
    - Planting along a levee bench per ETL 1110-2-571,
    - Planting of riparian vegetation per ETL 1110-2-571,
    - Installing a buried levee toe along a levee already set back from the river and abandoning the rock revetment,
    - Setting back a levee,
    - Constructing a side channel,
    - Installing habitat weirs,
    - Anchoring root wads, and/or
    - Purchasing credits at local mitigation banks.

3.2 Findings

Avoidance, minimization, and mitigation measures are conceptual at this stage. Further development will be made during the 35% design phase outlining specific measures. USACE has determined that all appropriate and practicable measures will be taken to minimize potential harm to the environment.

4. Other Factors in the Public Interest

4.1 Conservation

The action is unlikely to adversely affect conservation efforts already that are completed or ongoing. This project has no net benefits to the environment. Compensatory environmental features are proposed through multiple design additions and purchase of offsite mitigation credits and are designed to balance the impacts of the completed project.

4.2 Economics

The action will provide better flood protection to residents and businesses in the surrounding communities while also generating jobs and revenue from construction for the local economy.

4.3 Aesthetics

The action would not affect scenic resources or visual characteristics of the study area.

4.4 General Environmental Concerns

During public scoping and outreach efforts, the public has expressed general environmental concerns regarding this action. These concerns are conversion of agricultural lands, USACE vegetation levee safety policy, climate change and sea-level rise, and endangered species act and fisheries.

4.5 Wetlands

Wetlands would, most likely, be damaged or destroyed in the proposed project. Mitigation will occur to replace that which was lost either onsite or offsite possibly in the form of wetland credits. See Section 2.1 above.

4.6 Historic Properties

Existing historical and cultural resources within the action footprint are unknown at this time. However, surveys will be done prior to any work to asses, avoid, or mitigate damage done to these resources. See Section 2.2 above.

4.7 Fish and Wildlife Values

USACE has been and will continue to coordinate this General Investigation study with local Tribes, state, and Federal resource agencies with regard to impacts to fish and wildlife resources. USACE will submit a Biological Assessment for the proposed project to the National Marine and Fisheries Service and the Fish and Wildlife Service for review of compliance under Section 7 of the Endangered Species Act.

4.8 Flood Hazards

The action will not increase flooding hazards in the area but will provide better flood protection.

4.9 Floodplain Values

The action will not change the floodplain capacity in the area but will continue and increase the separation between the floodplain and the river throughout the action area.

4.10 Land Use

Land use patterns would continue by governed by local zoning, land use ordinances, and building codes. This action would provide an increase in the level of protection for land in the urban areas and small amount of rural land within the Urban Growth Areas for Burlington and Mount Vernon. In these rural areas, there could more pressure to intensively develop these areas, including agricultural land. However, local planning policies and regulations would regulate any development and thereby potentially minimizing develop of agricultural land. This action's footprint overlaps with the least amount of agricultural land.

4.11 Navigation

The action is unlikely to adversely affect navigation within the Skagit River.

4.12 Shore Erosion and Accretion

The action is not expected to result in increased accretion and shore erosion during normal and high flows.

4.13 Recreation

The action is unlikely to adversely affect recreational uses of the area.

4.14 Water Supply and Conservation

The action is unlikely to adversely affect water supply and conservation.

4.15 Water Quality

This alternative would involve short-term water quality impacts from placement of the riprap along the revetment in areas from RMs 20.9 to 13.0 and construction of the levee and culvert across Gages Slough. During construction there may be short-term, localized water quality impacts such as a minor increase in turbidity. During the construction of the 2011 Skagit Levee Rehabilitation Project, turbidity monitoring was conducted and no exceedances of the state standards (Washington State Code 173-201A-200) occurred. Based on this previous monitoring, it is expected that in water rock placement would not exceed state turbidity standards. Typical BMPs as suggested by WDOE for other levee project would be implemented and turbidity monitoring may be conducted during sediment generating activities in order to minimize any turbidity. Large trees are not typically found on the revetment areas due to regular vegetation maintenance. As such if there is vegetation on the revetments, it is mainly young willows and alders. These young trees do provide water quality benefits including some shading and nutrient input to the system. Construction would require the removal of trees wherever revetment work is needed. The placement of rock along the river would further increase temperatures through thermal retention and light reflection of the rocks. The increase in water temperature may locally reduce dissolved oxygen levels in

the water. No measurable effects to pH or dissolved oxygen would be expected. No pollutants are expected to be introduced to the river from levee repairs. Overall the CULI Alternative would have a minimal impact on water quality for the River.

4.16 Energy Needs

The action is unlikely to adversely affect energy needs.

4.17 Safety

The action will be subject to Federal safety laws and regulations. Therefore, the action is unlikely to adversely affect the safety within the project footprint.

4.18 Food and Fiber Production

The action will remove some agriculture land from food or fiber production for the proposed levees. However, this area would be small and confined to the levee footprint. Therefore, the action is unlikely to adversely affect food and fiber production.

4.19 Mineral Needs

The action is unlikely to adversely affect the needs of mineral resources.

4.20 Considerations of Property Ownership

The action will comply with 33 CFR 320.4(g) and is unlikely to adversely affect considerations of property ownership.

4.21 Needs and Welfare of the People

The action will provide protection against flooding that threatens the communities in the project area and is unlikely to adversely affect the needs and welfare of the people.

4.22 Conclusion

USACE finds that this project is within the public's interest and complies with the substantive elements of Section 404 of the Clean Water Act.

Attachment A

Clean Water Act 404(b)(1) Evaluation [40 CFR §230]

Permit Application Evaluation [33 CFR §320.4]

404(b)(1) Evaluation [40 CFR §230]

Potential Impacts on Physical and Chemical Characteristics [Subpart C]:

1. *Substrate [230.20]*

Armor placement will not substantially change the nature of the aquatic substrate in the Skagit River as the work will raise an existing structure, rebuild a previously armored bank, or build landward.

2. *Suspended particulates/turbidity [230.21]*

Minimal turbidity is expected during construction since the work will occur on the landward side of the levees to the greatest extent possible and past experience has shown water has stayed within acceptable parameters. If any in-water work does occur, it would involve individually placed clean rocks with no uncontrolled dumping. Best management practices (BMPs) for sediment control would be used throughout construction to minimize any potential turbidity issues.

3. *Water [230.22]*

The project is not expected to add any nutrients to the water that could affect the clarity, color, odor, or aesthetic value of the water. It may reduce the suitability of the Skagit River for aquatic organisms if placement will impact wetlands that have water quality and habitat functions. These impacts will be offset onsite to the extent possible, but will be mitigated offsite or through purchase of credits at a local mitigation bank.

4. *Current patterns and water circulation [230.23]*

During flood events, the Burlington Hill Cross Levee culvert across Gages Slough would be closed but would otherwise remain opened to allow normal water movement. Modifications to Baker Dam operations would have minimal effects because downstream flows would remain within normal dam releases and the drawdown for both reservoirs would be gradual and within existing reservoir elevations. USACE expects no disruption of current patterns and water circulation during or after construction on normal flows. A hydraulic engineer will assist with the designs of the project to minimize disturbance.

5. *Normal water fluctuations [230.24]*.

Higher levees may cause higher water levels within the Skagit River during flood events as water will be trapped within the levee confines to a greater degree than before. Water height during normal flows is not expected to change.

6. *Salinity gradients [230.25]*

The action is unlikely to adversely affect salinity gradients.

Potential Impacts on Biological Characteristics of the Aquatic Ecosystem [Subpart D]:

1. Threatened and endangered species [230.30]

USACE will prepare a Biological Assessment (BA) for this project and submit it to the National Marine and Fisheries Service (NMFS) and the Fish and Wildlife Service (USFWS) to ensure compliance with the Endangered Species Act (ESA). The BA will include a mitigation plan to offset project impacts ESA listed species. USACE anticipates receiving a Biological Opinions from NMFS and USFWS covering the listed species affected by the project by the Final Environmental Impact Statement.

2. Fish, crustaceans, mollusks, and other aquatic organisms in the food web [230.31]

Removal of riparian vegetation will have a negative impact on habitat for all salmonid species as it decreases organic inputs and simplifies the shoreline. The conversion of the soft mud bottom to the rough surface of riprap in some areas may cause descaling of juvenile salmonids during high river flows and would change the types of crustaceans, mollusks, and other aquatic organisms that use the site. Avoidance measures and mitigation efforts will be implemented to avoid and minimize these impacts.

3. Other wildlife [230.32]

Birds and other wildlife may be temporarily displaced during construction due to noise, construction vehicles, and material placement. Because these impacts will only occur during construction, they are expected to be inconsequential and temporary. The loss of the wetlands and trees has a potential longer term impact. However, onsite or offsite mitigation will provide similar nearby habitat features and functions for that lost during the proposed project.

Potential Impacts on Special Aquatic Sites [Subpart E]:

1. Sanctuaries and refuges [230.40]

The Skagit River was designated as a Wild and Scenic River System by Congress in 1978. It is managed by the U.S. Department of Agriculture, U.S. Forest Service, and Mt. Baker-Snoqualmie National Forest to protect and enhance its free-flowing characteristics and water quality, wildlife, fish, and scenic qualities. Work will be conducted during the fish window. Human access, essential maintenance along the Skagit, will remain essentially unchanged. Plantings will only use native vegetation, and there may be loss to existing vegetation that provides habitat to fish.

2. Wetlands [230.41]

Wetlands would, most likely, invariably be damaged or destroyed in the proposed project from levee construction. Mitigation will occur to replace that which was lost either onsite or offsite possibly in the form of wetland credits.

3. Mud flats [230.42]

The action is unlikely to adversely affect mud flats.

4. Vegetated shallows [230.43]

The action is unlikely to adversely affect vegetated shallows.

5. Coral reefs [230.44]

Not applicable.

6. Riffle and pool complexes [230.45]

Not applicable, since riffle and pool complexes are characteristics of streams.

Potential Effects on Human Use Characteristics [Subpart F]:

1. Municipal and private water supplies [230.50]

The Skagit River is designated for primary contact recreational uses, all water supply uses, and all miscellaneous uses. Levee modification and construction, as well as additional operations at Baker Dam, are not expected to change the amount or quality of water to such a degree that supply would be negatively affected.

2. Recreational and commercial fisheries [230.51]

Any in-water work will avoid the fish window. The levee work will not prevent access to recreational or commercial fishing in the long term; however, there could be short-term restrictions on recreational access.

3. Water-related recreation [230.53]

The project may temporarily affect water-related recreation. Recreational use of the top of levees and at Lions Park would be restricted while construction is occurring.

4. Aesthetics [230.53]

During construction there will be some minor disturbance from heavy equipment noise and exhaust. After construction the shoreline is expected to look similar as it does now. The existing levee will be higher but the overall aesthetics will be the same.

5. Parks, national and historic monuments, national seashores, wilderness areas, research sites and similar preserves [230.54]

During construction through the urban corridor, work will need to be done near or in recreational facilities. Sections of these faculties would need to be closed during construction, for safety, but would reopen after completion of the construction activities. Recreational uses would not change after the proposed action is finished.

Evaluation and Testing [Subpart G]:

1. General evaluation of dredged or fill material [230.60]

Bank stabilization material will be chosen under guidance of a hydraulic engineer. Exact class and placement is currently unknown at this phase. A buried toe may be utilized to minimize adverse biological impacts.

2. Chemical, biological, and physical evaluation and testing [230.61]

The rock used at the site under this analysis would be obtained from a permitted local source. There is reasonable assurance that the proposed discharge material is not a carrier of contaminants. Therefore, the

required determinations pertaining to the presence and effects of contaminants can be made without testing.

Actions to Minimize Adverse Effects [Subpart H]:

1. Actions concerning the location of the discharge [230.70]

Since USACE is not selecting a disposal site, but rather is repairing a flood control structure, the actions that will be taken are necessary for the location.

2. Actions concerning the material to be discharged [230.71]

Bank stabilization material will be required to meet Corps standards for placement of riprap. Material will be imported from an approved, clean source.

3. Actions controlling the material after discharge [230.72]

No actions should be required, as the structure is not expected to move after construction; however, should any structural deterioration occur, the responsible Diking Districts will be expected to address it as the owner or bring it to the attention of USACE.

4. Actions affecting the method of dispersion [230.73]

As described above, the structure is expected to be stable after construction and not disperse.

5. Actions related to technology [230.74]

No specific advanced technologies will be used to repair the structure.

6. Actions affecting plant and animal populations [230.75]

USACE will coordinate construction activities and compensatory mitigation features with state and federal resource agencies to minimize impacts to fishery and wildlife resources. There will be temporary disturbance to wildlife in the project vicinity due to noise from operation of machinery. Possible planting of the levee will minimize lost riparian functions such as cover, shade, and input of nutrients. Compensatory mitigation is included through the purchase of credits at a nearby mitigation bank. This is expected to offset impacts to fish and wildlife from the construction activities, the removal of vegetation at the project sites, and the placement of riprap on the riverward banks.

7. Actions affecting human use [230.76]

Repair of the flood control structure is not expected to diminish water quality, but may temporarily impact the aesthetics of the aquatic site and its recreational use.

8. Other actions [230.77]

Best management practices will be used in the proposed construction to ensure that no unnecessary damage to the environment occurs during construction.

General Policies for Evaluating Permit Applications [33 CFR §320.4]

1. Public Interest Review [320.4(a)]

USACE finds the proposed action to flood control structures to be in compliance with the 404(b)(1) guidelines and not contrary to public interest.

2. Effects on wetlands [320.4(b)]

USACE will obtain accurate wetland delineations of the proposed construction sites. Wetland resources will be avoided to the greatest extent possible. Destruction of wetland resources will be mitigated at an offisite mitigation bank. No net loss of wetlands is expected.

3. Fish and wildlife [320.4(c)]

USACE will consult with state and federal resource agencies, tribes and other interested members of the public on this action. Conceptual mitigation is proposed to offset the loss of habitat.

4. Water quality [320.4(d)]

USACE certifies that this project will not violate Water Quality Standards as set forth by the Clean Water Act. USACE will be seeking a 401 Water Quality Certification from the State of Washington.

5. Historic, cultural, scenic, and recreational values [320.4(e)]

Existing historical and cultural resources within the project footprint are unknown at this time. However, surveys will be done prior to any work to asses, avoid, or mitigate damage done to these resources.

6. Effects on limits of the Territorial Sea [320.4(f)]

Not applicable, since the project will not occur in coastal waters.

7. Consideration of property ownership [320.4(g)]

Access for construction equipment and materials will be via public rights-of-way and real estate rights of entry and will be obtained prior to construction.

8. Activities affecting coastal zones [320.4(h)]

USACE has determined that the proposed project complies with the policies, general conditions, and activities as specified in the Skagit County Unified Development Code. The proposed action will be consistent to the maximum extent practicable with the State of Washington Shoreline Management Program and policies and standards of the Snohomish County Shoreline Management Program. A CZMA consistency determination will be submitted to WDOE for review, for further design.

9. Activities in marine sanctuaries [320.4(i)]

Not applicable, since the area is not a marine sanctuary.

10. Other federal, state, or local requirements [320.4(j)]

USACE will initiate formal consultation with NMFS and USFWS on the findings of the BA for the proposed project. A mitigation plan will be proposed to offset project impacts on endangered salmonids and their critical habitat.

11. Safety of impoundment structures [320.(k)]

Not applicable, since an impoundment structure is not being built.

12. Water supply and conservation [320.4(m)]

No permit is needed concerning water supply.

13. Energy conservation and development [320.4(n)]

Not applicable.

14. Navigation [320.4(o)]

Not applicable.

15. Environmental benefits [320.4(p)]

No net benefits are anticipated as a result of this project.

16. Economics [320.4(q)]

Completion of the project will protect public infrastructure such as the residential and commercial areas, roads, and powerlines and prevent disruption of commerce and services should flood stage water levels occur in the Skagit River.

17. Mitigation [320.4(r)].

To address the loss of wetlands and the change of substrate, USACE will develop a mitigation strategy that could include the purchase of credits at a mitigation bank or mitigate onsite.

2) Fish and Wildlife Coordination Act

- Final Coordination Act Report (to be included in the Final FR/EIS)
- Skagit GI Preliminary Alternatives Comment Letter dated 15 June 2012
- Planning Aid Letter dated 30 October 2001
- Planning Aid Letter dated 7 May 2001
- Planning Aid Letter dated 10 October 2000
- Planning Aid Report dated 12 August 1997

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From: Karen_Myers@fws.gov
Sent: Friday, June 15, 2012 3:26 PM
To: Hadley, Hannah F NWS; Harrington, John M NWS
Cc: Martha_L_Jensen@fws.gov
Subject: Skagit GI preliminary comments

Hi Hannah and Matt-

At your request, and as follow up to our meetings and conference calls with you over the past couple of months, we are making the following preliminary comments for consideration at your upcoming internal discussion meeting on refinement of alternatives under the Skagit General Investigation (GI). We anticipate working with you more closely as this GI evolves to provide more formalized technical assistance under the FWCA, ESA, the CWA, and our other authorities. The following comments are offered under these authorities, and although they are relatively general in nature, they are intended to assist you in the next early stage of alternative review. We anticipate that we will be able to further refine our comments and coordination with you and other stakeholders and Tribes, especially under the FWCA, as you have a more refined list of likely alternatives.

