

Final Independent External Peer Review Report Mount St. Helens Sediment Management Project Documents for Limited Re-evaluation Report and Supplemental Environmental Impact Statement

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Flood Risk Management Planning Center of Expertise
Baltimore District

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Executive Summary

PROJECT BACKGROUND AND PURPOSE

The purpose of the Mount St. Helens Long-term Sediment Management Limited Re-evaluation Report (LRR) is to update the original plan and identify the least cost approach to manage sediment through 2035 under the existing project authority. The Mount St. Helens Project was authorized under Supplemental Appropriations Act, 1985, Public Law 99-88, with the State of Washington as the non-Federal sponsor. The plan will be updated based on maintaining Congressionally authorized levels of flood risk reduction on the Cowlitz River in a cost-effective and environmentally sound way.

The Mount St. Helens Sediment Management Project (MSH Project) is located in southwest Washington State. The study area encompasses 1,200 square miles in southwest Washington, reaching north from the Columbia River to the headwaters of the Toutle River at Mount St. Helens. The Columbia River flows east to west through a broad trough between the Cascade and Olympic mountain ranges. The Cowlitz River and its principal tributary, the Toutle River, are typical of rivers draining the west slopes of the Cascade Range. The terrain is mountainous and, except for clearcuts and areas devastated by the 1980 eruption, heavily forested.

The Cowlitz River drains an area of 2,480 square miles including the Toutle river drainage area. Below its confluence with the Toutle, the lower 20 miles of the Cowlitz River passes by the cities of Kelso, Longview, Castle Rock, and Lexington, Washington, before entering the Columbia River at river mile 67.8. The lower 20 miles of the Cowlitz River is where sediment from Mount St. Helens deposits and causes significant flood risk to the four communities.

The existing sediment reduction structure (SRS) has been operating as run-of-river since 1998 and as a result is now less efficient at trapping sediment. This was anticipated in the original plan and is a key reason it was recognized that additional actions would be required. The *Mount St. Helens, Washington, Decision Document, Toutle, Cowlitz and Columbia Rivers* (USACE 1985) identified dredging in the Cowlitz River as a means to maintain flood risk reduction levels once the SRS became a run-of-river project, but also provided the option for assessing other long-term alternatives that may be more cost-effective. The conditions in and around the Cowlitz River are different now from what they were in 1985. Endangered Species Act (ESA) issues and a lack of readily available dredge disposal sites make dredging the river difficult and expensive. Consequently, a new analysis was initiated to find the best long-term approach for managing sediment from Mount St. Helens. Since the Mount St. Helens project remains an open construction project, a traditional feasibility study was not completed and the overall project and project benefits were not reformulated.

A LRR and a Supplemental Environmental Impact Statement (SEIS) describe the least-cost analysis and identify a recommended updated long-term sediment management strategy. The goal is to combine measures into alternatives that will result in, with reasonable assurance, the support of the authorized levels of flood risk management benefits which will be maintained throughout the project life.

The following measures were considered:

- modifications to the existing spillway crest of the sediment retention structure
- modifications to the entire SRS, including the embankment and spillway crest
- construction of new grade building structures within the sediment plain
- dredging in the lower 20 miles of the Cowlitz River.

These measures were combined into alternatives and were evaluated in terms of least cost, environmental impact, and public acceptability. The final LRR/SEIS describes the remaining construction actions necessary to complete this project.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The U.S. Army Corps of Engineers (USACE) is conducting an Independent External Peer Review (IEPR) of the Mount St. Helens Sediment Management Project Document for Limited Re-evaluation Report and Supplemental Environmental Impact Statement (hereinafter: Mount St. Helens LRR/SEIS IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, is free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2012). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate the IEPR of the Mount St. Helens LRR/SEIS. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2012) and OMB (2004). This final report presents the Final Panel Comments of the IEPR Panel (the Panel). Details regarding the IEPR (including the process for selecting panel members, the panel members' biographical information and expertise, and the charge submitted to the Panel to guide its review) are presented in appendices.

Based on the technical content of the Mount St. Helens LRR/SEIS review documents and the overall scope of the project, Battelle identified potential candidates for the Panel in the following key technical areas: Civil Works planning/economics, environmental compliance, hydrologic and hydraulic engineering, and geotechnical/civil engineering. Battelle screened the candidates to identify those most closely meeting the selection criteria and evaluated them for COIs and availability. USACE was given the list of final candidates to confirm that they had no COIs, but Battelle made the final selection of the four-person Panel.

The Panel received electronic versions of the Mount St. Helens LRR/SEIS IEPR review documents (751 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2012) and OMB (2004), USACE prepared the charge questions, which were included in the draft and final Work Plans.

The USACE Project Delivery Team briefed the Panel and Battelle during a kick-off meeting held via teleconference prior to the start of the review to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. Other than Battelle-facilitated teleconferences, there was no direct

communication between the Panel and USACE during the peer review process. The Panel produced individual comments in response to the charge questions.

IEPR panel members reviewed the Mount St. Helens LRR/SEIS IEPR documents individually. The panel members then met via teleconference with Battelle to review key technical comments and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of: (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium/high, medium, medium/low, or low); and (4) recommendations on how to resolve the comment. Overall, nine Final Panel Comments were identified and documented. Of these, one was identified as having medium/high significance, five had a medium significance, two had medium/low significance, and one had low significance.

Battelle received public comments from USACE on the Mount St. Helens LRR/SEIS IEPR during the review period (approximately 89 total pages of written comments) and provided them to the IEPR panel members after they completed their review of the documents. The panel members were charged with determining if any information or concerns presented in the public comments raised any additional discipline-specific technical concerns with regard to the Mount St. Helens LRR/SEIS IEPR review documents. After completing their review, the Panel confirmed that no new issues or concerns were identified other than those already covered in their Final Panel Comments. The Panel also determined that adequate stakeholder involvement had occurred.

Results of the Independent External Peer Review

The panel members agreed among themselves on their “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” (USACE, 2012; p. D-4) in the Mount St. Helens LRR/SEIS review documents. The following summarizes the Panel’s findings.

Based on the Panel’s review, the LRR/SEIS is well-written and contains very good graphics to explain the problems and proposed solutions. Overall, the LRR/SEIS and the supporting review documents provide a comprehensive evaluation of a range of project components that can maintain the required level of protection for Cowlitz River communities in the face of uncertain future hydrology, hydraulics, and sediment transport.

Plan Formulation/Economics – There is a tremendous amount of data, analyses, and reports involved in analyzing the problem and potential alternative solutions. The presentation and summary of all the information in the LRR/SEIS are done very well and support the conclusions and recommendations as presented in the LRR/SEIS.

During the review of the alternatives, the Panel noted that 2035 is being used as the end date for the period of analysis based on the original 1985 authorization of the project. This means that the uncertainty surrounding sediment transport in the basin beyond that period has not been addressed. The Panel believes that the physical life of the project is of primary importance when considering the long-term effectiveness and the environmental consequences of the project. Therefore, discussion and evaluation of the alternatives for the period beyond 2035 should be provided for a more complete understanding of the longer term economic and environmental aspects of the alternatives and to support the selection of the recommended plan.

The LRR/SEIS also needs some clarification concerning the justification for screening out levee improvements in Castle Rock and Lexington from further consideration based on induced flooding. During review of the LRR/SEIS the Panel could not locate where the magnitude and/or impacts of the induced flooding are discussed and quantified. Therefore, it is not clear whether the levee improvements in the Castle Rock and Lexington areas would induce significant flooding in the non-leveed reaches compared to the future without-project conditions.

Engineering – The data and analysis presented in the supporting documents are impressive, in particular the engineering analyses and evaluations that went into the LRR/SEIS and supporting documents. The primary area of concern was the lack of clarification regarding potential earthquake risks and residual risks concerning possible loss of life. The Panel believes that the risk associated with extreme earthquake events should be addressed in the development and selection of the recommended plan. It also suggests that additional discussion regarding potential life safety issues under existing, future without-project, or future with-project conditions is necessary given how critical this concern is to the public.

Environmental – The Panel identified no significant environmental issues, however, the Panel noted that information was not provided on life history characteristics, life stages, timing, and habitat used by several of the listed aquatic species that are protected under the Endangered Species Act. Such information, or at least references to the information, should be provided to ensure that impacts on these species are considered as part of the alternative evaluation. Additionally, the public comments highlighted similar concerns on other species and wetland habitat in the area.

Table ES-1. Overview of 9 Final Panel Comments Identified by the Mount St. Helens LRR/SEIS IEPR Panel

No.	Final Panel Comment
Significance – Medium/High	
1	Using 2035 as the end year of analysis in the LRR does not address the uncertainty surrounding sediment transport in the basin for the period beyond 2035 and may affect the economic and environmental results of alternative evaluations.
Significance – Medium	
2	The justification for screening out levee improvements at Castle Rock and Lexington from further consideration based on induced flooding is not supported.
3	Potential earthquake risks are not addressed, qualified, or considered in terms of debris flow effects, levee stability, and potential level of protection.
4	The impacts on species listed under the Endangered Species Act are not described in sufficient detail to support assessment of the consequences of implementing the recommended plan.
5	The residual risks concerning possible loss of life have not been presented in sufficient detail to document how the proposed alternative is appropriate and adequate in terms of life safety.
6	The incremental benefit of Grade Building Structure (GBS) installation after completion of the 23-foot SRS and the uncertainty of long-term GBS performance need to be quantified to support the justification of this component of the recommended plan.
Significance – Medium/Low	
7	The screening criteria used to evaluate performance of the Cowlitz River flushing flows management measure are not described clearly enough to determine why the measure was removed from further consideration.
8	A clear and complete Implementation Strategy for the recommended plan has not been presented.
Significance – Low	
9	The basis for selecting the authorized LOP and the reasons for the differences in the LOPs for the four communities are not provided.

Table of Contents

	Page
Executive Summary	iii
1. INTRODUCTION.....	1
2. PURPOSE OF THE IEPR.....	2
3. METHODS FOR CONDUCTING THE IEPR	2
4. RESULTS OF THE IEPR.....	4
4.1 Summary of Final Panel Comments.....	4
4.2 Final Panel Comments	4
5. REFERENCES.....	18
Appendix A. IEPR Process for the Mount St. Helens LRR/SEIS IEPR Project	
Appendix B. Identification and Selection of IEPR Panel Members for the Mount St. Helens LRR/SEIS Project	
Appendix C. Final Charge to the IEPR Panel as Submitted to USACE on August 29, 2014, for the Mount St. Helens LRR/SEIS IEPR Project	

List of Tables

	Page
Table ES-1. Overview of 9 Final Panel Comments Identified by the Mount St. Helens LRR/SEIS IEPR Panel.....	vii
Table 1. Major Milestones and Deliverables of the Mount St. Helens LRR/SEIS IEPR	3

LIST OF ACRONYMS

AFPM	Association of Flood Plain Managers
ANGTS	Alaska Natural Gas Transportation System
ATR	Agency Technical Review
COI	Conflict of Interest
DrChecks	Design Review and Checking System
EC	Engineer Circular
EIS	Environmental Impact Statement
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
ESA	Endangered Species Act
ELJ	Engineering Log Jam
ESU	Evolutionarily Significant Units
FEDS	Future Expected Deposition Scenario
GBS	Grade Building Structure
GIS	Geographic Information System
H&H	Hydrologic and Hydraulic
IEPR	Independent External Peer Review
LOP	Level of Protection
LRR	Limited Re-evaluation Report
MCACES	Micro-Computer Aided Cost Estimating System
MSH	Mount St. Helens
NEPA	National Environmental Policy Act
O&M	Operation and Maintenance
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
PDT	Project Delivery Team
PMF	Probable Maximum Flood
SAR	Safety Assurance Review
SEIS	Supplemental Environmental Impact Statement
SEPA	State Environmental Policy Act
SRS	Sediment Reduction Structure
USACE	United States Army Corps of Engineers

1. INTRODUCTION

The purpose of the Mount St. Helens Long-term Sediment Management Limited Re-evaluation Report (LRR) is to update the original plan and identify the least-cost approach to manage sediment through 2035 under the existing project authority. The Mount St. Helens Project was authorized under Supplemental Appropriations Act, 1985, Public Law 99-88, with the State of Washington as the non-Federal sponsor. The plan will be updated based on maintaining Congressionally authorized levels of flood risk reduction on the Cowlitz River in a cost-effective and environmentally sound way.

