

# **REVIEW PLAN**

**Skagit River Basin Flood Risk Management General Investigation  
Skagit River Basin, Skagit County, Washington**

**Feasibility Report**

**Seattle District**

**Major Subordinate Command Approval Date: January 31, 2012**

**Last District Revision Date: January 4, 2011**



**US Army Corps  
of Engineers®**  
Seattle District

**REVIEW PLAN**

*Skagit River, Skagit County, Washington  
General Investigation*

**TABLE OF CONTENTS**

1. **PURPOSE AND REQUIREMENTS**..... 1  
2. **STUDY INFORMATION**..... 1  
3. **DISTRICT QUALITY CONTROL**..... 5  
4. **AGENCY TECHNICAL REVIEW**..... 5  
5. **INDEPENDENT EXTERNAL PEER REVIEW**..... 8  
6. **MODEL CERTIFICATION AND APPROVAL**..... 11  
8. **REVIEW SCHEDULES AND COSTS** ..... 14  
9. **PUBLIC PARTICIPATION**..... 15  
10. **PLANNING CENTER OF EXPERTISE COORDINATION**..... 16  
11. **MAJOR SUBORDINATE COMMAND (MSC) APPROVAL** ..... 16  
12. **REVIEW PLAN POINTS OF CONTACT** ..... 16  
**ATTACHMENT 1: GLOSSARY** ..... 17  
**ATTACHMENT 3: REVIEW PLAN REVISIONS**..... 21

**TABLES**

Table 1. Project Delivery Team Roster ..... 4  
Table 2. Agency Technical Review Team Roster ..... 7  
Table 3. Type 1 Independent External Peer Review Panel Members ..... 11  
Table 4. ATR Schedule ..... 14  
Table 5. Type 1 IEPR Schedule ..... 15  
Table 6. Model Certification/Approval Schedule..... 15

## 1. PURPOSE AND REQUIREMENTS

**a. Purpose.** This Review Plan (RP) defines the scope and level of review for the Skagit River Basin Flood Risk Management General Investigation, Skagit County, Washington.

### b. References

- (1) Engineering Circular (EC) 1165-2-209, Civil Works Review Policy, 31 Jan 2010
- (2) Engineering Regulation (ER) 1105-2-100, Planning Guidance Notebook
- (3) EC 1105-2-412, Assuring Quality of Planning Models, 31 March 2010
- (4) ER 1110-2-12, Quality Management, 30 Sep 2006
- (5) Project Management Plan (PMP) for Feasibility Study of Skagit River, Skagit County, Washington

**c. Requirements.** This RP was developed in accordance with EC 1165-2-209, which establishes the procedures for ensuring the quality and credibility of U.S. Army Corps of Engineers (USACE) decision documents through independent review. The EC outlines three levels of review: District Quality Control (DQC), Agency Technical Review (ATR), and Independent External Peer Review (IEPR). In addition to these three levels of review, decision documents are subject to policy and legal compliance review, real estate gross appraisal review, and, if applicable, model certification/approval. These various elements shall be documented in a RP as part of the Project Management Plan (PMP).

## 2. STUDY INFORMATION

**a. Study/Project Authority.** Section 209, 1962 Flood Control Act (P.L. 87-874).

**b. Decision Document.** The integrated Feasibility Report and Environmental Impact Statement (FR/EIS) for Skagit River, Skagit County, Washington is being undertaken to determine and evaluate alternatives related to flood risk management within the Skagit River floodplain. The integrated FR/EIS will require approval from Major Subordinate Command (MSC), USACE Headquarters (HQUSACE), Chief of Engineers as well as Congressional authorization. The EIS will satisfy all requirements under the National Environmental Policy Act (NEPA).

**c. Study Description.** The Skagit River originates near the 8,000-foot level of the Cascades Mountains in British Columbia, Canada and flows south and then west to the Skagit delta where it discharges through two distributaries – the North Fork and South Fork – to Skagit Bay. The Skagit River basin is located in northwest Washington State and has a total drainage area of 3,115 square miles. The project area for the feasibility study encompasses the Skagit River watershed from Ross Dam reservoir to Skagit Bay. The Skagit River floodplain contains about 22,000 acres east (upstream) of Sedro-Woolley (RM 22.4) and 74,000 acres west (downstream) of Sedro-Woolley. The major cities on the Skagit River delta – Mount Vernon, Burlington, Sedro-Woolley, and La Conner – lie about 60 miles north of Seattle, Washington.

Major flooding has occurred in the Skagit River Basin. Because of its geographic location, the Skagit River Basin is subject to winter rain floods and an increase in discharge during spring due to snowmelt runoff. Rain-type floods usually occur in November or December, but may occur as early as October or as late as February. Additionally, a light snow pack is frequently formed over most of the basin. Heavy rainfall and accompanying snowmelt result in a high rate of runoff, as the ground is already nearly saturated from earlier precipitation. Two or more crests may be experienced within a period of one to two weeks as a series of storms move across the basin from the west. The winter floods have a considerably higher magnitude than the average annual spring high water.

Flood damages have been reduced in recent years with a well-maintained local levee and dike system on the Lower Skagit River, and a well organized and effective flood fighting effort.

The purpose of the feasibility study is to formulate and recommend a comprehensive flood risk management plan for the Skagit River floodplain that will reduce flood hazards and damages in the urban and rural parts of the basin. The total estimated cost of the proposed project is \$49,300,000 (October 1993 price level. Source: Skagit River, Washington, Flood Damage Reduction Study, Draft Reconnaissance Report, May 1993).

The non-federal sponsor for this study is Skagit County, Washington.

- d. Factors Affecting the Scope and Level of Review.** The Project Delivery Team (PDT) made a risk informed decision that Agency Technical Review (ATR) is necessary for all major deliverables for this project. Furthermore, the team determined that Type I Independent External Peer Review (IEPR) and Safety Assurance Review will be required. These risk informed decisions regarding ATR and IEPR were guided by criteria presented in EC 1165-2-209, Section 15, Risk Informed Decisions on Appropriate Reviews. Below are identified aspects of the project that will affect the scope and level of review:

General:

- The feasibility phase of the Skagit River GI warrants a Type I IEPR, as the project has significant interagency interest, is very controversial, has significant economic, environmental, and social effects, and requires an EIS.