The preliminary alternatives that the Corps presented at the April 25, 2012 meeting were roughly categorized into different types of actions (e.g., nonstructural/storage, bypasses, setbacks, etc.). We recognize that the next list of alternatives is likely to combine different kinds of action types within a given alternative in order to allow for site-specific considerations and flexibility.

- As the Corps drafts the new list of alternatives, we recommend that the Corps promote alternatives that would improve habitat for listed species, anadromous fish, and other species in the Lower Skagit River and its tributaries. Many such alternatives are likely to have positive influences on the ability of the system to convey and/or more naturally attenuate flood flows compared to channelized conditions (e.g., setbacks).

- We encourage the Corps to draft alternatives that include promoting setbacks wherever possible, appreciable restoration or enhancement of functional riparian corridors, restoration and/or construction of high quality and fish friendly side channels (that are designed avoid stranding or other impacts to aquatic organisms), and removal of hard shoreline armoring (to reduce edge habitat impacts, constriction of the stream, preclusion of riparian buffer establishments, and other effects).

- Where certain stream configurations or hard armoring is planned to be maintained or constructed, as in the case of Preliminary Alternative 3 (Urban Areas and Critical Infrastructure Protection), we encourage the Corps to include and consider a reach-based analysis for determining stability and indirect effects of a given feature, and adequately determine and avoid downstream and across-stream negative effects from the features.

- These and other similar measures, if meaningfully implemented, can result in improved foraging, migration, and overwintering of bull trout and rearing and foraging habitat for juvenile salmonids. This GI process gives the Corps an important opportunity to implement section 7(a)(1) of the Endangered Species Act, by “carrying out programs for the conservation of endangered species and threatened species…”, and section 2(c) of the Act, “…to seek to conserve endangered species and threatened species” and use “authorities in furtherance of the purpose of this Act”.

We look forward to continuing to work with you as you evaluate the alternatives for the Skagit GI, and appreciate the opportunity to provide these preliminary comments. Please email me if you have any questions. I will be out of the office and only very infrequently checking voicemails until July 2, 2012.

Thanks very much,
Karen Myers
Fish and Wildlife Biologist
US Fish and Wildlife Service,
Consultation and Technical Assistance Division
510 Desmond Drive SE
Lacey, Washington

United States Department of the Interior

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PUBLIC WORKS ADMIN.

OCT 30 2001

Colonel Ralph H. Graves, District Engineer
Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, Washington 98124-2255
Attention: Mike Scuderi

Reference: Planning Aid Letter; Skagit River Flood Feasibility Study

Dear Colonel Graves:

The purpose of this letter is to provide comments on needed studies and important issues in the evaluation of alternatives for the above-referenced project. We are providing this letter pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16U.S.C. 661, et seq.). It is provided as preliminary guidance and is not intended to fulfill Section 2(b) of this act.

On October 9, 2001, with the National Marine Fisheries Service, we sent a joint letter to you clarifying 1) our assumptions about the basic project design (Attachment A) and, 2) listing the mitigation measures we would expect to see as part of basic project design to minimize impacts to salmonids (Attachment B). As part of a technical workgroup with expertise in estuarine and freshwater ecology, we have also begun to scope studies needed to evaluate alternatives (Attachments C and D). The attachments were developed by the Corps as working documents, as part of the technical workgroup. This letter builds upon our joint effort and recommends studies for and criteria important in evaluating alternatives.

We remain concerned about the momentum of the bypass option despite the fact that major questions regarding potential adverse impacts, assumed benefits to salmonids, feasibility of design, and maintenance needs remain unanswered. In addition, the issue of inducing flood plain development has not been definitively resolved for either the setback levees or the bypass alternatives. Until this issue has been thoroughly explored and a plan prepared to resolve it, we recommend that the overtopping levees option, which would tend to discourage further new development of the flood plain, remain a viable alternative.

Our underlying interest remains in selection of an alternative that meets the project purpose to reduce the risk of flood hazards and that restores habitat and riverine processes that create and maintain habitat for fish and wildlife. We urge the Corps to engage in a thorough and careful evaluation of each option so that an alternative that best meets both objectives may be identified.

cc: Chal, Dave, Don, Lorna

We believe that such a multiple purpose project would be much more acceptable to a variety of stakeholders than a single purpose project.

The following format is organized along five areas: 1) criteria important in alternative evaluation; 2) mitigation measures important for all alternatives; 3) studies important for all alternatives; 4) a discussion of each alternative; and, 5) recommendations.

CRITERIA FOR ALTERNATIVE EVALUATION

Development in the flood plain

The implications of this project on future urbanization of the flood plain has not been thoroughly discussed or even acknowledged as a serious problem, and yet this could be a serious impediment to our support of this project. Currently, the Skagit River delta, which is mostly in agricultural use, is designated a "100 year flood plain" on the Flood Insurance Rate Map (FIRM). This designation triggers certain land use controls, which inhibit development. If a flood project eliminates flooding of the delta and results in a redesignation of the flood plain, the dampening effect on development that currently exists would be lost.

Despite impacts from agriculture and other infrastructure, the lower Skagit River and delta has value for waterfowl, other birds and small mammals, fish, and future restoration for fish and wildlife habitat. Increased development of the flood plain would have adverse cumulative impacts on water quality and quantity, would further limit wildlife use of these areas, would increase impervious surfaces, and reduce the potential for future restoration for salmonids and other species.

Both the bypass and the levee setback options have the potential for inducing future development of the flood plain, which would make them inconsistent with the Executive Order on Floodplain Management, E.O. 11988. The purpose of the presidential EO 11988 is to "avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct or indirect support of flood plain development unless there is no practicable alternative."

In addition, under Section 209 of the Water Resources Development Act of 2000 (69407 33 U.S.C.A. Sect. 701b-12), the local sponsor must participate in and comply with applicable Federal flood plain management and flood insurance programs prior to construction of any flood protection project that receives Federal assistance. The statute also requires local sponsors to prepare a flood plain management plan that, among other measures, practices, and policies, will "preserve and enhance natural flood plain values." We would like to know where, how, and when this requirement will be addressed in the development of a preferred alternative.

For the reasons stated above, we believe there is a strong need to retain the overtopping alternative unless and until this issue is resolved. The overtopping alternative is the only one that would tend to discourage development in the flood plain by its very nature, thereby making it consistent with EO 11988.

Maintenance needs and/or costs

Maintenance costs for each alternative should be used as a criteria for alternative selection. Costs for operations and maintenance are borne solely by the local sponsor, so that if this consideration is not disclosed initially, the long term costs of a particular alternative may not become apparent until after a preferred alternative is chosen.

According to Skagit County, flow data for the Skagit River during the last 100 years indicate that the Swinomish bypass would have been used nine times during that period. Flood flows can flush juvenile salmonids to marine waters before they are physiologically prepared. Riparian vegetation, velocity refuge areas, wetlands, channels, or other habitat elements may be required to mitigate for this or other impacts. If flood flows periodically destroy habitat elements required as mitigation, the elements would need to be restored after flood events in order to remain functional as mitigation. It is also likely that an adaptive management plan would be required for the bypass alternative in order to monitor effects of the bypass on the Padilla Bay ecosystem and fish populations. Future management actions would be based on that monitoring.

Required maintenance and adaptive management activities could become a burden to the local sponsor and/or could be abandoned through lack of funding. Therefore, we want to make sure that future obligations associated with each alternative are fully understood and a plan developed for meeting these obligations for any alternative that goes forward for consideration.

Setback levees, because they would increase the channel width available for flood conveyance, would tend to reduce the energy and thus the wear and tear on the levees themselves. Although setback levees may require removal of sediments deposited on the banks between the levees that currently get swept away, this alternative may still require less maintenance than the bypass and should be evaluated for this criteria.

Support recovery of listed species and conservation of fish and wildlife

How well an alternative supports recovery of listed species and avoids or minimizes impacts to listed and unlisted species should be a criteria for comparison of alternatives.

The Skagit River supports all five species of Pacific salmon, including chinook (listed as threatened under the Endangered Species Act [Act]), coho (a candidate species under the Act), pink, chum, and sockeye. In addition, steelhead trout, cutthroat trout, white sturgeon, Dolly Varden char and bull trout (a char listed as threatened under the Act), are also found in the Skagit River. In addition to fishery resources, the lower Skagit basin is also valuable for wildlife habitat

for birds, mammals, amphibians and reptiles. The marshes and sloughs of the delta and open agricultural fields, in particular, provide valuable habitat for migratory waterfowl. The Skagit River is a wintering and nesting area for the bald eagle (listed as threatened under the Act and proposed for delisting).

Diking and flood control has eliminated much of the habitat for salmonids in the lower Skagit River, delta and estuary. This degradation includes the loss of massive amounts of large woody debris, riparian corridors, freshwater wetlands, the loss of channel meandering and resultant off channel or side channel habitat, and the blockage of distributary and blind tidal channels in the estuary. Many of these changes have not only resulted in a loss of habitat for fish and wildlife, but have also contributed to the flooding hazard. Because the lower river has been so severely channelized and altered, any further degradation to fish habitat would be inconsistent with salmon recovery. To obtain our endorsement, an alternative would need to restore habitat and/or the ecological processes important in the creation and maintenance of habitat for listed and unlisted fish and wildlife.

Alternatives should be evaluated not only for their creation or restoration of fish and wildlife habitat, but also the degree to which they also contribute to the restoration of ecological processes that create and maintain habitat. For example, placement of large wood in the channel is a type of habitat creation. Levee setbacks that allow the river to meander and thereby create habitat from side channel formation or natural recruitment of large wood is a step toward restoration of ecological processes. Mitigation and restoration projects should be self-maintaining.

The Skagit River system supports relatively strong populations of Puget Sound chinook and Coastal Puget Sound bull trout, both listed under the Act. Recovery Planning is in a relatively early stage and specific tasks have not been defined yet. However, we know that the Skagit River system supports important core populations for the recovery of these two species in the Puget Sound as a whole. Bull trout, for example, have numerous life history forms, including fluvial (rearing in streams), adfluvial (rearing in lakes), and anadromous (rearing in marine water). One of the keys to recovery of this species will be maintaining the anadromous life history form, which is unique to the coastal and Puget Sound region of Western Washington.

MITIGATION MEASURES FOR ALL ALTERNATIVES

Avoidance and minimization through alternative selection

We stress the importance of avoiding and minimizing adverse impacts through the selection of the least environmentally damaging alternative. Mitigation is defined as a sequential process that seeks to 1) avoid adverse impacts; 2) minimize impacts that can not be avoided; and, 3) compensate for unavoidable impacts.

Section 1505.2(b) of the National Environmental Policy Act requires that an Environmental Impact Statement specify the alternative or alternatives considered to be environmentally preferable. Additionally, under Section 404 of the Clean Water Act, (the statute that governs issuance of Corps permits for wetland impacts), the project alternative that is selected must be the least environmentally damaging, must meet state water quality standards, must not jeopardize any Federally listed threatened or endangered species, must not cause or contribute to significant degradation of the aquatic ecosystem, and must include appropriate and practicable measures to minimize potential harm to the aquatic ecosystem. Although the Corps is exempt from obtaining one of its own permits, it is legally obligated to meet the provisions of these statutes.

Avoidance and minimization as part of alternative formulation

We are concerned by the tendency to narrow the array of alternatives so quickly and to narrowly define the alternatives that remain for consideration. Narrowing the array of options prematurely can result in the elimination of feasible options that might be preferable from an environmental standpoint. We urge the Corps to consider the following factors in alternative formulation:

1) Alternative 2, or something similar should be retained for consideration. This alternative combines a 40,000 cfs diversion with levee setbacks in the Lower Skagit. Impacts to eelgrass from a smaller flood bypass may be more acceptable than from the large 80,000 cfs diversion. In addition, the inclusion of some level of levee setback would have the potential to restore ecological processes.

2) Although overtopping levees do not offer much direct habitat benefit and may increase the potential for stranding fish, this alternative does limit flood plain development and should be retained for consideration. We understand that this alternative could be considered too costly because it would necessitate reimbursement to landowners who would be flooded more frequently than at present. As defined in Corps documents, overtopping levees would allow flooding at a 25 year event or greater, which is probably more frequent than the random levee breaks that occur now. The objection to this alternative may be allayed by setting overtopping segments to flood at a 35 year event, which would provide agricultural lands with more flood protection than currently exists. Aside from the concern raised above, this alternative is much less costly than the others and could be combined with restoration measures to improve habitat or ecological processes.

3) Levee setbacks, in which we have a continuing interest, have been criticized because they would require buy outs of numerous, expensive properties. We are concerned that the levee setbacks have been too narrowly defined i.e., as a linear, 1,000 foot setback along both forks of the lower Skagit River, without regard to what makes sense both ecologically and economically. Other configurations of this alternative, i.e., setbacks of the same total area, but larger in some places and smaller in others, may result in the same flood protection and environmental benefits, but be less expensive and more palatable

locally. This approach was explored several years ago by Mike Scuderi, of your staff, and Lou Ellyn Jones, of my staff, and we would like to see this option included as a variation of the alternative.

This "variable setback" design may in fact be the best way to design setbacks from an environmental standpoint. The constrictions would mimic natural constrictions that might be caused by log jams or other physical elements, thus creating velocity diversity and facilitating depositional processes in the wider reaches upstream. These wider reaches, in turn, would function more like segments of a "real" flood plain since they are less confined laterally and thus would provide shallower, more sluggish flow than a uniform setback. These areas would also allow more room for complex side channels, wetlands, and riparian forest to develop.

Avoidance and minimization as part of basic project design

We urge the Corps to incorporate minimization measures up front as part of basic project design as we believe many of these measures would be included as nondiscretionary terms and conditions for a formal consultation done under the Endangered Species Act. Typically during the process of informal Section 7 consultation under the Endangered Species Act, the project proponent incorporates measures that minimize impacts to bull trout. Most of these avoidance and minimization measures are incorporated into the basic project design so that impacts are reduced up front. If possible, restoration measures are incorporated so that the baseline can be improved incrementally for the listed species. When these measures are incorporated into project design so that impacts are minimal or even beneficial, the consultation process may be done informally or at least expeditiously. Where adverse impacts can not be completely avoided, a formal consultation is undertaken to provide for incidental take of the listed species. In formal consultation, nondiscretionary terms and conditions are added to further minimize the take of that species.

We recommend the following measures for minimizing adverse impacts to bull trout and salmonids in general be incorporated as a part of basic project design for all alternatives:

1) Levee setbacks should be designed wherever possible to allow more natural channel meandering, to encourage the formation of side channels and off channels, and to allow establishment of riparian vegetation,

2) Setback areas should be planted with riparian vegetation, and riparian vegetation that grows on existing levees should not be removed (i.e., levees should not be maintained to current Corps standards with respect to vegetation removal). Riparian vegetation provides crucial edge habitat for juvenile salmonids that is severely limited in the channelized river system.

3) To the extent possible, existing rip rap should be removed as part of levee setbacks. Removing the toe rip rap will allow channel meandering and natural establishment of off channel and edge habitat. Retaining the toe rip rap may pose a stranding hazard to juvenile fish during flood events. In addition, juvenile salmonid densities are generally lower at rip rap banks, and predation of juvenile salmonids is also often higher at rip rapped banks than natural banks ((Peters et al. 1998, Beamer and Henderson 1998). Retaining the existing rip rap would create a linear feature that would encourage scour and erosion, without the accompanying benefits usually associated with bank erosion (e.g., recruitment of large woody debris [LWD], increases in streambank complexity, coarse sediment replenishment, or side channel development).

4) LWD, bioengineering retrofits, and riparian vegetation should be incorporated into existing levees to improve edge habitat.

5) To the extent possible, tide gates and water diversion structures should be retrofitted to increase fish passage and restore tidal and freshwater influence in distributary and blind channels.

STUDIES IMPORTANT FOR ALL ALTERNATIVES

Baseline information

As part of the analysis of impacts expected from each alternative, the Corps will provide baseline information. Baseline information helps describe existing conditions that could be affected by alternatives, either directly (i.e., construction impacts) or indirectly (i.e, changes in hydrology or sediment transport, or increases in flood plain development). Our understanding is that the Corps will be using the following baseline information, drawn from various existing sources or through studies that will be done in the coming year.

Current fish distribution, use and trends
Riparian mapping
Wetland mapping

In addition, we would like to have an inventory of fish and wildlife habitats that could be affected by the project (See our recommendations #1 and #2 from our Planning Aid Report dated August 12, 1997).

Geomorphic and sediment studies

Baseline studies should include an understanding of geomorphic and sediment processes (mobilization, scour, transport, and deposition) in the Skagit River with an emphasis on the lower basin. We need to understand how the geomorphic and sediment processes worked in the past, how they work now, and given the proposed projects, how would we expect those processes to

operate in the future. These studies should include an understanding of the physical processes involved in creating and maintaining both freshwater and estuarine habitats important to salmonids. If one of the alternatives has a higher anticipated risk of altering physical processes, the geomorphic and sediment studies should include a task list and plan for answering more detailed questions that may need to be addressed.