The Mount St. Helens Sediment Management Project (MSH Project) is located in southwest Washington State. The study area encompasses 1,200 square miles in southwest Washington, reaching north from the Columbia River to the headwaters of the Toutle River at Mount St. Helens. The Columbia River flows east to west through a broad trough between the Cascade and Olympic mountain ranges. The Cowlitz River and its principal tributary, the Toutle River, are typical of rivers draining the west slopes of the Cascade Range. The terrain is mountainous and, except for clearcuts and areas devastated by the 1980 eruption, heavily forested.

The Cowlitz River drains an area of 2,480 square miles including the Toutle river drainage area. Below its confluence with the Toutle, the lower 20 miles of the Cowlitz River passes by the cities of Kelso, Longview, Castle Rock, and Lexington, Washington, before entering the Columbia River at river mile 67.8. The lower 20 miles of the Cowlitz River is where sediment from Mount St. Helens deposits and causes significant flood risk to the four communities.

The existing sediment reduction structure (SRS) has been operating as run-of-river since 1998 and as a result is now less efficient at trapping sediment. This was anticipated in the original plan and is a key reason it was recognized that additional actions would be required. The *Mount St. Helens, Washington, Decision Document, Toutle, Cowlitz and Columbia Rivers* (USACE 1985) identified dredging in the Cowlitz River as a means to maintain flood risk reduction levels once the SRS became a run-of-river project, but also provided the option for assessing other long-term alternatives that may be more cost-effective. The conditions in and around the Cowlitz River are different now from what they were in 1985. Endangered Species Act (ESA) issues and a lack of readily available dredge disposal sites make dredging the river difficult and expensive. Consequently, a new analysis was initiated to find the best long-term approach for managing sediment from Mount St. Helens. Since the Mount St. Helens project remains an open construction project, a traditional feasibility study was not completed and the overall project and project benefits were not reformulated.

A LRR and a Supplemental Environmental Impact Statement (SEIS) describe the least-cost analysis and identify a recommended updated long-term sediment management strategy. The goal is to combine measures into alternatives that will result in, with reasonable assurance, the support of the authorized levels of flood risk management benefits, which will be maintained throughout the project life.

The following measures were considered:

- modifications to the existing spillway crest of the sediment retention structure
- modifications to the entire SRS, including the embankment and spillway crest
- construction of new grade building structures within the sediment plain
- dredging in the lower 20 miles of the Cowlitz River.

These measures were combined into alternatives and were evaluated in terms of least cost, environmental impact, and public acceptability. The final LRR/SEIS describes the remaining construction actions necessary to complete this project.

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Mount St. Helens Sediment Management Project Document for Limited Re-evaluation Report and Supplemental Environmental Impact Statement (hereinafter: Mount St. Helens LRR/SEIS IEPR) in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers (USACE), Engineer Circular (EC) *Civil Works Review* (EC 1165-2-214) (USACE 2012) and the Office of Management and Budget (OMB) *Final Information Quality Bulletin for Peer Review* (OMB 2004). Supplemental guidance on evaluation for conflicts of interest (COIs) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies 2003).

This final report presents the Final Panel Comments of the IEPR Panel (the Panel) on the existing engineering, economic, environmental, and plan formulation analyses contained in the Mount St. Helens LRR/SEIS IEPR documents (Section 4). Appendix A describes in detail how the IEPR was planned and conducted. Appendix B provides biographical information on the IEPR panel members and describes the method Battelle followed to select them. Appendix C presents the final charge to the IEPR panel members for their use during the review; the final charge was submitted to USACE on August 29, 2014.

2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review (ATR), as described in USACE (2012).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the engineering, economic, environmental, and plan formulation analyses of the project study. In particular, the IEPR addresses the technical soundness of the project study's assumptions, methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the IEPR of the Mount St. Helens LRR/SEIS was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC 1165-2-214; USACE 2012). Battelle, a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

3. METHODS FOR CONDUCTING THE IEPR

The methods used to conduct the IEPR are briefly described in this section; a detailed description can be found in Appendix A. Table 1 presents the major milestones and deliverables of the Mount St. Helens LRR/SEIS IEPR. Due dates for milestones and deliverables are based on the award/effective date of July 15, 2014 and receipt of the review documents on August 26, 2014. Note that the work items listed under Task 6 occur after the submission of this report. Battelle anticipates submitting the pdf printout of the USACE's Design Review and Checking System (DrChecks) project file (the final deliverable) on January

5, 2015. The actual date for contract end will depend on the date that all activities for this IEPR are completed.

Table 1. Major Milestones and Deliverables of the Mount St. Helens LRR/SEIS IEPR

Task	Action	Due Date
1	Award/Effective Date	7/15/2014
	Review documents available	8/26/2014
2	Battelle submits list of selected panel members ^a	8/14/2014
	USACE confirms the panel members have no COI	8/18/2014
3	Battelle convenes kick-off meeting with USACE	8/6/2014
	Battelle convenes kick-off meeting with USACE and panel members	9/11/2014
4	Panel members complete their individual reviews	9/30/2014
	Panel members provide draft Final Panel Comments to Battelle	10/16/2014
5	Battelle submits Final IEPR Report to USACE ^a	11/10/2014
6 ^a	Battelle convenes Comment-Response Teleconference with panel members and USACE	12/15/2014
	Battelle submits pdf printout of DrChecks project file ^a	1/5/2015
	Contract End/Delivery Date	4/30/2015

^a Task 6 occurs after the submission of this report.

Battelle identified, screened, and selected four panel members to participate in the IEPR based on their expertise in the following disciplines: Civil Works planning/economics, environmental compliance, hydrologic and hydraulic engineering, and geotechnical/civil engineering. The Panel reviewed the Mount St. Helens LRR/SEIS documents and produced 10 Final Panel Comments in response to 27 charge questions provided by USACE for the review. This charge included two questions added by Battelle that sought summary information from the IEPR Panel. Battelle instructed the Panel to develop the Final Panel Comments using a standardized four-part structure:

1. Comment Statement (succinct summary statement of concern)
2. Basis for Comment (details regarding the concern)
3. Significance (high, medium/high, medium, medium/low, or low; in accordance with specific criteria for determining level of significance)
4. Recommendation(s) for Resolution (at least one implementable action that could be taken to address the Final Panel Comment).

Battelle reviewed all Final Panel Comments for accuracy, adherence to USACE guidance (EC 1165-2-214 [USACE 2012], Appendix D), and completeness prior to determining that they were final and suitable for inclusion in the Final IEPR Report. There was no direct communication between the Panel and

USACE during the preparation of the Final Panel Comments. The Panel's findings are summarized in Section 4.1; the Final Panel Comments are presented in full in Section 4.2.

4. RESULTS OF THE IEPR

This section presents the results of the IEPR. A summary of the Panel's findings and the full text of the Final Panel Comments are provided.

4.1 Summary of Final Panel Comments

The panel members agreed among themselves on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE 2012; p. D-4) in the Mount St. Helens LRR/SEIS review documents. The following summarizes the Panel's findings.

Based on the Panel's review, the LRR/SEIS is well written and contains very good graphics to explain the problems and proposed solutions. Overall, the LRR/SEIS and the supporting review documents provide a comprehensive evaluation of a range of project components that can maintain the required level of protection for Cowlitz River communities in the face of uncertain future hydrology, hydraulics, and sediment transport.

Plan Formulation/Economics – There is a tremendous amount of data, analyses and reports involved in analyzing the problem and potential alternative solutions. The presentation and summary of all the information in the LRR/SEIS are done very well and support the conclusions and recommendations as presented in the LRR/SEIS.

During the review of the alternatives, the Panel noted that 2035 is being used as the end date for the period of analysis based on the original 1985 authorization of the project. This means that the uncertainty surrounding sediment transport in the basin beyond that period has not been addressed. The Panel believes that the physical life of the project is of primary importance when considering the long-term effectiveness and the environmental consequences of the project. Therefore, discussion and evaluation of the alternatives for the period beyond 2035 should be provided for a more complete understanding of the longer term economic and environmental aspects of the alternatives and to support the selection of the recommended plan.

The LRR/SEIS also needs some clarification concerning the justification for screening out levee improvements in Castle Rock and Lexington from further consideration based on induced flooding. During review of the LRR/SEIS the Panel could not locate where the magnitude and/or impacts of the induced flooding are discussed and quantified. Therefore, it is not clear whether the levee improvements in the Castle Rock and Lexington areas would induce significant flooding in the non-leveed reaches compared to the future without-project conditions.

Engineering – The data and analyses presented in the supporting documents are impressive, in particular the engineering analyses and evaluations that went into the LRR/SEIS and the supporting documents. The primary area of concern was the lack of clarification regarding potential earthquake risks and residual risks concerning possible loss of life. The Panel believes that the risk associated with extreme earthquake events should be addressed in the development and selection of the recommended plan. It also suggests that additional discussion regarding potential life safety issues under existing, future

without-project, or future with-project conditions is necessary given how critical this concern is to the public.

Environmental – The Panel identified no significant environmental issues, however, the Panel noted that information was not provided on life history characteristics, life stages, timing, and habitat used by several of the listed aquatic species that are protected under the Endangered Species Act. Such information, or at least references to the information, should be provided to ensure that impacts on these species are considered as part of the alternative evaluation. Additionally, the public comments highlighted similar concerns on other species and wetland habitat in the area.

4.2 Final Panel Comments

This section presents the full text of the 9 Final Panel Comments prepared by the IEPR panel members.

Final Panel Comment 1

Using 2035 as the end year of analysis in the LRR does not address the uncertainty surrounding sediment transport in the basin for the period beyond 2035 and may affect the economic and environmental results of alternative evaluations.

Basis for Comment

The Panel understands that the end date of 2035 for the period of analysis for the Mount St. Helens Long-Term Sediment Management Plan is based on the original 1985 authorization of the project in Public Law 99-88. However, the Panel believes that the physical life of a project is of primary importance when considering the long-term effectiveness and the environmental consequences of the project. The physical life of the Sediment Retention Structure (SRS) project extends well beyond the year 2035, but the projection for future sediment flows is uncertain and significant quantities of sediment could be transported into the SRS area and downstream into the areas of the lower Cowlitz protected by the levees well beyond the year 2035. The Panel is concerned that an evaluation of the effectiveness of the final array of alternatives in addressing sediment transport beyond the year 2035 could potentially show different economic and environmental results than if only the period until 2035 were considered. This could alter the selection of the recommended plan.