Challenges and controversies:

- This study will include data and models that are controversial and have significant interagency interest.
  - The technical results of the Corps' hydrologic and hydraulic studies have been challenged by various basin cities and their consultants.
  - The Corps will be utilizing the levee failure analysis which employs fairly new methods and modeling. This analysis will become less controversial after completion of ATR and/or IEPR.
- Local governments and members of the agricultural community want full protection of agricultural lands from becoming urbanized.

- The Skagit River supports a number of ESA listed species, and the potential environmental impacts of recommended projects are of great concern to three Native American Tribal Nations in the basin.

Risk-related factors and significant effects:

- Past floods have been determined by the Corps to be events that have a 3.3% or greater chance of occurring any year. It is expected that flood fighting, which is utilized to protect against flooding, will not be able to stop larger hydrologic events and there is potential for devastating flooding throughout the valley.
- The District Chief of Engineering has determined a significant threat to human life exists in the study area. Based on 2010 census data, the largest population centers in the study area are the cities of Mount Vernon (30,745), Burlington (6,757), and Sedro-Woolley (8,658). Total Skagit County population is estimated to be 113,859. In the without project condition, floods that occur less than 2% in any give year can flood a regionally significant hospital, sewage treatment facilities, a water treatment facility, and other emergency facilities; major arterials and evacuation routes are closed; and downtown Burlington and Mount Vernon are flooded, impacting businesses, industry and residences.
- The recommended plan for the Skagit Basin is likely to contain structural solutions that leave urban areas with a residual flooding risk for events greater than those anticipated to occur at a 1% chance in any give year or less and with limited protection to rural areas.

Interagency involvement:

- Significant interagency involvement is anticipated including project participation from:
  - Federal Emergency Management Agency (FEMA)
  - U.S. Geological Survey (USGS)
  - U.S. Fish and Wildlife Service (USFWS)
  - National Marine Fisheries Service (NMFS)
  - Department of Energy (DOE)
  - Washington State Department of Transportation (WSDOT)
  - Upper Skagit, Swinomish, Samish, and Sauk-Suiattle Tribal Nations
  - Puget Sound Energy
  - Seattle Public Utilities

**e. In-Kind Contributions.** The local sponsor for this project is Skagit County. In-kind activities, costs, and products may include, but are not limited to:

- Project management related activities and support (i.e. participating in meetings; coordination and planning activities; reports and documentation; review and management of project scope, schedule, budget, and risks; ongoing negotiations and revisions related to the study; project status and in-kind reporting)
- Development of project goals and objectives
- Identification of existing reports and information
- Identification of data gaps and approach to addressing those gaps
- Data and information collection and analysis

REVIEW PLAN  
Skagit River GI

- Modeling design, implementation, and analysis
- Feasibility plan formulation including identification of alternatives
- Development of project documents or reports
- Review of project documents or reports
- Participation in Corps Quality Control reviews and other review processes as appropriate
- Participation in or support for Alternative Formulation Briefing activities
- Real estate activities and costs
- Assistance in engineering analysis and design
- Assistance with cost estimates
- Development of monitoring and evaluation plan and adaptive management plan
- Environmental compliance support including, but not limited to, Hazardous Toxic Radioactive Waste (HTRW), socio/economics, environmental studies, and cultural resources
- Coordination with stakeholders
- Communication and public involvement activities
- Development of Project Partnership Agreement (PPA) and revised PMP

The above list will be updated as specific in-kind activities, costs, and products are identified. All in-kind products that comprise a portion of the decision document or its supporting documents will receive DQC, ATR and IEPR review as appropriate.

- f. **Project Delivery Team (PDT).** The PDT is presented in Table 1. The project manager is the main point of contact at the Seattle District for more information about this project and the RP; Dan Johnson, [Daniel.E.Johnson@usace.army.mil](mailto:Daniel.E.Johnson@usace.army.mil), 206-764-3423.

Table 1. Project Delivery Team Roster

<u>Discipline</u>	<u>Name</u>	<u>Organization</u>
Project Manager	Daniel Johnson	PM-CM-CJ
Lead Planner	Linda Smith	PM-PL-PF
Planner	Margaret Chang	PM-PL-PF
Economist	Charyl Barrow	PM-PL
Assistant Economist	Scott Long	PM-PL-PF
Environmental Coordinator	Hannah Hadley	PM-PL-ER
Cultural Resource Specialist	Danielle Storey	PM-PL-ER
Fish Biologist	Chuck Ebel	PM-PL-ER
Civil Engineer	Rosa Radding	EN-DB-CS
Structural Engineer	Tracey Snyder	EN-DB-SE
Mechanical Engineer	TBD	
Hydraulic Engineer	Douglas Knapp	EN-HH-HE
Hydraulic Engineer	Karl Eriksen	EN-HH-HE
HTRW	TBD	

Real Estate	Kevin Kane	RE-RS
Geotechnical	Travis Goss	EN-GB-SS
Public Affairs	Scott Lawrence	PA
Cost Engineering	TBD	EN-ES-CE
Office of Counsel	Francis Eugenio	OC
Project Manager (Non-Fed sponsor)	Lorna Ellestad	Skagit County

### 3. DISTRICT QUALITY CONTROL (DQC)

- a. **General. District Quality Control (DQC)** for decision documents covered by EC 1165-2-209 is managed by the home district in accordance with MSC guidance and the district Quality Management Plan. All draft products and deliverables will be reviewed within the district as they are developed by the PDT to ensure they meet project and customer objectives, comply with regulatory and engineering guidance, and meet customer expectations of quality. Work products will be forwarded to the appropriate Branch Chiefs of disciplines directly involved with the development of the document. The Branch Chiefs will determine the most appropriate person to carry out the review of the document.
- b. **Products for Review.** All work products and reports, evaluations, and assessments shall undergo necessary and appropriate DQC, including National Environmental Policy Act (NEPA) documents, other environmental compliance products, and any in-kind services provided by the local sponsor. Additionally, the PDT is responsible for a complete reading of the report to assure the overall integrity of the report, technical appendices, and the recommendations before approval by the District Commander.
- c. **Documentation of DQC.** DrChecks<sup>sm</sup> review software will be used to document all DQC comments, responses, and associated resolutions accomplished throughout the review process. Relevant DQC records will be reviewed during each ATR event and the ATR team will provide comments as to the adequacy of the DQC effort for the associated product.