Clear Lake, Sterling levees and Mt Vernon bypass

As presented in Attachment A, all alternatives would include 1) a Mt. Vernon floodwall; 2) a bypass around the Mr. Vernon landfill; 3) levees in the Clear Lake and Sterling areas; and, 4) levee setback and overbank excavation in the three bridge corridor. The levee proposals for Clear Lake and Sterling, and the Mt. Vernon bypass were not part of the original project, and these options have never been scoped for studies needed to evaluate impacts. We need a clear justification for these project features. If these measures cannot be justified in terms of project purpose, they should be removed from consideration. If they are justified, we need to study the potential impacts and spend the time evaluating them, the same as other options.

A DISCUSSION OF EACH ALTERNATIVE

The Swinomish Bypass

As described in Attachment A, this alternative would include measures common to all alternatives (levees for Clear Lake and Sterling, the Mt. Vernon bypass, and excavation and levee setback of the three-bridge corridor), and a flood overflow channel into Swinomish Channel. The Swinomish bypass is described as a straight 2,000 foot-wide bermed channel with little excavation, no vegetation, and no structure which impedes conveyance of flood waters. At the receiving end of this five-mile long bypass, a salt marsh would be allowed to develop to provide flood attenuation. As described in Attachment A, there would be no year-around flow and no fish passage. The following lists our concerns about the bypass as described in Attachment A with recommendations for evaluating impacts.

<u>Impacts to Padilla Bay</u>
Numerous questions remain unanswered about the extent of potential impact of this alternative to the Padilla Bay ecosystem. Without answers to the most basic questions posed about impacts, we could not support this alternative. Some of the issues include potential impacts to eelgrass due to changes in turbidity, salinity, dissolved oxygen, and other water quality parameters. Some of the effects may not show up at lesser flood events, but could be critical at, say, a 100 year event. The input of massive amounts of sediment from flood events may be resuspended from wind and waves, so that impacts could potentially be more enduring than might be expected from a single flood event. In addition, depending upon how the bypass channel is configured, transported sediments may cause the development of a tidal prism or increase in elevation of estuary habitat, thereby losing its original function. Tidal prisms have been observed in Dungeness Bay where they have buried eelgrass beds over time.

To determine what the impacts are to the Padilla Bay ecosystem, we recommend the approach set forth in Attachment C. Attachment C is a study proposal developed by Dr. Ron Thom and Martin C. Miller of Batelle Marine Sciences Laboratory specifically to determine impacts of the bypass alternative on Padilla Bay. In order to understand the impacts of the flood bypass on Padilla Bay, we agree it is important to: 1) provide a literature review of similar projects that would include an evaluation of the effectiveness of the design in meeting expected goals and impacts; 2) develop a model to compare effects of various flood event scenarios on parameters important to the survival of eelgrass; 3) compare the Skagit Bay eelgrass system (which has plentiful freshwater inputs and flood events) with the Padilla Bay eelgrass system (which does not) to help predict effects of the bypass alternative on Padilla Bay; and, 4) develop an adaptive management plan to guide changes in management if necessary.

In addition, there are a number of concerns and questions raised in Table 1 of Attachment C that need to be evaluated if the bypass goes forward for consideration.

Impacts to the lower Skagit River estuary

The dams on the upper.Skagit River currently reduce peak flood flows, and the bypass option would further decrease peak flows. Flood flows are a natural part of river ecology and geomorphology. Channel and bed formation are essentially flood-driven processes. Thus, the magnitude, duration, occurrence probability, and temporal patterns of floods determine such characteristics as streambed texture and structure, the spatial diversity of sediment deposits, and hyporheic flow pathways. Floods build estuaries from sediment, route nutrients and create and maintain side channels and off channel habitats. These factors are the physical building blocks for biological communities that support fish and wildlife. Further reduction of peak flows is likely to affect the physical factors as well as the biological communities upon which they depend. These processes are already altered by the current channelized condition of the lower river. The degree to which changes in physical processes will further affect conditions for salmonids in the Skagit River delta and estuary should be evaluated.

Fish losses during flood events

A flood bypass to Padilla Bay would have the potential for juvenile fish to be stranded or flushed to marine waters during a flood event before they are ready. To provide refuge from high flows, this option should have wetlands, high velocity refuge areas and/or sites for large wood placement to minimize losses of fish during flood events. Access to the bay should be maintained at all flows to reduce the likelihood of stranding.

Contamination from flood waters

A flood bypass channel has the potential to deliver contaminants into the Padilla Bay estuary by flowing over fields that have been treated with pesticides. Certain pesticides (e.g., organophosphates and carbamates) have been shown to be harmful to the olfactory functioning in salmonids and can result in disruptions of predator-prey relationships, navigation, or timing of

spawning. Contamination could occur as a pulsed event with floods that occupy the bypass route or as an ongoing source if the flood bypass is constructed with a low flow channel for habitat purposes. If agriculture will be allowed in this area, the degree of risk from contamination would depend upon the type and seasonality of crops grown and chemicals used. We recommend that the land use planned for the flood bypass be carefully considered in terms of the potential to increase contamination to fish and wildlife habitat. Depending upon the types of practices that will be allowed in the bypass area, a monitoring plan and set of Best Management Practices (BMPs) should be developed for tracking and improving water quality.

Assumed benefits to fish

One of the assumptions made in support of the bypass alternative is that it would be highly beneficial to salmonids if designed with a low flow channel that operated year around. We have been discussing the year around flow channel with technical experts both inside and outside our agency and are uncertain of the degree that salmonids would benefit from this measure. Many questions need to be answered before we can determine the actual benefit. These questions include: 1) the amount of water available for appropriation; 2) the physical characteristics of the site; 3) timing/seasonality of flows; 4) habitat and riparian conditions likely to develop; 5) maintenance requirements; 6) the degree to which fish passage is feasible; and, 7) the potential for increases in predation on juvenile salmonids. We want to make sure that if a low flow channel were built, it would be beneficial to fish and wildlife, would be self maintaining, and would be consistent with what would have developed in this area naturally.

We believe that increasing salmonid access to Padilla Bay would be very beneficial, although we are not sure that the low flow channel, given the constraints and uncertainties identified so far, is the best way to do it. Based on a study done for the Skagit System Cooperative (Yates 2001), the technical team discussed the possibility that breaching the jetty at the south end of Swinomish Channel could greatly benefit salmon by increasing access to Padilla Bay. Before a decision is made regarding the viability of the low flow channel, we would like to see a comparison of the predicted benefits from a low flow channel versus breaching the jetty.

In addition, although Padilla Bay features many acres of eelgrass, the shoreline does not consist of particularly diverse habitats. This scarcity of edge and other estuarine habitats beneficial to salmonids is largely due to the presence of rip rap and sea dikes along the perimeter of the bay. We recommend that the Corps explore ways to restore edge habitat and natural functioning of the shoreline areas of Padilla Bay as part of the bypass alternative.

Levee setbacks

In addition to the measures that would be included for all alternatives, this option would set levees back by 1,000 feet from the three bridge corridor downstream to the estuary and would include both forks of the river. Under the project description in Attachment A, no existing rip rap would be removed, and no plantings would occur. Riparian vegetation that developed would be removed, and the river would not be allowed to meander within the setbacks.

We generally favor setback levees because they restore natural processes that create and maintain habitat for salmonids, allow riparian vegetation and side channels to develop, increase the river's connectivity with its flood plain, and allow more room for natural flood plain functions of water storage and conveyance in high flow events. In addition, because levee setback projects have been done elsewhere, we have some understanding of the potential impacts and benefits of this action. Therefore we have relative comfort in recommending it as a fish-friendly method of meeting the project purpose for flood hazard reduction.

However, under the project description in Attachment A we would not expect to see the benefits to salmonids normally resulting from setback levees, i.e., edge habitat, side channel formation and riparian vegetation. The Attachment A description would result in a rather sterile setback scenario, in which no riparian forest would be allowed to grow and no shifts in the main channel or side channel dynamics would be permitted, providing little in the way of flood plain processes. This alternative, like the bypass, also has the potential to induce flood plain development, with all its attendant impacts. Other potential impacts of setback levees include turbidity and sedimentation from construction, alterations in sediment routing, and increased peak flows to the estuaries. The five mitigation measures for the setback levees in the three bridge corridor listed on page five should be incorporated into the design of this alternative to improve habitat for fish and wildlife.

Ring dikes with overtopping levees

In addition to the measures that would be included for any alternative, this option, according to Attachment A, would include a ring dike around Burlington, a cross dike at West Mt. Vernon, and four overtopping segments of the levees. The overtopping levees would spill flood waters to the west and south of the river forks at a 25 year event or greater. Levees on the left bank would be raised two feet in order to protect Interstate 5 from flooding. Levee maintenance would be continued, i.e., vegetation would be removed.

Because this alternative would retain some flooding in agricultural areas, it would tend to inhibit flood plain development. The urban ring dike and cross dike should impose few, if any, adverse impacts to fish and wildlife populations, although some wetland impacts would probably occur. Modifications to existing levees could further reduce edge habitat for some species, although there would be opportunities to incorporate large wood, retrofit habitat elements, and plant riparian vegetation. The overtopping segments of the levees in themselves would not appreciably alter existing conditions although they would increase the potential to strand fish in flood events. Assuming that all fish going over the top of these segments would be lost, and using best estimates of fish use during seasons likely to experience flood events, the Corps should calculate a quantitative figure representing the potential loss of salmonids for this alternative so that appropriate mitigation could be developed.

RECOMMENDATIONS

1. The Corps should review our Planning Aid Report (USFWS 1989) providing comments and recommendations during the reconnaissance phase of planning for this project. We expect that recommendations still relevant to the current project will be addressed.

2. The criteria by which alternatives should be evaluated have not yet been formalized. These criteria should be developed with input from stakeholders, including resource agencies and tribes, in order to fairly evaluate and compare the benefits and impacts of each alternative.

3. The list of environmental studies developed by the technical workgroup (Attachment D Freshwater and Estuarine Studies) should be used to guide development of study plans and evaluation of impacts. Our additional recommendations on studies, below, should be incorporated into that list.

4. The geomorphic and sediment studies should include an assessment of the freshwater and estuarine habitats and biological communities important to salmonids that could be affected by the project. Part of this effort should be to collect cross section data to monitor the bed elevation over time and to map delta elevations at low tide. This information would be used to determine effects of project alternatives on estuarine habitats.

5. Studies to evaluate potential impacts should be scoped for the levee proposals for Clear Lake and Sterling and the Mt. Vernon bypass. These measures were not part of the original project and have not been scoped for studies.

6. The Corps should consider alternatives formulated with the following options: a smaller diversion and setback levees, overtopping levees at a 35 year event, and flexible alignment of levee setbacks to make this alternative more feasible.

Studies related to the Swinomish bypass

7. A maintenance and adaptive management plan should be prepared for the bypass channel and salt marsh with input from the resource agencies and tribes so that if original assumptions about the functioning of this alternative and mitigation should be faulty, management actions could be identified and carried out to correct problems.

8. The Corps should compare the relative benefits to salmonids of a low flow channel in the bypass channel to those of breaching the Swinomish jetty.

9. Studies should be developed to evaluate the low flow channel from a geomorphic and sediment perspective. Questions to answer include, a) Is there a morphology of low flow

channel that can be self-maintaining? b) If the low flow channel cannot be self maintaining due to periodic flood disturbance, what measures would be proposed to solve that problem? c) What habitat value would such a channel have? d) What long-term maintenance commitment would it require?

10. The study proposal for assessing impacts to Padilla Bay (Attachment C) should be used to determine impacts to Padilla Bay. Issues raised on Table 1 (Attachment C) should be evaluated if this alternative is carried forward.

11. The Corps should develop a list of expectations for water quality in the low flow channel and a plan should be developed for improving water quality input into Padilla Bay and the low flow channel, if it is proposed.

12. For the bypass and setback levee, a plan should be developed showing how these alternatives could be made consistent with EO 11988 on flood plain management. In addition, the overtopping alternative should remain a viable alternative until a definitive plan is developed to limit flood plain development.

Thank you for the opportunity to provide these comments on the Skagit River Flood Feasibility Study. We look forward to working with you in the future on this project. If you have questions, please contact Lou Ellyn Jones at (360) 753-5822 or Lynn Childers at (360) 753-5831.

Sincerely,

for Ken S. Berg, Manager
Western Washington Office

cc: Skagit System Cooperative (L. Wasserman)
NMFS (D. Tonnes)
WDFW (R. Johnson)
DOE (R. Sacherson, T. D'acchi)
Skagit County Public Works (D. Brookings)

Enclosures

Attachment A.	Basic Project Design
Attachment B:	Mitigation measures
Attachment C:	Padilla Bay studies.
Attachment D:	Freshwater and Estuarine studies

REFERENCES

Beamer, E.R. and R.A. Henderson. 1998. Juvenile salmonid use of natural and hydro modified stream bank habitat in the mainstem Skagit River, northwest Washington. A report prepared for the U.S. Army Corps of Engineers, Seattle District, WA Dated September 1998.

Peters, R.J., B.R. Missildine, D.L. Low. 1998. Seasonal fish densities near river banks stabilized with various stabilization methods. Western Washington Office, U.S. Fish and Wildlife Service. Lacey, Washington.

Yates, S. 2001. Effects of Swinomish Channel jetty and causeway on outmigrating chinook salmon (Oncorhynchus tshawytscha) from the Skagit River Washington. A thesis presented for partial fulfillment of the Master of Science degree dated February 2001.

Attachment A
Working Document Prepared by the U.S. Army Corps of Engineers

FEATURES OF BASIC SKAGIT FLOOD DAMAGE REDUCTION ALTERNATIVES (NO MITIGATION)

Mt. Vernon Floodwall –

In all alternatives a 5-foot floodwall will be built at Mt. Vernon

Clearlake

Option one would have a levee constructed near Highway 9. This also includes a small levee between Clear Lake and Beaver Lake to prevent back flooding during a 100-year event.

Sterling

Two levee options are being considered for Sterling area. One option would be a setback at Highway 20 river ward of the railroad. The same alinement as in Recon report. The second option would construct the levee across the Sterling area protecting the majority of structures.

The Sterling and Clear Lake options have not been previously scoped.

Three Bridge Corridor Excavation (For all alternatives except number 6. In alternative 3 the excavation is less)

1. There will be a 500 foot setback in the three bridge corridor with no riprap removal of toe rock in the river, no plantings. Approximately 20 feet (vertical) of material would be excavated between the river channel and the setback levee. Excavation won't be below existing river surface. There could be possible stranding areas in setback zone. The setback levee would be riprapped with a buried toe.

Diversion (Alternative 1 or 7 is described below)

1. 2000' bermed channel with little excavation and no riprap on the side slopes. The channel would be utilized at greater than 25-year events. Design flow would be 80,000 cfs at 5 fps and 8 foot depth. The channel would be straight with no low flow channel or vegetation. Sheet pile grade control structures would be set at existing grade at major road crossings. There would be five of these grade control structures in alternative 1, set at major road crossings, and four of these grade control structures in alternative 7, placed on existing roads. Except for the La Conner Whitney road which would be placed on a trestle, and the Avon Allen Road in Alternative 7, all other roads would be at grade and passable except when flooding. There are two of these crossings in alternative 7 and four of these crossings in alternative 1.

2. There will be no tide gates to control saltwater intrusion. The upstream extent of tidal influence has not been calculated.
3. There will be a marsh at the end of the low flow channel to provide flow attenuation. No plantings or habitat enhancements are designed. The size of the marsh needed for flow attenuation is unknown. The marsh will also retain sediment as the velocities decline on entering the marsh from the diversion.
4. There will be a need to provide drainage structures for existing drainage facilities because the diversion crosses a ditching district and several sloughs used for local drainage.
5. There are an unspecified number of utilities running across the channel which will have to be protected.
6. Basic maintenance of the channel will consist of mowing the berms and keeping the channel free of woody vegetation. In the event that the channel is utilized, regrading as needed will be done after the event.
7. Acceptable land use activities have not been decided. No activities that will impede conveyance will be allowed.
8. The inlet will be 1100 feet wide using fuse gates to control flows. There will be no passage for fish.
9. The diversion point has not been set.
10. Channel length will be approximately 5 miles.
11. The trestle will not accommodate passage of wood. LWD in the channel will be removed.
12. All structures in the right of way will be removed.
13. No changes to levees downstream of the inlet are expected. These levees will not be part of the Federal project and will be covered by the maintenance procedures outlined in PL84-99.

There will be no additional risk to the reservation due to avulsion or sedimentation.

Setback Levee (Alternative 5 is described below)

1. Area downstream of three bridge corridor will be excavated on the right bank down to just below the Division Street bridge. Excavation will be similar to the three bridge corridor. Levee will be set back to Wall Street.
2. Division street bridge will be extended.
3. Area downstream of excavation will be setback 1000 total feet with no excavation. No riprap will be removed. Riprap will be maintained. No plantings will occur. No side channel formation will be allowed. See sheets C1.17, C1.18, C1.19
4. The existing levees will be removed and setback. Existing levee maintenance standards will be followed with regular mowing of the levees. County Riparian ordinance will have to be changed to allow for removal of riparian vegetation.
5. Maintenance requirements for channel are unknown. Dredging is not anticipated to be required.
6. There could be an option of building a small bypass around West Mt. Vernon to avoid the excavation of the old landfill. Design is unknown.

