FINAL

Review of Chehalis River Water Retention Structures Scoping Document and Proposed Studies

Prepared for:
Chehalis River Basin Flood Authority
Chehalis River Fish and Aquatics Work Group
Chehalis, WA

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Contents

1 Introduction

This report presents the results from a peer review of the draft titled, "*Chehalis River Water Retention Structures – Scoping Document and Proposed Studies – Revised Working Draft*" (RWD) dated November 10, 2009 and authored by EES Consulting. The goal of the review is to assist in improving the RWD to better scope and prioritize the studies needed to address the potential impacts of the water retention structures... Prior to issuing a contract for the next phase of fish studies, the Washington State Legislature, in a capital budget appropriation, required "an independent peer review of completed … hydrological studies of possible upper basin retention structures." This review has been authorized and funded by Chehalis River Basin Flood Authority.

1.1 Scope of Services

The request and ultimate contract for ENVIRON International Corp. (ENVIRON) is to provide document review services as described in an email from the Chehalis River Basin Flood Authority (Authority) that was emailed from the facilitator on May 13, 2010. The contract is to perform a peer review of the RWD using previous studies described in the request as background. The studies referenced in the request include the following:

- *Chehalis River Water Retention Facilities Potential Study, February 2009 (EES 2009).*
- *Geologic Reconnaissance Study, Proposed Chehalis River and South Fork Dam Sites, Lewis County, Washington, October 27, 2009 and Reconnaissance-Level Geotechnical Report, Proposed Chehalis River and South Fork Dam Sites, Lewis County, Washington, October 28, 2009 (Shannon & Wilson 2009).*
- *Chehalis River Water Retention Project, Phase IIB Feasibility Studies, Scope of Work and Estimated Budgets, November 13, 2009 (EES 2009).*

Other literature and data sources are used as necessary to complete the review.

The core ENVIRON review team includes Greg Reub, MA (Senior Fisheries Biologist/Aquatic Ecologist) and Felix Kristanovich, Ph.D. PE (Hydrology, Geomorphology and Water Quality). Jeff Fisher, Ph.D. (Fisheries and Water Quality), Domoni Glass (Watershed Processes), and Gretchen Greene Ph.D. (Environmental Economics) were consulted on specific sections and issues during the review.

1.2 Summary of Findings

The document succeeds in presenting relevant data on a variety of watershed attributes potentially affected by the proposed project. However, several improvements could be made that would strengthen the scientific merit of the report, and in doing so enhance the role of the report as a roadmap for project-related research investment. Throughout the review, the following key concerns were repeatedly identified by the ENVIRON review team:

1) The purpose of the scoping report needs to be stated clearly at the beginning of the report, and the subsequent content should be governed by that stated purpose.
2) A scoping document needs to identify the anticipated impacts associated with a project. By defining these key areas, research funding can be spent in a targeted

manner that prevents potentially costly efforts to remedy oversights later in the process. The RWD identifies very broad research topics for further study and does not address the specific research needs associated with project-related potential impacts. A structured approach to identifying the detailed research needs of the project will assist the Authority in supporting in the highest priority aquatic research study areas.

3) Much of the readily available data and information has been overlooked in the review of existing information for both fisheries and water resources. These data and information should be included in the scoping document.

4) It is recommended that the sections covering data gaps and proposed draft studies be revised to be consistent with the restated purpose of the document, priority research topics as defined by an understanding of potential impact analysis, and new data gaps as defined once the additional existing information has been incorporated into the document.

5) In light of the critical timing of this project a phased approach could be used to propose draft studies. An early phase can include the obvious research needs that are known, and requires annual (seasonal) data be gathered. A later phase can address the more targeted studies that will be identified after a more thorough draft of the scoping report is completed.

1.3 Review Organization

The following section of this report (Section 2) captures some general comments that were repeatedly identified by the review team. These comments are focused on suggestions to make the report more consistent, complete, and useful. Examples and guidance are provided with the goal of improving the final study recommendations.

