REVIEW PLAN

April 7, 2020

Project Name: Columbia River System Operations Environmental Impact Statement (EIS)

P2 Number: N/A, this project is maintained in a P6 module.

Decision Document Type: Records of Decision

Project Type: Operations and Maintenance

Major Subordinate Command (MSC): Northwestern Division

Contact: [redacted]

Review Management Organization (RMO): Northwestern Division

Key Review Plan Dates

Date of RMO Endorsement of Review Plan: 07 APR 2020
Date of MSC Approval of Review Plan: 07 APR 2020
Date of IEPR Exclusion Approval: N/A
Has the Review Plan changed since PCX Endorsement? No
Date of Last Review Plan Revision: None
Date of Review Plan Web Posting: Pending
Date of Congressional Notifications: Pending

Milestone Schedule

	Scheduled	Actual	Complete
Release Draft EIS to Public:	FEB 2020	*28 FEB 2020*	Yes
Notice of Availablity Posted in Federal Register:	JUL 2020	*(enter date)*	No
Records of Decision:	SEP 2020	*(enter date)*	No

Project Fact Sheet
March 06, 2020

Project Name: Columbia River System Operations Environmental Impact Statement (EIS)

Location: Interior Columbia River basin, Columbia-Snake River System within Idaho, Montana, Oregon and Washington.

Authority: Requirement to prepare documentation in accordance with the National Environmental Policy Act (NEPA) for the Columbia River System Operations is a court order of Michael H. Simon, United States District Judge, dated May 4, 2016.

Sponsor: There is no non-Federal sponsor for the study/project. The U.S. Army Corps of Engineers (Corps), U.S. Bureau of Reclamation (BOR or Reclamation) and the Bonneville Power Administration (BPA) are project action agencies or co-lead agencies as the Corps and Reclamation operate system dams and related facilities and BPA markets and transmits the power generated by the dams.

Type of Study: NEPA document, Enivironmental Impact Statement

Project Area: The project area is located within the Interior Columbia River basin within Idaho, Montana, Oregon and Washington and consists of the 14 Columbia River System Operations (CRSO) Federal multipurpose dams and related facilities that are operated as a coordinated sytem within the four major regions of the Columbia River Basin CRSO management area (Figure 1). Corps dams within the project area include Libby, Albeni Falls, Dworshak, Chief Joseph, Lower Granite, Little Goose, Lower Monumental, Ice Harbor, McNary, John Day, The Dalles, and Bonneville. Reclamation dams within the project area include Hungry Horse and Grand Coulee.

Problem Statement: The co-lead agencies have operated the system consistent with the analyses in the Columbia River System Operation Review EIS and associated 1997 Records of Decision with changes to system operations adopted under subsequent Endangered Species Act (ESA) consultations and project-specific NEPA documents. The proposed Columbia River System Operations EIS will assess and update the approach for long-term system operations and configuration.

The co-lead agencies are responsible for managing the system for various authorized purposes including operations and management, flood risk management, hydropower, irrigation, navigation, fish and wildlife and recreation. Due to the co-lead agencies operating the CRSO as a coordinated system, this collective effort results in differentiating this project from normal decision documents.

The use of BOR and BPA models and the development of technical appendices for assessing systems operation is an example of this collaborative effort. Although BOR and BPA models are not Corps certified, the uniqueness of this project with co-lead agency missions requires using BOR and BPA models as appropriate without Corps certification. However, all models used in this study that are not Corps certified will undergo independent external peer review (IEPR) regardless of the model's agency origination. The co-lead agencies will use their collective expertise to evaluate a range of operating alternatives and potential structural modifications to CRSO features and evaluate

the potential impacts of alternatives on the human and natural environments in compliance with NEPA.

In addition to public and agency scoping, the co-lead agencies have a memoranda of understanding with approximately 25 cooperating agencies so that sovereign entities with applicable expertise and jurisdiction may assist the co-lead agencies with various parts of EIS scoping, alternatives development, model development and analysis.

Risk Identification: Potential project risks identified include connection to on-going litigation on the Columbia River System, the likelihood for public, tribal and state government dispute due to potential competing interests and potential human life safety impacts due to the consideration of structural modifications to existing projects. Existing conditions do not pose a significant threat to human life or the environment. The future without project condition and future with project condition will not likely result in a significant threat to human life or the environment due to structural modifications considered as EIS documentation primarily addresses existing and proposed system operations and related impacts. This project will also require IEPR for numerous models and discipline-specific technical appendices including the methods and analytical results to confirm the scientific and technical sufficiency and accuracy of the analyses prepared for the draft EIS (DEIS). However, the independent review of model and technical appendices is not considered an inherent project risk, but is part of the overall project analysis.