Although the primary period of analysis to the year 2035 may be appropriate, the Panel believes that discussion and evaluation of the alternatives for the period beyond 2035 is important for a more complete understanding of the longer term economic and environmental aspects of the alternatives and to support the selection of the preferred phased construction plan. For example, if Alternative 3, the phased construction plan, is implemented and then a significant raise of the SRS structure similar to Alternative 2 is needed to address the sediment transport issues shortly after the year 2035, this could change the economic evaluations of the alternative plans and could also alter the timing and magnitude of the environmental effects. However, if the economic evaluations and environmental effects of this scenario beyond 2035 do not show significantly different results, the selection of the phased construction plan would be further supported.

The Panel also recognizes that the physical life of the SRS will extend well beyond 2035 and believes that discussion of the effects of the SRS and the alternatives beyond 2035 is important to a complete understanding of the issues related to sediment transport in the basin. A sensitivity analysis of the alternatives for the period beyond 2035 to a point when the sediment flows from the debris avalanche are anticipated to subside to pre-eruption or background levels should consider performance of the alternatives in maintaining the desired Levels of Protection (LOPs), including probabilistic future performance, cost effectiveness, and environmental effects.

The Panel also recognizes that the LOP at the communities along the lower Cowlitz are extremely dependent on the amount of sediment transported into the area and that the trapping efficiency of the SRS structure is a good indicator of the effectiveness of the SRS in preventing sediment from reaching the lower Cowlitz. Although the trapping efficiencies for Alternative 3, the phased construction plan, and Alternative 2, the SRS spillway and embankment raise, are not presented, the Panel believes that SRS trapping efficiency (similar to that presented for the existing SRS in Figure 4-4) should be estimated and would be helpful in assessing the potential for the effectiveness of these alternatives in addressing the possible sediment loading that could occur up to and beyond 2035.

Because of the short period of analysis until the year 2035, the LRR does not address climate change effects. The Panel is concerned that consideration of the period beyond 2035 would require assessment of the potential effects of climate change on the project and could result in reassessments of the probable maximum flood (PMF), sediment transport volumes and rates, and the performance, cost effectiveness, and environmental effect of the alternatives.

Significance –Medium/High

A period end date of 2035 does not fully address the ultimate project conditions and consideration beyond 2035 could impact the selection of the recommended plan.

Recommendations for Resolution

1. Present a sensitivity analysis of the cost effectiveness and environmental effects of the final array of alternatives for the period beyond 2035 to a point when the sediment flows from the debris avalanche are anticipated to subside to pre-eruption or background levels.
2. Discuss the likely future scenarios beyond 2035 for the final array of alternatives both from the Probabilistic Future Performance related to the LOPs and to the anticipated environmental conditions near and upstream of the SRS.
3. Include screening criteria or discussion about potential benefits of proposed components beyond 2035 under the influence of climate change.

Final Panel Comment 2

The justification for screening out levee improvements at Castle Rock and Lexington from further consideration based on induced flooding is not supported.

Basis for Comment

As shown in Figure 5-1 in the LRR, the only levee reaches where the LOP is effectively below authorized during the period 2010 to 2035 are in the Castle Rock and Lexington areas. Table 6-1 in the LRR states that the levee improvements were dropped from further consideration due to the induced flooding in the non-leveed reaches. However, the magnitude and/or impacts of the induced flooding are not discussed or quantified. Although there may be significant sediment deposition in the river in these reaches as described under the Future Expected Deposition Scenario (FEDS) (without-project conditions), the FEDS condition affects both the leveed and the non-leveed reaches. It is not clear whether the levee improvements in the Castle Rock and Lexington areas would induce significant flooding in the non-leveed reaches compared to the future without-project conditions.

A review of the benefits from flood damage reduction indicates that a very small percentage of the benefits come from the Castle Rock and Lexington areas. Figure 2-4 in the LRR shows that the lengths of levees in Castle Rock and Lexington are relatively short compared to those of levees in Kelso and Longview. If the LOPs at the primary flood damage locations of Kelso and Longview are maintained under the FEDS condition, it is not clear, without additional information or discussion, whether levee improvements at Castle Rock and Lexington would be cost-effective. This alternative is not discussed in any detail in the LRR.

Significance – Medium

The validity of dropping the levee improvement measures at Castle Rock and Lexington from further consideration cannot be determined without quantifying the effects of induced flooding in the non-leveed reaches or the costs of the needed levee improvements.

Recommendations for Resolution

1. Add a description in the LRR of levee improvements needed at Castle Rock and Lexington to maintain the LOPs during the period of analysis.
2. Include in the LRR a quantification of the induced flooding in the non-leveed reaches due to levee improvements at Castle Rock and Lexington.
3. Add additional discussion and rationale for the reasons the levee improvements at Castle Rock and Lexington were dropped from further consideration.

Final Panel Comment 3

Potential earthquake risks are not addressed, qualified, or considered in terms of debris flow effects, levee stability, and potential level of protection.

Basis for Comment

Earthquake strong ground shaking associated with a major seismic event could be a common cause of both (1) an extreme sediment event, potentially including a mudflow that reaches the SRS or beyond, and (2) concurrent levee geotechnical instability, causing an immediate decrease in LOP. Earthquake ground shaking could destabilize the debris avalanche material or liquefy the sediment plain, causing a sudden or prolonged increase in sediment transport to the Cowlitz River, decreasing LOP. At the same time, earthquake-induced instability of the levees could reduce their effective LOP. Levee repairs would take time and may not be complete before the further LOP reduction from increased sediment transport and deposition. The LOP reductions would be most problematic if the earthquake effects occurred during or preceding periods of high flow.

While the limitations to the forecasted conditions identified in the FEDS Study include “no allowance for very rare events...including but not limited to volcanic eruptions, lake breakout, and extreme hydrologic events” (p. 9), the Panel believes that the risk associated with extreme earthquake events should be addressed in the development and selection of the recommended plan. The Panel could not find if or how earthquake loadings were considered in the levee geotechnical stability analyses, the levee fragility curves, the determination of the LOP for the levee sections, or the evaluation and selection of the alternatives.

The Panel believes that potential earthquake effects should be explicitly addressed and qualified in the LRR in terms of the redundancy, resiliency, and robustness of the recommended plan and the potential effect on LOP.

Significance – Medium

Earthquake events are common-cause risks that can decrease LOP through both increased sediment loading and decreased levee stability, and should therefore be appropriately addressed in the LRR.

Recommendations for Resolution

1. Address in the LRR potential earthquake loading that could be a common cause for both increased sediment loading and decreased levee stability and their combined effect on LOP.
2. Address in the LRR the characteristics of the recommended plan in terms of redundancy, resiliency, and robustness to mitigate the adverse effects of potential extreme earthquake loading.
3. Identify in the LRR how the adverse effects of potential extreme earthquake loading will be handled in the design or operation of the Recommended Plan.
4. Discuss in the LRR how earthquake events could potentially affect the reliability of the three final plans evaluated in maintaining the LOPs and minimizing the risk to the populations downstream of the SRS (i.e., discuss how the raising of the SRS and the Phased Construction Plan would compare under an earthquake scenario, especially as it might relate to the mud flows that could result).

Final Panel Comment 4

The impacts on species listed under the Endangered Species Act are not described in sufficient detail to support assessment of the consequences of implementing the recommended plan.

Basis for Comment

An Environmental Impact Statement (EIS) must stand on its own as an analytical document that fully informs decision makers and the public of the environmental effects of the proposal and those of the reasonable alternatives (Section 1502.1, Ref: 40 CFR Parts 1500 - 1508, 1987). The Draft Supplemental EIS (SEIS) identifies species listed under ESA) and provides basic listing information for species that may occur within the assessment areas of the Cowlitz and Toutle River basins. However, information on the life history characteristics, life stages, timing, and habitat used by the listed aquatic species is not provided in the Draft SEIS or by reference to other project documents. This information is necessary to appropriately assess the environmental consequences of the recommended plan (proposed action). The Panel offers these examples of insufficient detail:

- **Listed Species Distribution:** It would be helpful to clearly indicate that many ESA-listed fish species and Evolutionarily Significant Units (ESUs) only occur in the downstream Columbia River portion of the Cowlitz River assessment area and not in the other portions of the project area.
- **Species Information:** Information would be useful on the life cycle and habitat used to properly assess species such as Eulachon that occur only in the Cowlitz River assessment area, where they may be adversely affected by actions such as dredging, which is included in the recommended plan and one alternative.
- **Eulachon:** Eulachon reproduce in the lower Cowlitz River requiring sediment habitat that might be altered by frequent dredging. The 2014 Biological Assessment (USACE 2014) identifies the Cowlitz River as likely the most productive and important spawning river for Eulachon in the Columbia River System. Eulachon reproduction in the lower Cowlitz River requires sediment habitat that might be adversely altered by frequent dredging. Summary information on the timing and nature of Eulachon reproduction in the Cowlitz River would strengthen the assessment.
- **Pacific River Lamprey:** Information on habitat used for reproduction and juvenile rearing of Pacific River Lamprey in the Cowlitz River Basin should be included if available or the SEIS should indicate that such information is not available and use general information from other river systems to evaluate potential impacts.
- **Green Sturgeon:** Any information on the use of the Cowlitz River habitat by Green Sturgeon should be included or the absence of such information indicated if none is available.

Significance – Medium

The SEIS should include appropriate information on the ESA-listed species, either by inclusion or by reference, to support reasonable evaluation of alternatives.

Recommendations for Resolution

1. Provide at least summary information on the life history characteristics and habitat requirements of ESA-listed species identified as occurring within the various assessment areas of the project. This information may be included in the main body of the draft SEIS or in an appendix.
2. Identify how aspects of the alternative actions, such as frequent dredging, may alter the habitat characteristics important to the production of the ESA-listed species within the project area.

3. Include the Oregon Spotted Frog, *Rana pretiosa* that was listed by the USFWS August 29, 2014.

Literature Cited:

USACE (2014). Biological Assessment for Anadromous Fish Species and Essential Fish Habitat Assessment Mount St. Helens Project Phased Construction Alternative. Portland District, U.S. Army Corps of Engineers, Portland, Oregon. 80 pp.

Final Panel Comment 5

The residual risks concerning possible loss of life have not been presented in sufficient detail to document how the proposed alternative is appropriate and adequate in terms of life safety.

Basis for Comment

The decision documents do not explicitly discuss potential life safety issues under existing, future without-project, or future with-project conditions. While LOP is the presumptive surrogate for life safety, life safety goes beyond LOP to also consider the consequences of levee breaching or overtopping and loss of protection. The Panel is concerned that the LRR does not explicitly address residual risk or life safety issues associated with loss of protection.

The focus on maintaining the authorized LOP seems to be based on flood damages, and not on potential life safety issues. The Panel believes that additional discussion is needed to improve the understanding of potential life safety issues. For example, a discussion of several pertinent characteristics of the levee protected areas and large flood events would be helpful in assessing the true nature of the life safety issues:

- populations at risk in the various reaches of the river that would be affected by levee overtopping
- nature of the flooding, such as flood timing, flood forecast reliability, and the rate of rise of potentially levee overtopping flood events
- relationship (i.e. magnitude and timing) of sediment deposition to peak flood levels for large flood events
- types of emergency management plans that exist and are implemented in the basin.

Discussion of the potential implications of a dam break scenario could also be helpful.

Significance – Medium

Life safety is a critical issue that can raise the risk level if not appropriately addressed.