The specific comments are provided in three subsequent sections. The first of the three (Sections 1 through 3) covers water resource comments, including comments and recommendations on the identification of existing data, data gaps, and proposed draft studies. The next (Section 4) addresses fishery and aquatic resources. Section 5 contains a review of the proposed draft study section of the RWD in general terms.

Section 6 provides a summary of comments along with some direction as to the review team's understanding of the significance of each comment, and Section 7 identifies references used in the review. An appendix covers additional bibliographic information that should be considered for background information, impact identification and study development.

2 General Comments

This section provides comments of a general nature that address overarching themes related to the purpose, content, structure, and editorial tone of the report.

2.1 Purpose

There is no succinct purpose or goal stated for the scoping report, although inconsistent lists of study components are provided in the Executive Summary, Introduction and throughout the RWD.

The Executive Summary of the RWD (and as well the peer review request provided to ENVIRON by the Authority) identifies the contents of the document as describing data that have been obtained to date about the water quality, water quantity, fish and fish habitat resources in the project areas (existing information). The Executive Summary describes A list of data that are considered important but is currently missing (data gaps) and a framing of the important fish and aquatic issues and the studies would be required to support the environmental analysis of the potential project's effects. (pg. ES-1)

The Executive Summary also describes the RWD to include:

- Compilation of the known information regarding environmental resources in the potential project area;
- Consultation with the resource agencies and the public;
- Presenting scoping of potential aquatic concerns to focus the important issues;
- Prepare initial study plans for aquatic field studies to gather environmental information;
- Prepare a schedule for conducting environmental studies. (pg. ES-1)

The Introduction states that the document describes,

> The fish and aquatic issues and the studies that would be required to support permitting and establishment of appropriate instream flows for such a project. (pg. 1)

The Introduction also refers to the report as a Scoping Document and Proposed Study Plan to include information for fish and water quality resources likely affected by construction of the two impoundment structures including:

- Existing Information,
- Identification of Limiting Factors and Data Gaps,
- Issues (to be addressed by studies), and
- Potential Initial Studies. (pg. 6)

Although these descriptions of the document contents and purposes are all similar, whether or not limiting factors are to be identified, whether or not the purpose is to support permitting and instream flows, whether consultations with resource agencies or a schedule for studies is to be

included is not clear, and the confusion on this point is echoed in the lack of clear and specific direction produced by the report.

In review of the legislation associated with funding [(Subsection (3) (c) (ii))], it is obvious that the scoping report and associated review should be at a level of effort and scale that is consistent and appropriate for the anticipated level of funding for the studies and issues associated with human and natural resources at risk. A good indicator is that the contract for the aquatics study could be at a level of $900,000 for this phase. The standard should also consider the potential magnitude of effects and potential solutions related to human safety, property and the aquatic resources associated with the second largest river in the state of Washington.

Section 4.0 of the RWD (Potential Issues and Concerns) mentions that State and Federal Agencies require specific information to meet their obligations with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA). The ENVIRON review team therefore assumes that this scoping document and the study recommendations for the aquatic resources should contain information to support a future SEPA or NEPA analysis. The information is not expected to be at the same scale, level of detail and content but should establish a framework for this type of analysis that will be required as the project goes forward. The team also assumes that the information should be consistent and inclusive, to the extent practical, with basic information requirements set forth by the Federal Energy Regulatory Commission (FERC) that will also be required. This information will assist in developing the Pre-Application Document (PAD) as required for licensing a hydroelectric project as part of the FERC Integrated Licensing Process (ILP) or other process chosen for licensing. In general, the potential FERC applicant must exercise due diligence in determining what information exists that is relevant to describing the existing environment and potential impacts of the project proposal (including cumulative impacts), obtaining that information if the potential applicant does not already possess it, and describing or summarizing it. The data gaps and studies that fill those gaps should be prioritized based on that information.