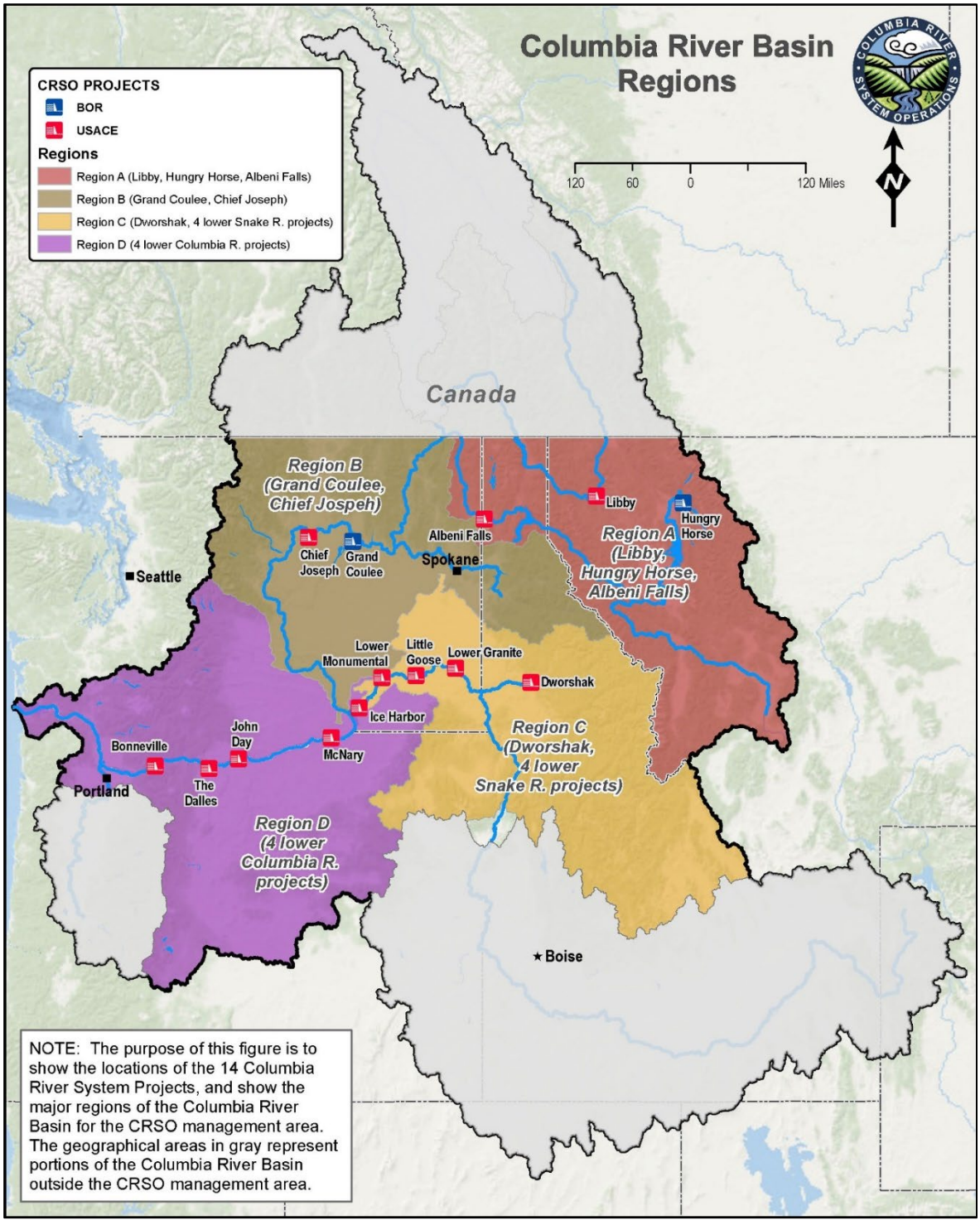

Figure 1. Project Area System Overview Map

1. FACTORS AFFECTING THE LEVELS OF REVIEW

Scope of Review.

- Will the study likely be challenging? The study will likely be challenging due to the previously identified risks.

- Provide a preliminary assessment of where the project risks are likely to occur and assess the magnitude of those risks. Identified risks include those above in "Risk Identification". Identified risks and their magnitude include:

  - Potential impacts to human life safety due to the consideration of structural modifications to existing projects. Low magnitude risk as potential structural modifications such as dam breaching is not a precedent setting activity and has been completed successfully on both federal and nonfederal dams. The EIS addresses the no action alternative and changes to existing operations, maintenance, and configuration of 14 federal projects.

  - Project litigation due to on-going litigation on the Columbia River System. High magnitude risk for litigation, whether linked, or not linked to on-going litigation based on the nature of the project and potential competing interests.

  - High magnitude risk for public, tribal and state government dispute due to potential competing interests.

- Is the project likely to be justified by life safety or is the study or project likely to involve significant life safety issues? The project is not justified by life safety and is not likely to involve significant life safety issues as the project primarily addresses changes in system operations, maintenance, and configuration of 14 federal projects.

- Has the Governor of an affected state requested a peer review by independent experts? No.

- Will the project likely involve significant public dispute as to the project's size, nature, or effects? The project will likely involve significant public dispute based on the project's relatively large size, the environmental nature of the project and its potential effects of proposed actions on the human and natural environments.

- Is the project/study likely to involve significant public dispute as to the economic or environmental cost or benefit of the project? The project will likely involve significant public dispute due to the economic or environmental cost or benefit of the project.

- Is the information in the decision document or anticipated project design likely to be based on novel methods, involve innovative materials or techniques, present complex challenges for interpretation, contain precedent-setting methods or models, or present conclusions that are likely to change prevailing practices? The information in the decision document or anticipated project design is not anticipated to be based on novel methods, involve innovative materials or techniques, present complex challenges for interpretation, contain precedent-setting methods or models or present conclusions that are likely to change

prevailing practices. Although structural modifications are under consideration for this project, no detailed design is currently available to asses design methods, materials or techniques, or additional design characteristics. The evaluation of detailed design would occur prior to implementation of any structural measures.

- Does the project design require redundancy, resiliency, and/or robustness, unique construction sequencing, or a reduced or overlapping design/construction schedule? The EIS being produced for this project generally includes operational changes. Strucutral changes such as features to increase fish passage and dam breaching are considered, but no detailed, structural design is included at this stage of the project. At this poin this point in time, it is unknown if the design of any structural changes to this system would likely require resiliency, and/or robustness, unique construction sequencing, or a reduced or overlapping design/construction schedule. This will be further evaluated when detailed design of any structural measures would occur.

- Is the estimated total cost of the project greater than $200 million? Yes.

- Will an Environmental Impact Statement be prepared as part of the study? An environmental impact statement will be prepared for this project.

- Is the project expected to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources? The project has the potential to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources.

- Is the project expected to have substantial adverse impacts on fish and wildlife species and their habitat prior to the implementation of mitigation measures? The project is not expected to have substantial adverse impacts on fish and wildlife species and their habitat prior to the implementation of mitigation measures as the project proposes changes in operations that are anticipated to benefit fish and wildlife.