### 4. AGENCY TECHNICAL REVIEW

- a. **General.** Agency Technical Review (ATR) for decision documents covered by EC 1165-2-209 is managed by the Flood Risk Management Planning Center of Expertise (FRM-PCX) and conducted by a team of reviewers from outside the home district. The ATR team shall be from outside the home MSC. The ATR shall ensure that the product is consistent with established criteria, guidance, procedures, and policy. The ATR will assess whether the analyses presented are technically correct and comply with published USACE guidance, and that the document explains the analyses and the results in a reasonably clear manner for the public and decision makers. Products will be reviewed against published guidance, including ER's, EC's, manuals, engineering technical letters, and bulletins.
- b. **Products for Review.** Products estimated for ATR include, but are not limited to: Feasibility Scoping Meeting documentation; Alternative Formulation Briefing (AFB) documentation including 10% design appendix; Draft and Final NEPA and other environmental compliance documentation, including appendices; draft and final FR/EIS

including 35% design appendix; and other interim key technical products such as necessary hydrology, surveys, investigations, economic and environmental inventories. ATR of the environmental without project conditions report has been completed. The without project condition economics report had previously undergone ATR, but will be reviewed again based on updated economic data. The without project condition hydrology and hydraulics report will undergo ATR.

**c. Required ATR Team Expertise.**

The current ATR plan is to include at least 14 reviewers from outside the district (Table 2). This number is based on the following disciplines required to develop the draft and final FR/EIS. The ATR team leader will be from outside the home MSC. ATR reviewers shall be selected by the RMO (Division or PCX), as appropriate. ATR team candidates may be nominated by the home district.

The Skagit River Basin encompasses a variety of land uses ranging from national forest lands, agriculture, light industry, electricity generation and moderately developed urban areas. The study will involve complex analysis of flood patterns, environmental impacts, and economic analysis and will require a team of experts in the following disciplines with expertise in flood risk management in the Pacific Northwest. It is recommended that reviewers should have a minimum of 5 years of experience working in the field of flood risk management in their respective discipline, and be a GS 12 or GS 13.

- Plan Formulation: Experience with Flood Risk Management studies, General Investigation requirements (feasibility), feasibility reports, experience with Planning ERs and ECs, and IWR Planning Suite.
- Environmental/NEPA: Knowledge of Northwest biology, specifically knowledge of salmonid species (spawning, rearing, freshwater migration), wetlands, riparian habitats, knowledge of riverine systems. Familiarity with Standardized Assessment Methodology, Washington State Wetland Function Assessment. Expert in compliance with the environmental laws, policies, and regulations, including compliance in NEPA, Fish and Wildlife Coordination Act, Endangered Species Act, etc., required for Feasibility level water-resource studies.
- Cultural Resources: Knowledge of Northwest tribal cultures and archaeology
- Hydrologist or Hydraulic: Knowledge of HEC models, northwest hydrology and specialized expertise in hydrology on complex systems.
- Hydraulics: Specialized experience in river engineering, sediment transport and hydraulic modeling. Knowledge of HEC models, northwest hydraulics and hydrology, familiarity with rivers with water control structures and dredging projects. (Note Hydrologist and Hydraulics technical disciplines may be filled by 1 ATR member if they are senior in both specialties and have the required expertise for both technical areas)
- Geotechnical: Knowledge of levee fragility curve analysis, drilling requirements, design and construction of levees.
- Civil: Familiarity with levee design, construction, flood proofing, relocations.
- Structural: Familiarity with dam structures for flood risk management, knowledge of design and construction of bridges, specifically railroad systems.

REVIEW PLAN  
Skagit River GI

- Mechanical: Familiarity with mechanical structures used for flood risk management including but not limited to pumps, floodgates, and hydraulic devices.
- Electrical: Familiarity with electrical systems needed for mechanical structures used for flood risk management and relocation electrical lines.
- Geomorphology: Strong knowledge of riverine sediment transport and levee construction.
- Economics: Expertise in economic analysis for flood risk management, specifically with acceptable methodologies for estimating damages, and set-up and use of HEC-FDA v1.2.5. Familiarity with the IWR Planning Suite.
- Cost Estimating: MCASES experience. Experience costing levee construction, dredging, flood risk management structures, non-structural measures.
- Real Estate: Experience developing real estate requirements for levee construction, relocations.
- Risk Analysis: Strong familiarity with USACE risk analysis policies as defined in ER 1105-2-101, EM 1110-2-1619, and related guidance. General understanding of the inputs and application of risk analysis across the fields of hydrology, hydraulics, geotechnical engineering, and economics. Knowledge of the appropriate use of risk and uncertainty language in planning decision documents to effectively convey overall flood risks to the public and decision makers.

Other disciplines may be involved in the project including, Hazardous/Toxic/Radioactive Waste.

Table 2. Agency Technical Review Team Roster\*

<u>Discipline</u>	<u>Name</u>	<u>Office/Agency</u>	<u>Years Experience</u>
Review Team Lead	TBD		
Planning	TBD		
Environmental Coordinator	TBD		
Cultural Resources	TBD		
Civil/Soils Engineer	TBD		
Structural Engineer	TBD		
Hydraulic Engineer	TBD		
Hydrology Engineer/Hydrologist	TBD		
Mechanical Engineer	TBD		
Electrical Engineer	TBD		
Geomorphology	TBD		
Environmental Engineer	TBD		
Geotechnical Engineer	TBD		
Cost Engineering	TBD		
Real Estate Specialist	TBD		
Economist	TBD		
Risk Analysis	TBD		

\*Note: Some Technical Disciplines listed may not be required for every ATR, an assessment will be made prior to each ATR for which disciplines are needed and coordinated with the RMO

- d. Documentation of ATR.** DrChecks<sup>sm</sup> review software will be used to document all ATR comments, responses and associated resolutions accomplished throughout the review process. Comments should be limited to those that are required to ensure adequacy of the product. The ATR team leader will prepare a Review Report which includes a summary of each unresolved issue; each unresolved issue will be raised to the vertical team for resolution.