Recommendations for Resolution

1. Add discussion in the LRR to explicitly address the public safety issue and how the recommended plan is appropriate and adequate in terms of life safety.
2. Discuss the populations at risk in the various reaches of the river that would be affected by levee overtopping, the nature of the flooding including flood timing, flood forecast reliability, rate of rise for large flood events, the relationship of large flood peaks to the sediment deposition, and the types of emergency management plans that exist and are implemented in the basin.
3. Add discussion of the potential implications of a dam break scenario.

Final Panel Comment 6

The incremental benefit of Grade Building Structure (GBS) installation after completion of the 23-foot SRS and the uncertainty of long-term GBS performance need to be quantified to support the justification of this component of the recommended plan.

Basis for Comment

The technical justification for implementing GBS after the 23 foot SRS raise is a set of hydraulic and sediment transport modeling evaluations that compare GBS construction after 10, 20, and 30 foot SRS raises to FEDS and 10 foot “SRS raise only” baselines. The two-dimensional hydraulic and sediment transport modeling conducted to quantify the sediment retention benefits of GBS is well-founded. The most relevant modeling evaluation compares GBS installation after a 20 foot SRS raise to a 10 foot “SRS raise only” baseline; however, it does not quantify the incremental benefit (i.e., additional accumulated sediment) produced by GBS installation after a 23 foot SRS raise.

In addition, the LRR lacks a quantitative evaluation of the likely uncertainties surrounding GBS performance, and how these uncertainties could diminish expected incremental benefits of additional accumulated sediment with GBS. The LRR states (Appendix A, p. A-33) that at least one component of the GBS, the Cross-Valley Structure, is unique. Further, the scale and application of the proposed system of GBS on the still dynamic Mount St. Helens eruption sediment plain are unique, and very little data exist on the performance of the GBS system in the recommended plan.

A recent study of a 2010 pilot GBS project on the Mount St. Helens eruption sediment plain (Thorne et al. 2014; p. iv) provides the best available performance data. It notes that “While it is clear that the pilot project has increased sand storage on the sediment plain, to date most of the storage is upstream of the [cross valley structure] and diversion berm. It is simply too early to judge the effectiveness of the ELJs in trapping and retaining additional, sand-sized sediment.”

The LRR states (p. 6-8) that actual design and implementation of these [Grade Building] structures could vary considerably, and that unknown future sediment loads could drive a different configuration or magnitude of GBS. The Panel believes that quantifying the uncertainty possible with different design and implementation approaches and different future sediment loads would clarify the incremental benefits associated with GBS.

Significance – Medium

The GBS component of the recommended plan is a major structural change to the existing landscape with significant cost. As such, the LRR must present a clear quantitative assessment of the expected benefits of GBS, and the extent to which those benefits could be lost if GBS performance is less effective than expected due to uncertainties surrounding long-term performance.

Recommendations for Resolution

1. Compare the GBS after a 20 foot SRS raise modeling scenario to a 20 foot SRS only baseline and quantify the incremental benefit of GBS compared to this more relevant baseline.
2. Quantify the potential for GBS performance uncertainty to reduce the modeled additional sediment accumulation benefit with GBS.
3. Justify the continued inclusion of the GBS component based on the results of 1 and 2 above.

Literature Cited:

Thorne, C, J. Townsend, and T. Ashley (2014). Geomorphic and Ecological Assessment and Evaluation of Grade Building Structures on the SRS Sediment Plain, North Fork Toutle River. Performed under contract W9127N-13-P-0072 for U.S. Army Corps of Engineers, Portland District.

Final Panel Comment 7

The screening criteria used to evaluate performance of the Cowlitz River flushing flows management measure are not described clearly enough to determine why the measure was removed from further consideration.

Basis for Comment

The LRR states that flushing flows (referred to as “Modify Operations of Mossyrock Dam”) were one of the 16 original sediment management measures (LRR, Figure 6-1, p. 6-3), and one of nine measures advanced through a first round of screening based on preliminary cost information, updated sediment budget information, and input from sediment experts (LRR, p. 6-1). This measure was then removed from further consideration based on a second level of screening that considered conceptual designs, refined cost estimates, and limited hydrologic, hydraulic, and sediment transport modeling.

Based on a review of the long-term sediment management plan progress report (USACE 2010), the Panel was unable to determine why the second level of screening resulted in the removal of flushing flows from further consideration. The USACE report states (p. 55) that re-regulation of flood control projects on the Cowlitz River (i.e., flushing flows) can result in decreased deposition in the Lower Cowlitz River by as much as 12% on a biannual basis. It further notes (p. 58) that implementation would require coordination between USACE and the Tacoma Power Company and more study to identify potential adverse impacts involved with re-regulation. However, neither the LRR nor the USACE report indicates why these requirements justify removal of flushing flows from further consideration. Since flushing flows have been shown to provide a 12% biannual decrease in sediment deposition, the application of screening criteria to remove this measure from consideration should be clearly presented and discussed in the context of the measure’s benefits.

Significance – Medium/Low

The screening criteria used to remove flushing flows from further consideration must be shown clearly and compared quantitatively with the stated potential benefit.

Recommendations for Resolution

1. Identify the screening criteria applied to flushing flows in the second level of screening that resulted in the measure’s removal from further consideration.
2. Present the quantitative thresholds set for the screening criteria identified in #1 above that resulted in the measure’s removal from further consideration.
3. Quantify the indirect negative impacts (if they exist) of flushing flows and compare these with the benefits associated with the 12% biannual reduction in sediment deposition in the Cowlitz River.

Literature Cited:

USACE (2010). Progress Report - Mount St. Helens Long-Term Sediment Management Plan for Flood Risk Reduction. U.S. Army Corps of Engineers Portland District. June. Available online at:<http://cdm16021.contentdm.oclc.org/cdm/ref/collection/p16021coll3/id/86>

Final Panel Comment 8

A clear and complete Implementation Strategy for the recommended plan has not been presented.

Basis for Comment

LRR Section 8, Implementation Strategy for the recommended plan, shows a complex monitoring, analysis, and evaluation process that is based on an adaptive management approach. As the LRR implies, successful implementation of the recommended plan will require the use of scientific and engineering insight and judgment to interpret and evaluate evolving conditions and take appropriate action. While much of this is unavoidably subjective and situational, the success of this effort will partly depend on implementing USACE's experience, knowledge, and understanding of the project-history know-how and know-why that went into developing the recommended plan.

The Panel therefore believes that LRR Section 8 should explicitly state that the detailed implementation plans (e.g., the "Operations and Management Plan," "Monitoring and Adaptive Management Plan," or the like) will include documentation of the pertinent historic and evolving USACE insights and project-specific guidance relevant to plan implementation. The Panel believes that presentation of this practical technology-transfer documentation and a statement indicating that the implementation process itself will likely evolve and adapt over time as conditions evolve is necessary.

The Panel also believes the guidance should include an explicit, detailed identification and discussion of the critical assumptions and hypotheses, including the engineering judgments and their justifications and rationale for the selection of the appropriate actions. This discussion should consider and address the resulting effects on the environment and the species of importance to plan implementation. Appropriate clarity and completeness is essential to the usefulness of this effort.

Significance – Medium/Low

To ensure success, the Implementation Strategy should include sufficient detail to guide USACE in executing the recommended plan.

Recommendations for Resolution

1. State in the LRR that future implementation plans for the recommended plan will include documentation of project-specific insights and guidance supporting plan implementation, including identification, discussion and justification of the critical assumptions, hypotheses, and engineering judgments; state this discussion will include the resulting environmental effects important or potentially important to plan implementation.
2. Expand discussion in LRR Section 8 to include documentation recommended above in 1.
3. Effect a suitable combination of Recommendations 1 and 2. For example, add some expanded discussion in the LRR, but also include further elaborations and details in the implementation documents.

Final Panel Comment 9

The basis for selecting the authorized LOP and the reasons for the differences in the LOPs for the four communities are not provided.

Basis for Comment

The purpose of the Mount St. Helens Long Term Sediment Management Plan, including the LRR and Recommended Plan, is to maintain through year 2035 the flood risk LOPs, as authorized in 1985 and verified in 2012, for the lower Cowlitz River communities of Castle Rock, Lexington, Kelso, and Longview. The Panel believes that to support this purpose, the LRR should explain the technical basis for determining the originally authorized LOPs and why the LOPs are different for the four communities. The current draft LRR does not provide this supporting explanation.

Significance – Low

An explanation of how the authorized LOPs were determined and why they differ among the four communities will improve understanding of the process and the resulting recommended plan.

Recommendations for Resolution

1. Provide a summary explanation in the LRR for the basis of the authorized LOPs and the reasons why there are different LOPs for the four communities.

5. REFERENCES

OMB (2004). Final Information Quality Bulletin for Peer Review. Executive Office of the President, Office of Management and Budget, Washington, D.C. Memorandum M-05-03. December 16.

The National Academies (2003). Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports. The National Academies (National Academy of Science, National Academy of Engineering, Institute of Medicine, National Research Council). May 12.

Thorne, C, J. Townsend, and T. Ashley (2014). Geomorphic and Ecological Assessment and Evaluation of Grade Building Structures on the SRS Sediment Plain, North Fork Toutle River. Performed under contract W9127N-13-P-0072 for U.S. Army Corps of Engineers, Portland District.

USACE (2014). Biological Assessment for Anadromous Fish Species and Essential Fish Habitat Assessment Mount St. Helens Project Phased Construction Alternative. Portland District, U.S. Army Corps of Engineers, Portland, Oregon. 80 pp.

USACE (2012). Water Resources Policies and Authorities: Civil Works Review. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) 1165-2-214. December 15.

USACE (2010). Progress Report - Mount St. Helens Long-Term Sediment Management Plan for Flood Risk Reduction. U.S. Army Corps of Engineers Portland District. June. Available online at: <http://cdm16021.contentdm.oclc.org/cdm/ref/collection/p16021coll3/id/86>.

USACE (1985). Mount St. Helens, Washington, Decision Document, Toutle, Cowlitz, and Columbia Rivers. Portland District, U.S. Army Corps of Engineers, Portland, Oregon. 330 pp.

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APPENDIX A

IEPR Process for the Mount St. Helens LRR/SEIS Project

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A.1 Planning and Conduct of the Independent External Peer Review (IEPR)

Table A-1 presents the schedule followed in executing the Independent External Peer Review (IEPR) of the Mount St. Helens Sediment Management Project Document for Limited Re-evaluation Report and Supplemental Environmental Impact Statement (hereinafter: Mount St. Helens LRR/SEIS IEPR). Due dates for milestones and deliverables are based on the award/effective date of July 15, 2014. The review documents were provided by the U.S. Army Corps of Engineers (USACE) on August 26, 2014. Note that the work items listed under Task 6 occur after the submission of this report. Battelle will enter the nine Final Panel Comments developed by the Panel into USACE's Design Review and Checking System (DrChecks), a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle. Battelle will provide USACE and the Panel a pdf printout of all DrChecks entries, through comment closeout, as a final deliverable and record of the IEPR results.