- Is the project expected to have, before mitigation measures, more than a negligible adverse impact on an endangered or threatened species or their designated critical habitat? The project is not expected to have more than a negligible adverse impact on endangered or threatened species or their designated critical habitat before mitigation measures as the project proposes changes in operations that are anticipated to benefit fish and wildlife including species listed under the ESA and their designated critical habitat, where applicable.

2. REVIEW EXECUTION PLAN

This section describes each level of review to be conducted. Based upon the factors discussed in Section 1, this study will undergo the following types of reviews:

District Quality Control. All decision documents (including data, analyses, environmental compliance documents, etc.) undergo DQC. This internal review process covers basic science and general engineering work products and fulfills the project quality requirements of the Project

Management Plan. DQC conducted for this project included review of the DEIS and associated appendices.

Agency Technical Review. ATR is to be performed by a qualified team from outside the home district that is not involved in the day-to-day production of the project/product. These teams are preferably comprised of certified USACE personnel. The ATR team lead will be from outside the home MSC. If significant life safety issues are involved in a study or project a safety assurance review should be conducted during ATR.

Independent External Peer Review. Type I IEPR may be required for decision documents under certain circumstances. This is the most independent level of review, and is applied in cases that meet criteria where the risk and magnitude of the project are such that a critical examination by a qualified team outside of USACE is warranted. A risk-informed decision is made as to whether Type I IEPR is appropriate.

Cost Engineering Review. All decision documents shall be coordinated with the Cost Engineering Mandatory of Expertise (MCX). The MCX will assist in determining the expertise needed on the ATR and IEPR teams. The MCX will provide the Cost Engineering certification. The RMO is responsible for coordinating with the MCX for the reviews. These reviews typically occur as part of ATR.

Model Review and Approval/Certification. EC 1105-2-412 mandates the use of certified or approved models for all planning work to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. Based on the uniqueness of this study including the collaberation of three co-lead agencies, all models used in this study that are not Corps certified will undergo Type I IEPR.

Policy and Legal Review. All decision documents will be reviewed for compliance with law and policy. These reviews culminate in determinations that report recommendations and the supporting analyses and coordination comply with law and policy, and warrant approval or further recommendation to higher authority by the home MSC Commander. These reviews are not further detailed in this section of the Review Plan.

Table 1 provides the schedules and costs for reviews. The specific expertise required for the teams are identified in later subsections covering each review. These subsections also identify requirements, special reporting provisions, and sources of more information. review is addressed in Section 2.d. MODEL CERTIFICATION OR APPROVAL.
All models not Corps certified or approved will undergo IEPR but are not expected to be submitted for approval.
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Table 1: Levels of Review

Product(s) to undergo Review	Review Level	Start Date	End Date	Cost	Complete
Planning Models Review will be included as part of Type I IEPR	Model Review (see EC 1105-2-412)	3/2/20	7/2/20	TBD	No
Draft EIS	District Quality Control	12/04/19	03/31/20	TBD	Final Backcheck Ongoing
Draft EIS	Agency Technical Review	2/28/20	4/24/20	TBD	No
Draft EIS	Type I IEPR	3/2/20	7/2/20	TBD	No
Draft EIS	Policy and Legal Review	1/2/20	2/27/20	N/A	Yes
Final EIS	Policy and Legal Review	TBD	TBD	N/A	No

a. DISTRICT QUALITY CONTROL

The home district shall manage DQC and will appoint a DQC Lead to manage the local review (see EC 1165-2-217, section 8.a.1). The DQC Lead should prepare a DQC Plan and provide it to the RMO and MSC prior to starting DQC reviews. Table 2 identifies the required expertise for the DQC team.

Table 2: Required DQC Expertise

DQC Team Disciplines	Expertise Required
DQC Lead	A senior professional with experience preparing Civil Works decision documents and conducting DQC. The lead may also serve as a reviewer for a specific discipline (such as planning, economics, environmental resources, etc).
Plan Formulation	Water resources planner experienced with evaluating Federal Environmental Impact Statements and/or Federal Planning Studies for compliance with agency-specific policy and guidance. Experience with policies and guidance documents of one or more of the CRSO co-lead agencies is preferred. Planners should have the experience to critique the CRSO alternatives development process.
Economics -Cost Analysis -Hydropower -Water Supply -Flood Risk Management -Recreation -Navigation	Economists with experience in evaluating socioeconomic and economic-related resource impacts analyses including cost analysis similar in scale and scope to the CRSO EIS project. <u>Hydropower</u> Energy and hydropower impacts analysis experience including hydropower operation, generation and transmission. Familiarity with the FColumbia River System, energy modeling, energy pricing and the EIS study process. <u>Water Supply</u> •Evaluating impacts to water deliveries due to changes in water surface elevations (i.e. ability to pump from reservoirs or rivers). Experience with water rights (in particular, interruptible rights in Washington) and impacts to groundwater due to changes in surface water resources is also beneficial. <u>Flood Risk Management</u> •Flood risk management impacts analysis experience, specifically experience and knowledge of hydraulic and economic modeling methods to evaluate changes in flood risk. <u>Recreation</u> •Recreation impact analysis experience, specifically experience with the application of utility modeling and benefits transfer modeling to evaluate changes in recreation benefits.