2.2 Report Content

Under the above-described assumption that one purpose of the RWD is to direct research to develop information to meet the above regulatory obligations, the content of the report should identify potential positive and negative impacts or effects of the project instead of issues and concerns as described in the first sentence of Section 4.0: “A number of issues regarding the effects the water retention facilities would have on fish and water quality must be understood in order to evaluate their impacts”. The section also references state and federal information needs to meet the state SEPA and Federal NEPA requirements, which would mean at least preliminary identification of impacts. The last sentence states “This section describes the issues for which agencies have expressed concern and issues that are routinely addressed on this type of project.” As such, the RWD does not specifically identify potential impacts, which is a critical aspect of scoping and certainly critical to the development of study plans. Some of the questions presented as issues in Section 4 can be translated into statements about a specific impact but most are extremely broad and are not suitable for establishment of an analytical framework as a basis for a study plan. ENVIRON understands that potential impact identification at this stage is a preliminary step but a scoping document must provide at least a first attempt at identifying potential impacts for study development and refinement. General

statements about information that is lacking in the basin, but does not necessarily have a connection to potential impacts from a proposed project, can direct important funds and effort toward gathering and analyzing unrelated data.

Impact identification is standard protocol for scoping documents as provided by the Council for Environmental Quality (CEQ) that gave formal recognition to the term scoping many years ago (In 1978, with the publication of the proposed NEPA regulations and since adopted as formal rules, 40 C.F.R. Parts 1500-1508), and provides guidance in avoiding pitfalls in a scoping process (CEQ 1981). CEQ describes one scoping pitfall as only identifying causes or issues but fails to identify the principal "effects" that should be evaluated in depth. Otherwise issues that are identified are too broad to be useful for analytical purposes (CEQ 1981). This section should identify what the impacts are (as precisely as possible) that should be examined so that the preliminary study plans can at least generally specify what is needed in evaluation and analysis.

Part of the concern about identifying impacts stems from the possible over-reliance of this document on the "Lewis County PUD – Chehalis River Water Retention Facilities Potential Study" (Phase I). The phase I report is the best information of potential impacts from the projects. Still, it appears that the document is heavily skewed towards beneficial effects of the storage projects and does not equally explore the negative effects to aquatic resources. The Phase I report lacks citation to literature, data, analysis or personal communication to substantiate statements with significant connotations such as increase in certain fish populations as a result of the dams. There are several beneficial statements that are carried forward to this scoping document although the nature of the effect (e.g. benefits of water releases below the facilities on fish) has not been scientifically examined. For example, Section 4.3.2 Fish Habitat – Instream Flow states that the following bullet should be addressed:

- "How much summer rearing and spawning habitat for priority species (e.g., Chinook and coho salmon and steelhead trout) would be gained in the mainstem Chehalis and South Fork Chehalis Rivers as a result of increased summer flows released from the proposed projects?"

There will certainly be some type of an effect (positive or negative) on aquatic resources and it may vary depending on species and lifestage (priority species may need to be determined) downstream of the retention facilities. The study design should address the potential effects from an unbiased scientific method approach.

2.3 Analysis of Alternatives

The scoping report and supporting documents referenced in the request for review do not have information on project alternatives. The RWD describes this effort as still in the feasibility stage so the Phase I and/or Phase II report should provide alternatives analysis. But if there are other potential alternatives that may be more effective, the scoping and studies should be designed to evaluate those alternatives too. At this stage of the project, it would make sense to include alternative water retention facilities or summarize the existing alternative analysis that have been done and provide rational for choosing the retention facilities as the preferred alternative. This is the only way that human and natural resource benefits can be measured to minimize monetary and environmental costs and this method is a standard part of all other water storage

project analyses in the state. According to the Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA), the analysis and comparison of alternatives is considered the "heart" of the NEPA process and is also a stringent requirement for FERC licensing. Smith (2006) examined decisions on challenges to alternative analyses contained in federal agency NEPA documents in federal Courts of Appeals for the ten-year period 1996–2005. The results show that the most common challenge was that a full reasonable range of alternatives was not included in the process.