7. Tidegate retrofits are part of the project design to allow for fish passage (4d requirement).
8. No borrow pits onsite.
9. The entire inside bend in the Mt. Vernon area will not be opened up..

Overtopping (Alternative 3 is described below)

1. I-5 is protected
2. Two options for Sterling Levee. One option for Clear Lake.
3. Ring Dike around Burlington
4. 3 Bridge corridor excavation where levee will be set back 500-feet.
5. 4 overtopping sections, 3 on left bank, 1 one right bank (north Fork Fir Island). Overtopping Structures are between 1000 and 4000 feet long, with 4:1 hardened backslopes. There will be a 750-foot flowage easement behind the levee structure.
6. Raise levee 2 feet on right bank to protect freeway south of Mount Vernon.
7. Cross dike at West Mt. Vernon to protect west side from back-flooding.
8. Weak or low levees will be raised to preclude flood fighting (potentially weakest part of system). Existing levees will remain as is.
9. Existing water control structures will be retrofitted for fish passage
10. Sand dikes built into existing sea dikes will drain flood water from protected areas. Sand dikes will also allow designers to predetermine blowouts and aid access and repair. Other alternatives, such as tide gates, are too expensive.
11. Levee maintenance will continue. No channel encroachment
12. Baseflood elevation will change
13. Unknown need for maintenance dredging Sediment is expected to drop in the main channel downstream from each overflow section. This is a local maintenance issue and the design would include features to minimize dredging.

No Action

1. Random series of breaks both in levees and sea dikes
2. Levees will continue to be strengthened
3. There will be a biological opinion on levee maintenance
4. Sporadic development will continue in floodplain

Attachment A
Working Document Prepared by the U.S. Army Corps of Engineers

FEATURES OF BASIC SKAGIT FLOOD DAMAGE REDUCTION ALTERNATIVES (NO MITIGATION)

Mt. Vernon Floodwall –

In all alternatives a 5-foot floodwall will be built at Mt. Vernon

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The Sterling and Clear Lake options have not been previously scoped.

Three Bridge Corridor Excavation (For all alternatives except number 6. In alternative 3 the excavation is less)

1. There will be a 500 foot setback in the three bridge corridor with no riprap removal of toe rock in the river, no plantings. Approximately 20 feet (vertical) of material would be excavated between the river channel and the setback levee. Excavation won't be below existing river surface. There could be possible stranding areas in setback zone. The setback levee would be riprapped with a buried toe.

Diversion (Alternative 1 or 7 is described below)

1. 2000' bermed channel with little excavation and no riprap on the side slopes. The channel would be utilized at greater than 25-year events. Design flow would be 80,000 cfs at 5 fps and 8 foot depth. The channel would be straight with no low flow channel or vegetation. Sheet pile grade control structures would be set at existing grade at major road crossings. There would be five of these grade control structures in alternative 1, set at major road crossings, and four of these grade control structures in alternative 7, placed on existing roads. Except for the La Conner Whitney road which would be placed on a trestle, and the Avon Allen Road in Alternative 7, all other roads would be at grade and passable except when flooding. There are two of these crossings in alternative 7 and four of these crossings in alternative 1.

2. There will be no tide gates to control saltwater intrusion. The upstream extent of tidal influence has not been calculated.
3. There will be a marsh at the end of the low flow channel to provide flow attenuation. No plantings or habitat enhancements are designed. The size of the marsh needed for flow attenuation is unknown. The marsh will also retain sediment as the velocities decline on entering the marsh from the diversion.
4. There will be a need to provide drainage structures for existing drainage facilities because the diversion crosses a ditching district and several sloughs used for local drainage.
5. There are an unspecified number of utilities running across the channel which will have to be protected.
6. Basic maintenance of the channel will consist of mowing the berms and keeping the channel free of woody vegetation. In the event that the channel is utilized, regrading as needed will be done after the event.
7. Acceptable land use activities have not been decided. No activities that will impede conveyance will be allowed.
8. The inlet will be 1100 feet wide using fuse gates to control flows. There will be no passage for fish.
9. The diversion point has not been set.
10. Channel length will be approximately 5 miles.
11. The trestle will not accommodate passage of wood. LWD in the channel will be removed.
12. All structures in the right of way will be removed.
13. No changes to levees downstream of the inlet are expected. These levees will not be part of the Federal project and will be covered by the maintenance procedures outlined in PL84-99.

There will be no additional risk to the reservation due to avulsion or sedimentation.

Setback Levee (Alternative 5 is described below)

1. Area downstream of three bridge corridor will be excavated on the right bank down to just below the Division Street bridge. Excavation will be similar to the three bridge corridor. Levee will be set back to Wall Street.
2. Division street bridge will be extended.
3. Area downstream of excavation will be setback 1000 total feet with no excavation. No riprap will be removed. Riprap will be maintained. No plantings will occur. No side channel formation will be allowed. See sheets C1.17, C1.18, C1.19
4. The existing levees will be removed and setback. Existing levee maintenance standards will be followed with regular mowing of the levees. County Riparian ordinance will have to be changed to allow for removal of riparian vegetation.
5. Maintenance requirements for channel are unknown. Dredging is not anticipated to be required.
6. There could be an option of building a small bypass around West Mt. Vernon to avoid the excavation of the old landfill. Design is unknown.

7. Tidegate retrofits are part of the project design to allow for fish passage (4d requirement).
8. No borrow pits onsite.
9. The entire inside bend in the Mt. Vernon area will not be opened up..

Overtopping (Alternative 3 is described below)

1. I-5 is protected
2. Two options for Sterling Levee. One option for Clear Lake.
3. Ring Dike around Burlington
4. 3 Bridge corridor excavation where levee will be set back 500-feet.
5. 4 overtopping sections, 3 on left bank, 1 one right bank (north Fork Fir Island). Overtopping Structures are between 1000 and 4000 feet long, with 4:1 hardened backslopes. There will be a 750-foot flowage easement behind the levee structure.
6. Raise levee 2 feet on right bank to protect freeway south of Mount Vernon.
7. Cross dike at West Mt. Vernon to protect west side from back-flooding.
8. Weak or low levees will be raised to preclude flood fighting (potentially weakest part of system). Existing levees will remain as is.
9. Existing water control structures will be retrofitted for fish passage
10. Sand dikes built into existing sea dikes will drain flood water from protected areas. Sand dikes will also allow designers to predetermine blowouts and aid access and repair. Other alternatives, such as tide gates, are too expensive.
11. Levee maintenance will continue. No channel encroachment
12. Baseflood elevation will change
13. Unknown need for maintenance dredging Sediment is expected to drop in the main channel downstream from each overflow section. This is a local maintenance issue and the design would include features to minimize dredging.

No Action

1. Random series of breaks both in levees and sea dikes
2. Levees will continue to be strengthened
3. There will be a biological opinion on levee maintenance
4. Sporadic development will continue in floodplain

Attachment B
Working Document Prepared by the U.S. Army Corps of Engineers

POSSIBLE MINIMUM MITIGATION FEATURES NECESSARY FOR EACH OF THE PROJECTS.

This list does not include additional measures that may need to be taken (such as opening sloughs) if these measures don't don't adequately compensate for the impacts of the project.

Bypass:

1. ***Low flow stream***: The channel should contain adequate depths and velocities to provide appropriate rearing and flood refuge habitat. It should be variable to allow for a dynamic, self-maintaining channel. Specific criteria for depth and width should be developed to ensure that the channel is not too shallow and wide, which would result in increased water temperatures.
2. ***Inlet Structure:*** Should allow for fish passage for year round access.
3. ***Downstream Outlet:*** .No tide gate will be used for prevention of saltwater intrusion (Use of tide gates will severely limit the usefulness of the low flow channel for salmonid rearing).
4. ***Riparian Buffer:*** .500-foot native riparian buffer will be adjacent to the low flow channel
5. ***High Flow Refugia:*** Wetlands and/or sites for high flow refuge will be provided between the dikes. This could include placement of LWD in bypass area outside of the riparian buffer.
6. ***Land use:*** No farming or other activities that can result in disruption of natural processes necessary to provide "good" fish habitat should occur in the bypass area.
7. ***LWD:*** LWD might be placed in the diversion on an interim basis to provide habitat features. However, over the longterm, the riparian buffer should be managed to provide a source of new LWD to the system.
8. ***Saltwater Gradient:*** There needs to be an adequate saltwater gradient through the channel to assure for functioning marsh and proper juvenile salmonid rearing habitat. The control structures should not of impede the establishment of an appropriate salinity gradient or restrict fish passage.
9. ***Sediment Control:*** The marsh at the lower end of the diversion will be in part used as an energy dissipation area. However, appropriate sediment control must be in place to assure that sediment will not stack up in the "estuary" at the lower end, so that salt water and fish passage be impeded (see item 8 also).
10. ***Maintenance:*** Maintenance in the diversion should be kept to a minimum and clearly defined before implementation of the project. After flood events, reestablishment of mitigation features should be clearly defined.
11. ***Swinomish Channel:*** Appropriate dredging in Swinomish channel related to boat use and marina operations should be clearly defined before project implementation.
12. ***Water Quality:*** Water quality control measures and passage considerations for drainages entering the low flow channel need to be implemented.

13. ***Fishing:*** If large numbers of returning fish use the channel, some measures of enforcement to reduce/eliminate poaching need to be implemented.

Set back including Three Bridge Corridor:

1. ***Riprap Removal:*** In setback areas, riprap including toe rock must be removed from the areas where on river levees are being removed. It is understood that 100 percent efficiency in riprap recovery will not be obtained.
2. ***Side Channel Formation:*** It is expected that the river will be allowed to meander within the setback area and side channel formation will be allowed
3. ***Riparian Buffer:*** There will be establishment of riparian vegetation within areas outside of the dike prism to the rivers edge
4. ***Retrofitting of Dikes with Bioengineering and Fish Structures:*** Bioengineering will be used along the new and old dikes to provide habitat better and will be supplemented with inwater habitat structures.
5. ***Dredging:*** No maintenance dredging will be allowed. After significant flood events, restoration of the main channel may be necessary (reference Toutle River, St. Helens event)
6. ***Maintenance:*** Maintenance in the setback areas should be kept to a minimum and clearly defined before implementation of the project. After flood events, reestablishment of mitigation features should be clearly defined. No clearing of channel obstructions is expected. Levees should be maintained with some woody vegetated cover.
7. ***Fish Passage:*** Existing and new gates and pumphouses will be retrofitted for fish passage.

Overtopping

1. ***Riparian Buffer:*** There will be establishment of riparian vegetation within areas outside of the dike prism to the rivers edge
2. ***Retrofitting of Dikes with Bioengineering and Fish Structures:*** Bioengineering will be used along the new and old dikes to provide habitat better and will be supplemented with inwater habitat structures.
3. ***Dredging:*** No maintenance dredging will be allowed
4. ***Maintenance:*** Maintenance should be kept to a minimum and clearly defined before implementation of the project. After flood events, reestablishment of mitigation features should be clearly defined. No clearing of channel obstructions is expected. Levees should be maintained with some woody vegetated cover.
5. ***Fish Passage:*** Existing and new gates and pumphouses will be retrofitted for fish passage.

If the results of the studies indicate that the features outlined above do not adequately compensate for project impacts, then the features listed below could be used for additional mitigation. Otherwise these features could be added to the project as restoration actions.

Other Potential Mitigation/Restoration Features

Put natural meanders in the diversion channel.
Reopen sloughs
Reopen side channels
Restore estuary areas
Modify Swinomish Channel Jetty to enhance fish use and passage
Connect bypass to other side channels

Monitoring

The channel and flood plain elevations should be monitored following project completion to determine how the channel is responding. Several cross sections should be established in each channel. These should be surveyed every three to five years.

ATTACHMENT C: EVALUATION OF NECESSARY ENVIRONMENTAL IMPACT STUDIES FOR SKAGIT RIVER FLOOD CONTROL PROJECT BYPASS

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Battelle Marine Sciences Laboratory
1529 W. Sequim Bay Road
Sequim, Washington

Prepared for

Michael Scuderi
Seattle District, U.S. Army Corps of Engineers

June 29, 2001

Introduction

The U.S. Army Corps of Engineers, Seattle District (CENWS), in cooperation with Skagit County, is studying the feasibility of providing flood damage reduction to lower Skagit River (Sedro Woolley to the mouth of the river). One of the alternatives being evaluated would take water out of the Skagit River at flood events greater than 25 years recurrence intervals and route the water through a bypass to Swinomish Slough, which then empties into Padilla Bay and Skagit Bay. Between 40,000 and 80,000 cfs would be diverted during flood events. Fish passage would be provided through the levee on the Skagit River. An intertidal marsh would be recreated at the downstream end of the bypass. In non-flood conditions, a permanent flow (less than 1,000 cfs) would remain in the channel to provide fish habitat.

Impacts and benefits from this alternative must be identified as part of the Environmental Impact Statement process. In the impact analysis the Corps needs to identify potential impacts to the Padilla Bay Estuary caused from sediment and freshwater inputs. The objective of this report is to provide an assessment regarding studies necessary to evaluate the environmental impacts of constructing a bypass channel for high water flows in the Skagit River.

Review of Background Information

The information we reviewed relative to the project includes the following:

- Collins, B. 1998. Preliminary assessment of historic conditions of the Skagit River in the Fir island area: implications for salmonid habitat restoration. Report to Skagit System Cooperative. La Conner, WA.

- Sommer, T.R., M.L. Nobriga, W.C. Harrell, W. Batham, and W.J. Kimmerer. Can. J. Fish. Aquatic Sci. 58:325-333.
- Seattle District Power point presentation on project alternatives
- Yolo Basin Wetland Project document and web site materials
- Maps showing project location, historical conditions, flow vectors
- Letter dated August 2, 199? from Gordon White (Washington State Department of Ecology) to Brent Mahan (USACE) regarding the Skagit River flood damage reduction feasibility study – concerns with study alternatives that may impact Padilla Bay National Estuarine Research Reserve (PBNERR)
- The set of documents on the Swinomish Channel Maintenance Dredging program
- The set of aerial photographs of the project site.

Information Gathering Meeting

Ecosystem Issues

In addition to reviewing the documents listed above, we attended a coordination meeting at PBNERR on 23 March 2001. The purpose of the meeting was to discuss with the Padilla Bay NERR staff possible study options for obtaining necessary information needed to determine all impacts of the proposed by-pass options. Attendees included representatives from the PBNERR, the Skagit System Cooperative, Washington State Department of Ecology Flood Plain Management, Skagit County Commission, Skagit County Public Works, Seattle District Corps of Engineers and Battelle Marine Sciences Laboratory. On 30 May 2001, there was a follow up meeting to review and revise the list of potential issues and studies required.

Discussions covered topics including hydrological flow volumes, saltwater intrusion, and the various alternative plans. In Table 1 is listed the environmental concerns and questions associated with the project. The overriding issue was whether the bypass would significantly alter the functioning of the Padilla Bay ecosystem. It was strongly stated that there must be a rigorous and scientifically based understanding of the effects of the bypass flooding on what might happen to water properties and habitats in the estuary.

Restoration

There was general agreement that restoration of the marsh and channel habitats that would be part of the bypass project are highly desirable. However, the project must be developed in a way to afford protection to the eelgrass community in the Bay.

Framework for Assessment

Many of the topics listed in Table 1 can be addressed through analysis of existing information. However, there are a number of topics that require new studies and analysis. The group discussed the various methods that could be applied to investigate the key issues. A conceptual model was proposed that can be a framework for designing the studies. The conceptual model in its general form is

Controlling factors→Habitat Structure→Functions

A simple conceptual model using this format for eelgrass is illustrated in Figure 1. The current understanding of the ranges of values that are required to sustain eelgrass growth are summarized under the major controlling factors. The model makes the simplifying assumptions that, if these factors are satisfied, eelgrass should flourish, and the functions associated with an eelgrass meadow should also be established. The controlling factors have been reasonably well developed for Puget Sound, but do not predict eelgrass recovery after a major disturbance

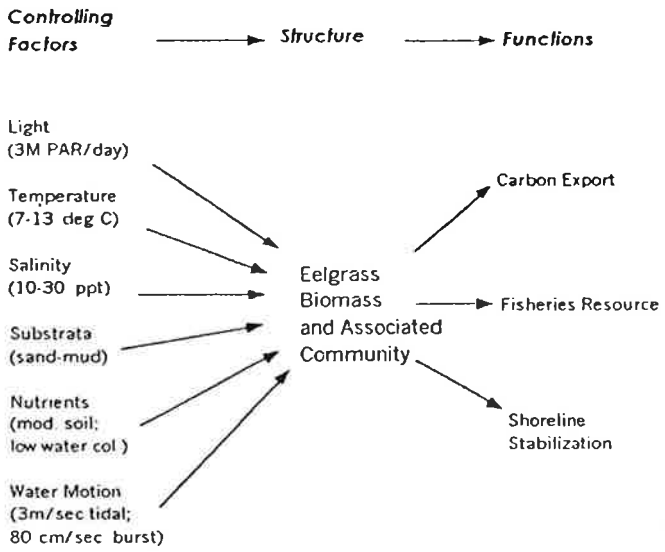

Figure 1. Conceptual model of eelgrass

The model organizes the basic requirements of eelgrass that can be used to assess potential impacts from alterations of these factors. For example, data on the relationship between salinity and eelgrass net primary productivity can be contrasted with predictions on alterations of salinity in Padilla Bay. The existing information from experiments conducted at Battelle Marine Sciences Laboratory is shown in Figure 2. Although not strongly predictive (because of relatively high degree of variability within each salinity treatment), the results indicate that eelgrass has a fairly wide tolerance of short-term salinity variations. Whether these results are relevant to the predicted duration, magnitude and frequency of salinity variations associated with flooding events from the Skagit Bypass needs to be evaluated.