	<u>Navigation</u> •The application of navigation and transportation modeling including experience with forecasting carrier and shipping cost impacts, carrier response to changes, barge shipping availability and cost and forecasting cost impacts to alternate shipping modes if barge shipping is reduced or eliminated. Experience with commercial, recreational, and tribal fisheries economic impacts analysis is also beneficial.
NEPA Sufficiency and Environmental Compliance	Reviewer will have experience preparing, completing, and reviewing NEPA Environmental Compliance Documents (EAs, EISs) for complex projects, to include coordinating with other in-house disciplines (such as biologists, archaeologists, water quality specialists, engineers, etc.), Tribes, and outside federal and non-federal resource agencies to comply with applicable environmental laws and regulations including, but not limited to the Clean Water Act, Clean Air Act, and Endangered Species Act; and evaluating the proposed alternatives for potential environmental effects and for appropriate mitigation measures and the development of mitigation plans.
Environmental Justice	Reviewer will have experience addressing and evaluating the fair treatment, meaningful involvement and potential disproportionate effects regarding all people regardless of race, color, culture, national origin, income, and educational levels with respect to the development, implementation, and enforcement of protective environmental laws, regulations, and policies. Experience with tribal and indigenous people is beneficial.
Cultural Resources	Reviewer should meet the Secretary of the Interior's Professional Qualification Standards as defined and officially adopted in 1983 (48 FR 44716, September 29, 1983 ; 36 C.F.R. § 61) and the Secretary of the Interior's Historic Preservation Professional Qualification Standards as expanded and revised in 1997 (62 FR 33708, June 20), although not formally adopted for federal regulatory purposes. Following the categories described in 62 FR 33708, reviewers need to include expertise in the following fields: archaeology, cultural anthropology, and architectural history or historic architecture. In addition to meeting these basic Federal standards, preferred experience includes working with Pacific Northwestern archaeological resources, working with tribes on issues relating to historic properties of traditional religious and cultural significance to Indian tribes and tribal consultation. With regard to the built environment, reviewers should have experience with the evaluation of historic architecture. The cultural resources reviewer must be ATR certified.
Tribal Interests	Sacred Sites - Reviewers should be experienced with the application of Presidential Executive Order 13007 and have communication

	experience with Indian tribes in the Pacific Northwest regarding sacred sites. Indian Trust Assests - Reviewers should be familiar with the fiduciary responsibilities of the Federal government toward Indian tribes. Work history should include experience in the management of specific Indian trust assets like land, water, minerals, funds, treaty-secured rights, or other properties that have been reserved by or granted to Indian tribes.
Fisheries	Fisheries scientists with experience in advanced statistics and fish passage issues at dams on large river systems. Reviewers should have extensive experience ecological models of anadromous salmonid and resident fisheries.
Wildlife	Preferably a wildlife biologist/wetland scientist who is experienced with large game (i.e. ungulates, elk) and predator relationships. Experience with avian predation (i.e. terns, gulls, and cormorants), cottonwood restoration experience, and the effects to vegetation and wildlife as a result of dam breaching would also be very helpful.
Water Quality	Reviewer should be a water quality modeler, limnologist with knowledge of sediment quality and knowledge of large rivers systems, limnologic and/or freshwater ecological processes and 1-D/2-D water quality modeling. Reviewer experience should include temperature and total dissolved gas modeling in large river systems with knowledge of contaminated sediment issues related to mobilization caused by dam breaching.
River Mechanics and Geomorphology	Reviewer should have the following areas of experience: • Experience with large navigable rivers, smaller tributary habitat rivers, streams and reservoirs in the Pacific Northwest. • Experience in large and medium size regulated river restoration, reservoir processes, and hydraulics of mobile bed sand and gravel rivers, preferably in the Pacific Northwest. • Experience in numerical mobile bed analysis of sediment scour and deposition, experience with dam removal and/or dam removal impact studies and regulated systems. • Familiarity with Mobile Bed HEC-RAS, AdH, PTM, Rouse # interpretation and hydromorphic indicators.
Real Estate	Experience in developing and reviewing real estate plans and appraisals with preference for project experience related to dams and associated structures. Must have experience or be very familiar with federal real estate acquisition and disposal laws, regulations and processes as defined in the Uniform Relocation Assistance and Real Property Acquisitions Policies Act. Must have demonstrated competence with the application of: fee rights; reserved rights; easements; leases; licensing and permitting related to the use of lands.
Climate Change and Preparedness	Experience with the assessment of adjustments or changes in operations and the ability to integrate climate change adaptation

	planning and actions to enhance resilience or reduce vulnerability of projects and systems to observed or expected climate changes.
Hydrolgy and Hydraulics/Water Management	Reviewers should be able to describe the climate and hydrology of the Columbia River and its sub-basins, associated reservoirs and reservoir operations of the basin and summary descriptions of the river reaches between dams. Experience with engineering models including HEC-WAT and HEC-ResSim, the evaluation of H&H impacts to a large river system due to a change in reservoir elevations, water releases from multiple dams, including spill, flow and stages (water levels). Experience with Columbia River System is preferred.

Documentation of DQC. Quality Control should be performed continuously throughout the study. A specific certification of DQC completion is required at the draft and final report stages. Documentation of DQC should follow the District Quality Manual and the MSC Quality Management Plan. An example DQC Certification statement is provided in EC 1165-2-217, on page 19 (see Figure F).

Documentation of completed DQC should be provided to the MSC, RMO and ATR Team leader prior to initiating an ATR. The ATR team will examine DQC records and comment in the ATR report on the adequacy of the DQC effort. Missing or inadequate DQC documentation can result in delays to the start of other reviews (see EC 1165-2-217, section 9).

b. AGENCY TECHNICAL REVIEW

The ATR will assess whether the analyses are technically correct and comply with guidance, and that documents explain the analyses and results in a clear manner. An RMO manages ATR. The review is conducted by an ATR Team whose members are certified to perform reviews. Lists of certified reviewers are maintained by the various technical Communities of Practice (see EC 1165-2-217, section 9(h)(1)). Table 3 identifies the disciplines and required expertise for this ATR Team. ATR team reviewers shall be ATR certified if possible.