In a brief review of the existing literature, it appears that there are at least two alternative studies that have been completed related to storing excess water and augmenting flows during the summer in the project areas. A study by Tetra Tech (2003) looked at a variety of options in the basin, including new or modified water retention facilities. New dams were not recommended for further investigation, although modification of the Skookumchuck dam was. A thorough study was done by the U.S. Corps of Engineers in 1982 (USACE 1982) and updated in 2003 (USCOE 2003). The Corps investigated five potential locations for multipurpose storage dams in the upper Chehalis River Basin including two sites on the Newaukum River, one site on the South Fork Chehalis River, and two sites on the mainstem of the Chehalis River, upstream of the Newaukum River. Dams at all five locations were determined to be economically infeasible at the time of the earlier investigations. Review for this study indicated that these dam options remain economically infeasible. In addition, the study concludes there would be significant environmental issues associated with their construction and operation, including blockage of fish passage, inundation and loss of fish and wildlife habitat.

If alternatives to the proposed two storage dams have already been analyzed to a degree that the stakeholders are comfortable, then just the alternatives for the two proposed projects need be examined. The Phase 1 report mentions that five sites were examined as potential locations although no information is provided. Alternatives in facility location and size, for example, can demonstrate how to derive the greatest benefit with the least environmental and economic cost. Alternatives related to location or size can demonstrate differences in effects such as footprint of the facility in relation to loss of habitat, most efficient reservoir configuration to provide low temperature and high oxygenated water, among other comparisons.

2.4 Other Suggestions and Comments

1) The Executive Summary does not accurately summarize the scoping report and should be rewritten after the final body of the scoping report is complete so that it is consistent with the main text.

2) The Introduction should state the purpose of the scoping report and clearly describe what information is presented. The first page + needs to be organized under subheadings (most can go in the ones that exist).

3) It would be helpful to put this report into context with the other documents and activities mentioned in the background section. In particular, how does this report relate to the Phase I report (Chehalis River Water Retention Facilities Potential Study, February 2009) (EES 2009). We assume this report is the Phase II report and is associated with the subject Phase I report.

4) Figure 1: Reservoirs on South Fork and North Fork occupy significant areas behind (upstream) of the proposed detention structures. It is important to show the proposed

reservoirs on this figure because they affect large areas, not just a small dot where the dam would go.

5) In section 1.1 (Description of the Potential Flood Retention Facilities), it is critical that a statement of purpose be included for the proposed projects. Shannon & Wilson (2009) provide the only concise statement of purpose for the proposed structures within the documents that were included in the review request. They state "The primary purpose of the dams would be flood control and summertime flow augmentation, with a secondary purpose of hydroelectric power generation".

6) If we assume that the primary purpose of the retention facilities is flood control and summertime flow augmentation, it appears that the proposed reservoirs are overdesigned or the project capacities should be better explained. For flood control, you only need to capture the portion of the flow during a flood event that would put the river over the banks. It would not seem necessary to capture 100% of the mean annual flow plus 100% of the peak flood flow plus enough to meet minimum fish flows. Capture of the flows during a major event would require 80,000 acre-ft or less in the upper Chehalis and 20,000 acre-ft or less in the South Fork. Capture of the peak flows will provide sufficient volume to provide for summer instream flow releases of roughly 10 percent greater than the natural flows. During non-storm events, releases should equal natural inflows, so no storage is needed. If the primary purpose of both reservoirs is to capture flood flows, there needs to be an explanation of why three times the flood storage amount is proposed. If one of the primary purposes of the projects is the production of electricity, it should be clearly stated. The proposed reservoirs sizes and locations have substantial influence on aquatic resource effects and will have a significant influence with regard to scoping, effects and development of study plans.

7) Include a Project Description section that provides enough information for comparison to existing information on aquatic resources so that impacts can be identified and study plan outlines can be focused.

8) Provide a summary of contacts with Federal, state agencies, Indian tribes, non-governmental organizations, or other members of the public made in connection with preparing the scoping document.

3 Water Resources

Based on our review of the scoping document related to water resources, we have provided the following comments that should be considered by the project team as they move forward with investigating the project feasibility. A thorough and detailed assessment of water resources in the Chehalis River Basin is necessary to sufficiently assess potential impacts from the proposed project. Although some pertinent data is included, we have found that the sections on water quality, quantity, and geomorphology do not include much of the more important information available for the Chehalis River Basin. The water quality section primarily depends on data from Washington State Department of Ecology (WDOE), and the water quantity section primarily relies on data from the U.S. Geological Survey (USGS). Additional basin-specific data and information should also be reviewed and described in the scoping document. An appendix to this document provides a partial list of literature sources that should be consulted to ensure that water resources are properly addressed in the document.