ATR may be certified when all ATR concerns are either resolved or referred to USACE Headquarters (HQUSACE) for resolution and the ATR documentation is complete. Certification of ATR should be completed, based on work reviewed to date, for the Feasibility Scoping Meeting (FSM), Alternative Formulation Briefing (AFB) (including 10% design appendix), draft report, and final report (including 35% design appendix).

## 5. INDEPENDENT EXTERNAL PEER REVIEW

- a. General.** Type I IEPR is conducted for decision documents if there is a vertical team decision (involving the district, MSC, PCX, and HQUSACE members) that the covered subject matter meets certain criteria (described in EC 1165-2-209) where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside the USACE is warranted. Type I IEPR is conducted by nationally recognized technical experts outside of the Corps of Engineers. Type I IEPR is coordinated by the appropriate PCX and managed by an Outside Eligible Organization (OEO) external to the USACE. The scope of the review will address all underlying planning and engineering, including safety assurance, economics, and environmental analyses performed, not just one aspect of the project. Type I IEPR will be conducted on the draft FR/EIS. Type I IEPR is 100% federal cost and limited to \$500,000. Additional costs associated with Type I IEPR are cost shared.

A Safety Assurance Review is typically conducted on implementation documents related to design and construction activities for hurricane and storm risk management and flood risk management projects as well as other projects where potential hazards pose a significant threat to human life. As stated in Section 2d. Risk-related factors and significant effects, the District Engineer has determined that a significant threat to human life exists in the study area. The Type II IEPR panel will review the design and construction activities prior to initiation of physical construction and periodically thereafter until construction activities are completed. Since design initiates in the decision document phase, a Safety Assurance Review of the selected alternative will be charged to the Type I IEPR panel and is further discussed later in this section.

Type II IEPR will be conducted on design and construction activities after the approval of a decision document. (EC 1165-2-209, Appendix E). The cost for Type II IEPR will be cost shared in accordance with the project purpose and phase. Oversight of Type II IEPR is the responsibility of the MSC, Chief, Business Technical Division. The Reviewing Management Organization (RMO) for Type II reviews is the USACE Risk Management Center.

- b. Decision on IEPR.** The feasibility phase of the Skagit River GI warrants a Type I IEPR, as the project has significant interagency interest, is very controversial, has significant

REVIEW PLAN  
Skagit River GI

economic, environmental, and social effects, and requires an EIS. A Safety Assurance Review will be conducted by the Type I IEPR Panel on the selected alternative.

Type II IEPR will be required during the Preconstruction, Engineering, and Design (PED) phase due to the life safety risks associated with Flood Risk Management. A subsequent Review Plan outlining requirements for Type II IEPR will be developed during the end of the feasibility phase.

The primary focus of the Type I IEPR will be to assess the adequacy and acceptability of the following:

- Economic and environmental assumptions and projections
- Project evaluation data
- Economic analyses
- Environmental analyses
- Formulation of alternative plans
- Methods for integrating risk and uncertainty
- Models used in the evaluation of hydraulic conditions, channel geomorphology, and flooding
- Models used in the evaluation of economic or environmental impacts of the proposed project
- Biological opinions of the project study
- Appropriateness of real estate required for action
- Safety assurance issues (as defined in Appendix D of EC 1165-2-209)

Type I IEPR will also be used to assess the adequacy and acceptability of the entire draft decision document (including NEPA documentation and supporting technical appendices). The District will conduct Issue Resolution Conferences with the Vertical Team to review and resolve complex/controversial issues associated with key interim products prior to completion of the draft decision document.

**c. Safety Assurance Review:** The District will specifically charge the Type I IEPR panel to conduct a Safety Assurance Review for the selected alternative per EC 1165-2-209, Appendix D, paragraph 2.c.(3). Since the design and construction activities will require a Safety Assurance Review as defined in EC 1165-2-209 Appendix E, the Type I IEPR panel will address the following questions for the selected alternative:

- In accordance with ER 1110-2-1150, is the quality and quantity of the surveys, investigations, and engineering sufficient for a concept design?
- Are the models used to assess hazards appropriate?
- Are the assumptions made for the hazards appropriate?
- Does the analysis adequately address the uncertainty given the consequences associated with the potential for loss of life for this type of project?

**d. Products for Type I IEPR Review.** The draft FR/EIS (including documentation and technical appendices) will undergo Type I IEPR during the public review and prior to final approval. The Type I IEPR will use appropriate analytical methods for each technical area. Additional review of key interim products will be determined as the study progresses. Type I

IEPR may be conducted as necessary on any in-kind services provided by the local sponsor. The Type I IEPR panel will also conduct a Safety Assurance Review on the selected alternative resulting from the draft FR/EIS.

**e. Required Type I IEPR Panel Expertise.**

Type I IEPR reviewers will be selected by the RMO, contractor, or Outside Eligible Organization, as appropriate. The Type I IEPR panel candidates may be nominated by the District. The Skagit River Basin encompasses a variety of land uses ranging from national forest lands, agriculture, light industry, electricity generation and moderately developed urban areas. The study will involve complex analysis of flood patterns, environmental impacts, and economic analysis and will require a team of experts with expertise in flood risk management in the Pacific Northwest in the following disciplines listed below. (Table 3) Additional technical areas requiring Type I IEPR may be identified during the study/review process.

Required IEPR Panel Expertise.