Table 3: Required ATR Team Expertise

ATR Team Disciplines	Expertise Required
ATR Lead	A senior professional with extensive experience preparing civil works decision documents and conducting DQC. The lead may also serve as a reviewer for a specific discipline (such as planning, economics, environmental resources, etc).
Plan Formulation	Water resources planner or similar discipline experienced with evaluating environmental impact statements and/or federal planning studies for compliance with agency-specific policy and guidance. Experience with policies and guidance documents of one or more of the CRSO co-lead agencies is preferred. Planners should have the experience to critique the CRSO alternatives development process.
Economics -Cost Analysis -Hydropower -Water Supply -Flood Risk Management -Recreation -Navigation	Economists with experience in evaluating socioeconomic and economic-related resource impacts analyses including cost analysis similar in scale and scope to the CRSO EIS project and the application of socioeconomic modeling. Hydropower Energy and hydropower impacts analysis experience including hydropower operation, generation and transmission. Familiarity with the Columbia River System, energy modeling, energy pricing, and the EIS study process. Water Supply •Evaluating impacts to water deliveries due to changes in water surface elevations (i.e. ability to pump from reservoirs or rivers). Experience with water rights with preferred experience with interruptible rights in Washington and impacts to groundwater due to changes in surface water resources is also beneficial. Flood Risk Management •Flood risk management impacts analysis experience, specifically experience and knowledge of hydraulic and economic modeling methods to evaluate changes in flood risk. Recreation

	•Recreation impact analysis experience, specifically experience with the application of utility modeling and benefits transfer modeling to evaluate changes in recreation benefits. Navigation •The application of navigation and transportation modeling including experience with forecasting carrier and shipping cost impacts, carrier response to changes, barge shipping availability and cost and forecasting cost impacts to alternate shipping modes if barge shipping is reduced or eliminated. Experience with commercial, recreational, and tribal fisheries economic impacts analysis is also beneficial.
NEPA Sufficiency and Environmental Compliance	Reviewers will have experience preparing, completing, and reviewing NEPA Environmental Compliance Documents (EAs, EISs) for complex projects, to include coordinating with other in-house disciplines (such as biologists, archaeologists, water quality specialists, engineers, etc.), Tribes, and outside federal and non-federal resource agencies to comply with applicable environmental laws and regulations including, but not limited to the Clean Water Act, Clean Air Act, and Endangered Species Act; and evaluating the proposed alternatives for potential environmental effects and for appropriate mitigation measures and the development of mitigation plans.
Environmental Justice	Reviewer should be experienced with addressing and evaluating the fair treatment, meaningful involvement and potential disproportionate effects regarding all people regardless of race, color, culture, national origin, income, and educational levels with respect to the development, implementation, and enforcement of protective environmental laws, regulations, and policies. Experience with tribal and indigenous people is beneficial.
Cultural Resources	Reviewers should meet the Secretary of the Interior's Professional Qualification Standards as defined and officially adopted in 1983 (48 FR 44716, September 29, 1983 ; 36 C.F.R. § 61) and the Secretary of the Interior's Historic Preservation Professional Qualification Standards as expanded and revised in 1997 (62 FR 33708, June 20), although not formally adopted for federal regulatory purposes. Following the categories described in 62 FR 33708, reviewers need to include expertise in the following fields: archaeology, cultural anthropology, and architectural history or historic architecture. In addition to meeting these basic Federal standards, preferred experience includes working with Pacific Northwestern archaeological resources, working with tribes on issues relating to historic properties of traditional religious and cultural significance to Indian tribes and tribal consultation. With regard to the built environment, reviewers

	should have experience with the evaluation of historic architecture. The cultural resources reviewer must be ATR certified.
Tribal Interests	Sacred Sites - Reviewers should be experienced with the application of Presidential Executive Order 13007 and have communication experience with Indian tribes in the Pacific Northwest regarding sacred sites. Indian Trust Assests - Reviewers should be familiar with the fiduciary responsibilities of the Federal government toward Indian tribes. Work history should include experience in the management of specific Indian trust assets like land, water, minerals, funds, treaty-secured rights, or other properties that have been reserved by or granted to Indian tribes.
Fisheries	Reviewers should have extensive knowledge and experience in advanced statistics and fish passage issues at dams on large river systems. Reviewers should have extensive experience with ecological models of anadromous salmonid and resident fisheries.
Wildlife	Preferably a wildlife biologist/wetland scientist. Someone who is experienced with large game (i.e. ungulates, elk) and predator relationships. Experience with avian predation (i.e. terns, gulls, and cormorants), cottonwood restoration experience, and the effects to vegetation and wildlife as a result of dam breaching would also be very helpful.
Water Quality	Reviewers should be comprised of water quality modelers, limnologists with knowledge of sediment quality and knowledge of large rivers systems, limnologic and/or freshwater ecological processes and the application of 1-D/2-D water quality modeling. Reviewer experience should include temperature and total dissolved gas modeling in large river systems with knowledge of contaminated sediment issues related to mobilization caused by dam breaching.
River Mechanics and Geomorphology	Reviewers should have the following areas of expertise: • Experience with large navigable rivers, smaller tributary habitat rivers, streams and reservoirs. • Experience in large and medium size regulated river restoration, reservoir processes, and hydraulics of mobile bed sand and gravel rivers,. • Experience in numerical mobile bed analysis of sediment scour and deposition, experience with dam removal and/or dam removal impact studies and regulated systems. • Familiarity with the application of Mobile Bed HEC-RAS, AdH, PTM, Rouse # interpretation and hydromorphic indicators.
Real Estate	Per NWD, real estate ATR will not be required for this project.
Climate Change and Preparedness	Reviewers should have experience with the assessment of adjustments or changes in operations and the ability to integrate climate change adaptation planning and actions to enhance resilience or reduce vulnerability of projects and systems to observed or expected climate change.

Hydrolgy and Hydraulics/Water Management	Reviewers should be able to describe the climate and hydrology of the Columbia River and its sub-basins, associated reservoirs and reservoir operations of the basin and summary descriptions of the river reaches between dams. Experienced with the application of engineering models including HEC-WAT and HEC-ResSim, the evaluation of H&H impacts to a large river system due to a change in reservoir elevations, water releases from multiple dams, including spill, flow and stages (water levels). Experience with CRSO is preferred.