Further, while the studies proposed in the scoping document generally address data gaps, the studies should be based on hypotheses that can be tested, and these hypotheses should be clearly stated such that impact conclusions can be drawn without ambiguity from the results of such studies. Our comments on the water resource sections are provided below:

3.1 Water Quality

1) Interpret the water quality and quantity information in relation to state water quality standards. Although some of this information is provided in the text, it is not consistent, and would be useful in the tables summarizing existing water quality information from throughout the watershed, with an interpretation of the quality in relationship to the standards.

2) Water quality targets are different at different reaches of the Chehalis River. Describe narrative classifications (Class AA, Class A, Class B) for all pertinent tributaries discussed in the text, including South Fork Chehalis River, Upper mainstem, Newaukum Creek.

3) The sections of river that are listed on the 303(d) list need to be identified (locations and parameter), and those sections that are in the potential impact range of the project should be further addressed.

4) The detailed implementation plans for the TMDLs have been completed. The total maximum daily load has been established. It would be pertinent to summarize targets identified by the WDOE and any action items which may affect the project in potential effects and study plans.

3.2 Water Quantity

5) Provide the water quantity and quality information in correlation with the proposed project facilities. Maps that overlay the project footprint on this information are extremely valuable in estimating impacts.

6) Update figures with other gages not shown. For example, include gages included in Figure 2.2 of the Chehalis River Basin Comprehensive Flood Hazard Management

Plan, which shows at least twice as many gages. Consider showing WDOE gages on the same figure, as some of these gages are discussed in the text, but not shown in the Figure. WDOE actually operates 11 recording gages in the Chehalis River Basin, 3 of which are located on the main-stem of Chehalis River; two of which have less than 5-year period of record. Also, since flood control is the primary issue of concern, this section should discuss flood flows and include magnitude of the 25- 50- 75- and 100-year events at representative gages.

7) Include a description of design flow for the existing or planned levee systems and describe relationship to projects design and storage capabilities.

8) Provide monthly flow duration curves and flood frequency curves at each reservoir location.

9) Summarize existing and proposed uses of water other than flood storage, stream augmentation and hydropower (e.g. irrigation, industrial, etc.). Include a summary of water rights in the basin.

10) Provide an estimate of the frequency that the reservoir would have to be dredged to maintain needed capacity.

3.3 Physical Characteristics and Geomorphology

11) If possible, include estimates of surface area, maximum depth, minimum depth, mean depth, flushing rate, shoreline length, general substrate composition and gradient, especially for downstream reaches directly affected by the proposed project.

12) Sediment transport is an important issue that could affect downstream geomorphology and water quality and the resulting fish resources habitat. As such, sediment transport information is necessary to assess biological and hydraulic impacts of retention facilities on downstream reaches. For example, the placement of reservoirs would, in general, reduce flow velocities downstream during high flow events. This in turn could reduce scouring depth in the channel, often essential for fish habitat. Reservoirs also trap sediment reducing sediment and gravel downstream of the reservoirs. The scoping document needs to include a discussion of impacts and studies related to spawning gravels and other habitats that fish use. A study is mentioned at the very end of the document. However, the issue is extremely important and should have been discussed under “Existing Information” and/or “Data Gaps”, as well under “Potential Issue and Concerns”.

3.4 Preliminary Impact Identification

13) Reservoir establishment can lead to an initially enriched lacustrine habitat, through inundation of surrounding uplands, and accelerated release of terrestrial-based nutrients into the aquatic system. Effects of the impoundments on water quality both upstream and downstream of the proposed dams should be considered for their additional potential effects on aquatic and aquatic-dependent resources, through the potentiality of these ‘reservoir-effect’ outcomes.