Table A-1. Mount St. Helens LRR/SEIS Complete IEPR Schedule

Task	Action	Due Date
1	Award/Effective Date	7/15/2014
	Review documents available	8/26/2014
	Battelle submits draft Work Plan ^a	7/23/2014
	USACE provides comments on draft Work Plan	7/28/2014
	Battelle submits final Work Plan ^a	8/29/2014
2	Battelle requests input from USACE on the conflict of interest (COI) questionnaire	7/17/2014
	USACE provides comments on COI questionnaire	7/24/2014
	Battelle submits list of selected panel members ^a	8/14/2014
	USACE confirms the panel members have no COI	8/18/2014
	Battelle completes subcontracts for panel members	9/4/2014
3	Battelle convenes kick-off meeting with USACE	8/6/2014
	Battelle sends review documents to panel members	9/5/2014
	Battelle convenes kick-off meeting with panel members	9/8/2014
	Battelle convenes kick-off meeting with USACE and panel members	9/11/2014
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	9/16/2014
4	Panel members complete their individual reviews	9/30/2014
	Battelle provides panel members with talking points for Panel Review Teleconference	10/6/2014

Table A-1. Mount St. Helens LRR/SEIS Complete IEPR Schedule (continued)

Task	Action	Due Date
	Battelle convenes Panel Review Teleconference	10/7/2014
	Battelle provides Final Panel Comment templates and instructions to panel members	10/8/2014
	Public Comment Review Period	8/20/14- 10/6/14
	USACE provides public comments (round 1) ^b	10/7/2014
	Battelle sends public comments to Panel	10/9/2014
	Panel completes their review of the public comments	10/15/2014
	Panel members provide draft Final Panel Comments to Battelle	10/16/2014
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	10/16/2014 - 10/27/2014
	Panel finalizes Final Panel Comments	10/27/2014
	USACE provides additional public comments (round 2) ^b	10/28/2014
	Battelle sends public comments to Panel	10/28/2014
	Panel completes their review of the public comments	10/30/2014
	Battelle and Panel review Panel's response to Public Comments	10/31/2014
	Public Comment Final Panel Comment Finalized (if needed)	11/4/2014
	Battelle convenes Panel Review Teleconference	10/7/2014
5	Battelle provides Final IEPR Report to panel members for review	11/5/2014
	Panel members provide comments on Final IEPR Report	11/6/2014
	Battelle submits Final IEPR Report to USACE ^a	11/10/2014
6^c	Battelle inputs Final Panel Comments to DrChecks and provides Final Panel Comment response template to USACE	11/10/2014
	Battelle convenes teleconference with USACE to review the Post-Final Panel Comment Response Process	11/13/2014
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process	11/13/2014
	USACE provides draft Project Delivery Team (PDT) Evaluator Responses to Battelle	12/4/2014
	Battelle provides the panel members the draft PDT Evaluator Responses	12/5/2014
	Panel members provide Battelle with draft BackCheck Responses	12/9/2014
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	12/10/2014

Table A-1. Mount St. Helens LRR/SEIS Complete IEPR Schedule (continued)

Task	Action	Due Date
6 ^c	Battelle convenes Comment-Response Teleconference with panel members and USACE	12/15/2014
	USACE inputs final PDT Evaluator Responses to DrChecks	12/18/2014
	Battelle provides final PDT Evaluator Responses to panel members	12/22/2014
	Panel members provide Battelle with final BackCheck Responses	12/29/2014
	Battelle inputs the Panel's final BackCheck Responses in DrChecks	12/31/2014
	Battelle submits pdf printout of DrChecks project file ^a	1/5/2015
	Contract End/Delivery Date	4/30/2015

^a Deliverable.

^b The public comment period that ended on October 6, 2014. USACE notified Battelle on October 7, 2014 that they would provide public comments in two rounds. The first round would be provided after the close of the public comment period but they were expecting additional comments (i.e., round 2) from the Cowlitz Tribe at a later date, noting that the tribe had additional time to provide comment. Battelle received the second round of comments on October 28, 2014 date. Both rounds of comments were provided to the panel immediately upon Battelle receipt.

^c Task 6 occurs after the submission of this report

At the beginning of the Period of Performance for the Mount St. Helens LRR/SEIS IEPR, Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan. In addition, 25 charge questions were provided by USACE and included in the draft and final Work Plans. Battelle added two questions that seek summary information from the IEPR Panel. The final charge also included general guidance for the Panel on the conduct of the peer review (provided in Appendix C of this final report).

Prior to beginning their review and within four days of their subcontracts being finalized, all members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Battelle planned and facilitated a second kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meetings, the IEPR Panel received an electronic version of the final charge as well as the Mount St. Helens LRR/SEIS review documents and reference materials listed below. The documents and files in bold font were provided for review; the other documents were provided for reference or supplemental information only.

- **Limited Re-evaluation Report (91 pages)**
- **Environmental Appendix, Supplemental EIS (462 pages)**
- **Real Estate Appendix (32 pages)**
- **Economic Appendix (22 pages)**
- **Cost Engineering Appendix, Certification (5 pages)**
- **Engineering Appendix (139 pages)**
- **Public Review Comments (89 pages)**

- Progress Report: Mount St. Helens Long-Term Sediment Management Plan for Flood Risk Reduction, USACE, June 2010
- Mount St. Helens Future Expected Deposition Scenario (FEDS), USACE, April 14, 2011
- Mount St. Helens, Washington Feasibility Report and Environmental Impact Statement, USACE, December 1984.
- Mount St. Helens Briefing Presentation, USACE, April 2014
- USACE guidance Civil Works Review, (EC 1165-2-214, 15 December 2012)
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review*, December 16, 2004.

About halfway through the review of the Mount St. Helens LRR/SEIS IEPR documents, a teleconference was held with USACE, the Panel, and Battelle so that USACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted 25 panel member questions to USACE. USACE was able to provide responses to all of the questions during the teleconference or within a few days via email.

In addition, throughout the review period, USACE provided documents at the request of panel members. These documents were provided to Battelle and then sent to the Panel as additional information only and were not part of the official review. A list of these additional documents requested by the Panel is provided below.

- Updated MSH Economic Appendix July 2014 or ATR Revised
- Updated Cost Table 7.2
- Toutle-Cowlitz Sediment Budget Report Revised May 18 2010
- SRS DM11 Sediment Ranges December 1986
- Olds Report 2002
- MSH BA Final 25 June 2014
- HEC-FDA Certification Report
- HEC-FDA Users Manual Version 1.2.4
- Final FEDS Report April 14 2011
- Final Cowlitz LOP 02-04-10
- Cowlitz River Levees Safe Water Level Study 2010 Final
- Cowlitz NMFS BA 032907
- Cowlitz River Basin Hydrologic Summary Water Years 2003–2004
- 2002 Hydrologic Summary

- 2001 Hydrologic Summary
- Final Report, Geomorphic and Ecological Assessment and Evaluation of Grade Building Structures on the SRS Sediment Plain, North Fork Toutle River
- Development of the PMF for the SRS, August 26, 2011

A.2 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a charge question response table provided by Battelle. At the end of the review period, the Panel produced individual comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. At the end of the review, Battelle summarized the individual comments in a preliminary list of 12 overall comments and discussion points. Each panel member's individual comments were shared with the full Panel in a merged individual comments table.

A.3 IEPR Panel Teleconference

Battelle facilitated a 2-hour teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member would serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of significant importance to the findings, and merged any related individual comments. At the conclusion of the teleconference, Battelle reviewed each Final Panel Comment with the Panel, including the associated level of significance, and confirmed the lead author for each comment.

At the end of these discussions, the Panel identified nine comments and discussion points that should be brought forward as Final Panel Comments.

A.4 Preparation of Final Panel Comments

Following the teleconference, Battelle prepared a summary memorandum for the Panel documenting each Final Panel Comment (organized by level of significance). The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the Mount St. Helens LRR/SEIS IEPR:

- **Lead Responsibility:** For each Final Panel Comment, one Panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed the merged individual comments table, a summary detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.

- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel member as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:
 1. Comment Statement (succinct summary statement of concern)
 2. Basis for Comment (details regarding the concern)
 3. Significance (high, medium/high, medium, medium/low, and low; see description below)
 4. Recommendation(s) for Resolution (see description below).
- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
 1. **High:** Describes a fundamental issue with the project that affects the current recommendation or justification of the project, and which will affect its future success, if the project moves forward without the issue being addressed. Comments rated as high indicate that the Panel determined that the current methods, models, and/or analyses contain a “showstopper” issue.
 2. **Medium/High:** Describes a potential fundamental issue with the project, which has not been evaluated at a level appropriate to this stage in the Planning process. Comments rated as medium/high indicate that the Panel analyzed or assessed the methods, models, and/or analyses available at this stage in the Planning process and has determined that if the issue is not addressed, it could lead to a “showstopper” issue.
 3. **Medium:** Describes an issue with the project, which does not align with the currently assessed level of risk assigned at this stage in the Planning process. Comments rated as medium indicate that, based on the information provided, the Panel identified an issue that would raise the risk level if the issue is not appropriately addressed.
 4. **Medium/Low:** Affects the completeness of the report at this time in describing the project, but will not affect the recommendation or justification of the project. Comments rated as medium/low indicate that the Panel does not currently have sufficient information to analyze or assess the methods, models, or analyses.
 5. **Low:** Affects the understanding or accuracy of the project as described in the report, but will not affect the recommendation or justification of the project. Comments rated as low indicate that the Panel identified information that was mislabeled or incorrect or that certain data or report section(s) were not clearly described or presented.
- Guidelines for Developing Recommendations: The recommendation section was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g.,

suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, nine Final Panel Comments were prepared and assembled. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Final Panel Comments are presented in the main report.

A.5 Conduct of the Public Comment Review

Battelle received 89 pages of public comments in three submissions on the Mount St. Helens IEPR from USACE on October 7, 2014, October 24, 2014, and October 28, 2014. Following the receipt on October 28, 2014 of the final set of Public Comments, Battelle then sent the public comments to the panel members on October 28, 2014 in addition to two charge questions:

- 1. Does information or concerns raised in the public comments raise any additional discipline-specific technical concerns with regard to the overall report?**
- 2. Has adequate stakeholder involvement occurred to identify issues of interest and to solicit feedback from interested parties?**

The panel members were charged with responding to the two charge questions above.

Near the end of the review period, the Panel wrote individual comments in response to the two charge questions. Each panel member's individual comments were shared with the full Panel via email. Battelle reviewed the comments to identify any new technical concerns that had not been previously identified during the initial IEPR. The panel members confirmed that no Final Panel Comment related to the Public Comments would be developed. The Panel did acknowledge the Public Comments were environmentally based and were similar to the Panel's concerns highlighted in FPC 4 but focused on additional organisms and environments.

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APPENDIX B

Identification and Selection of IEPR Panel Members
for the Mount St. Helens LRR/SEIS Project

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B.1 Panel Identification

The candidates for the Mount St. Helens Sediment Management Project Documents for Limited Re-evaluation Report (LRR) and Supplemental Environmental Impact Statement (SEIS) (hereinafter: Mount St. Helens LRR/SEIS IEPR) Panel were evaluated based on their technical expertise in the following key areas: Civil Works planning/economics, environmental compliance, hydrologic and hydraulic engineering, and geotechnical/civil engineering. These areas correspond to the technical content of the Mount St. Helens LRR/SEIS IEPR review documents and overall scope of the Mount St. Helens LRR/SEIS project.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle evaluated these candidate panel members in terms of their technical expertise and potential conflicts of interest (COIs). Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and availability, and ultimately selected four experts for the final Panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

The candidates were screened for the following potential exclusion criteria or COIs.¹ These COI questions serve as a means of disclosure and to better characterize a candidate's employment history and background. Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous USACE technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit.

