

# Review Plan Dworshak Dam Phase II Issues Evaluation Study

Dworshak Dam, Orofino Idaho  
Walla Walla District, Northwestern Division

November 2012



REVIEW PLAN

*Dworshak Dam, Orofino, Idaho  
Issue Evaluation Study, Phase II*

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## 1. PURPOSE AND REQUIREMENTS

a. **Purpose.** This Review Plan defines the scope and level of peer review for Dworshak Dam, Orofino, Idaho, Issue Evaluation Study (IES) Phase II Report as required by the Dam Safety Assurance Program (DSAP). The Review Plan describes the review of basic science and engineering work products focused on fulfilling the project quality requirements defined in the Dworshak Dam IES Project Management Plan (PMP) date May 2012. This Review Plan is a component of the PMP.

### b. References

- (1) Engineering Circular (EC) 1165-2-209, Civil Works Review Policy, 31 Jan 2010
- (2) ER 1105-2-100, Planning Guidance Notebook, Appendix H, Policy Compliance Review and Approval of Decision Documents, Amendment #1, 20 Nov 2007
- (3) Dworshak Issue Evaluation Study, Phase II PMP, May 2012
- (4) Engineering Regulation (ER) 1110-2-1156, Safety of Dams – Policy and Procedure, 28 October 2011
- (5) NWWOM 5-1-10, Quality Management Plan, 22 May 2009
- (6) Engineering Regulation (ER) 5-1-11, USACE Business Process
- (7) Engineering Regulation (ER) 1110-1-12, Quality Management, 31 Mar 2011

c. **Requirements.** This review plan was developed in accordance with EC 1165-2-209, which establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products by providing a seamless process for review of all Civil Works projects from initial planning through design, construction, and operation, maintenance, repair, replacement and rehabilitation (OMRR&R). The EC outlines four general levels of review: District Quality Control/Quality Assurance (DQC), Agency Technical Review (ATR), Independent External Peer Review (IEPR), and Policy and Legal Compliance Review. In addition to these levels of review, decision documents are subject to cost engineering review and certification (per EC 1165-2-209) and planning model certification/approval (per EC 1105-2-412).

## 2. REVIEW MANAGEMENT ORGANIZATION (RMO) COORDINATION

The RMO is responsible for managing the overall peer review effort described in this Review Plan. The RMO for dam safety related work, including this IES, is the Risk Management Center (RMC). Contents of this review plan have been coordinated with the RMC and Northwestern Division, the Major Subordinate Command (MSC). Informal coordination with NWD has occurred throughout the IES development, including briefings to the NWD Dam Safety Committee and Program Review Board updates. In-Progress Review (IPR) team meetings with the RMC, NWD, and HQ will be scheduled on an “as needed” basis to discuss programmatic, policy, and technical matters. The NWD Dam Safety Program Manager will be the POC for vertical team coordination. The PDT does not foresee interaction with the Planning Center of Expertise, Flood Damage Reduction (FRM-PCX), since Dworshak Dam is managed under the Hydropower Business Line. This review plan will be updated for each new project phase.

### 3. STUDY INFORMATION

- a. **Decision Document.** The Walla Walla District is preparing an Issue Evaluation Study (IES), Phase II at this time. The IES is not a decision document. It is a document that is used to present information that confirms dam safety issues and supports the need for a dam safety modification study (DSMS), or states the case to revise the current Dam Safety Action Classification (DSAC) rating. If the IES supports the need for a DSMS then a Dam Safety Modification (DSM) Report and an Environmental Impact Statement (EIS) will be prepared for the remediation of Dworshak Dam. The DSM Report will serve as the decision document authorizing remediation. This IES, Phase II, will require review and approval from HQUSACE Dam Safety Officer and Senior Oversight Group Chairman.
- b. **Study/Project Description.** Dworshak Dam is a multipurpose project located at river mile 1.9 on the North Fork of the Clearwater River near Orofino, Idaho. Construction began in 1966, flood damage reduction operations began in June 1972, and power generation came online in 1973. The project includes the dam, reservoir, powerhouse, recreation facilities, wildlife mitigation and Dworshak National Fish Hatchery. The reservoir is 54 miles long and has a surface area of about 20,000 acres. Additional information can be found on the Walla Walla District website at <http://www.nww.usace.army.mil/Locations/DistrictLocksandDams/DworshakDamandReservoir.aspx>