Documentation of ATR. A spreadsheet will be used to document all ATR comments, responses and resolutions. Comments should be limited to those needed to ensure product adequacy. If a concern cannot be resolved by the ATR team and PDT, it will be elevated to the vertical team for resolution using the EC 1165-2-217 issue resolution process. Concerns can be closed in spreadsheets by noting the concern has been elevated for resolution. The ATR Lead will prepare a Statement of Technical Review (see EC 1165-2-217, Section 9), for the draft and final reports, certifying that review issues have been resolved or elevated. ATR may be certified when all concerns are resolved or referred to the vertical team and the ATR documentation is complete.

c. INDEPENDENT EXTERNAL PEER REVIEW

(i) Type I IEPR.

Type I IEPR is managed outside of the USACE and conducted on studies. Type I IEPR panels assess the adequacy and acceptability of the economic and environmental assumptions and projections, modeling assumptions and sufficiency, project evaluation data, economic analysis, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in the evaluation of environmental impacts of proposed projects, and biological opinions of the project study.

Decision on Type I IEPR. The decision to perform Type I IEPR is based on the criteria provided in Section 11 of EC 1165-2-217. The criteria includes:

- The estimated total cost of the project, including mitigation costs, is greater than $200 million.
- There is a potential for significant public dispute as to size, nature or effects of the project.
- There is a potential for significant public dispute as to the economic or environmental cost or benefit of the project.
- The use of models not certified or approved by the Corps.

Products to Undergo Type I IEPR. The DEIS and all models not Corps certified or approved will undergo IEPR.

Required Type I IEPR Panel Expertise. Panels will consist of independent, recognized experts from outside of the USACE in disciplines representing a balance of areas of expertise suitable for the review being conducted. Table 4 lists the required panel expertise.

Table 4: Required Type I IEPR Panel Expertise

IEPR Panel Member Disciplines	Expertise Required
Economist	The Review Panel Member should be from academia, a public agency, a non-governmental entity, or an Architect-Engineer or Consulting Firm with a minimum MS degree or higher. The Review Panel member must have at least 10 years demonstrated experience in evaluating socioeconomic and economic-related resource impacts forcomplex, regional projects. Extensive experience with inland navigation and transportation modeling, fisheries evaluations, utility modeling, and power rate modelingis required. In addition, experience with analysis and evaluation of socioeconomic impacts(e.g., recreation and environmental justice impacts) is required.
Environmental Resources	The Review Panel member should be a scientist from academia, a public agency, a non-governmental entity, or an Architect-Engineer orConsulting Firm with a minimum MS degree or higher in a related field. The Review Panel member must have at least 10 years of experience directly related to environmental evaluation or review as well as compliance with environmental laws, policies, and regulations including the National Environmental Policy Act (NEPA). Familiarity withimpact assessments, including cumulative effects analysis for complex operating projectsystems with competing trade-offs, is highly desirable. The panel member should have extensive knowledge of fish passage issues at dams on large river systems. They should have extensive experience in life cycle models and ecological models of anadromoussalmonid and resident fisheries with a strong background in statistics. Experience with Instream Flow Incremental Methodology (IFIM) and related concepts is preferred.
Cultural Resources	The Review Panel member should be a scientist from academia,a public agency, a non-governmental entity, or an Architect-Engineer or Consulting Firm with a minimum MS degree or higher in a related field. The Review Panel member must have at least 10 years of experience and should meet the Secretary of the Interior's Professional Qualification Standards as defined and officially adopted in 1983 (48 FR44716, September 29, 1983; 36 C.F.R. § 61) and the Secretary of the Interior's HistoricPreservation Professional Qualification Standards as expanded and revised in 1997 (62FR 33708, June 20), although not formally adopted for federal regulatory purposes. Inaddition to meeting these basic Federal standards, the reviewer should have demonstrated Tribal coordination experience. With regard to archaeological resourcesand historic properties of religious and cultural significance to Indian tribes, this experience should include participation in tribal consultation as well as experience in the management of specific Indian trust assets like land, water, minerals, funds, treaty secured rights, or other properties that have been reserved by or granted to Indian tribes.

Hydrology and Hydraulic Engineer	The Review Panel member must be a registered professional engineer from academia, a public agency, or consulting firm witha minimum of 10 years of experience in their area of expertise. The Review Panel member should be experienced with all aspects of hydrology and hydraulic engineering including a thorough understanding of regulated systems as well as regional water management operations. The Review Panel member must be familiar with development and applicationof complex open channel hydraulic models including Hydraulic Engineering Center (HEC) modeling computer software such as HEC River Analysis System (RAS) and HEC Hydrologic Modeling System (HMS). Additionally, the Review Panel member should have specialized experience in river mechanics, sediment transport (including numerical mobile bed analysis of scour and deposition), and large and medium size regulated river restoration. Experience with dam removal and/or dam removal impact studies is preferred.
Hydropower Operations and Water Supply	The Review Panel member should be a scientist from academia, a public agency, a non-governmental entity, or an Architect-Engineer or Consulting Firm with a minimum MS degree or higher in a related field and a minimum of 10 years of experience in the areas of operation, generation, and transmission. The Review Panel member should have experience with operations of large and complex multi-purpose hydroregulation systems including knowledge of large dam hydraulic components and hydropower production. Experience in development of hydropower models as well as seasonal water supply forecasting is required. In addition,experience with water supply concepts is also required, including experience evaluating impacts to water deliveries due to changes in water surface elevations (i.e. ability to pump from reservoirs or rivers), impacts to groundwater due to substantial changes in surfacewater resources, and water rights (in particular, interruptible rights in Washington).
Climate Change	The Review Panel member should be a scientist from academia, a public agency, a non-governmental entity, or an Architect-Engineer or Consulting Firm with a minimum MS degree or higher in a related field and a minimum of 10 years of experience related to climate change assessments including impact/vulnerability assessments, snowmelt hydrology (sensitivity of snowmelt systems to warming temperature), and climate change and hydrological model output data application and interpretation. Familiarity with ECB 2018-14 (Guidance for Incorporating Climate ChangeImpacts to Inland Hydrology in Civil Works Studies, Designs, and Projects) andReclamation Climate Policy documents(https://www.usbr.gov/watersmart/wcra/docs/WWCRATechnical Guidance.pdf) isrequired, as well as familiarity with the current state of climate science research andimpact assessment applications.
Water Quality	The Review Panel member should be a scientist from academia, a public agency, a non-governmental entity, or an Architect-Engineer or Consulting Firm with a minimum MS degree or higher in a related field. The panel member should be a water quality modeler, limnologist, or sediment quality expert with a minimum of 10 years ofexperience. The reviewer must have experience evaluating large rivers systems, limnologic or freshwater ecological processes, temperature and dissolved gas modeling,and water quality modeling.