- Previous and/or current involvement by you or your firm² in the Mount St. Helens Sediment Management Project Documents for Limited Re-evaluation Report (LRR) and Supplemental Environmental Impact Statement (SEIS).
- Previous and/or current involvement by you or your firm² in flood risk management feature design in southwest Washington State, including the Columbia, Toutle, and Cowlitz Rivers and the Cascade and Olympic mountain range regions.
- Previous and/or current involvement by you or your firm² in the Mount St. Helens LRR and SEIS related projects.
- Previous and/or current involvement by you or your firm² in the conceptual or actual design, construction, or operation and maintenance of the Mount St. Helens LRR and SEIS and/or related projects.

¹ Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. See OMB (2004, p. 18), "...when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects."

² Includes any joint ventures in which a panel member's firm is involved and if the firm serves as a prime or as a subcontractor to a prime.

- Current employment by USACE.
- Previous and/or current involvement with paid or unpaid expert testimony related to Mount St. Helens LRR and SEIS.
- Previous and/or current employment or affiliation with the non-Federal sponsors or any of the following cooperating Federal, state, county, local, and regional agencies, environmental organizations, and interested groups (for pay or pro bono) including the State of Washington and/or the Cowlitz County dike districts.
- Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to southwest Washington State, including the Columbia, Toutle, and Cowlitz Rivers and the Cascade and Olympic mountain range regions.
- Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Portland District.
- Previous or current involvement with the development or testing of models that will be used for, or in support of the Mount St. Helens LRR and SEIS project including HEC-RAS, mobile bed components of HEC-RAS, HEC-FDA, MIKE 21C, and ADH 3.2.1-Particle Tracking Model 2.0, or MCACESII, Version 4.1.
- Current firm² involvement with other USACE projects, specifically those projects/contracts that are with the Portland District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the Portland District. Please explain.
- Any previous employment by USACE as a direct employee, notably if employment was with the Portland District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Any previous employment by USACE as a contractor (either as an individual or through your firm²) within the last 10 years, notably if those projects/contracts are with the Portland District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning engineering, economic, and environmental issues associated with flood risk management feature design (i.e. ecosystem review, flood management), and include the client/agency and duration of review (approximate dates).
- Pending, current, or future financial interests in Mount St. Helens LRR and SEIS related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm² revenues within the last 3 years from USACE contracts.
- A significant portion (i.e., greater than 50%) of personal or firm² revenues within the last 3 years from contracts with the non-Federal sponsors (State of Washington and Cowlitz County dike districts).
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to Mount St. Helens LRR and SEIS.

- Participation in relevant prior and/or current Federal studies relevant to the Mount St. Helens LRR and SEIS and/or relevant studies.
- Previous and/or current participation in prior non-Federal studies relevant to Mount St. Helens LRR and SEIS and/or relevant studies.
- Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe:

Other considerations:

- Participation in previous USACE technical review panels
- Other technical review panel experience.

B.2 Panel Selection

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. Three of the four final reviewers are affiliated with consulting companies; the fourth is an independent consultant. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was given the list of candidate panel members, but Battelle selected the final Panel.

An overview of the credentials of the final four members of the Panel and their qualifications in relation to the technical evaluation criteria is presented in Table B-1. More detailed biographical information regarding each panel member and his area of technical expertise is presented in Section B.3.

Table B-1. Mount St. Helens LRR/SEIS IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Spychalla	Weitekamp	Tompkins	Vita
Civil Works Planner/Economist				
Minimum 15 years of experience in economics	X			
Minimum of 15 years of expertise in flood risk management analysis, cost effectiveness analysis, and benefit calculations	X			
Experience evaluating both structural and nonstructural measures	X			
Familiarity with USACE plan formulation process, procedures, and standards as they relate to flood risk management	X			
Minimum of five years of experience directly dealing with the USACE six-step planning process	X			
Direct experience working for or with USACE preferred	X			
Familiarity with the USACE flood risk management analysis and economic benefit calculations, including use of HEC-FDA	X			
Active participation in related professional societies	X			
B.S. degree or higher in economics	X			
Environmental Compliance Specialist				
Minimum 15 years of experience directly related to assessing		X		
a. environmental impacts		X		
b. ecosystem restoration studies		X		
c. National Environmental Policy Act (NEPA) compliance		X		
Familiarity with non-native and native species in the Pacific Northwest		X		
Expertise in				
a. all environmental laws		X		
b. cultural resource compliance, specifically Native American		X		
c. Fish and Wildlife Coordination Act requirements		X		
d. Section 106 of the National Historic Preservation Act		X		
e. State and Federal laws/executive orders pertaining to American Indian Tribes		X		
Minimum M.S. degree or higher in a related field		X		
Hydrologic and Hydraulic Engineer				
Minimum 15 years of experience in hydrologic and hydraulic engineering			X	
Proficiency in:				
a. northwest hydrology			X	
b. river hydraulics			X	
c. sediment transport analysis.			X	
d. risk and uncertainty analysis			X	
e. other closely associated technical subjects as these relate to sediment transport			X	

Table B-1. Mount St. Helens LRR/SEIS IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Spychalla	Weitkamp	Tompkins	Vita
Experience with, and a working knowledge of, implementation of engineering log jams (ELJ's) in systems similar to rivers within the Northwest is preferred			X	
Proficiency in:			X	
a. HEC-RAS			X	
b. mobile bed components of HEC-RAS			X	
c. HEC-FDA			X	
Familiarity with MIKE 21C and ADH 3.2.1-Particle Tracking Model 2.0, preferred			X	
Active participation in related professional societies			X	
M.S. degree or higher in engineering			X	
Licensed professional engineer			X	
Geotechnical/Civil Engineer				
Minimum 15 years of experience in geotechnical engineering and geomorphology				X
Demonstrated experience in performing geotechnical evaluation and geo-civil design for flood risk management projects in the Northwest				X
Familiarity with, and demonstrated experience related to, USACE geotechnical practices associated with:				
a. flood management channels				X
b. construction of large and small sediment management measures				X
c. soil engineering				X
Familiarity with the following, as well as other closely associated technical subjects:				
a. sampling and laboratory testing				X
b. embankment stability and seepage analyses				X
c. planning analysis				X
Competency in cost estimating for construction using Micro-Computer Aided Cost Estimating System M2 (2nd generation of MCACES, Version 4.1)				X
Working knowledge of construction and ability to make professional determinations based on experience				X
Ability to address the USACE Safety Assurance Review (SAR)* aspects of all projects				X
Active participation in related professional societies				X
M.S. degree or higher in engineering				X
Registered professional engineer				X

B.3 Panel Member Qualifications

William Spsychalla, P.E.

Role: Civil Works planning and economics experience and expertise.

Affiliation: Barr Engineering, Inc.

Mr. Spsychalla has more than 40 years of experience in water resource management. He earned his M.S. in water resource management from the University of Wisconsin, Madison in 1967 and became a USACE Planning Associate in 1976 after completing the course work at the Board of Engineers for Rivers and Harbors, Ft. Belvoir, Virginia. The focus in the Planning Associate program was on the methodology used and approved by USACE for developing and justifying projects. He is a registered professional engineer in Minnesota and a Senior Water Resources Engineer at Barr Engineering. Prior to this position he was employed for 27 years with USACE St. Paul District as a water resources planner and project manager developing the comprehensive justification for flood risk reduction projects to meet USACE criteria. This included development of benefit analyses and annualized cost calculations used in the benefit/cost ratios and cost effectiveness and economic optimization of projects, and net benefit analyses to justify the Federal level of participation and cost-sharing agreements with non-Federal project sponsors.

Mr. Spsychalla has experience evaluating both structural and non-structural measures through the development of flood hazard mitigation plans for several communities, including Roseau and Granite Falls, Minnesota. He has managed feasibility and Phase 1 general design memoranda for USACE flood risk reduction studies that analyzed the full range of alternative measures from structural through non-structural options using the USACE six-step planning and plan formulation processes. He is familiar with USACE plan formulation process, procedures, and standards and has worked on flood risk reduction projects for USACE, other agencies, and communities for more than 40 years. He managed and developed the plan formulation process for the Sheyenne River Basin (North Dakota) study and project from feasibility stages through authorization by Congress and, ultimately, construction, and has managed other flood risk reduction feasibility studies and projects throughout the Red River Basin in North Dakota and Minnesota. This included using the USACE plan formulation process to evaluate a full range of alternatives--from multiple purpose dams, levees, channel modifications, and diversion channels to non-structural floodplain management and relocation strategies.

Mr. Spsychalla has 40 years of experience directly dealing with the USACE planning process following the Water Resources Council Principles and Guidelines including following the six-step planning process as presented in ER 1105-2-100. This process has been applied most recently in a flood risk reduction study of the Souris/Mouse River in North Dakota for the North Dakota State Water Commission, and was also used extensively in the development of the USACE Sheyenne River, North Dakota, flood risk reduction study and project and on other feasibility-level flood risk reduction studies in the Red River Basin. He is familiar with the USACE flood risk management analysis and economic benefit calculations, including use of HEC-FDA. He has used economic determinations of flood damages from the HEC-FDA and other programs to evaluate flood risk reduction alternatives, determine benefit/cost ratios, and to optimize projects using net benefits. These projects include the Sheyenne River Basin study, North Dakota; Grafton, North Dakota; Devils Lake, North Dakota; Red Lake River Basin study, Minnesota; Pembina River Basin study, North Dakota; Wild Rice River Basin study, Minnesota; and Grand Forks, North Dakota.

He is an active member of the Minneapolis/St. Paul and Rock Island Posts of the Society of American Military Engineers (SAME) and of the Minnesota Association of Floodplain Managers (MN AFPM). He has made technical and policy presentations at both SAME and Minnesota AFPM meetings and conferences.

Don Weitkamp, Ph.D.

Role: Environmental compliance experience and expertise.

Affiliation: Leon-Environmental, LLC

Dr. Weitkamp is an aquatic biologist who has been dealing with fish, invertebrate, and associated aquatic resource issues, primarily in the Pacific Northwest, since 1971. He earned his Ph.D. in fisheries biology from the University of Washington in 1977. He began EIS analysis work in 1985 and continued to work on assessments of biological resources and environmental impacts of potential actions (NEPA, SEPA). He has been involved in more than 20 EISs in the Northwest on both native and non-native fish including the Carrier Homeport EIS, Everett WA project, the SR 509 East-West Corridor Environmental Studies and NEPA EIS project, the Cedar River Salmon Project EIS, and the Yakima River IFIM Studies and Flow Recommendations. He has led ecosystem restoration efforts to avoid and minimize impacts of actions and routinely reviews and critiques the work of others as part of legal proceedings and scientific processes and to ensure they meet Endangered Species Act requirements. Most recently, he prepared aquatic resources impacts analyses for NEPA EISs in Columbia River Basin and Puget Sound. In addition, he provided analyses of state and Federal regulations on water quality and habitat requirements for NEPA and SEPA and identified water quality issues, prepared monitoring plans, conducted agency coordination, and prepared water quality analysis for dredging and sediment remediation projects in the Lower Columbia River, Tacoma Kraft Mill, ASARCO Smelter, Navy Homeport Everett, City of Tacoma outfall, Seattle Seawall, and the Grays Harbor pontoon construction site.

Dr. Weitkamp has experience with non-native and native species, specifically salmonid and non-salmonid species of the Pacific Northwest through project work since 1979. His expertise includes salmonid biology and habitat requirements, salmonid spawning rearing and predation analysis, environmental impact analysis, resident aquatic species analysis, endangered species habitat requirements, and riparian habitat analysis and aquatic habitat restoration. He has routinely provided peer review for journals and other technical publications. Recently, he and two other experts reviewed the Sacramento Delta Smelt decision of a Federal judge regarding the work of two Federal biologists (U.S. Fish and Wildlife Service and Bureau of Reclamation) on water regulation in the delta to protect the endangered species. The expert review determined that the judge's comments were not justified and that minor inconsistencies and inadequacies in explanation did not represent violations of scientific professional standards.