Dworshak Dam was identified as a DSAC II project in 2007. Construction General Wedge funding for a Dam Safety Study was initially received in FY2008. The Interim Risk Reductions Measure (IRRM) Plan was prepared in January 2008 and approved by NWD in February 2008. A Potential Failure Modes Analysis (PFMA) was conducted by NWW with a Facilitator from the FERC in August 2008. A second PFMA occurred during September 2009, co-facilitated by Dave Schaaf and Dr. Loren Anderson, in support of the phase 1 IES. A hydraulic model created by the Modeling, Mapping, and Consequences (MMC) Production Center was used and further updated by the H&H IES team for this study. The results from that model were used to evaluate the failure modes presented in the IES report. The Phase I IES report was completed in January 2012. The Phase II Issues Evaluation Study was recommended at the November 2011 HQUSACE Dam Senior Oversight Group (SOG) meeting and approved by the Headquarters Dam Safety Officer 3 May 2012. This IES, Phase II, will be presented to the HQUSACE Senior Oversight Group in FY2013 or FY2014.

A total of four credible failure modes were deemed significant enough to warrant further consideration as part of the Dworshak IES. These are as follows:

- a. PFM #7 Earthquake Fails Spillway Gate Causing Release of Upper Part of Pool
- b. PFM #13 Overtopping of Dam Causing Washout of Abutment and Release of Reservoir
- c. PFM #32 Monolith Instability of Dam Sections with Longitudinal Cracking
- d. PFM #33 External Monolith Instability of General Monolith Sections (combination of PFM #1, 3, 4)

Additional failure modes, based on new information, may also be considered.

- c. **Factors Affecting the Scope and Level of Review.** The review of all work products will be in general accordance with the requirements of EC 1165-2-209 by following the guidelines established within this review plan. All engineering and design products will undergo District Quality Control Reviews. In accordance with ER 1110-2-1156, Chapter 8, this IES will undergo the following reviews:



- (1) District Quality Control Review, coordinated and managed by the NWW
- (2) Quality Assurance Review, coordinated and managed by the NWD
- (3) Agency Technical Review, coordinated and managed by the RMC
- (4) Quality Control and Consistency Review, coordinated and managed by the RMC
- (5) Dam Senior Oversight Group Review, coordinated and managed by the RMC

d. **In-Kind Contributions.** There are no in-kind contributions identified for this project.



**Dworshak Dam, Vicinity Map**

#### **4. DISTRICT QUALITY CONTROL (DQC)**

District Quality Control (DQC) is the review of basic science and engineering work products focused on fulfilling the project quality requirements. DQC will be performed for all Walla Walla district engineering products by staff not involved in the work and/or study. Basic quality control tools include a plan providing for seamless review, quality checks and reviews, supervisory reviews, Project Delivery Team (PDT) reviews, etc.

- a. **Documentation of DQC.** DQC will be conducted with a phased approach; phase one is review of the Foundation Report, phase two is review of the Structural Analysis, and phase three is review of the final draft IES, inclusive of appendixes. The phased approach will provide critical reviews of documents before the information is used in subsequent phases and decisions are made. DQC requires section chief oversight and District technical experts. NWW will conduct a robust DQC in accordance with EC 1165-2-209, Civil Works Review Policy, NWWOM 5-1-10, Walla Walla District Quality Management Plan, and ER 1110-2-12, Quality Management. Documentation of DQC activities is required and will be in accordance with the NWW Quality manual and the NWD MSC.

The DQC and ATR will be concurrent. Comments and responses from DQC will be available for the ATR team to review through ProjNet DrChecks.

ProjNet DrChecks review software will be used to document reviewer comments, responses and associated resolutions. Comments should be limited to those that are required to ensure the adequacy of the product.

- b. Products to Undergo DQC.** The DQC will review the Foundation Report, Structural Analysis, and draft IES report, inclusive of appendixes.
- c. Required DQC Expertise.** The DQC should include PDT members from Geotechnical, Dam Safety, Hydrology & Hydraulics, Structures, Mechanical, General Engineering, Cost Engineering, Project Management, Planning, and Operations.

**5. AGENCY TECHNICAL REVIEW (ATR)**

The ATR is an in-depth review, managed within USACE, and conducted by a qualified team outside of the home district that is not involved in the day-to-day production of the project/product. The purpose of this review is to ensure the proper application of clearly established criteria, regulations, laws, codes, principles and professional practices. The ATR will assess whether the analyses presented are technically correct and comply with published USACE guidance, and that the document explains the analyses and results in a reasonably clear manner for the public and decision makers. The ATR team reviews the various work products and assure that all the parts fit together as a coherent whole. ATR teams will be comprised of senior USACE personnel (Regional Technical Specialists, etc.), and may be supplemented by outside experts as appropriate. To assure independence, the leader of the ATR team shall be from outside the home Major Subordinate Command (MSC).