- Planning: Experience with Flood Risk Management studies, General Investigation requirements (feasibility), feasibility reports, experience with Planning ERs and ECs, and IWR Planning Suite.
- Environmental/NEPA: Knowledge of Northwest biology, specifically knowledge of salmonid species (spawning, rearing, freshwater migration), wetlands, riparian habitats, knowledge of riverine systems. Familiarity with Standardized Assessment Methodology and Washington State Wetland Function Assessment. Expert in compliance with the environmental laws, policies, and regulations, including compliance in NEPA, Fish and Wildlife Coordination Act, Endangered Species Act, etc., required for Feasibility level water-resource studies.
- Civil: Familiarity with levee design, construction, flood proofing, relocations.
- Structural: Familiarity with dam structures for flood risk management, knowledge of design and construction of bridges, specifically railroad systems.
- Mechanical: Familiarity with mechanical structures used for flood risk management including but not limited to pumps, floodgates, and hydraulic devices.
- Electrical: Familiarity with electrical systems needed for mechanical structures used for flood risk management and relocation electrical lines.
- Hydrologist or Hydraulic: Knowledge of HEC models, northwest hydrology and specialized expertise in hydrology on complex systems.
- Hydraulics: Specialized experience in river engineering, sediment transport and hydraulic modeling. Knowledge of HEC models, northwest hydraulics and hydrology, familiarity with rivers with water control structures and dredging projects. (Note Hydrologist and Hydraulics technical disciplines may be filled by 1 ATR member if they are senior in both specialties and have the required expertise for both technical areas)
- Economics: Expertise in economic analysis for flood risk management, specifically with acceptable methodologies for estimating damages, and set-up and use of HEC-FDA v1.2.5. Familiarity with the IWR Planning Suite.
- Geomorphology: Strong knowledge of riverine sediment transport.

Table 3. Type I Independent External Peer Review Panel Members

<u>Discipline</u>	<u>Name</u>	<u>Office/Agency</u>	<u>Years Experience</u>
Planning	TBD		
Environmental	TBD		
Civil Engineering	TBD		
Structural Engineering	TBD		
Mechanical Engineering	TBD		
Electrical Engineering	TBD		
H&H	TBD		
Economics	TBD		
Geomorphology	TBD		

- f. **Documentation of Type I IEPR.** The Type I IEPR panel will submit a final review report containing the panel’s economic, engineering, and environmental analysis of the study; and the Safety Assurance Review of the selected alternative. The report will include the panel’s assessment of the adequacy and acceptability of the methods, models, and analyses used by the Corps. The final review report will be submitted by the Type I IEPR panel no later than 60 days following the close of the public comment period for the draft FR/EIS. Written responses to the Review Report will be prepared to explain the agreement or disagreement with the views expressed in the report, the actions undertaken or to be undertaken in response to the report, and the reasons those actions are believed to satisfy the key concerns stated in the report (if applicable). The district or PCX shall disseminate the final Review Report, USACE response, and all other materials related to the review, and include them in the applicable decision document. The final decision document for the study shall summarize the Review Report and USACE responses. The District may request that DrChecks<sup>sm</sup> review software be used to document all Type I IEPR and Safety Assurance Review comments, responses and associated resolutions accomplished throughout the review process.

## 6. MODEL CERTIFICATION AND APPROVAL

### General.

EC 1105-2-412 mandates the use of certified or approved models for all planning activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. Planning models, for the purposes of the EC, are defined as any models and analytical tools that planners use to define water resources management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives and to support decision making. The use of a certified/approved planning model does not constitute technical review of the planning product. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, and IEPR (if required).

EC 1105-2-412 does not cover engineering models used in planning. The responsible use of well-known and proven USACE developed and commercial engineering software will continue and the professional practice of documenting the application of the software and modeling

REVIEW PLAN  
Skagit River GI

results will be followed. As part of the USACE Scientific and Engineering Technology (SET) Initiative, many engineering models have been identified as preferred or acceptable for use on Corps studies and these models should be used whenever appropriate. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, and IEPR (if required).

- a. **Planning Models.** The following planning models are anticipated to be used in the development of the decision document. For those models that are not certified, the PDT will request careful review of the model during the ATR process for appropriateness of application and will request approval for use in this study.

<b>Model Name and Version</b>	<b>Brief Description of the Model and How It Will Be Applied in the Study</b>	<b>Certification / Approval Status</b>
HEC-FDA 1.2.5 (Flood Damage Analysis)	The Hydrologic Engineering Center's Flood Damage Reduction Analysis (HEC-FDA) program provides the capability for integrated hydrologic engineering and economic analysis for formulating and evaluating flood risk management plans using risk-based analysis methods. The program will be used to evaluate and compare the future without- and with-project plans along the Wild River near River City to aid in the selection of a recommended plan to manage flood risk.	Certified
IWR Planning Suite (v.1.0.11.0)	IWR Planning Suite assists with plan formulation by combining user-defined solutions to planning problems and calculating the effects of each combination, or "plan." The program can assist with plan comparison by conducting cost effectiveness and incremental cost analyses, identifying the plans which are best financial investments and displaying the effects of each on a range of decision variables.	Certified
Standardized Assessment Methodology (SAM)	The SAM has been specifically developed as an assessment tool to ensure adequate habitat loss mitigation and compensation measures are adopted for the focus fish species. The SAM is intended to systematically compare species response to habitat features by bank protection projects.	Needs approval
Washington State Wetland Function Assessment	The wetland assessment is a set of procedures that identify the functions being performed in a wetland, determine how well the wetland is performing those functions, can evaluate wetland impacts, and if wetlands are created, assess how well the wetland is functioning. This assessment incorporated the Hydrogeomorphic Classification system.	Needs approval

**b. Engineering Models.** The following engineering models are anticipated to be used in the development of the decision document:

<b>Model Name and Version</b>	<b>Brief Description of the Model and How It Will Be Applied in the Study</b>	<b>SET Status</b>
HEC-RAS 4.0 (River Analysis System)	The Hydrologic Engineering Center's River Analysis System (HEC-RAS) program provides the capability to perform one-dimensional steady and unsteady flow river hydraulics calculations. The program will be used for steady flow analysis to evaluate the future without- and with-project conditions.	CoP Preferred
HEC-DSS	The Hydrologic Engineering Center's Data Storage System is a database system designed to efficiently store and retrieve scientific data that is typically sequential. Such data types include, but are not limited to, time series data, curve data, spatial-oriented gridded data, and others. The system was designed to make it easy for users and application programs to retrieve and store data. HEC-DSS is incorporated into most of HEC's major application programs.	CoP Preferred
HEC-FFA	The Hydrologic Engineering Center's Flood Frequency Analysis performs frequency computations of annual maximum flood peaks in accordance with the Water Resources Council "Guidelines for Determining Flood Flow Frequency," Bulletin 17B.	Allowed for Use
HEC-geoRAS	The Hydrologic Engineering Center's tool for ArcGIS is used to communicate between HEC-RAS and ArcGIS. Geographic data can be sent from ArcGIS to HEC-RAS, and HEC-RAS results can be sent back to ArcGIS.	CoP Preferred
ArcGIS 9.2	ArcGIS, developed by ESRI, is a geographic management tool that can be used to develop hydraulic models, indicate inundation areas, and store project data.	CoP Preferred
Micro-Computer Aided Cost Estimating System (MCACES, MII)	The second generation of the Micro-Computer Aided Cost Estimating System (MCACES). It is a detail cost estimating program that was developed in conjunction with Project Time & Cost, Inc. (PT&C). MII provides an integrated cost estimating system (software and databases) USACE requirements for preparing cost estimates for project alternatives.	Allowed for Use
CHL SMS with ADH (Surface Water Modeling System with	The USACE Coastal Hydraulic Laboratory's Surface Water Modeling System (SMS) is a comprehensive environment for one-, two-, and three-dimensional hydrodynamic modeling. Adaptive Hydraulics (ADH) is a state-of-the-art modeling system capable of handling sediment transportation.	CHL SMS: CoP Preferred ADH: Allowed for Use (Note: Also using Flo-2D, which is