Table 1. Topics of concern or important questions identified at the 23 March 2001 workshop.

No.	Topic	Note
1	Ecosystem alteration of Padilla Bay	How to predict with confidence where flow is going and effects on eelgrass and its community, and economically important resources such as Dungeness crab, salmon and juvenile bivalves.
2	Salinity intrusion	What is the range and dynamics of salinity intrusion?
3	Wildlife	Effects of bypass on corridors of movement, Brandt graveling areas, other waterfowl and shorebird use of area
4	Wetland area and function and salmon recovery impacts	What are the predicted areas and functions of the restored wetland system? What is current area and function? Tradeoffs of marsh vs eelgrass.
5	Contamination	Will contaminants be introduced to Padilla Bay through flooding as well as immediately after breaching?
7	Sedimentation	What are the predicted spatial and temporal patterns of sedimentation associated with flood events?
8	Factors controlling development of estuarine ecosystem	Will elevation and hydrology changes alter the natural development patterns in the estuary?
9	Effects on *Spartina alterniflora and S. anglica*	Will the invading species spread? How to control and manage?
10	Water properties in the estuary	How will flows from the bypass affect changes in water properties in the estuary? Salinity, DO, temperature, nutrients, suspended sediment
11	Erosion issues	Will flows cause erosion and where will this occur?
12	Salinity tolerance of Padilla Bay eelgrass	Contrast salinity tolerances of eelgrass relative to predicted changes in salinity in the estuary. Use eelgrass from other bays in this assessment.
13	Flood effects on other eelgrass systems (e.g., Skagit, Samish, Nooksak)	Can other eelgrass systems provide a model with which to judge the effects of periodic floods on eelgrass in Padilla Bay? Can recovery rates of eelgrass be predicted from information in other bays? A monitoring program would document before- and after-flood impacts and recovery rates.
14	Water level effects in Swinomish channel	Will floods alter water levels in the Slough and create a flood hazard?
15	Effects of extreme high tides and storm surges on flooding	Can the bypass handle flood during extreme high tides and storm surge?
16	Variation in location of diversion	Are there better locations for the diversion that will reduce potential impacts on Padilla Bay? Evaluate relative to effects on salmonids and Padilla Bay ecosystem.
17	Flow of water from Swinomish Slough to Samish Bay	Will flows be great enough to affect Samish Bay ecosystems?
18	Harbor seal pupping	Will the project impact seal pupping areas adjacent to the channel at the north end of Swinomish navigation channel?
19	Bait fish spawning	Are there any impacts on baitfish spawning habitat?
20	La Conner jetty	Will improvements of the jetty at La Conner result in better fish movement through the slough?
21	DNR Shellfish beds	Will the project impact shellfish beds managed by the WDNR?

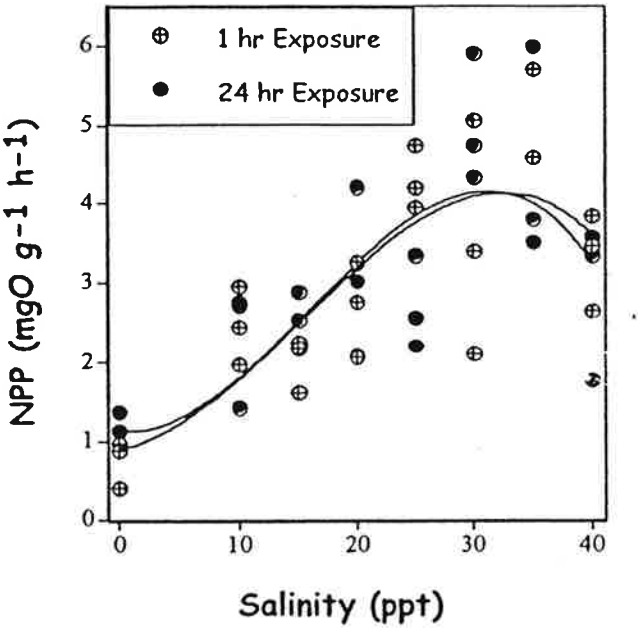

Figure 2. Experimental analysis of eelgrass net primary productivity (NPP) versus various salinity treatments and two exposure times.

Meeting with Padilla Bay Research Advisory Committee

At the recommendation of the Padilla Bay reserve Manager and Research Coordinator, the Skagit Bypass proposal was discussed with the Padilla Bay Research Advisory Committee on 17 June 2001. This group advises the Reserve regarding the types of research to be conducted in Padilla Bay and related matters. The group generally agreed with the 21 issues listed in Table 1. They recommended the following:

- Modeling of the flow of freshwater and suspended matter into the bay was essential, and that the modeling must be used to determine risks to the eelgrass community from this type of perturbation. They felt that the worst-case scenario of high flow-high tide should be among the scenarios modeled. They felt that eelgrass within Padilla Bay must be protected (i.e., no risk to eelgrass) before restoration of salmonid habitat is considered.
- Because of their perception that some Corps projects did not perform in accordance with design expectations, the committee recommends that a review of the functioning of similar projects be conducted. Though several projects were suggested for review, the committee was not aware of exact analogs to the proposed Skagit Bypass. This review would include an evaluation of the effectiveness of the design in meeting the expected ecological or environmental goals as well as the validity of model predictions.
- Impacts to salmonids, crabs and other economically important species should be considered explicitly.

- They were concerned about the long-term maintenance of the restored system if a flood destroyed the vegetation and channel. Who would be responsible for restoring the habitat?
- There was a strong recommendation to consider a bypass route that ran south toward the Skagit delta instead of west to Swinomish Slough. This would result in no changes to Padilla Bay ecosystem, while providing very important rearing habitat for juvenile chinook in an area where they probably spend a relatively long time during their outmigration. The Yolo bypass is a general model for this option.

Recommendations

The key issues of concern should be evaluated adequately to allow assessment of the impacts of the project alternatives on the Padilla Bay ecosystem. The ecosystem is dominated by eelgrass, and any permanent alterations of the distribution, abundance or functions of the system needs to be anticipated. There are six high priority efforts that emerged from the meetings:

- Prior to development of any environmental studies in Padilla Bay, the southern route bypass option that would route water into the Skagit delta should be investigated because it provides protection to Padilla Bay and may provide high quality rearing habitat for juvenile chinook salmon.
- In order to accurately predict impacts, an integrated hydrology-eelgrass system study should be undertaken. This study should include assessments of the degree of alteration of in-water properties most likely to change, e.g., salinity, turbidity, and inorganic nutrients. Hydrologic and hydrodynamic models should be run to predict the spatial patterns of change in water properties in the Swinomish Channel, Padilla Bay and Samish Bay systems. The hydrodynamic model should be capable of predicting the 3-dimensional circulation of the channel and bays since density stratification caused by fresh water and seasonal heating are likely to be important. The model should also accommodate flooding and drying. Consideration should be given to models that have flexible, unstructured grids in order to better represent the detailed geometry of the area. The models should provide information on seasons when events are expected to occur, and the frequency and duration of the events. The studies should further evaluate whether existing information on eelgrass requirements now available are applicable to eelgrass in Padilla Bay. It would be highly advisable to develop a linked set of models that allow predictions of impacts to eelgrass to be coupled with various flood event scenarios. This would create a valuable tool for quickly evaluating various Bypass alternatives relative to effects on eelgrass.
- One of the most effective ways to verify potential effects is through assessment and monitoring of the Skagit eelgrass system. This assessment should include data on eelgrass location, abundance or cover, and recovery following a flood event, as well as data on turbidity, salinity and nutrients. The design of the study should adequately assess the spatial and temporal aspects of each of the eelgrass and water property parameters. As a first step, a search should be made of any information that could be used to judge pre- and post flood conditions on Skagit Bay or other appropriate eelgrass systems.
- Because farm and pasturelands can contain pesticides and herbicides, as well as fecal coliform bacteria, an assessment of the potential for release of these contaminants should also be carried out. There are documented cases where dike breaches to restore tidal marsh systems have resulted in the release of high concentrations of these contaminants.
- An evaluation of the relative improvement of the ecosystem and habitat for salmonids needs to be carried out. As a start, information from the other areas should be used to determine the

aspects of those systems that support juvenile salmonid feeding and rearing. For example, some species and life history stages spend considerable time feeding and rearing in the tidal channels and estuary. The study should clearly identify what aspects of these areas should be promoted to enhance the potential use of the restored tidal marsh. Elements of the system could include tidal channel morphology, reduced salinity, reduced current velocities, and elevations where salmonids would likely be known to occur in greatest abundance (e.g., –0.1m to –2m in the water column). Hydrologic and hydrodynamic modeling combined with GIS presentations would be an integral part of this analysis.

- Development of an adaptive management plan is critical. Since there will likely be uncertainties in the assessment of impacts, an adaptive management plan should be developed that clearly outlines alternative actions should the system be sustaining more or less impact than expected. The plan should use a conceptual model to help understand why the predictions were not accurate, and what might be done that would most efficiently and effectively rectify the problem. The management program would require a long-term manager as well as a monitoring program. The managers would rely on input from concerned agencies and other individuals to assess the project on an annual basis.

Attachment D:
Working Document Prepared by the U.S. Army Corps of Engineers

SKAGIT RIVER FLOOD DAMAGE REDUCTION STUDY – ENVIRONMENTAL STUDIES

Alternatives to be assessed are:

1. Baseline
2. No Action
3. Overtopping
4. Setbacks
5. Bypass

Alternatives 3, 4 & 5 include analysis with and without Nookachamps and Stirling levees

FRESHWATER ORIENTED STUDIES

1. Assessment effects of riprap versus no riprap
   a. Fish use (use existing literature
   b. Riparian Habitat – Measure change in acres
1. Turbidity/Sedimentation impacts of flows going over raw overbank areas (use Mud Mountain study data)
2. Sediment transport/budget study for mainstem for all alternatives (Elwha modeling could be of some use/ What about USGS information?)
3. Geomorphic Analysis
   a. Channel Morphology
   b. Habitat Changes
   c. Effect of reduction of peaks versus baseline (overtopping and bypass) including impacts to estuarine areas
   d. Effect of increasing peaks versus baseline (setback) including impacts to estuarine areas
4. Temperature
   a. Micro habitat changes
   b. Bypass impacts
5. Analysis of possible gate/pumphouse retrofits
6. Landuse Analysis/Secondary Impacts
   a. Fish and wildlife habitat loss with and without project
   b. Possible loss of other restoration opportunities
   c. Water quality/quantity impacts, impervious surfaces
7. Fish Loss Estimate for each alternative due to operation of the project (baseline (catastrophic break); overtopping; bypass use; setback)

BYPASS DESIGN

1. Inlet Structure Design – These questions need to be answered first before proceeding to other design studies

a. Can fish passage (i.e., adults and juveniles) be assured year-round? (Don Dixon notes that the regulated nature of the river might make this feasible year-round at some point in every 24 hour period).
b. Can design assure continuous flow year-round?
c. Will soils support surface flows or will the water seep into the ground?

2. Develop goals for low flow channel
   a. Dynamic
   b. Self maintaining
   c. Rearing habitat
   d. Contains velocity refuge
   e. Wetlands can be added to enhance rearing potential
3. Develop flow requirements for channel
   d. What is needed to meet goals
5. Design low flow channel
6. Design overall bypass channel specifying ~~how~~:
   a. How grade control structures will pass fish. What is the potential for scour around these structures and how will this be addressed so that use of rip rap may be avoided?
   b. What provisions will be made for velocity refuge in overall channel
   c. Where will low flow channel be located in bypass
   d. **Predicted** sediment regime (transport, deposition and erosion) in bypass (as part of overall sediment budget)
5. Inlet Structure Location and design
   a. What are the attraction cues that fish need to enter and use the bypass?
   b. What is the relationship between LWD, hydraulics, and fish behavior at the inlet?
3. Potential to intercept existing drainage and associated water quality impacts (need for wet bioswales).

ESTUARINE ORIENTED STUDIES

1. DOWNSTREAM IMPACTS - Impact of low flow diversion on downstream marshes
   a. How will low flow diversion effect main stem (compare percentage withdrawn to total flow in river)
   c. Downstream impacts of taking peaks off the high flows and adding to the highflows with the setbacks will be covered in the geomorphic analysis

4. MARSH
   a. For all channel designs and flows assess habitat types created in relation to historic and existing habitats, and relate those habitat changes to maximum possible fish use.
   b. Assess fish use with and without low flow and Swinomish Jetty breach (the understanding here is that actual access might result in a lower number of fish using the site).
   c. Assess impacts of flood events on marsh (sedimentation and channel forming processes)
4. BYPASS

a. What is the potential for connecting with Sloughs
b. Hydrogeomorphic study of the potential for and impact of saltwater intrusion
    1 Into soils
    2 Into groundwater
    3 On quantity/quality of habitat for various fish species in the bypass channel and mainstem
    4 Extent of saltwater wedge should be mapped at various discharges and tidal elevations up to 11 feet.
d. What will be the impact of attraction flows?
e. Evaluate need for dike and fill removal
f. Assess construction impacts of new dike construction
g. Spartina Dispersion – How would the bypass increase the likelihood of spartina spreading to Padilla Bay

8. SWINOMISH CHANNEL (ASSUMPTIONS MUST BE SPELLED OUT CLEARLY)
    a. Sediment modeling including Jetty Breach
    b. Flow modeling including Jetty breach

United States Department of the Interior

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MAY 7 2001

NWS S-14.

Colonel Ralph H. Graves, District Engineer
Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, WA 98124-2255

Re: Planning Aid Letter, Skagit River Flood Feasibility Study

This letter is in response to the last Skagit Flood Risk Management Workgroup, dated April 26, 2001. At that meeting, we learned that the local sponsor, Skagit County, is considering removal of the language that incorporates appropriate fish and wildlife habitat improvements as part of the project purpose.

We are concerned about this action and urge the Corps of Engineers (Corps) to retain the language including fish and wildlife habitat improvements within the project purpose. Flood control projects and land use changes have eliminated much of the habitat needed by salmonids in the lower Skagit River and delta. Despite the degradation that has resulted from human activities, the watershed as a whole is extremely rich in fish and wildlife resources. It supports all five species of Pacific salmon, anadromous steelhead and cutthroat trout, native char, and a great multitude of resident trout. Species warranting special protection under the Endangered Species Act, such as Puget Sound chinook, coastal/Puget Sound bull trout, and the bald eagle, are dependent upon the habitat in the lower Skagit River. These species are an important regional resource, and improving habitat in the lower river is of great importance to their survival and recovery.

In our planning aid letter dated October 10, 2000, we indicated support of a feasibility study that aimed to both minimize the risk of flood damages and improve fish and wildlife habitat in the Skagit River valley. Our support was based on the understanding that both the Corps and the local sponsor intended to develop a flood strategy to meet these multiple objectives. In this time of Endangered Species Act listings, when so many of our native salmonids are struggling to survive, we do not want to see another flood control project that ignores the needs of fish and wildlife. We need to see a project that reflects our best collective thinking about how to solve a complex problem with benefits for multiple stakeholders.

The Skagit Flood Risk Workgroup has devoted many hours to developing a project that addresses a broad range of needs, including habitat improvements. We urge the Corps to honor the work that has already been done and retain the language about habitat improvements as part

of the project purpose. We believe that maintaining the broader purpose will result in a project that is more supportable by diverse stakeholders and has a better chance of eventually being approved and funded for construction.

This planning aid letter is being provided under the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661, et seq.), but it not intended to fulfill Section 2(b) of this Act. If you have any questions concerning this letter, please contact Lou Ellyn Jones at 360-753-5822 or Lynn Childers at (360) 753-5831,

Sincerely,

Lynn P. Childers

Ken S. Berg, Manager
Western Washington Office

cc: NMFS (Tonnes)
USACE (Pierce)
USACE (Scuderi)
WDFW Region 4 (Brokes)
WDFW Region 4 (Buchanan)
Skagit Cooperative (Wasserman)
Skagit County Public Works (VanDer Veen)
Shirley Solomon, P.O. Box 2856, Mt. Vernon, WA 98273

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OCT 1 0 2000

Colonel Ralph H. Graves, District Engineer
Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, Washington 98124-2255

Reference: Planning Aid Letter; Skagit River Flood Feasibility Study

Dear Colonel Graves:

This planning aid letter responds to a request by Michael Scuderi, of your staff, to provide comments on the Skagit River Flood Feasibility Study. We understand that a hydrological model has been completed and will be used to determine the effect of various flood control measures on flooding. As this "what if" analysis is to begin soon or has already begun, we provide the following comments to advise you of our interests.