Draft ER 1110-2-1156, Chapter 8 describes the purpose, process, roles and responsibilities for an IES in addition to the submittal, review, and approval process. The Risk Management Center (RMC) is responsible for coordinating and managing agency technical review of the IES Report in accordance with EC 1165-2-209.

- a. Products to Undergo ATR.** The ATR will be conducted with a phased approach; phase one is review of the Foundation Report, including the Geology, phase two is review of the Structural Analysis, including the Finite Element Analysis, and phase three is review of the final draft IES, inclusive of appendixes. The phased approach will provide critical reviews of documents before the information is used in subsequent phases and decisions are made.
- b. Required ATR Team Expertise.** The ATR team will be chosen based on each individual’s qualifications and experience with similar projects.

ATR Team Members/Disciplines	Expertise Required
ATR Lead	The ATR lead is a senior professional with extensive experience in preparing Civil Works decision documents and conducting ATRs (or ITRs). The lead has the necessary skills and experience to lead a virtual team through the ATR process. The ATR lead may also serve as a reviewer for a specific discipline.

Economics	The Economist shall be knowledgeable of policies and guidelines of ER 1110-2-1156 as well as experienced in analyzing flood risk management projects in accordance with ER 1105-2-100, the Planning Guidance Notebook. The economist shall be knowledgeable and experienced with standard Corps computer models and techniques used to estimate population at risk, life loss, and economic damages.
Hydraulic Engineering	The Hydraulic Engineer shall have experience in the analysis and design of hydraulic structures related to mass concrete dams including the design of hydraulic structures (e.g., spillways, outlet works, and stilling basins). The hydraulic engineer shall be knowledgeable and experienced with the routing of inflow hydrographs through multipurpose flood control reservoirs utilizing multiple discharge devices, Corps application of risk and uncertainty analyses in flood damage reduction studies, and standard Corps hydrologic and hydraulic computer models used in drawdown studies, dam break inundation studies, hydrologic modeling and analysis for dam safety investigations.
Geotechnical Engineering	The Geotechnical Engineer shall have experience in the field of geotechnical engineering, analysis, design, and construction of mass concrete dams. The geotechnical engineer shall have experience in subsurface investigations, rock and soil mechanics, internal erosion (seepage and piping), slope stability evaluations, erosion protection design, and earthwork construction. The geotechnical engineer shall have knowledge and experience in the forensic investigation of seepage, settlement, stability, and deformation problems associated with high head mass concrete dams and appurtenances constructed on rock and soil foundations.
Engineering Geologist	The Engineering Geologist shall have experience in assessing internal erosion (seepage and piping) beneath mass concrete dams constructed on bedrock formations. The engineering geologist shall be familiar with identification of geological hazards, exploration techniques, field and laboratory testing, and instrumentation. The engineering geologist shall be experienced in the design of grout curtains and must be knowledgeable in grout theology, concrete mix designs, and other materials used in foundation seepage barriers.
Structural Engineering	The Structural Engineer shall have experience and be proficient in performing stability analysis, finite element analysis, seismic time history studies, external stability analysis including foundations on high head mass concrete dams. The structural engineer shall have specialized experience in the design, construction and analysis of concrete dams.
Mechanical Engineering	The Mechanical Engineer shall have experience in machine design, machine rehabilitation and familiarity with design of mechanical gates and controls for flood control structures.

**c. Documentation of ATR.** DrChecks review software will be used to document all ATR comments, responses and associated resolutions accomplished throughout the review process. Comments should be limited to those that are required to ensure adequacy of the product. The four key parts of a quality review comment will normally include:

- (1) The review concern – identify the product’s information deficiency or incorrect application of policy, guidance, or procedures;
- (2) The basis for the concern – cite the appropriate law, policy, guidance, or procedure that has not been properly followed;
- (3) The significance of the concern – indicate the importance of the concern with regard to its potential impact on the plan selection, recommended plan components, efficiency (cost), effectiveness (function/outputs), implementation responsibilities, safety, Federal interest, or public acceptability; and
- (4) The probable specific action needed to resolve the concern – identify the action(s) that the reporting officers must take to resolve the concern.