	Knowledge of contaminated sediment issues (e.g.,mobilization) related to dam breaching is preferred.
Civil/Geotechnical Engineer	The Review Panel member should be a registered professional engineer having a minimum of 10 years experience in civil or geotechnical engineering with a minimum MS degree. The panel member should have experience in slope stability assessments, settlement analysis, rock slides, dewatering of dams, scour and erosion analysis. In addition, experience in the design and construction (or modification) of large facilities to include dams, road, railroads, water systems is required. Experience in the geology of the Lower Snake River is preferred.
Cost Engineer	The Review Panel member should be a scientist from academia, apublic agency, a non-governmental entity, or an Architect-Engineer or Consulting Firmwith a minimum MS degree or higher in a related field. The Review Panel member should be a registered Cost Estimating Professional, Certified Cost Consultant, or Certified Cost Engineer with a minimum of 10 years experience in scheduling and estimating costs for large construction projects involving significant earth moving and dewatering. Experience in evaluating cost and schedule risk is also required.

Documentation of Type I IEPR. The outside eligible organization (OEO) will submit a final Review Report no later than 60 days after the end of the draft report public comment period. USACE shall consider all recommendations in the Review Report and prepare a written response for all recommendations. The final decision document will summarize the Review Report and USACE response and will be posted on the internet.

d. MODEL CERTIFICATION OR 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 are any models and analytical tools used to define water resources management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives and to support decision making.

The use of a certified/approved planning model does not constitute technical review of a planning product. The selection and application of the model and the input and output data is the responsibility of the users and may be subject to DQC, ATR, and IEPR. All of the planning and engineering models used for this project will be used for the future without project condition, alternatives evaluation and comparison, aid in the selection of a recommended plan and with-project condition. All models used for this project that are not Corps certified, including BOR and BPA models, will undergo IEPR in lieu of Corps certification.

Table 5: Planning Models. The following models may be used to develop the decision document:

Model Name and Version	Brief Model Description and How It Will Be Used in the Study	Certification / Approval
AURORA	Used by BPA to model power markets.	Commercial off-the-shelf
Comparative Survival Study Model (CSS)	Used to study seasonal fish passage and survival.	Will be reviewed as part of IEPR
Comprehensive Passage Model (COMPASS)	Predicts the effects of alternative operations of Snake and Columbia River dams on salmon survival rates.	Will be reviewed as part of IEPR
Impact Analysis for Planning (IMPLAN)	Economic input-output model for planning impact analysis.	Commercial off-the-shelf
Instream Flow Incremental Methodology (IFIM)	Determines the relationship between stream flows and fish habitat. Used for calculating Weighted Usavle Area for fish in the Kootenai basin	Will be reviewed as part of IEPR
Snake Columbia Economic Navigation Tool (SCENT)	Economic model.	Will be reviewed as part of IEPR
Transmission long-term rates analysis model	Used by BPA to determine the cost of power transmission as a result of different alternatives.	Will be reviewed as part of IEPR
Transportation Optimization Model (TOM)	Models economic effects of closing navigation on the Snake River.	Will be reviewed as part of IEPR
University of Washington Exposure Tool and Vitality Model	Examines the role of seasonal temperatures on fish early life development and growth and relates stressors and environmental properties to fish survivorship.	Will be reviewed as part of IEPR
Waterbased Recreation Access Model	Economic model.	Will be reviewed as part of IEPR

EC 1105-2-412 does not cover engineering models used in planning. The responsible use of well-known and proven USACE developed and commercial engineering software will continue. The professional practice of documenting the application of the software and modeling results will be followed. The USACE Scientific and Engineering Technology Initiative has identified many engineering models as preferred or acceptable for use in studies. These models should be used when appropriate. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, and IEPR.

Table 6: Engineering Models. These models may be used to develop the decision document:

Model Name and Version	Brief Model Description and How It Will Be Used in the Study	Approval Status
HEC-RAS 5.0 (River Analysis System)	The software performs 1-D steady and unsteady flow river hydraulics calculations and has capability for 2-D (and combined 1-D/2-D) unsteady flow calculations. Used for steady flow analysis to evaluate the future without-project and future with-project conditions.	HH&C CoP Preferred Model
HEC-ResSim (Reservoir System Simulation)	Integrates hydrologic engineering and economic analysis to formulate and evaluate alternative plans using risk-based analysis methods.	Approved
HEC-WAT (Watershed Analysis Tool)	Analyzes complex riverine systems while implementing flood risk and uncertainty and systems analysis.	Approved
Adaptive Hydraulics Model System (ADH)	Used for one-, two- and three-dimensional flow and transport, surface water modeling, ground-water modeling, internal flow and open channel flow.	Approved
CRSO System CE-QUAL W2 model	Used to predict total dissolved gas in support of the Columbia River system operations	Approved
ParticleTracking Model (PTM)	Determines sediment and dredged material dispersion, transport, settling, deposition, mixing and resuspension processes.	Approved
Hourly Operations System Simulator (HOSS)	BPA model to assess power generation against demand.	Will be reviewed as part of IEPR
Hydro System Simulator (HYDSIM)	BPA H&H model.	Will be reviewed as part of IEPR
AURORA	Used by BPA to model power markets.	Off-the-Shelf
Power rate model (RAM2020)	Used by BPA to help determine rates.	Will be reviewed as part of IEPR
Genesys	Used by BPA to measures Loss-of-Load-Probablity.	Will be reviewed as part of IEPR
Grid View	Used by BPA to evaluate transmission.	Commercial off-the-shelf

e. POLICY AND LEGAL REVIEW

Policy and legal compliance reviews for draft and final planning decision documents are delegated to the MSC (see Director's Policy Memorandum 2018-05, paragraph 9).