In 1997, our Fish and Wildlife Coordination Act Planning Aid Report described the preferred project alternative as ring dikes around the urban areas accompanied by a series of overflow weirs. Since 1997, stakeholders have increased the array of measures that might be incorporated into a preferred alternative, including setback levees; sea dike outlets; overtopping levees; increasing flood storage, bypass channels, widening bottlenecks, and non-structural measures such as softening banks, improving bank vegetation, land use controls, flood warnings, buyouts, and flood proofing. Many of these measures, which would have potential benefits or adverse impacts to fish and wildlife, were not mentioned in our 1997 report because they had not yet been discussed. Some were not included when this project was scoped. The purpose of this letter is to provide feedback on the measures discussed recently and the planning process. We also will reiterate the points made in our last Planning Aid Report.

We are pleased that the Corps is approaching the feasibility study with the multiple objectives of minimizing flood damages and improving salmonid habitat in the Skagit River valley. We understand that the local sponsor, Skagit County, is also interested in developing a flood strategy that meets multiple objectives for flood reduction and habitat restoration.

Natural processes that create and sustain habitat in the aquatic system are often damaged by flood control projects. These processes include a natural range of variability of flows, channel meandering and flood plain storage, large woody debris recruitment, and sediment routing and transport. Such processes are important to retain or restore because native aquatic species have adapted to them and cannot thrive when they are damaged. We urge the Corps to evaluate and

prioritize alternatives, mitigation, and restoration opportunities from a process-based approach that determines whether a proposal will further degrade, maintain, or enhance natural riverine processes. We believe this approach is more likely to result in a preferred alternative that can meet the multiple objectives of reduction of flood damage and restores habitat conditions for fish and wildlife.

To this purpose, we recommend that the Corps work closely with the Skagit System Cooperative. With the Skagit Watershed Council, the Cooperative has developed a habitat restoration and protection strategy that prioritizes restoration projects based on natural processes that create and maintain habitat (Skagit Watershed Council 1998). We recommend that the Corps ensure that flood hazard reduction alternatives be consistent with the restoration strategy and that they do not further degrade natural riverine processes or preclude restoration in the future.

Skagit River Fish and Wildlife Resources

The Skagit River supports all five species of Pacific salmon, including chinook (listed as threatened under the Endangered Species Act [Act]), coho (a candidate species under the Act), pink, chum, and sockeye. In addition, steelhead trout, cutthroat trout, white sturgeon, Dolly Varden char and bull trout (a char listed as threatened under the Act), are also found in the Skagit River, the largest in Puget Sound. Although hatcheries augment some chinook, coho and steelhead stocks, all of these fishes reproduce naturally in the Skagit River (U.S. Army Corps 1997). Historically, the Skagit River supported the largest natural chinook run and currently supports the largest natural population of bull trout/Dolly Varden in Puget Sound (WDFW 1993, WDFW 1998b).

Most spawning by anadromous fishes occurs upstream of Sedro Woolley (USFWS 1997) in the mid to upper reaches of the watershed. The lower Skagit River is important for migration and for juvenile rearing for salmon. Adult salmonids use the estuaries for staging and physiological transition. Juveniles use the estuaries for foraging, physiological transition, and refugia (USFWS 1998b).

In addition to fishery resources, the Skagit basin is rich in wildlife habitat. While much of the lower Skagit basin has been altered for human use, many areas support blacktail deer, beaver, mink, muskrat, river otter, red fox, and other mammals. The marshes and sloughs of the delta and open agricultural fields provide valuable habitat for migratory waterfowl, including trumpeter and tundra swans, Canada and snow goose, merganser, great blue heron, and dipper. Raptors, such as peregrine falcon, red tailed hawk, northern harrier, kestrel, osprey, and great horned and barn owls may be found in the lower Skagit. Bald eagles (listed as threatened under the Act and proposed for delisting) winter and nest along the lower Skagit River, feeding on spawned out salmon carcasses (USFWS 1997).

Impacts Due to Human Development:

The value of habitat for fish and wildlife in the lower Skagit basin has been degraded through changes in land use and flood control. Most of the lower Skagit valley has been converted from natural conditions to agriculture, residential, and urban development. Flood or erosion control has resulted in over 70 miles of levees, 39 miles of sea dikes, and water storage behind dams in the upper watershed. In the river delta, sea dikes isolate 45,000 acres of land from saltwater influence, resulting in the loss of estuarine habitat and saltwater mixing in dendritic channels and sloughs (U.S. Army Corps 1997). For chinook salmon, this loss of estuarine habitat is a limiting factor (Wasserman, pers. com.). Of the types of habitat alteration reviewed in the 1997 Skagit Fisheries Investigation Feasibility Study, channelization of rivers and streams had the most severe impacts on fish populations (U.S. Army Corps 1997).

Levees have channelized the river and isolated the flood plain, nearly eliminating flood plain storage of water, sediments, and nutrients. The loss of flood plain function has exacerbated flood problems and disrupted ecological functioning. By precluding lateral movement of flood waters, levees reduce groundwater recharge, important for retaining a natural range of variability of flows to which salmon have adapted. Routing of nutrients is also disrupted.

Flood and erosion control have resulted in the loss of opportunity for the river to meander and avulse, natural processes that create habitat such as side channels, oxbows, and wetlands. Bank armoring or channelization in one place tends to transfer erosive energy or flooding downstream. This results in additional bank armoring or flood protection in other locations with a cumulative loss of habitat. Not only is more habitat lost through these activities, but the opportunity for natural processes to create more habitat is progressively eliminated through time.

Bank hardening, whether for levees or for erosion control, destroys riparian vegetation. On older levees, where trees might become established over time, the Corps' own vegetation management standards prescribe tree removal. The loss of riparian vegetation degrades habitat for fish. Juvenile salmonids use the margins of large river channels where, under natural conditions, vegetation and large woody debris create slower velocities and provide cover. Without these refugia, small fish can be flushed prematurely out to marine waters during high flows, where they perish. Studies comparing fish densities next to hardened versus natural river banks found that the highest numbers of fish were found adjacent to natural river banks. Older levees where vegetation had been allowed to grow had more fish than new or recently "maintained" levees, although fewer than natural banks (USFWS 1998a, Skagit System Cooperative 1998).

Flood Hazard Reduction Alternatives

Setback levees

Of all the structural measures discussed as part of the Skagit River Flood Feasibility Study, we believe that setback levees hold the most promise for restoring natural processes in the Skagit. Setback levees would increase the river's connectivity with its flood plain and would allow more

room for water storage and conveyance in high flow events. Loss of flood plain storage has worsened flooding and habitat for fish, so it makes sense to reverse that process by pulling back the levees. In addition to levee setbacks downstream of the forks, we also recommend that the Corps examine the river bend area for potential setbacks and explore means of roughening the channel in the stretch between Mt. Vernon and Burlington. This area is currently like a pipe, providing little resting or refuge for juvenile salmonids. We also support measures that would restore tidal and freshwater mixing to diked sloughs. These measures would include dike breaching or the retrofitting of tide gates to allow more mixing of salt and freshwater.

Nonstructural measures

Nonstructural measures should be incorporated wherever possible because they would have little impact to, and in some cases could help restore, natural processes. Nonstructural measures include relocation or removal of structures, improving bank vegetation, land use controls, flood warnings, and flood proofing.

Ring dikes

We are interested in the feasibility of ring dikes around urban areas, discussed in the original scoping document. Ring dikes should impose few adverse impacts to fish and wildlife if combined with setback levees and substantial increases in flood plain storage, although some wetlands could be impacted. Ring dikes in the urban areas would be a less damaging alternative to new or upgraded levees providing flood protection for rural areas. Ring dikes would not preclude restoration measures in the future.

Flood bypass

The flood bypass alternative has the potential to cause adverse effects to natural resources in Padilla Bay. Padilla Bay has one of the largest eelgrass beds on the West Coast of the United States–over 7,000 acres–constituting a resource of national importance. The eelgrass provides habitat and forage for juvenile salmonids and other fish, crabs, migratory waterfowl, and shorebirds. These animals are prey, in turn, to larger species of fish and wildlife, including peregrine falcons and bald eagles.

A bypass project could provide some benefit to fish if it incorporated year-around flows to marine waters and was designed with large scale wetland restoration and opening up of dendritic channels. However, potential impacts may far outweigh any benefit. Potential adverse impacts would include the following: 1) a bypass channel could allow silt to bury areas of eelgrass with the potential disruption of an entire ecosystem. Silt carried into the bay from flood events could continue to affect the eelgrass long after the original siltation occurred through resuspension by currents; 2) eelgrass may be adversely affected by reduced salinity that comes from inputs of freshwater; 3) a bypass channel could act as a flume to flush juvenile salmonids out to marine waters prematurely, before they have had a chance to acclimate to salt water, 4) alteration or damage of eelgrass habitat could directly or indirectly affect numerous species listed under the

Act, including Puget Sound chinook, Coastal Puget Sound bull trout, marbled murrelet, and the bald eagle; and 5) the bypass could result in instability of the channel or of flows, which could result in fish stranding.

If a bypass included year-around flows, it could have adverse impacts on in stream flows. The Department of Ecology recently proposed a rule providing minimum in stream flows that would ensure estuarine function for salmonids. Any bypass measure would need to be evaluated for impacts to in stream flows and salmonid habitat.

Evaluation methods would need to be carefully developed to weigh the potential benefits and impacts of such an option. The bypass option was dropped from detailed consideration during reconnaissance because of economic and environmental concerns. The concept was never included during scoping. As the bypass alternative has recently been brought forth by the Skagit Flood Risk Management Workgroup, it appears that more attention will be given to this alternative. If the Corps decides to seriously consider a bypass alternative, the project should be rescoped to allow adequate development of studies necessary to properly evaluate the impacts of a bypass.

In order to be acceptable to resource advocates, we believe the bypass option would need to be developed as a large scale estuarine restoration. If the Corps decides to seriously consider this option, it should contract with an independent party known for expertise in eelgrass and estuarine ecology. This approach could be very costly to develop and implement.

We have other general concerns about the bypass option, including: 1) a bypass would leave little incentive to breach dikes or do levee setbacks, actions which would benefit fish and wildlife by restoring flood plain processes; 2) a bypass could result in further development and encroachment of the flood plain, since the flooding problem "would be solved." If a bypass alternative made further development of the flood plain more feasible, it would be contrary to the intent of Executive Order 11988, which prohibits federal agencies from participating in projects that encourage development in the flood plain; 3) the bypass would increase conveyance, but do nothing to increase flood plain storage, thus doing little to help restore natural processes; and 4) some kind of structural mechanism would need to be installed at the inlet of the bypass to ensure year around flows and stability of the inlet..

Overtopping levees

We have concerns about any alternative that relies upon overtopping segments of existing levees because of the potential to increase stranding of adult and juvenile fish. It is difficult to model the numbers of fish that might be stranded due to overtopping segments. Any estimate of the potential loss of fish in planning compensatory mitigation for this measure, therefore, would need to assume a worst case scenario and would necessarily be conservative. Compensatory mitigation to offset potential impacts under this alternative could be very costly.

Upgrading existing levees

Upgrading existing levees is likely to preclude future restoration, and therefore we would not support this measure at this point in the planning process. Once a levee is upgraded using federal funds, it becomes part of the federal management of levees. This investment in existing levees would make future proposals such as setbacks, dike breaching, or reconnecting off channel habitat unlikely to be carried forward. Upgrading existing levees does nothing to restore flood plain function or natural processes that create and sustain habitat conditions. In addition, upgrading existing levees would remove vegetation that has become established with time and that provides much-needed habitat for fish and wildlife.

New levees

We oppose building any new levees that would increase channelization of the river. The concept of building a new, overtopping levee in the Nookachamps area was introduced in recent meetings of the Skagit Flood Risk Management Workgroup. This option would add yet another constriction to a river system that has already lost much of its flood plain function to levees. Frequent flood events are important for fish in terms of habitat creation. Building any new levees, even though they would be overtopped by higher flood events, would further reduce flood plain function and processes that create and sustain habitat. New levees would have a potential to impact wetlands and riparian areas. Should the concept of the Nookachamps levee be carried further, the project would need to be rescoped to allow input for studies to evaluate impacts of this alternative.

We appreciate the opportunity to provide comments at this point in the process of developing an array of alternatives for flood hazard reduction and habitat restoration on the Skagit River. We look forward to continued cooperation with your staff in planning of this project. This planning aid letter is being provided under the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661, et seq.), but is not intended to fulfill Section 2(b) of this Act. If you have any questions concerning this letter, please contact Lou Ellyn Jones at 360-753-5822 or Lynn Childers at (360) 753-5831.

Sincerely,

Lynn P. Childers

for Gerry A. Jackson, Manager
Western Washington Office

cc: EPA, Seattle
NMFS, Lacey (Zillges)
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REFERENCES

Skagit System Cooperative. 1998. Juvenile salmonid use of natural and hydro modified stream bank habitat in the mainstem Skagit River, northwest Washington. A report LaConner, WA.

Skagit Watershed Council. 1998. Habitat Restoration and Protection Strategy, accepted by the Council May 13, 1998.

U.S. Army Corps of Engineers, Seattle District. 1997. Skagit Fisheries Investigation Feasibility Study. Department of the Army.

US Fish and Wildlife Service, Western Washington Office. 1997. Planning Aid Report for the Skagit River Flood Damage Reduction Study. Department of the Interior.

U.S. Fish and Wildlife Service, Western Washington Office. 1998a. Seasonal fish densities near river banks treated with various stabilization methods. Department of the Interior. Lacey, Washington.

US Fish and Wildlife Service, Western Washington Office. 1998b. The importance of estuarine habitats to anadromous salmonids of the Pacific Northwest: a literature review. Department of Interior. Lacey, Washington.

Washington State Department of Fish and Wildlife. 1994. 1992 Washington State Salmon and Steelhead Stock Inventory, North Puget Sound. Olympia, WA.

Washington State Department of Fish and Wildlife. 1998. 1998 Washington State Salmon and Steelhead Stock Inventory, Bull Trout and Dolly Varden. Olympia, WA.

Wasserman, L. Skagit System Cooperative. Personal communication by telephone. June 26, 2000 and October 5, 2000.

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August 12, 1997

Colonel James M. Rigsby
District Engineer
Seattle District, U.S. Army Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124
Attention: Mike Scuderi, Environmental Resources Section

Re: Skagit River Flood Damage Reduction Study
FWS Ref: 1-3-97-SP-0314

Dear Colonel Rigsby:

The enclosed planning aid report is provided to assist you in the reconnaissance level study of the Skagit River Flood Damage Reduction Study. The following comments and recommendations are based on information obtained at several meetings with your representatives, other state and federal resource agencies, and tribes. This planning aid report is being provided under the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661, *et seq.*), but is not intended to fulfill Section 2(b) of this Act.

We look forward to continued cooperation with your staff in the planning of this project if it continues into feasibility planning. If you have any questions concerning our report, please contact Tim Romanski at (360) 753-5823 or Lynn Childers at (360) 753-5831.

Sincerely

David C. Frederick
Supervisor

tvr/jmc
Enclosure
c: EPA, Seattle (Steve Roy)
NMFS, Lacey (Dennis Carlson)
WDFW, Region 4 (Kurt Buchanan)
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SKAGIT RIVER FLOOD DAMAGE REDUCTION

RECONNAISSANCE STUDY

PLANNING AID REPORT

Prepared For

U.S. Army Corps of Engineers, Seattle District

By

Tim Romanski
U.S. Fish and Wildlife Service
North Pacific Coast Ecoregion
Western Washington Office
Lacey, Washington

August 1997

The U. S. Army Corps of Engineers (Corps), in cooperation with Skagit County (local sponsor), have undertaken a reconnaissance level study for the Skagit River under the authority of the Puget Sound and Adjacent Waters Comprehensive Water and Related Land Resource Study from the Flood Control Act of 1962, Public Law 87-874, Section 209. This planning aid report provides a preliminary reconnaissance level description of the fish and wildlife resources of the Skagit River basin study area and of potential project related impacts to those resources. It also provides recommendations to assist the Corps in avoiding or mitigating potentially adverse impacts. This report has been prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended, 16 U.S.C. et. seq.), the Endangered Species Act, as amended, and other authorities mandating Department of the Interior concerns for environmental values. This report is not intended to fulfill Section 2(b) of the Fish and Wildlife Coordination Act.

The purpose of the reconnaissance study is to comprehensively examine multiple alternatives for flood damage reduction for further feasibility studies. The Corps, U.S. Fish and Wildlife Service (Service), National Marine Fishery Service (NMFS), Washington Department of Fish and Wildlife (WDFW), U.S. Environmental Protection Agency (EPA), Skagit System Cooperative, and members of the public initially identified roughly eight flood damage reduction alternatives. Further refinement of these alternatives has resulted in one alternative being selected for further analysis.

This report is organized to provide general and project-specific information. The project has been described as a comprehensive study covering the lower river basin; however, a broader description of the river and its adjacent environment and resource inventory is also included in the planning aid report. Should this project advance to the feasibility study phase, the Service will work with the Corps to develop a scope of work that will cover our participation in that phase as well as the preparation of the Fish and Wildlife Coordination Act report.