In some situations, especially addressing incomplete or unclear information, comments may seek clarification in order to then assess whether further specific concerns may exist.

The ATR documentation in DrChecks will include the text of each ATR concern, the PDT response, a brief summary of the pertinent points in any discussion, including any vertical team coordination (the vertical team includes the district, RMO, MSC, and HQUSACE), and the agreed upon resolution. If an ATR concern cannot be satisfactorily resolved between the ATR team and the PDT, it will be elevated to the vertical team for further resolution in accordance with the policy issue resolution process described in either ER 1110-1-12 or ER 1105-2-100, Appendix H, as appropriate. Unresolved concerns can be closed in DrChecks with a notation that the concern has been elevated to the vertical team for resolution.

ATR may be certified when all ATR concerns are either resolved or referred to the vertical team for resolution and the ATR documentation is complete. The ATR Lead will prepare a Statement of Technical Review certifying that the issues raised by the ATR team have been resolved (or elevated to the vertical team). A Statement of Technical Review should be completed, based on work reviewed to date. A sample Statement of Technical Review is included in Attachment 2.

## **6. INDEPENDENT EXTERNAL PEER REVIEW (IEPR)**

IEPR is the most independent level of review, and is applied in cases that meet certain criteria where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside of USACE is warranted. This IES is not a decision document and does not cover work requiring a Type I or Type II IEPR. Issue Evaluation Studies are used to justify Dam Safety Modification Studies (DSMS). If this project requires a DSMS, both Type I and Type II IEPR will be conducted.

## **7. POLICY AND LEGAL COMPLIANCE REVIEW**

All decision documents will be reviewed throughout the study process for their compliance with law and policy. Since this IES is not a decision document it does not require a Policy and Legal Compliance



Review. If this project requires a Dam Safety Modification Study, a Policy and Legal Compliance Review will be conducted.

## 8. COST ENGINEERING DIRECTORY OF EXPERTISE (DX) REVIEW AND CERTIFICATION

All decision documents shall be coordinated with the Cost Engineering DX, located in the Walla Walla District. Since this IES is not a decision document it does not require a Cost Engineering Directory of Expertise (DX) Review and Certification. If this project requires a Dam Safety Modification Study, a Cost Engineering DX Review and Certification will be conducted.

## 9. MODEL CERTIFICATION AND APPROVAL

EC 1105-2-412 mandates the use of certified or approved models for all planning activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. Planning models, for the purposes of the EC, are defined as any models and analytical tools that planners use to define water resources management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives and to support decision making. This IES does not include Planning models, therefore no certification and approval is required.

## 10. REVIEW SCHEDULES AND COSTS

### DQC and ATR Schedule and Cost.

Following is the proposed schedule and estimated cost for the Dworshak Dam IES, Phase II reviews. This is contingent on resource availability.

Review	Start	Duration	Cost
DQC – Foundation Report	November 2012	4 weeks – review	\$12,000
		4 weeks – revisions and backcheck	
ATR – Foundation Report	November 2012	4 weeks – review	\$12,000
		4 weeks – revisions and backcheck	
DQC – Structural Analysis	May 2013	4 weeks – review	\$18,000
		4 weeks – revisions and backcheck	
ATR – Structural Analysis	May 2013	4 weeks – review	\$18,000
		4 weeks – revisions and backcheck	
DQC – IES Report	TBD	4 weeks – review	\$30,000
		4 weeks – revisions and backcheck	
ATR – IES Report	TBD	4 weeks – review	\$80,000
		4 weeks – revisions and backcheck	
QCC – IES Report	TBD	4 weeks – review	\$60,000
		4 weeks – revisions and backcheck	

## **11. PUBLIC PARTICIPATION**

Public participation will not take place until the IES phase is completed. Public and stakeholder coordination has been performed to inform interested parties about the DSAC rating change and ongoing IES. Findings of the Final IES will also be shared with appropriate stakeholders. If this project results in a Dam Safety Modification Study (DSMS), future public coordination will occur.

## **12. REVIEW PLAN APPROVAL AND UPDATES**

The Northwest Division Commander (MSC Commander) is responsible for approving this Review Plan. The Commander's approval reflects vertical team input (involving district, MSC, RMO, and HQUSACE members) as to the appropriate scope and level of review for the decision document. Like the PMP, the Review Plan is a living document and may change as the study progresses. The home district is responsible for keeping the Review Plan up to date. Minor changes to the review plan since the last MSC Commander approval are documented in Attachment 3. Significant changes to the Review Plan (such as changes to the scope and/or level of review) should be re-endorsed by the RMC and re-approved by the MSC Commander following the process used for initially approving the plan. The latest version of the Review Plan, along with the Commanders' approval memorandum, will be provided to the RMO and home MSC.