Dr. Weitkamp is familiar with all associated environmental laws including the National Environmental Policy Act, Clean Water Act 404(b)1 and 404 Dredge and Fill Requirements/Washington State Water Quality Standards for Surface Waters (WAC 173-201A), Federal Endangered Species Act of 1973 (16 U.S.C. § 1531 et seq., 50 C.F.R. (Parts 200 and 402), Marine Mammal Protection Act (16 U.S.C. § 1361 et. seq.), Rivers and Harbors Appropriations Act (33 U.S.C. § 403, 33 C.F.R. Part 322) Section 10, CERCLA P.L. 96-510, Section 121. He has experience in cultural resource compliance, specifically Native American, through a direct analysis of potential historic tribal occupation of an Asarco shoreline site. He has experience with the Fish and Wildlife Coordination Act requirements through NEPA and SEPA coordination on the Columbia River Channel Deepening project. He has experience with Section

106 of the National Historic Preservation Act, primarily focused on aquatic resources evaluations and fishing rights issues, through the preparation of EIS sections describing usual and accustomed fishing areas on such projects as the Seattle Seawall, Commencement Bay ASARCO site, and Navy Homeport Everett project. He is also familiar with Washington State regulations to protect Native American fishing rights including the Puyallup Land Claims Settlement Act (25 U.S.C. § 1773) and the Puyallup Tribe of Indians Settlement Act of 1989.

Mark R. Tompkins, P.E., Ph.D.

Role: Hydrologic and hydraulic engineering experience and expertise.

Affiliation: NewFields River Basin Services, LLC

Dr. Tompkins is an engineer, scientist, and planner with extensive experience developing and implementing water resources and aquatic ecosystem projects. He earned his B.S. in civil engineering from the University of Illinois in 1996, his M.S. in environmental engineering from the University of Illinois in 1998, and his Ph.D. in environmental planning (with an emphasis on fluvial geomorphology) from the University of California, Berkeley, in 2006. He is a registered professional engineer (P.E.) in California and Washington. Dr. Tompkins has more than 15 years of experience focused on flood management, river restoration, applied fluvial geomorphology, and aquatic ecology. Over the past decade, Dr. Tompkins has planned, designed, and implemented dozens of flood management and ecosystem restoration projects on the Sacramento and San Joaquin Rivers and many of their tributaries, the Bay Delta, the Klamath River, and many other river systems across the country. He also serves on interdisciplinary technical advisory committees for the San Joaquin River Restoration Program and the Cache Creek Improvement Program, where he advises on large-scale flood management, water supply, and ecosystem management issues.

Since 1998, Dr. Tompkins' work has focused on hydrology and hydraulics (H&H) in support of flood management, fluvial geomorphology (including sediment transport), and river ecosystem management and restoration work, primarily on the west coast of the United States. For most of his career, he has worked on rivers in watersheds with Northwest hydrology, including major rivers in Northern California, Oregon, and Washington. In addition, he has taught graduate-level courses on river restoration that include extensive instruction in H&H.

Dr. Tompkins has conducted numerous field and numerical model-based studies of river hydraulics and sediment transport for planning, design, and post-project monitoring purposes. He has also conducted flood risk management analyses for river projects throughout California's Central Valley and has conducted a wide range of closely related technical work on fluvial geomorphology and river restoration. Most recently, he has conducted field work and H&H analyses on the Yakima River system in Washington. For that project, he provided expert testimony in support of evaluation of state highway impacts on private landowners from flooding and channel morphology changes. He reviewed project flood data and documents, developed a Geographic Information System (GIS) to support quantification of impacts, conducted site investigations to document changes in channel conditions from redirected flood impacts, and evaluated basic sediment transport characteristics. From 2013 to the present, Dr. Tompkins has led the quantification of historical, existing, and needed floodplain rearing habitat to support the Anadromous Fish Restoration Program's "doubling" goals in support of the Central Valley Flood Protection Plan (CVFPP) Conservation Strategy Floodplain Targets project. This effort includes extensive

hydrologic, hydraulic, and GIS-based analyses of the Central Valley flood system of channels, bypasses, and structures. In addition, during his career, he has supported California's Bay Delta Conservation Plan (BDCP) project in a variety of capacities: Expert Review of Effects Analyses, The Nature Conservancy and American Rivers (integrating water systems operations modeling data, Delta ecosystem data, and extensive watershed data; developing custom analytics and visualizations); Principal Flood and Ecosystem Engineer (leading an interdisciplinary effort aimed at enhancing flood management and creating floodplain, riparian, and aquatic habitat; conducting hydrologic evaluations to determine design hydrology); and Senior Fluvial Geomorphologist (charting the geomorphology team and guiding research on historical and current geomorphic conditions in the Sacramento-San Joaquin Bay Delta). For the Geomorphic Assessment of the Klamath River project (southern Oregon and northern California) in support of Federal Energy Regulatory Commission (FERC) relicensing, he served as fluvial geomorphologist, designing and conducting an assessment of approximately 100 miles of the river, writing and editing a study plan, and leading a team to collect data on bed material, channel geometry and slope, riparian vegetation, and large wood at 14 representative river reaches.

Dr. Tompkins experience includes a familiarity with the implementation of engineered logjams in rivers of the Northwest. He has designed several river projects that included significant anchored large wood elements and has evaluated large-wood dynamics in several Northwest rivers, including the Klamath River. During his career, he has used USACE's Hydrologic Engineering Center-River Analysis System (HEC-RAS) modeling software for a wide range of river planning, design, and monitoring projects, including sediment transport analyses. He has reviewed outputs from HEC-Flood Damage Reduction Analysis (HEC-FDA) software and used such outputs to develop a range of flood risk management projects, and has used results from MIKE 21C on several river management and design projects, including work on the Yolo Bypass on the Sacramento River. In addition, he has provided quality assurance/quality control support on MIKE 21C model setup and output for subconsultants who have used this model.

Dr. Tompkins is an active participant in the National Academy of Engineering's Frontiers of Engineering program. Most recently, he organized and led a session on water resources in the face of climate change for the Indo-American Frontiers of Engineering held in Mysore, India, in May 2014. He is also a member of the American Society of Civil Engineers, American Geophysical Union, American Ecological Engineering Society, and Society for Ecological Restoration.

Charles "Chuck" Vita, P.E., G.E., Ph.D.

Role: Geotechnical/civil Engineering experience and expertise.

Affiliation: Independent Consultant

Dr. Vita has 41 years of professional civil and geotechnical engineering experience, with an extensive background in large river processes in complex systems and in geotechnical theory and practice. He earned his B.S. in civil engineering from the University of California, Berkeley, in 1972, his M.S. in civil (geotechnical) engineering from the University of California, Berkeley, in 1973, and his Ph.D. in civil engineering (geosystems) from the University of Washington in 1985. He is a registered professional civil engineer (P.E.) in California, Washington, and Alaska and a registered geotechnical engineer (G.E.) in California. Dr. Vita's geotechnical engineering practice includes geomorphology factors and issues based on his Ph.D. research and project experience with the Alaska Natural Gas Transportation System

(ANGTS) Project, the Trans-Alaska Pipeline System (TAPS) Project, the Coeur d'Alene River Basin Project, the Cedar-River Landsburg Dam Risk Analysis Project, the California Levee Evaluation Program, and current geotechnical evaluation for a site on the North Fork of the Stillaguamish River associated with channel instability and river avulsions due to geotechnical instability. Two of these projects (the Coeur d'Alene River Basin Project and the Cedar-River Landsburg Dam Risk Analysis Project), as well as other projects (the Puyallup River Sha Dadx Habitat Restoration Project, northern portions of the California Levee Evaluation Program project, and various forensic engineering projects associated with storm water and flooding issues), demonstrate his extensive experience in performing geotechnical evaluation and geo-civil design for flood risk management projects in the Northwest. He has also conducted IEPRs for major USACE flood control and storm damage risk reduction projects and river ecosystem restoration projects.

Dr. Vita's work on the California Levee Evaluation Program and the Coeur d'Alene River Basin Project, as well as his many completed USACE IEPRs, demonstrate his familiarity with (1) USACE geotechnical practices associated with flood management channels, construction of large and small sediment management measures, and soil engineering, and (2) geotechnical sampling and laboratory testing, embankment stability and seepage analyses, planning analysis, and other closely associated technical subjects. The ANGTS Project, the TAPS Project, the Puyallup River Sha Dadx Habitat Restoration Project, and the Interstate 90 Snoqualmie East Project, and numerous other projects during his 41 years of geotechnical practice, have also drawn on his knowledge of geotechnical sampling and laboratory testing, analysis of embankment stability and seepage, and planning.

Dr. Vita is an experienced reviewer of cost estimates for construction that use the Micro-Computer Aided Cost Estimating System (MCACES) M2 software, based on his previous IEPR experience in geotechnical, civil, and cost engineering roles. In addition, he is familiar with USACE risk registers and cost and schedule risk analysis. Over his 41-year career, he has gained a working knowledge of construction and is capable of making professional determinations involving construction-related issues. He has addressed safety assurance review (SAR) aspects on several USACE projects, including the Greater New Orleans Hurricane and Storm Damage Risk Reduction System Design Elevation Report, the New Orleans to Venice (NOV) Project, and the Morganza to the Gulf of Mexico Project. Dr. Vita is particularly skilled in the analysis and evaluation of uncertainty and risk and in the reliability of complex infrastructure systems. As part of California's Urban Levee Geotechnical Evaluation Program, he developed a probabilistic formulation of underseepage analysis for risk and uncertainty considerations. He also initiated development of a geotechnical analysis of levee-system slope stability as part of risk and uncertainty consideration of length effects in levee system reliability. He investigated the use of statistical analysis to characterize the probability of undiscovered geologic and geotechnical details affecting levee stability, and reviewed and commented on USACE's draft Engineer Technical Letter 1110 2-570, Certification of Levee Systems for the National Flood Insurance Program, with a focus on geotechnical risk and uncertainty considerations.

Dr. Vita is active in the American Society of Civil Engineers. He has published many professional papers in journals and conference proceedings and has made many technical presentations to professional and lay audiences.

APPENDIX C

Final Charge to the IEPR Submitted
to USACE on August 29, 2014 for
the Mount St. Helens LRR/SEIS
IEPR Project

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CHARGE QUESTIONS AND GUIDANCE TO THE PANEL MEMBERS FOR THE IEPR OF THE MOUNT ST. HELENS SEDIMENT MANAGEMENT PROJECT DOCUMENTS FOR LIMITED RE-EVALUATION REPORT AND SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

BACKGROUND

The purpose of the Mount St. Helens (MSH) Long-term Sediment Management Limited Re-evaluation Report (LRR) is to update the original plan and identify the least-cost approach to manage sediment through 2035 under the existing project authority. The Mount St. Helens Sediment Management Project (MSH Project) was authorized under Supplemental Appropriations Act, 1985, Public Law 99-88, with the State of Washington as the non-Federal sponsor. The plan will be updated based on maintaining Congressionally authorized levels of flood risk reduction on the Cowlitz River in a cost-effective and environmentally sound way.