PROJECT LOCATION AND DESCRIPTION

To describe the lower Skagit valley in the context of floods and flood damage reduction, the lower Samish River must also be included. Before dikes and levees were constructed in either basin, Skagit River floodwaters frequently mixed with floodwaters of the Samish River. Most of the study area is now diked, the earliest being constructed in the 1860's. Organized diking districts were formed in the late 1890's (Corps 1979). The reconnaissance study area described by the Corps includes the lower basin and valley from south of the mouth of the South Fork of the Skagit at the dike road dividing the Skagit valley from Stanwood, north along Skagit Bay, Padilla Bay to Samish Bay and the mouth of the Samish River, up the Samish River to Interstate 5, and up the Skagit River to the Highway 9 bridge near Sedro Woolley.

The lower Skagit valley is a moderately broad, flat floodplain composed of rich soils. Agriculture is the primary land use in the lower valley. Major crops include flower bulbs, vegetables, seeds, berries,

and wheat. Dairy farms are another agricultural-related land use associated with the Skagit River valley. Over 100,000 acres are farmed county-wide (Corps, 1979). About 60,000 acres are located in the floodplain of the study area, not counting an additional 14,000 floodplain acres in common with the Samish River (Corps, 1979). Several cities and towns are also located in the floodplain. They include LaConner, Conway, Mount Vernon, Burlington, Sedro Woolley, Avon, Allen, and, to the north of the Samish River, Edison. High ground in the lower valley is occupied by the towns of Bow Hill, Bayview Ridge, Pleasant Ridge, Burlington Hill, and Sterling Hill. Mount Vernon abuts higher ground to the east and southeast which forms the left bank edge of the Skagit valley.

From Highway 9 near Sedro Woolley, the Skagit River flows west toward Burlington, then continues southward. Just downstream of Mount Vernon the river branches into its major distributaries, the north and south forks. In the absence of flood control structures, the lower Skagit River would naturally braid into numerous channels and meander across the lower valley. The north fork flows southwest to Skagit Bay to a point south of LaConner. The south fork flows almost due south, but further divides into increasingly smaller distributaries that include Freshwater Slough, Steamboat Slough, and Tom Moore Slough.

The principal project alternatives have been reduced to one preferred alternative. This alternative includes ring dikes around the urban areas of Mount Vernon and Burlington, accompanied by a series up to six overflow weirs from Hart Island Slough to Fir Island. The ring dikes would provide 100 year flood protection to the urban areas, and the overflow weirs would extend 25 year to 50 year protection to the rural and agricultural areas. The precise locations of these features will not be known until the feasibility study, but the general description is as follows:

The Burlington dike would leave the Skagit River near Sterling bend and stretch northerly to Sterling Hill, then to Burlington Hill, then west to I-5. From there it turns south to the elementary school, then west to about Pulver Road, then south to the Skagit River, and then upstream to the point of origin.

The Mount Vernon dike would begin near the Burlington Northern Railroad bridge and extend west along the river to the city limits, then south to Riverbend Road, then downstream along the river through town to the sewage treatment plant, then south along Britt Slough to Blackburn Road, and then east to high ground.

The overflow weirs could potentially be located near Hart Island Slough, downstream of the Mount Vernon dike, downstream of the Burlington dike, near Memorial Highway, near the mouth of Britt Slough, and near the 1990 break at the Fir Island dike. An overflow weir at River Bend is also being considered, but is likely to be discounted because of water storage problems. Unspecified additional levee improvement work would also be a part of this project alternative. We understand these sites are preliminary and are described for reconnaissance study and evaluation purposes only.

FISH AND WILDLIFE RESOURCES IN THE SKAGIT RIVER BASIN

The Skagit River is the largest drainage in Puget Sound, contributing approximately one-third of the Sound's freshwater inflow. The river drains flat lowlands and foothills in the western end of Skagit County and mountainous areas in the eastern half of the county including peaks of six and seven thousand feet in elevation. The mainstem Skagit is 162 miles in length, including the 35 miles it extends into Canada. The portion of the watershed that lies in Washington is approximately 3,093 square miles, with an additional 400 square miles in Canada (USGS, 1991). Average annual runoff exceeds 11.7 million acre-feet per year with an average discharge of 16,220 cubic feet per second at Sedro Woolley. The river drains Skagit County and part of Whatcom and Snohomish Counties as well as a portion of southern British Columbia.

The Skagit has a very slight gradient, averaging less than one tenth of one percent, from its mouth to Gorge powerhouse at Newhalem. The Newhalem stream gage near River Mile 93 is at elevation 393 feet above mean sea level at average stream flow. Most of the land in the study area and the entire valley floor have been converted from its natural condition. The principal land uses are agriculture with numerous dairy farms in the lower valley, rural residential development, small towns, and limited forestry. The stream banks of the lower river are either naturally sharp earth cuts through sandy silt soil, artificially contoured, or riprapped dikes. A significant proportion of the streambank has been armored with riprap. The stream bed downstream of Highway 9 likewise consists of sand and silt with limited gravel deposits. Riparian cover is intermittent, consisting primarily of dense stands of deciduous trees and underbrush. The most common streamside vegetative feature is grass covered levees.

Utilization of the lower mainstem by anadromous fish is primarily for upstream and downstream migration and juvenile rearing (Williams, 1975). No significant spawning by adult salmonids occurs in the mainstem downstream of the Highway 9 bridge near Sedro Woolley. The frequency of occurrence of gravel bars increases upstream of Sedro Woolley, and especially upstream of Lyman. Mainstem spawner densities also increase as one progresses upstream. Fish production in the mainstem is limited by the lack of stream channel complexity, the presence of riprap, the clearing and maintenance of streambanks, channelization, sedimentation, and channel shifting. The last of these limiting factors is the only one resulting almost exclusively from natural processes. All the others are caused by or exacerbated by human development. According to information provided by the Skagit System Cooperative, flood protection measures have caused the greatest loss of juvenile salmon rearing habitat, because these measures have effectively isolated the river from much of the floodplain (Wasserman, pers. comm.). The Skagit System Cooperative also found that the juvenile standing crop was reduced 90 percent for coho and 50 percent for all salmonids along diked and protected banks of the mainstem Skagit when compared to natural streambanks along the mainstem.

AQUATIC RESOURCES

The fisheries resources of the Skagit River evolved with the basin's hydrologic cycle much as it exists today, with large seasonal flow variations, from drought to flood. This flow regime is modified somewhat by development and the operation of five major hydroelectric developments; three on the mainstem Skagit and two on the Baker River. Two of the projects, one each on the Skagit and Baker, are storage projects. These projects alter the time water is released from late spring and summer to the winter season, for the purpose of generating power. The change in land use, from old growth forests and a low average rate of change in landscape features to agriculture, farm forestry, residential, and urban development with their relatively rapid changes to landscape features, is significant. The rates of change commonly exceed the rates of stabilization processes that typically accompany change. These accelerated rates of change have influenced important stream channel modifications, especially in tributaries, which in turn, have modified fisheries habitat. Channel complexity has been reduced. Large woody debris has been removed, reducing the frequency of pools and the quantity and quality of juvenile salmon habitat. Levees have been built decreasing the channel width, reducing the width of meanders, and denying the river access to its floodplain.

Biologists have identified six characteristics of viable anadromous fish habitat. They can be summarized by the following:

* Access to and from the sea,
* An adequate supply of good quality water,
* Suitable gravel for spawning,
* Food,
* Depth, and
* Sufficient shelter.

These are features generally abundant in the Skagit River as a whole, but specifically lacking in the sections of the Skagit River system being considered in this analysis. Access to spawning and rearing habitat is generally excellent except possibly at extreme low flows at some tributary locations. Access to the Baker River is compromised by the presence of two of the Skagit dams. The water quality is described by the Washington State Department of Ecology (WDOE) as AA, its highest rating. Occasional floods scour incubating eggs from the gravel and prematurely drive juvenile salmonids to the sea when shelter is lacking. Low summer flows limit juvenile rearing habitat in tributaries but not the mainstem. Spawning gravel is abundant throughout most of the basin, but is least common in the lower mainstem, and much of that available gravel is tidally influenced. Food is usually not limiting for juvenile salmonid production, but when it is absent, production in the glacially influenced tributaries may be negatively affected. Shelter provided by overhanging vegetation, deep water, and large woody debris is also lacking in the lower Skagit.

Hydrologists and stream geomorphologists indicate that changes in land use, intensive logging, and increased road building in the watershed contribute to increased frequency of occurrence of lower

and higher stream discharges. These variables adversely influence the delicate dynamics of the habitat components and fish reproduction in the Skagit River basin.

The Skagit River system supports major populations of anadromous fish, including five Pacific salmon species, trout, char, and sturgeon. The salmonid species include spring and summer/fall chinook salmon *(Oncorhynchus tshawytscha)*, coho salmon *(O. kisutch)*, pink salmon *(O. gorbuscha)*, chum salmon (*O. keta*), sockeye salmon *(O. nerka)*, steelhead trout (*O. mykiss*), cutthroat trout *(O. clarki)*, Dolly Varden char *(Salvelinus malma)*, and bull trout *(S. confluentus)*. The other anadromous species is white sturgeon (*Acipenser transmontanus*). The river system provides spawning, rearing, and migration habitat for the respective life stages of these species in the study area and throughout the accessible reaches of the basin. Most of these migratory fisheries resources are the result of self-sustaining natural production. Hatchery fish culture does augment the production of spring and summer chinook, coho, and steelhead. Large populations of pink and chum salmon are the result of natural production in the basin. Multi- year sums for several species from this basin are summarized in the following table:

Skagit River Salmon Production[1]

Spring Chinook	21,124
Summer/Fall Chinook	160,520
Coho	304,331
Pink	6,374,651
Chum even years odd years	1,240,645 405,948
Steelhead	93,802

(Source: Washington State Department of Fish and Wildlife run reconstruction data 1985-1995)

The chinook salmon are considered locally to occur as two discreet races or stocks; spring and summer/fall, corresponding to their season of freshwater entry as adults. Spring chinook enter the Skagit River system in peak numbers in the months of May and June. They ascend the mainstem, dispersing to spawn in the upper Cascade River, the upper Sauk River, and the tributaries of the Suiattle River. Spawning occurs from late July through early September. This stock is now cultured in small numbers at the state hatchery at Clark Creek near Marblemount. Egg incubation lasts through the fall and winter, with juvenile emergence beginning as early as January, but probably not peaking until March. The young fish rear in freshwater for a few months or as much as a year. Most of the smolts emigrate over a protracted spring out-migration, from March to July peaking in May.

The summer/fall chinook begin entering the river in late June, with the peak of the run in the last week of July and first week of August. Fish continue to enter through autumn. The peak period of spawning is in September. Spawning occurs in the mainstem from Lyman upstream to Newhalem, the middle and lower Sauk River, the Cascade River, and a number of the major tributary streams. This stock of fish is also cultured at the Clark Creek hatchery. Peak emergence of the summer/fall chinook is in March, and most of the juveniles undergo smoltification and out-migration in their first spring as sub-yearlings. Juvenile emergence occurs earlier at the hatcheries because of warmer thermal regimes, but the out-migration usually coincides with that of the naturally produced fish.

Significant numbers of coho salmon enter the river from late August through November, with the peak of the run coming in October. Coho spawn in all accessible tributaries, and peak spawning usually occurs in December. Coho are also cultured at the state and tribal fish facilities. Peak emergence of naturally spawned coho is in April, with the juveniles rearing throughout the river basin for one year prior to emigrating as yearling smolts in their second spring. The peak month for the coho out-migration is May.

Pink salmon return to the Skagit River in odd numbered years only, beginning their upstream migration in mid-August and lasting into October. Spawning usually begins by mid-September and is completed by late October. Pinks spawn in the mainstem from Lyman to Newhalem, the Sauk, the Cascade, and nearly all tributaries except the Baker. Juvenile emergence peaks in March and April. Young pink salmon are smolts at emergence, and immediately begin their downstream migration. Very few pink salmon are cultured in the Skagit basin.

Chum salmon enter the river in large numbers from October through December. Peak spawning is in December. Most spawning occurs in the mainstem, side channels and sloughs in the upper river upstream of Rockport. Significant numbers also spawn in the Sauk and Cascade Rivers. Juvenile emergence and out-migration occur in March through May. Like the pink salmon, juvenile chum do not rear very long in freshwater. Most of the chum salmon production is the result of natural production; few chums are cultured in the Skagit River.

A depressed, but rapidly recovering sockeye salmon run returns to the Skagit River each year at mid-summer to spawn in specially developed beaches in the Baker River system. This population appears to have been adversely affected at the smolt out-migration stage by the development and operation of hydroelectric facilities on the Baker River. The power company, state, federal, and tribal fisheries agencies are attempting to restore the sockeye population to viability. Juvenile sockeye are usually lake rearing obligates, and they rear in Baker Lake for one year before emigrating in their second spring. Most of the production results from natural rearing, however, some sockeye smolts are artificially reared each year as a part of the restoration program.

Four stocks of steelhead occur in the Skagit River basin. Hatchery winter run steelhead enter the system primarily December through February, peaking either in December or January. Spawning usually occurs in January through March in the vicinity of release sites or collection facilities. Native winter run steelhead begin entering in January and the run extends through March. The native fish spawning is well distributed in the mainstem, all major tributaries except the Baker, and most minor

tributaries from mid-March until early June, peaking in mid-May. A small run of summer steelhead also occurs in the Skagit River, consisting of hatchery and some native fish. They may enter as early as May and trickle in through September or October, but most enter between June and August. Summer steelhead may be found anywhere in the accessible basin, but are most common in the upper mainstem, the upper Cascade, the upper Sauk, and selected tributaries. The summer run fish are believed to spawn in February and March in these upper headwaters and tributaries. Juvenile steelhead emerge from the gravel in June through August and rear throughout the basin for two and sometimes three years, before smolting. Most steelhead smolts emigrate from mid-April through May.

Sea-run cutthroat may run in the Skagit River over so broad a period as to seem resident; however, the main spawning run occurs from August through October. The fish are well dispersed in the mainstem up through the middle reach and its tributaries. Cutthroat spawning peaks in February or March, with the juveniles emerging in the late spring. Juvenile cutthroat, like steelhead, rear in freshwater for two or three years before migrating to saltwater in the spring. Dolly Varden/bull trout, commonly referred to as native char, are quite abundant in the Skagit River system. They can be found in the river throughout the year, but the principle adult migration is in the late summer and early fall. Dolly Varden spawn in the upper accessible reaches of the major tributaries from September through November. Like steelhead and sea run cutthroat, juvenile Dolly Varden rear two or three years in freshwater prior to smoltification. The juvenile out-migration occurs in the spring.

All the Pacific salmon species die after spawning. The trout and char may survive, returning to marine waters and executing a subsequent spawning run. Post spawning steelhead kelts may return to salt water shortly after spawning, but cutthroat and Dolly Varden typically overwinter in freshwater and return to saltwater the following spring, often feeding on out-migrating pink and chum salmon smolts along the way.

Other migratory fish utilizing the Skagit basin include the white sturgeon (*Acipenser transmontanus*) and the Pacific lamprey (*Lampetra tridnetata*). Information on these species and their numbers is limited. Sturgeon are sparsely distributed, and probably utilize only the lower river. They spawn in the spring and early summer, favoring sandy substrate for their spring spawning rather than the gravel that predominates further upstream. Lamprey were once found in all rivers where salmon and steelhead migrated. They enter freshwater in May through September and spawn in March through April. Population declines have been attributed to the loss of habitat and the erection of dams.

Several resident fish species are also common to the Skagit River basin. The mainstem and various reaches of the forks and tributaries support resident rainbow and cutthroat trout, whitefish, sculpins, large-scale suckers, peamouth, and dace.

The Samish River also produces important populations of anadromous fish. A major run of fall chinook salmon is supported by the state salmon hatchery on Friday Creek. Natural production of coho and chum salmon in this basin account for about 18,000 and 2,500, respectively, each year. Steelhead, primarily a hatchery supported winter run, and cutthroat trout are also present in the Samish.

TERRESTRIAL RESOURCES

The project study area traverses predominately agricultural lands interrupted by several towns and rural communities as well as scattered rural residences, occurring singly and in clusters. Limited deciduous forest cover is found along the river within the study area, scattered between Mount Vernon and Sedro Woolley, and along the lower forks. Most wildlife species typical of the region are found in or near the study area. Mammals found in the area include game species such as blacktail deer, as well as fur bearers including beaver, mink, muskrat, raccoon and river otters. Deer may be expected wherever forest browse and cover are nearby. The furbearing species occur throughout the study area. Rabbits and rodents are likewise common throughout the study area. Coyotes are abundant, and red foxes may be found at some locations.

Numerous bird species are present, either as seasonal migratory species or year round residents. Several raptor species occur in the Skagit valley, including the federally threatened bald eagle and the federally endangered peregrine falcon. Wintering bald eagles use the area heavily, feeding on spawned-out salmon carcasses along gravel bars of the Skagit River, with the upper river outside the study area receiving the greatest bald eagle utilization. Other common raptors are red-tailed hawks, northern harriers, kestrels, ospreys, great horned owls, and barn owls. Snowy owls can be winter visitors to the Skagit valley. A large number of passerine species are present in the study area, most of them seasonally. Waterfowl are more common to lakes, ponds, and marine waters, but they are important species in the study area as well. Trumpeter and tundra swans, Canada goose, snow goose, mallard, widgeon, teal, and other ducks occur there, often utilizing flooded cropland. The common merganser, great blue heron, and dipper are common year round residents. The belted kingfisher is found along all river reaches in the study area. Ruffed grouse are common to all deciduous forest areas, and introduced ring-necked pheasant occur near shrub and brushy cover, particularly near the wildlife management area on the south fork of the Skagit River.