REVIEW PLAN  
Skagit River GI

Adaptive Hydraulics)		also Allowed for Use)
Bentley Microstation V8 XM	MicroStation V8 XM is used by engineers, architects, GIS professionals, constructors, and owner operators to design, model, visualize, document, map, and sustain infrastructure projects. This will be used to create 10% CAD designs of possible courses of action.	CoP Preferred
Bentley Inroads XM	Bentley Inroads offers an innovative approach to designing civil components in the context of the whole project. Used to model proposed topography and site grading.	CoP Preferred
GeoStudio 2007e	Analysis of levee failure potential for existing without project conditions is based on exploratory borings in the levee and foundation material, levee composition, slope stability, and seepage analysis. Results are provided in a levee fragility curve, presenting failure probability percentages with increasing river stage.	Status Unknown

- c. Software requirements:
  - o ArcGIS. This application facilitates storage and processing of geo-spatial data related to the study. GIS is commonly used by the Corps.

**7. POLICY AND LEGAL COMPLIANCE REVIEW**

- a. **General.** All **decision documents** will be reviewed throughout the study process for their compliance with law and policy by the District Office of Counsel as addressed in Appendix C, EC 1165-209. Guidance for policy and legal compliance reviews is addressed in Appendix H, ER 1105-2-100. These reviews culminate in determinations that the recommendations in the reports and the supporting analyses and coordination comply with law and policy, and warrant approval or further recommendation to higher authority by the Chief of Engineers. DQC and ATR augment and complement the policy review processes by addressing compliance with pertinent published Army policies, particularly policies on analytical methods and the presentation of findings in decision documents.

**8. REVIEW SCHEDULES AND COSTS**

- a. **ATR Schedule and Cost.** The ATR schedule and cost estimate is presented in Table 4.

Table 4. ATR Schedule

<u>Task</u>	<u>Date Completed*</u>	<u>Estimated Cost</u>
ATR of FSM Document 1	2010	N/A
ATR of AFB Documents	July 2013	\$75,000
ATR of 35% Design	January 2015	\$75,000
ATR of final FR/EIS	May 2015	\$75,000
Total:		\$225,000

\* Backcheck of ATR comments completed.

- b. Type I IEPR Schedule and Cost.** The IEPR schedule and cost estimate is presented in Table 5.

Table 5. Type 1 IEPR Schedule

<u>Task</u>	<u>Date Completed*</u>	<u>Estimated Cost</u>
PCX Coordination of Type I IEPR	April 2013	\$25,000
Type I IEPR of draft FR/EIS and Safety Assurance Review of Selected Alternative	June 2013	\$475,000*
Total:		\$500,000

\* Back check of Type I IEPR comments completed.

\*\* Estimated contract for seven (7) reviewers

- c. Model Certification/Approval Schedule and Cost.** The model certification/approval schedule and cost estimate is presented in Table 6.

Table 6. Model Certification/Approval Schedule

<u>Model</u>	<u>Action</u>	<u>Date Completed</u>	<u>Estimated Cost</u>
Stream Assessment Model (SAM)	Approval for use	TBD	TBD
Ecology Rating System for Wetlands	Approval for use	TBD	TBD

All models listed above will undergo rigorous ATR to verify that each model is based on sound engineering and/or ecology principles, is computationally correct, and is consistent with USACE policy.

## 9. PUBLIC PARTICIPATION

The public will be invited to comment directly to the PDT through informal and formal public scoping meetings and public review comment periods programmed into the feasibility schedule. This includes but will not be limited to documents developed for the FSM, AFB, and NEPA documentation. The Draft and Final FR/EIS will be made available for public comment either when the document is submitted to, or is being reviewed by, the Type I IEPR team. A public meeting may be scheduled. Additionally, the public will be provided with the opportunity to nominate reviewers. Public input will be available to the ATR and Type I IEPR teams to ensure public comments have been considered in development of the draft and final FR/EIS.

This RP and the accompanying PMP will be posted to the District web site for public review once it is approved by the MSC. Final ATR and Type I IEPR documents will be posted on District website for public review.

## **10. PLANNING CENTER OF EXPERTISE COORDINATION**

Review plans for decision documents and supporting analyses outlined in EC 1165-2-209 are coordinated with the appropriate Planning Center of Expertise (PCX) based on the primary purpose of the basic decision document to be reviewed.

The lead PCX will also coordinate with the Cost Engineering Directory of Expertise (DX) to conduct ATR of cost estimates, construction schedules and contingencies.

The lead PCX will also coordinate with HEC for ATR of risk and uncertainty.

Lead PCX - Flood Risk Management Planning Center of Expertise:  
<http://www.spd.usace.army.mil/frm-pcx>

## **11. MAJOR SUBORDINATE COMMAND (MSC) APPROVAL**

Northwestern Division is the MSC that oversees the Seattle District, and is responsible for approving the RP. A MSC approval letter is required for each review plan and must be signed by the MSC Commander. The commander's approval should reflect vertical team input (involving district, MSC, PCX, and HQUSACE members) as to the appropriate scope and level of review for the decision document. Like the PMP, the RP is a living document and may change as the study progresses. Changes to the RP should be approved by following the process used for initially approving the plan. In all cases the MSC will review the decision on the level of review and any changes made in updates to the project. A RP for the subsequent project phase (Design and Implementation) will be included with the final decision document submittal.