The MSH Project is located in southwest Washington State. The study area encompasses 1,200 square miles in southwest Washington, reaching north from the Columbia River to the headwaters of the Toutle River at Mount St. Helens. The Columbia River flows east to west through a broad trough between the Cascade and Olympic mountain ranges. The Cowlitz River and its principal tributary, the Toutle River, are typical of rivers draining the west slopes of the Cascade Range. The terrain is mountainous and, except for clearcuts and areas devastated by the 1980 eruption, heavily forested.

The Cowlitz River drains an area of 2,480 square miles including the Toutle river drainage area. Below its confluence with the Toutle, the lower 20 miles of the Cowlitz River passes by the cities of Kelso, Longview, Castle Rock, and Lexington, Washington, before entering the Columbia River at river mile 67.8. The lower 20 miles of the Cowlitz River is where sediment from MSH deposits and causes significant flood risk to the four communities.

The existing sediment reduction structure (SRS) has been operating as run-of-river since 1998 and as a result is now less efficient at trapping sediment. This was anticipated in the original plan and is a key reason it was recognized that additional actions would be required. The *Mount St. Helens, Washington, Decision Document, Toutle, Cowlitz and Columbia Rivers* (USACE, 1985) identified dredging in the Cowlitz River as a means to maintain flood risk reduction levels once the SRS became a run-of-river project, but also provided the option for assessing other long-term alternatives that may be more cost-effective. The conditions in and around the Cowlitz River are different now from what they were in 1985. Endangered Species Act (ESA) issues and a lack of readily available dredge disposal sites make dredging the river difficult and expensive.

Consequently, a new analysis was initiated to find the best long-term approach for managing sediment from MSH. Since the MSH project remains an open construction project, a traditional feasibility study was not completed and the overall project and project benefits were not reformulated.

The LRR and Supplemental Environmental Impact Statement (SEIS) describe the least-cost analysis and identify a recommended updated long-term sediment management strategy. The goal is to combine

measures into alternatives that will result, with reasonable assurance, that the authorized levels of flood risk management benefits will be maintained throughout the project life.

The following measures were considered:

- modifications to the existing spillway crest of the sediment retention structure
- modifications to the entire SRS, including the embankment and spillway crest
- construction of new grade building structures within the sediment plain
- dredging in the lower 20 miles of the Cowlitz River.

These measures were combined into alternatives and were evaluated in terms of least cost, environmental impact, and public acceptability. The final LRR/SEIS describes the remaining construction actions necessary to complete this project. Upon approval of the study, detailed design documentation will be prepared for the implementation of the long-term plan measures. These documents will provide planning, engineering for final design, and construction to proceed, subsequent to Northwest Division and, as needed, HQUSACE approval.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Mount St. Helens Sediment Management Project Document for Limited Re-evaluation Report and Supplemental Environmental Impact Statement (hereinafter: Mount St. Helens LRR/SEIS IEPR) in accordance with the Department of the Army, U.S. Army Corps of Engineers (USACE), Water Resources Policies and Authorities' *Civil Works Review* (Engineer Circular [EC] 1165-2-214, December 15, 2012), and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004).

Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to assess the "adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (EC 1165-2-214; p. D-4) for the Mount St. Helens LRR/SEIS documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) with extensive experience in Civil Works planning/economics, environmental compliance, hydrologic and hydraulic engineering, and geotechnical/civil engineering issues relevant to the project. They will also have experience applying their subject matter expertise to flood risk management.

The Panel will be "charged" with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-214, Appendix D, review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

DOCUMENTS PROVIDED

The following is a list of documents, supporting information, and reference materials that will be provided for the review.

Documents for Review

The following documents are to be reviewed by designated discipline:

Title	Actual No. of Pages	Required Disciplines
Review Documents		
Limited Re-evaluation Report	91	All Disciplines
Environmental Appendix, Supplemental EIS	462	All Disciplines
Real Estate Appendix	32	Civil Works Planner/ Economist
Economic Appendix (2 files)	22	Civil Works Planner/ Economist
Cost Engineering Appendix, Certification	5	Hydrology and Hydraulic (H&H) Engineering; Geotechnical/Civil Engineering; Civil Works Planner/ Economist
Engineering Appendix	139	Hydrology and Hydraulic (H&H) Engineering; Geotechnical/Civil Engineering
Public Review Comments *	50	All Disciplines
Total Review Document Page Count	751	
Supplemental Documents		
Progress Report: Mount St. Helens Long-Term Sediment Management Plan for Flood Risk Reduction, USACE, June 2010	195	All Disciplines
Mount St. Helens Future Expected Deposition Scenario (FEDS), USACE, April 14, 2011	190	All Disciplines
Mount St. Helens, Washington Feasibility Report and Environmental Impact Statement, USACE, December 1984.	515	All Disciplines
MSH Briefing Presentation, USACE, April 2014	25	All Disciplines
Total Supplemental Page Count	925	

* Public review comments will be provided approximately 30 days after the start of the public review period.

Documents for Reference

- USACE guidance *Civil Works Review*, (EC 1165-2-214, December 15, 2012)
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004).

SCHEDULE

This final schedule is based on the August 26, 2014, receipt of the final review documents. Note that dates presented in the schedule below could change due to panel member and USACE availability.

Task	Action	Due Date
Conduct Peer Review	Battelle sends review documents to panel members	9/3/2014
	Battelle convenes kick-off meeting with panel members	9/5/2014
	Battelle convenes kick-off meeting with USACE and panel members	9/5/2014
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	9/16/2014
	Panel members complete their individual reviews	9/26/2014
	Battelle sends public comments to panel members	9/29/2014
Prepare Final Panel Comments and Final IEPR Report	Panel members complete their individual reviews of the Public Comments	10/1/2014
	Battelle provides panel members with talking points for Panel Review Teleconference	10/2/2014
	Battelle convenes Panel Review Teleconference	10/3/2014
	Battelle provides Final Panel Comment templates and instructions to panel members	10/6/2014
	Panel members provide draft Final Panel Comments to Battelle	10/14/2014
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	10/14-23/2014
	Battelle finalizes Final Panel Comments	10/23/2014
	Battelle provides Final IEPR Report to panel members for review	10/27/2014
	Panel members provide comments on Final IEPR Report	10/29/2014
	*Battelle submits Final IEPR Report to USACE	10/31/2014
Comment/Response Process	Battelle inputs Final Panel Comments to DrChecks and provides Final Panel Comment response template to USACE	10/31/2014
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process	11/4/2014
	USACE provides draft Project Delivery Team (PDT) Evaluator Responses to Battelle	11/24/2014
	Battelle provides the panel members the draft PDT Evaluator Responses	11/25/2014
	Panel members provide Battelle with draft BackCheck Responses	12/1/2014
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	12/2/2014
	Battelle convenes Comment-Response Teleconference with panel members and USACE	12/5/2014
	USACE inputs final PDT Evaluator Responses to DrChecks	12/10/2014
	Battelle provides final PDT Evaluator Responses to panel members	12/12/2014
	Panel members provide Battelle with final BackCheck Responses	12/17/2014

Task	Action	Due Date
	Battelle inputs the panel members' final BackCheck Responses to DrChecks	12/19/2014
	*Battelle submits pdf printout of DrChecks project file	12/22/2014

* Deliverables

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the Mount St. Helens LRR/SEIS documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, and properly documented; satisfies established quality requirements; and yields scientifically credible conclusions. The Panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The panel members are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the Panel (by report section or appendix) are included in the general charge guidance, which is provided below.

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the Mount St. Helens LRR/SEIS documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note the following guidance. Note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-214; Appendix D).

1. Your response to the charge questions should not be limited to a "yes" or "no." Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.
3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluating economic or environmental impacts of the proposed project.
4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
7. Please focus the review on assumptions, data, methods, and models.

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also please **do not** comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Agency Technical Review (ATR).
2. Please contact the Battelle Project Manager (Jessica Tenzar, tenzarj@battelle.org) or Program Manager (Karen Johnson-Young (johnson-youngk@battelle.org)) for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Karen Johnson-Young (johnson-youngk@battelle.org) immediately.
4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report, but will remain anonymous.

Please submit your comments in electronic form to Jessica Tenzar, tenzarj@battelle.org, no later than September 26, 2014, 10 pm ET.

Independent External Peer Review

of the

Mount St. Helens Sediment Management Project Document for Limited Re-evaluation Report and Supplemental Environmental Impact Statement

Charge Questions and Relevant Sections as Supplied by USACE

General

1. Are the models used appropriately, in a manner that supports the conclusions drawn from them (i.e., identify meaningful differences among alternatives)?
2. Are the quality and quantity of the surveys, investigations, and engineering sufficient for a concept design?

Problem, Opportunities, Objectives, and Constraints

3. Are the problems, opportunities, objectives, and constraints adequately and correctly defined? Are there any gaps or overstatements?
4. In describing the criteria, goals, and objectives of the study, were the resources and issues important to the decision-making process clearly identified? Did the study address those resources and issues?

Existing and Future Without-Project Resources

5. Has the character and scope of the study area been adequately described and is the identified study area appropriate?
6. Were the environmental surveys and studies supporting Supplemental Environmental Impact Statement development conducted with scientific integrity (i.e., fish and stream surveys, elk habitat GIS survey, wetland determination, old growth forest survey, cultural and historic resource survey)?
7. Was the sediment transport and hydrologic discussion sufficient to characterize current baseline conditions and to allow for evaluation of how forecasted conditions (with and without proposed actions) are likely to affect sediment transport and hydrologic conditions?
8. Was the discussion of natural resources sufficient to characterize current baseline conditions and to allow for evaluation of forecasted conditions (with and without proposed actions)?
9. Were the assumptions used as the basis for developing the most probable future without-project conditions reasonable? Were the potential effects of climate change addressed?

Plan Formulation/Alternative Development

10. Was a reasonably complete array of possible measures considered in the development of alternatives?
11. Is there sufficient information presented to identify, explain, and comment on the assumptions that underlie the engineering, environmental, and economic analyses?
12. Please comment on the screening of the proposed alternatives. Are the screening criteria appropriate?
13. Were the engineering, economic, and environmental analyses used for this study consistent with generally accepted methodologies?
14. Are cumulative impacts adequately described and discussed? If not, please explain.
15. The existing Sediment Retention Structure (SRS) is eligible for listing on the National Register of Historic Places. Does the document adequately address potential impacts and mitigation measures for cultural resources? Does the document adequately address impacts and mitigation measures for Endangered Species Act-listed fish species, wetlands, and wildlife habitat?
16. Assess the adequacy and acceptability of the formulation, evaluation, and comparison of alternative plans.
17. Have risk and uncertainty adequately been integrated into the engineering, economic, and environmental analyses to support the evaluation and comparison of alternatives?

Recommended Plan

18. Does the recommended plan adequately address the ESA-listed fish species rearing and passage requirements of the North Fork Toutle River?
19. Does the recommended plan and proposed fish outplant site mitigation support ongoing use of the existing fish collection facility and the trap and haul program?

Safety Assurance

20. Is the quality and quantity of the surveys, investigations, and engineering sufficient for a concept design and to support the models and assumptions made for determining the hazards?
21. Are the models used to assess hazards appropriate?
22. Are the assumptions made for the hazards appropriate?
23. Does the analysis adequately address the uncertainty and residual risk given the consequences associated with the potential for loss of life for this type of project?
24. Are potential life safety issues accurately and adequately described under existing, future without-project, and future with-project conditions?

25. From a public safety perspective, is the proposed alternative reasonably appropriate or are there other alternatives that should be considered?

Summary Questions

26. Please identify the most critical concerns (up to five) you have with the project and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.
27. Please provide positive feedback on the project and/or review documents.