SITE SPECIFIC FISH AND WILDLIFE RESOURCES

All earlier described fish species migrate through the project area. The Mount Vernon and Burlington urban areas would not be expected to support extensive wildlife populations, although deer, raccoons, and other wildlife tolerant of human encroachment are sighted fairly often. Terrestrial habitat is limited to urban backyards, agricultural land recently converted to commercial and residential developments, and cultivated agricultural cropland. Wetlands exist within urban boundaries and could potentially be impacted by the proposed ring dikes. Passerines, wading birds, waterfowl, raptors, beaver, mink, and otter probably utilize the non- urban areas. The remainder of the alignment is on agricultural or recently converted farmland and probably supports some limited populations of small rodents and other mammals.

POTENTIAL IMPACTS TO FISH AND WILDLIFE RESOURCES

There is insufficient information about the project to gauge the net impact to fisheries at this time. Floods are usually negatively correlated to subsequent brood returns of salmonids. Upstream migrations are inhibited by very high flows, and overbank flooding causes some adult fish to migrate out of the river channel and onto the floodplain where they may become stranded when floodwaters recede. Off-channel storage behind levees creates refuges for juvenile fish from flood forces, but those same areas may subsequently strand those fish when flood waters recede. With insufficient access to off-channel refuge, juvenile fish could be flushed out to marine water during floods. Most of the young fish are presumed to perish, since the majority are not saltwater tolerant when winter floods occur. Overflow weirs created to allow for uniform flooding of agricultural lands to reduce the risk of flooding in more populated areas could facilitate the stranding of adult and juvenile fish. Until this is more closely studied, the Corps needs to consider the potential negative effects of constructing these overflow weirs.

Additional levee construction immediately adjacent to the river bank may have the most potential to adversely impact fish. Placing new riprap over existing riprap will likely eliminate any vegetation that was able to colonize the existing riprap between the time it was first placed and the present. Although these vegetated sections of riprap are not ideal habitat features, they can be significant in the absence of other more preferred habitats. Juvenile fish utilization of mainstem habitat is severely reduced in areas modified by flood protection measures such as levees and riprap (Knudsen and Dilley 1987). Strong flows created by confining the river within armored levees create a hostile environment for juvenile salmonids. Poorly sized riprap with few interstices provide virtually no habitat for fish as they attempt to avoid strong currents. Strategically placed large boulders at the toe of the levee or revetment would provide an opportunity for fish to escape currents during bank full or near bank full conditions. This would exclude riprap located in the tidally influenced portion of the Skagit River, where predators, other than large salmonids, commonly prey on juvenile salmonids. In these areas, riprap with few interstices is preferred to reduce predation. In summary, any modifications to the existing riprap banks or natural banks are likely to have an incremental, adverse effect on the quality and quantity of the existing habitats. Proper measures to avoid, minimize, and mitigate for these anticipated impacts need to be taken into consideration during future planning efforts.

The urban ring dikes of the preferred alternative should impose few, if any, adverse impacts to fish and wildlife populations, although based on current information we do anticipate that some wetlands will be impacted. Potential, unavoidable impacts to all wetlands can be addressed, in detail, during the feasibility study and a comprehensive mitigation plan can be developed for the project at that time. Modifications to existing levees may further reduce already low aquatic habitat utilization by some species. Opportunities may exist to improve habitat features of levees by incorporating large woody debris, rock groins, large boulders, or vegetation during construction. The urban areas currently provide minimal wildlife habitat. Vegetated areas used by wildlife for foraging may be lost due to structural features of the ring dikes.

The overflow weirs associated with the preferred project alternative may have a greater potential impact on fish and wildlife habitat than the ring dikes, even though the weirs will likely be located along streambanks that are already modified. The overflow weirs would have a substantially larger footprint than existing levees, and could displace existing aquatic and terrestrial habitats. Modifying levees to function as overflow weirs may further reduce the value of aquatic habitat for fish and wildlife. Wildlife foraging habitat and cover may also be lost to structural features of the overflow weirs.

ASSESSMENT OF THE NEED TO QUANTIFY IMPACTS TO ANADROMOUS FISH

To determine the project-specific impacts, an assessment of the fish resources within the project area is needed. The Service does not recommend relying solely on existing literature and previous studies to predict fish losses. These have little site-specific information and are likely to unknowingly either underestimate or overestimate the impacts of the proposed project to important fish species. In addition, without project-specific, statistically significant data showing fish use of various habitats, it would be difficult to justify and defend the need for mitigation.

The need for project-specific fish studies and appropriate sampling methods was discussed and refined during several meetings between the Service, Corps, Skagit System Cooperative, WDFW, NMFS, and U.S. EPA. The methodology that was determined to best fit the needs of the group and fit within known time constraints is a sampling method discussed in Hayman et. al. (1996) and successfully employed by the Skagit System Cooperative on the Skagit River. The objective of employing this method would be to quantify potential habitat losses as a result of project implementation. The same methodology could also be used to assess the benefits of creating mitigation features including: setback levees, backwater areas, riparian areas, large boulders, and large woody debris.

Although a multi-year study would provide more reliable information, it was the decision of the group to conduct the sampling within a year, trying to encompass a spring that had high pink salmon numbers. The species that would be sampled include chinook, chum, pink, and coho salmon, and rainbow trout. Several habitat types were also identified: natural bank, bars, backwaters, old riprap, and new riprap. The Service also considers it critical to develop a method to estimate losses of fish due to stranding behind levees following levee breaks and overtoppings. The group did agree that a consultant could be used to determine the amount of fish loss due to overtopping and levee breaks. The Service would like to be involved in the development of a scope of work for this effort.

As mentioned earlier, the Service would be reluctant to concur with estimates of fish losses that were developed by using existing literature only. This methodology is likely to produce the least reliable numbers. If such a method were selected for other than biological reasons, the Service would need a binding agreement that would assure an adequate level of mitigation would be budgeted for and implemented concurrently with other elements of the project. Mitigation needs could be determined during the feasibility study phase with the assistance of all the resource agencies.

THREATENED AND ENDANGERED SPECIES

The proposed project is in the normal range of wintering bald eagles. Bald eagles are listed by the federal government as a threatened species in the state of Washington. The Skagit River is known to provide significant habitat to the second largest concentration of wintering bald eagles in the lower forty-eight states, because of important runs of spawning salmon, whose spent carcasses provide a ready source of food. The river corridor contains suitable perch trees and gravel bars for resting and foraging, while nearby coniferous forest stands provide night roosts. There are active nest sites along the river and elsewhere in the basin as well. Nesting peregrine falcons occur near the project area, and foraging by wintering falcons from January through March has been reported within the project area (Bud Anderson, Falcon Research Group, pers. comm.). The federally listed as threatened marbled murrelet (*Brachyramphus marmoratus marmoratus)* and candidate spotted frog (*Rana pretiosa*) also occurs in the Skagit River basin.

Enclosed is a list of federally listed threatened and endangered species, candidate species, and species of concern (Attachment A) that may be present within the vicinity of the proposed Skagit River Flood Damage Reduction Project Between Sedro Woolly and the mouth of the Skagit River in Skagit County, Washington. The list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act of 1973, as amended (Act). We have also enclosed a copy of the requirements for Corps compliance under the Act (Attachment B).

Should the Biological Assessment (BA) determine that a listed species is likely to be affected (adversely or beneficially) by a project, the Corps should request section 7 consultation through this office. If the BA determines that a proposed action is "not likely to adversely affect" a listed species, the Corps should request Service concurrence with that determination through the informal consultation process. Even if the BA shows a "no effect" situation, we would appreciate receiving a copy for our information.

Candidate species and species of concern may occur in the vicinity of the project as well. Candidate species are those species for which the Service has sufficient information to support a proposal for listing as threatened or endangered under the Act. Species of concern (many were formerly known as Category 1 and Category 2 candidates) are those species whose conservation standing is of concern to the Service, but for which further status information is still needed. Conservation measures for candidate species and species of concern are voluntary, but recommended. Protection provided to these species now may preclude possible listing in the future.

There may be other federally listed species that may occur in the vicinity of your project which are under the jurisdiction of the NMFS. Please contact the NMFS at (503) 230-5400 to request a species list.

RECOMMENDATIONS FOR STUDIES AND PROJECT DESIGN

The following are the Service's preliminary recommendations to avoid or mitigate potential adverse impacts to fish and wildlife resources. They are based on reconnaissance level information about the project alternatives and meetings between the Corps, EPA, WDOE, WDFW, and the Skagit Cooperative. If the proposed project is modified during the feasibility phase, the Service may change its recommendations or make entirely new recommendations.

The Corps, in cooperation with the local project sponsor, tribes, and resource agencies, should:

1. Inventory fish and wildlife habitats of all areas that could be affected by the project. Utilize aerial photos to quantify and characterize terrestrial and riparian habitats that may be affected by the proposed project. Ground-truthing may be required to assess habitat quality. Wetland delineation should be conducted to determine the extent of wetlands in the project area.

2. Include quantitative and qualitative assessments of aquatic and terrestrial species and their associated habitats as they relate to the project area, especially an assessment of fish losses due to modifications of instream habitats, the stranding of fish following overbank flows, and the removal of large, mature trees that could be utilized as perches.

3. Develop a fish and wildlife mitigation and monitoring plan in cooperation with the Service, EPA, NMFS, Tribes, and state resource agencies. A monitoring and remediation plan should also be developed to determine the success of revegetation efforts (especially on erodible surfaces), aquatic habitat mitigation features, and mitigation features implemented to prevent or reduce stranding of adult and juvenile salmonids

4. Utilize setback levees where feasible. Setback levees are preferred, because they facilitate the natural processes that usually enhance, rather than degrade, habitat features.

5. Efforts should be made to protect and enhance wetlands that may occur along or adjacent to proposed levee or overflow weir alignments.

6. Minimize disturbance to existing vegetation, especially riparian areas that provide shading and refuge during high flows. Revegetate disturbed areas where vegetation is removed or destroyed by construction activities. Plantings of indigenous grasses, shrubs, and trees are recommended. Revegetation efforts should occur in the first planting season following the disturbance. Construction equipment should be staged to avoid vegetation and wetlands.

7. Coordinate the construction season with Service, NMFS, Tribes, WDFW, and state and local regulatory agencies to ensure protection of migrating salmonids.

8. Avoid expansion of levees riverward of the existing levees.

9. Rock groins, large boulders, and large woody debris should be incorporated into any proposal to place riprap. These provide foundation material for bank armor and mitigate for lost fish habitat. Groins may be extended at selected locations to surface elevations of flows up to about 18,000 cfs (slightly above the mean flow of 16,000 CFS) and vegetated to offset habitat loss due to levee construction.

10. Investigate opportunities to restore the floodplain by using setback levees or restoring freshwater flows to diked off sloughs, such as Dry Slough on Fir Island. Potential mitigation measures that should be considered if this project goes forward include: setback levees, mini-setback levees, restoring cut-off sloughs, culvert improvements, placement of large woody debris, restoration of riparian habitats, and modification of levee vegetation standards to allow for more natural overhanging vegetation.

11. Conduct additional studies to address impacts if the Corps investigates the use of levees to protect the towns of Clear Lake and Beaver Lake.

12. Develop levee vegetation maintenance standards that allow for the retention of valuable woody riparian vegetation and encourage the planting of selected plant species to create additional habitat as well as to prevent erosion

13. Consider overbuilding sections of levees landward to allow for development of large woody vegetation riverward that would not normally be allowed to grow on most PL 84-99 levees.

14. Complete consultation under the Endangered Species Act.

REFERENCES

Anderson, B. 1993. Personal communication with Steve Fransen of the U.S. Fish and Wildlife Service, Western Washington Office, Lacey, WA.

Hayman, R. A., E. M. Beamer, and R. E. McClure. 1996. FY 1995 Skagit River chinook restoration research, final project performance report. Skagit System Cooperative. In compliance with NWIFC Contract #3311 for 1995.

U.S. Army Corps of Engineers, Seattle District. 1979. Skagit River, Washington. General Design Memorandum, Levee Improvements. Department of the Army.

U.S. Geological Survey, 1991. Water Supply Bulletin.

Wasserman, L. 1993. Personal communication with Steve Fransen of the U.S. Fish and Wildlife Service, Western Washington Office, Lacey, WA.

Williams, R.W., R. M. Laramie, and J. J. Ames. 1975. A Catalog of Washington Streams and Salmon Utilization, Volume 1. Washington Department of Fisheries.

ATTACHMENT A

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, CANDIDATE SPECIES AND SPECIES OF CONCERN WHICH MAY OCCUR WITHIN THE VICINITY OF THE PROPOSED SKAGIT RIVER FLOOD DAMAGE REDUCTION PROJECT IN SKAGIT COUNTY, WASHINGTON

FWS REF: 1-3-97-SP-0314

LISTED

Bald eagle *(Haliaeetus leucocephalus)* - wintering bald eagles may occur in the vicinity of the project from about October 31 through March 31.

There are 17 bald eagle nesting territories located in the vicinity of the project. Nesting activities occur from about January 1 through August 15. Several nests may be associated with a territory. The following locations are of known nests and territories of bald eagles found in the project area: T33N R03E Sec. 5 & 8(one), T33N R02E Sec. 12(one), T34N R03E Sec. 9(one), T34N R03E Sec. 4(one), T32N R03E Sec. 17(one), T33N R03E Sec. 13(one), T32N R06E Sec. 6(one), T33N R03E Sec. 9(one), T32N R03E Sec. 17(one), T33N R04E Sec. 30 & T33N R03E Sec. 25(one), T34N R04E Sec. 10(one), T32N R03E Sec. 16 & 21(one), T34N R04E Sec. 6(one), T35N R04E Sec. 25(one), T34N R04E Sec. 3(one), T34N R03E Sec. 10(one), and T33N R02E Sec. 36(one).

Peregrine falcon (*Falco peregrinus*) - spring and fall migrant falcons and nesting falcons may occur in the project area.

Marbled murrelet (*Brachyramphus marmoratus marmoratus*) may occur in the project area.

Major concerns that should be addressed in your biological assessment of project impacts to listed species are:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas and falcon foraging, roosting, nesting, and dispersal habitat in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) which may result in disturbance to listed species and/or their avoidance of the area.

ATTACHMENT A (Continued)

CANDIDATE

The following candidate species may occur in the vicinity of the project:

Spotted frog (*Rana pretiosa*)

SPECIES OF CONCERN

The following species of concern may occur in the vicinity of the project:

Long-eared myotis (*Myotis evotis*)
Bull trout *(Salvelinus confluentus)*
Long-legged myotis (*Myotis volans*)
Fringed myotis (*Myotis thysanodes*)
Pacific Townsend's big eared bat (*Corynorhinus townsendii townsendii*)
Olive sided flycatcher (*Contopus borealis*)
Bull Trout (*Salvelinus confluentus*)
Pacific lamprey *(Lampetra tridentata)*
River lamprey *(Lampetra ayresi)*

ATTACHMENT B

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7(a) AND 7(c) OF THE ENDANGERED SPECIES ACT OF 1973, AS AMENDED

SECTION 7(a) - Consultation/Conference

Requires:

1. Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2. Consultation with FWS when a federal action may affect a listed endangered or threatened species to ensure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the federal agency after it has determined if its action may affect (adversely or beneficially) a listed species; and

3. Conference with FWS when a federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or an adverse modification of proposed critical habitat.

SECTION 7(c) - Biological Assessment for Construction Projects *

Requires federal agencies or their designees to prepare a Biological Assessment (BA) for construction projects only. The purpose of the BA is to identify any proposed and/or listed species which is/are likely to be affected by a construction project. The process is initiated by a federal agency in requesting a list of proposed and listed threatened and endangered species (list attached). The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the species list, please verify the accuracy of the list with our Service. No irreversible commitment of resources is to be made during the BA process which would result in violation of the requirements under Section 7(a) of the Act. Planning, design, and administrative actions may be taken; however, no construction may begin.

To complete the BA, your agency or its designee should: (1) conduct an onsite inspection of the area to be affected by the proposal, which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or potential reintroduction of the species; (2) review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; (3) interview experts including those within the FWS, National Marine Fisheries Service, state conservation department, universities, and others who may have data not yet published in scientific literature; (4) review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; (5) analyze alternative actions that may provide conservation measures; and (6) prepare a report documenting the results, including a discussion of study methods used, any problems encountered, and other relevant information. Upon completion, the report should be forwarded to our Endangered Species Division, 510 Desmond Drive SE, Suite 102, Lacey, WA 98503-1273.

*

"Construction project" means any major federal action which significantly affects the quality of the human environment (requiring an EIS), designed primarily to result in the building or erection of human-made structures such as dams, buildings, roads, pipelines, channels, and the like. This includes federal action such as permits, grants, licenses, or other forms of federal authorization or approval which may result in construction.

3) Endangered Species Act Consultation (pending)

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