## **12. REVIEW PLAN POINTS OF CONTACT**

Questions and/or comments on this RP can be directed to the following points of contact:

- Daniel Johnson, Project Manager, Skagit River, WA Feasibility Study, 206-764-3423.
- Valerie Ringold, Northwest Division, 503-808-3984
- Eric Thaut, Program Manager, Flood Risk Management PCX  
(415) 503-6852  
*US Army Corps of Engineers, South Pacific Division*  
*Attn: FRM-PCX Program Manager, CESPDPDS-P*  
*1455 Market Street*  
*San Francisco, CA 94103-1398*

## **ATTACHMENT 1: GLOSSARY**

### **Agency Technical Review (ATR):**

ATR is an in-depth review, managed within USACE, and conducted by a qualified team outside of the home district that is not involved in the day-to-day production of the project/product. The purpose of this review is to ensure the proper application of clearly established criteria, regulations, laws, codes, principles and professional practices. The ATR team reviews the various work products and assures that all the parts fit together in a coherent whole. ATR teams will be comprised of senior USACE personnel (Regional Technical Specialists, etc.), and may be supplemented by outside experts as appropriate. To assure independence, the leader of the ATR team shall be from outside the home Major Subordinate Command (MSC).

### **District Quality Control (DQC):**

DQC is the review of basic science and engineering work products focused on fulfilling the project quality requirements defined in the PMP. It is managed in the home district and may be conducted by staff in the home district as long as they are not doing the work involved in the study, including contracted work that is being reviewed. Basic quality control tools include a Quality Management Plan providing for seamless review, quality checks and reviews, supervisory reviews, Project Delivery Team (PDT) reviews, etc. Additionally, the PDT is responsible for a complete reading of the report to assure the overall integrity of the report, technical appendices and the recommendations before approval by the District Commander.

### **Independent External Peer Review (IEPR):**

IEPR is the most independent level of review, and is applied in cases that meet certain criteria where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside of USACE is warranted. Any work product, report, evaluation, or assessment that undergoes DQC and ATR may also be required to undergo IEPR. IEPR is coordinated by the appropriate Planning Center of Expertise (PCX) and managed by an Outside Eligible Organization (OEO) external to the USACE. The OEO will select panel members using the National Academies of Science (NAS) policy for selecting reviewers. The scope of review will be scalable to the work product being reviewed and will address all underlying planning and engineering, including safety assurance, economics, and environmental analyses performed, not just one aspect of the project. Type I IEPR is generally for decision documents whereas Type II IEPR is generally for implementation documents.

- (i) Type I IEPR is mandatory if any of the following are true: 1) Significant threat to human life; 2) Total estimated project cost is > \$45M; 3) A request is made for independent peer review by a State Governor of an affected state; 4) Chief of Engineers determines that the project study is controversial due to significant public dispute over either the size, nature, or effects of the project or the economic or environmental costs or benefits of the project. If a decision document does not automatically trigger a Type I IEPR, a risk-informed recommendation will be developed. Type I IEPR is discretionary where a request is made by the head of a Federal or state agency charged with reviewing the project study if he/she determines that the project is likely to have significant adverse impacts.

- (ii) Type II IEPR – Safety Assurance Review (SAR). All design and construction activities addressing hurricane and storm risk management; flood risk management; and other projects where existing and potential hazards pose a significant threat to human life are required to undergo SAR. External panels will review the design and construction activities prior to initiation of physical construction and periodically thereafter until construction activities are completed on a regular schedule sufficient to inform the Chief of Engineers on the adequacy, appropriateness, and acceptability of the design and construction activities for the purpose of assuring public health, safety, and welfare.

**Model Certification/Approval:**

EC 1105-2-412 requires certification (for Corps models) or approval (for non-Corps models) of planning models used for all planning activities. The EC defines planning models as any models and analytical tools that planners use to define water resources management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives, and to support decision-making.

**Outside Eligible Organization:**

An organization that:

- (1) is described in section 501(c)(3), and exempt from Federal tax under section 501(a), of the Internal Revenue Code of 1986;
- (2) is independent;
- (3) is free from conflicts of interest;
- (4) does not carry out or advocate for or against Federal water resources projects; and
- (5) has experience in establishing and administering peer review panels.

**Peer Review:**

Peer Review is the process of subjecting research, assumptions, analyses, and conclusions to the scrutiny of others who are experts in the same field. Peer review requires a community of experts in a given (and often narrowly defined) field, who are qualified and able to perform impartial review.

**Policy and Legal Compliance Review:**

Decision documents will be reviewed throughout the study process for their compliance with law and policy. These reviews culminate in determinations that the recommendations in the reports and the supporting analyses and coordination comply with law and policy, and warrant approval or further recommendation to higher authority. Guidance for policy and legal compliance reviews is addressed further in Appendix H, ER 1105-2-100, Planning Guidance Notebook. DQC and ATR will address compliance with pertinent USACE policies. IEPR teams are not expected to be knowledgeable of Army and administration policies, nor are they expected to address such concerns. The home district Office of Counsel is responsible for the legal review of each decision document and signing a certification of legal sufficiency.

**Real Estate Review Certification:**

Real Estate Gross Appraisals are used to support final decision documents or other aspects of project approval, authorization, and funding. These reports are subject to policy compliance

review. Gross appraisal reports must contain an appropriate certification by a qualified review appraiser.