(i) Policy Review.

The policy review team includes representatives from each of the co-lead agencies and is identified in Attachment 1 of this Review Plan. The makeup of the Policy Review team may be drawn from Headquarters (HQUSACE), the MSC, the Planning Centers of Expertise, and other review resources as needed.

- The Policy Review Team will be invited to participate in key meetings during the development of decision documents. These engagements may include In-Progress Reviews, Issue Resolution Conferences or other vertical team meetings plus the milestone events.

- The input from the Policy Review team should be documented in a Memorandum for the Record (MFR) produced for each engagement with the team. The MFR should be distributed to all meeting participants.

- In addition, teams may choose to capture some of the policy review input in a risk register if appropriate. These items should be highlighted at future meetings until the issues are resolved. Any key decisions on how to address risk or other considerations should be documented in an MFR.

(ii) Legal Review.

Representatives from the Office of Counsel will be assigned to participate in reviews. Members may participate from the District, MSC and HQUSACE. The MSC Chief of Planning and Policy will coordinate membership and participation with the office chiefs.

- In some cases legal review input may be captured in the MFR for the particular meeting or milestone. In other cases, a separate legal memorandum may be used to document the input from the Office of Counsel.

- Each participating Office of Counsel will determine how to document legal review input.

ATTACHMENT 1: TEAM ROSTERS

PROJECT TECHNICAL LEADS			
Name	Office	Primary Team	Phone Number
[redacted]	[redacted]	Socioeconomics	[redacted]
[redacted]	[redacted]	Fish	[redacted]
[redacted]	[redacted]	Cultural Resources	[redacted]
[redacted]	[redacted]	Hydrology & Hydraulics	[redacted]
[redacted]	[redacted]	Climate Change	[redacted]
[redacted]	[redacted]	NEPA Compliance	[redacted]
[redacted]	[redacted]	Tribal Affairs	[redacted]
[redacted]	[redacted]	River Mechanics	[redacted]
[redacted]	[redacted]	Wildlife, Wetlands & Vegetation	[redacted]
[redacted]	[redacted]	Water Quality	[redacted]

*Provided DQC documentation prior to DQC team review.

DISTRICT QUALITY CONTROL TEAM			
Name	Office	Position	Phone Number
[redacted]	[redacted]	DQC Lead	[redacted]
[redacted]	[redacted]	Plan Formulation	[redacted]
[redacted]	[redacted]	Cost Analysis	[redacted]
[redacted]	[redacted]	Hydropower	[redacted]
[redacted]	[redacted]	Water Supply	[redacted]
[redacted]	[redacted]	Flood Risk Management & Recreation	[redacted]
[redacted]	[redacted]	Navigation	[redacted]
[redacted]	[redacted]	NEPA Compliance	[redacted]
[redacted]	[redacted]	Environmental Justice	[redacted]
[redacted]	[redacted]	Cultural Resources & Tribal Interests	[redacted]
[redacted]	[redacted]	Resident Fish	[redacted]
[redacted]	[redacted]	Anadromous Fish	[redacted]
[redacted]	[redacted]	Wildlife	[redacted]
[redacted]	[redacted]	Water Quality	[redacted]
[redacted]	[redacted]	River Mechanics	[redacted]
[redacted]	[redacted]	Real Estate	[redacted]
[redacted]	[redacted]	Climate Change	[redacted]
[redacted]	[redacted]	Hydrology & Hydraulics	[redacted]

AGENCY TECHNICAL REVIEW TEAM			
Name	Office	Position	Phone Number
[redacted]	[redacted]	ATR Lead; Fish, Env Justice	[redacted]
[redacted]	[redacted]	Plan Formulation	[redacted]
[redacted]	[redacted]	Econ: Cost Analysis & FRM	[redacted]
[redacted]	[redacted]	Econ: Hydropower	[redacted]
[redacted]	[redacted]	Econ: Water Supply	[redacted]
[redacted]	[redacted]	Econ: Recreation	[redacted]
[redacted]	[redacted]	Econ: Navigation	[redacted]
[redacted]	[redacted]	NEPA/Enviro Compliance	[redacted]
[redacted]	[redacted]	Cultural Res & Tribal Interest	[redacted]
[redacted]	[redacted]	Wildlife	[redacted]
[redacted]	[redacted]	Wildlife	[redacted]
[redacted]	[redacted]	Water Quality	[redacted]
[redacted]	[redacted]	River Mechanics & Geomorph	[redacted]
[redacted]	[redacted]	Climate Change & Preparedness	[redacted]
[redacted]	[redacted]	H&H/Water Mgt.	[redacted]

POLICY AND LEGAL REVIEW TEAM			
Name	Office	Position	Phone Number
[redacted]	[redacted]	Program Manager, CRSO EIS	[redacted]
[redacted]	[redacted]	Legal	[redacted]
[redacted]	[redacted]	Ecosystems Program Manager	[redacted]
[redacted]	[redacted]	Legal	
[redacted]	[redacted]	Co-Program Manager, CRSO EIS	
[redacted]	[redacted]	Co-Program Manager, CRSO EIS	
[redacted]	[redacted]	Legal	