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

Points of Contact are listed in Attachment 1, Team Rosters.

## **ATTACHMENT 1: TEAM ROSTERS**

### Walla Walla District PDT

NWW Dam Safety Officer  
NWW Dam Safety Program Manager  
Dworshak IES Project Manager  
Chief Design Branch, PDT Lead Engineer  
Chief Structural Design  
Chief Geotechnical (and Geology)  
Chief Hydrology and Hydraulics  
Chief Mechanical  
Chief General Engineering  
Chief Cost Branch  
Chief Planning Division (and Economists)  
Chief Operations Division  
Dworshak Operations Manager  
Structural Engineer  
Structural Engineer  
Geologist  
Geologist

### PDT Advisors

Geologist, RMC  
Structural Engineer, ERDC, ITL  
Structural Engineer, Consultant

### RMC Risk Cadre

Per Mark Ahlstrom, to be determined

### Vertical Team

NWW Dam Safety Program Manager  
NWW Dam Safety Officer  
NWD Dam Safety Program Manager  
NWD Dam Safety Officer  
HQUSACE Special Assistant for Dam and Levee Safety  
HQUSACE Dam Safety Program Manager  
RMC Advisor  
RMC Review Manager  
RMC Chief (Western Division)  
RMC Director

District Quality Control (DQC) Team

Engineering Geologist  
Geotechnical Engineer  
Hydrologic Engineer  
Structural Engineer  
Mechanical Engineer  
Cost Engineer  
Economics  
Operations

Agency Technical Review (ATR) Teams

ATR Phase 1, Foundation Report Team

Engineering Geologist, NWP

ATR Phase 2, Structural Analysis Team

Structural Engineer, BOR  
Structural Engineer, NWP

ATR Phase 3, IES Report Team

ATR Lead  
Structural Engineer  
Hydraulic Engineer  
Mechanical Engineer  
Geotechnical Engineer  
Engineering Geologist  
Hydraulic Engineer  
Mechanical Engineer  
Consequences  
Risk  
Structural Engineer



**ATTACHMENT 2: SAMPLE STATEMENT OF TECHNICAL REVIEW FOR DECISION DOCUMENTS**

**COMPLETION OF AGENCY TECHNICAL REVIEW**

The Agency Technical Review (ATR) has been completed for the <type of product> for <project name and location>. The ATR was conducted as defined in the project’s Review Plan to comply with the requirements of EC 1165-2-209. During the ATR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the customer’s needs consistent with law and existing US Army Corps of Engineers policy. The ATR also assessed the District Quality Control (DQC) documentation and made the determination that the DQC activities employed appear to be appropriate and effective. All comments resulting from the ATR have been resolved and the comments have been closed in DrChecks<sup>sm</sup>.

*SIGNATURE*

Name  
ATR Team Leader  
Office Symbol/Company

\_\_\_\_\_  
Date

*SIGNATURE*

Name  
Project Manager  
Office Symbol

\_\_\_\_\_  
Date

*SIGNATURE*

Name  
Architect Engineer Project Manager<sup>1</sup>  
Company, location

\_\_\_\_\_  
Date

*SIGNATURE*

Nathan Snorteland  
Review Management Office Representative  
CEIWR-RMC

\_\_\_\_\_  
Date

**CERTIFICATION OF AGENCY TECHNICAL REVIEW**

Significant concerns and the explanation of the resolution are as follows: Describe the major technical concerns and their resolution.

As noted above, all concerns resulting from the ATR of the project have been fully resolved.

*SIGNATURE*

Name  
Chief, Engineering and Construction Division  
Office Symbol

\_\_\_\_\_  
Date

*SIGNATURE*

Name  
Dam Safety Officer  
Office Symbol

\_\_\_\_\_  
Date

<sup>1</sup> Only needed if some portion of the ATR was contracted  
<sup>2</sup> Only needed if different from the Chief, Engineering Division

**ATTACHMENT 3: REVIEW PLAN REVISIONS**

<b>Revision Date</b>	<b>Description of Change</b>	<b>Page / Paragraph Number</b>



**ATTACHMENT 4: ACRONYMS AND ABBREVIATIONS**

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