**ATTACHMENT 2: ACRONYMS AND ABBREVIATIONS**

<u>Term</u>	<u>Definition</u>	<u>Term</u>	<u>Definition</u>
AFB	Alternative Formulation Briefing	NED	National Economic Development
ASA(CW)	Assistant Secretary of the Army for Civil Works	NER	National Ecosystem Restoration
ATR	Agency Technical Review	NEPA	National Environmental Policy Act
CWRB	Civil Works Review Board	O&M	Operation and maintenance
DQC	District Quality Control	OMB	Office and Management and Budget
DX	Directory of Expertise	OMRR&R	Operation, Maintenance, Repair, Replacement and Rehabilitation
EA	Environmental Assessment	OEO	Outside Eligible Organization
EC	Engineer Circular	OSE	Other Social Effects
EIS	Environmental Impact Statement	PCX	Planning Center of Expertise
EO	Executive Order	PDT	Project Delivery Team
ER	Ecosystem Restoration	PAC	Post Authorization Change
FEMA	Federal Emergency Management Agency	PMP	Project Management Plan
FRM	Flood Risk Management	PL	Public Law
FSM	Feasibility Scoping Meeting	QMP	Quality Management Plan
GRR	General Reevaluation Report	QA	Quality Assurance
HQUSACE	Headquarters, U.S. Army Corps of Engineers	QC	Quality Control
IEPR	Independent External Peer Review	RED	Regional Economic Development
MSC	Major Subordinate Command	RTS	Regional Technical Specialist
		USACE	U.S. Army Corps of Engineers

**ATTACHMENT 3: REVIEW PLAN REVISIONS**

<b>Revision Date</b>	<b>Description of Change</b>	<b>Page / Paragraph Number</b>
3 August 2011	Reference to EC 1110-2-407 replaced with reference to EC 1110-2-412	Page 1, 1b. References
3 August 2011	The total estimated cost of the proposed project of \$49,300,000 (October 1993 price level. Source: Skagit River, Washington, Flood Damage Reduction Study, Draft Reconnaissance Report, May 1993) has been added to Section 2c. Study Description.	Page 2, Section 2c. Study Description
3 August 2011	Reference to Type II IEPR changed to Type I IEPR	Page 2, Section 2.d. Factors Affecting the Scope and Level of Review
3 August 2011	Text added: “The District Chief of Engineering has determined a significant threat to human life exists in the study area. Based on 2010 census data, the largest population centers in the study area are the cities of Mount Vernon (30,745), Burlington (6,757), and Sedro-Woolley (8,658). Total Skagit County population is estimated to be 113,859. In the without project condition, floods that occur less than 2% in any give year can flood hospitals, sewage treatment facilities, and other emergency facilities; major arterials and evacuation routes are closed; and downtown Burlington and Mount Vernon are flooded, impacting businesses, industry and residences.”	Page 3, Section 2.d Risk-related factors and significant effects
3 August 2011	Use of the term recurrence interval (level of protection) has been removed from text in Section 2d. and the remainder of the review plan. The recurrence interval/level of protection has been restated in terms of X% chance event.	Page 3, Section 2.d Risk-related factors and significant effects
3 August 2011	Mechanical engineering and electrical engineering added to Table 3. Real estate deleted from Table 3.	Page 11, Section 5.e. IEPR
3 August 2011	Engineering Models table updated with current approval/certification status. HEC-FDA deleted from Engineering Models table.	Page 13, Section 6.b. Model Certification and Approval
3 August 2011	PCX coordination cost on Table 5 changed to \$25,000, per comment. IEPR cost changed to \$475,000 and total cost changed to \$500,000.	Page 15, Section 8.b. Review Schedules and Costs, Page 14, Table 5 - Type I IEPR Schedule

3 August 2011	Levee Failure Analysis (Geostudio/Geoslope) software is an approved model and has been removed from Table 6.	Page 15, Section 8.b. Review Schedules and Costs, Page 15, Table 6, Model Certification/Approval Schedule
3 August 2011	Text added to Section 10 “The lead PCX will also coordinate with HEC for ATR of risk and uncertainty.”	Page 16, Section 10 PCX Coordination
21 September 2011	Risk analysis reviewer added to list of required ATR experience.	Page 6, Section 4.c, Required ATR Team Expertise
21 September 2011	HEC-FDA version 1.2.4 updated to version 1.2.5	Page 7, Section 4.c, Required ATR Team Expertise; Page 11, Section 6.a, Planning Models
21 September 2011	Change references to EC 1105-2-407 to EC 1105-2-412.	Page 11, Section 6 Model Certification and Approval
21 September 2011	Added Eric Thaut’s contact information to FRM-PCX contact information.	Page 18, Section 12 Review Plan Points of Contact
21 September 2011	Added Eric Thaut’s contact information to FRM-PCX contact information.	Page 18, Section 12 Review Plan Points of Contact
4, January 2012	Added “Expert in compliance with the environmental laws, policies, and regulations, including compliance in NEPA, Fish and Wildlife Coordination Act, Endangered Species Act, etc., required for Feasibility level water-resource studies.” to the required expertise for the Environmental/NEPA ATR team member	Page 6, Section 4c. Required ATR Team Expertise
4 January 2012	Added “Hydrologist or Hydraulic: Knowledge of HEC models, northwest hydrology and specialized expertise in hydrology on complex systems.	Page 6, Section 4c. Required ATR Team Expertise
4 January 2012	Added “Specialized experience in river engineering, sediment transport and hydraulic modeling.” And “(Note Hydrologist and Hydraulics technical disciplines may be filled by 1 ATR member if they are senior in both specialties and have the required expertise for both technical areas)” to Hydraulics ATR team member description.	Page 6, Section 4c. Required ATR Team Expertise
4 January 2012	Added “Hydrology Engineer/Hydrologist” to Table 2. Agency Technical Review Team Roster	Page 7, Section 4c. Required ATR Team Expertise

4 January 2012	Added “*Note: Some Technical Disciplines listed may not be required for every ATR, an assessment will be made prior to each ATR for which disciplines are needed and coordinated with the RMO” to Table 2. Agency Technical Review Team Roster	Page 7, Section 4c. Required ATR Team Expertise
4 January 2012	Added “Expert in compliance with the environmental laws, policies, and regulations, including compliance in NEPA, Fish and Wildlife Coordination Act, Endangered Species Act, etc., required for Feasibility level water-resource studies.” to description of Environmental/NEPA IEPR team member	Page 11, Section 5e. Required Type I IEPR Panel Expertise
4 January 2012	Deleted reference to H&H team member. Separated the single position into two positions, Hydrology and Hydraulics.	Page 11, Section 5e. Required Type I IEPR Panel Expertise
4 January 2012	Inserted SET status of engineering models listed in 6b. Engineering Models.	Page 15, Section 6b. Engineering Models