14) Global climate change has resulted in increased atmospheric concentrations and deposition of carbon dioxide. Atmospheric deposition of carbon dioxide onto large bodies of water can drive the carbonic acid cycle towards the production of carbonic

acid, lowering the pH. This effect can be either mitigated or exacerbated by primary production in lacustrine systems, depending on the seasonal and diurnal growth cycle of phytoplankton production, amongst other factors. The EPA is currently evaluating permitted freshwater discharges with specified pH criteria for their potential effect on marine waters, where ocean acidification has been recognized—including the coastal Gray's Harbor estuary. The degree to which pH and buffering capacity of the reservoir and downstream waters could be affected by the project did not appear to be considered.

15) Reservoir inundation may also have the potential to liberate chemicals and pesticides formerly applied to inundated agricultural, mines or forestry lands. Include information, and if substantial, consider studies that consider potential impacts either in the reservoir, or downstream from this potential source of water quality impact.

16) Inundation could yield impacts to wetlands in the riparian corridor and in other areas inundated. Inundation could eliminate wetlands, or create additional wetlands. Wetlands provide important water quality functions in regulating temperature, ameliorating flood flows, and filtering water that is ultimately conveyed downstream. Consider mapping of wetlands and a potential source of impact and develop study parameters, if warranted.

17) Provide a discussion of potential impacts from proposed reservoirs on groundwater recharge and subsurface flows from Chehalis River downstream of both locations. Significant reduction in river flows, particularly during the flood season, might affect subsurface flows adjacent to the river. That might result in significant reduction of flows to the side channels and other peripheral habitats in the river (channels outside of the main stem channel that are usually flooded during high water), as subsurface flow in the floodplain might provide significant water to these channels. The corresponding reduction of flows should be studied relative to the fish habitat.

18) The data that are summarized on water quality do not generally consider how the project would influence the parameters previously monitored, and where in the watershed changes are most likely to occur. Although potential changes to flows from the project are provided, as inherent to the project description, no similar projection of the project's influence on water quality either upstream or downstream of the resultant reservoirs is provided. Thus, the studies and data that are reviewed are not considered fully in light of how the metrics that were monitored in these baseline studies could be altered.

4 Fishery and Aquatic Resources

The following list of comments relate to the review of existing information, the identification of data gaps in the report relating to fishery and aquatic resources, and the proposed studies. In addition to the general comment below, additional comments are organized into three general topic areas: Fish Distribution and Habitat, Species Covered, and Impact Analysis.

1) The review of existing data on fishery and aquatic resources covers some but not all of the important data available for the Chehalis basin in these topic areas. Basin specific information should also be included in the review. The following documents should be reviewed, and the relevant information summarized in this scoping document. At a minimum, an annotated bibliography might be provided as an appendix.
    - WRIA 22/23 Watershed Planning documents (which also contain considerable information on flows, water use, water quality, and fish habitat)
    - WDNR watershed analyses (which contain substantial fish, water quality, sediment, and hydrology information – several have been completed in the Chehalis basin)
    - Ecosystem Diagnosis and Treatment Analysis done for the basin (Mobrand Biometrics, Inc 2003
    - Coastal Lead Entities E-Library and Data Needs Assessment for WRIA 22-23 is a great resource (http://wcssp.org/WCSSP library/wria22_23/wria22_23).
    - Bull Trout Recovery Plan
    - In addition to the above referenced documents, an appendix to this document provides a collection of potentially important documents related to the Chehalis Basin.

4.1 Fish Distribution and Habitat

2) Fish distribution maps are typically provided in a scoping report with an overlay of the estimated reservoir footprint and downstream to, at a minimum, the first major tributary. River Miles are normally included on maps and all areas discussed in text such as the Town of Porter, East Fork Chehalis River and West Fork Chehalis River. Discuss spawning and/or rearing habitat for stocks, especially upstream of the proposed dam sites and downstream as appropriate. Provide spawning and rearing areas in a Figure, if possible.
3) The available habitat and limiting factors information is too general and inadequate (not focused on Project influences) for scoping and study development purposes. Please provide specific limiting factors associated with important stocks, species and life stages with a focus on the area above the proposed dams and downstream to where effects could be found. There is considerable specific in the literature
4) Limiting factors are important for estimation potential impacts that form the study plans. Several of the items listed as limiting factors, such as riparian corridor, are not by definition, possible limiting factors. Limiting factors will likely be,
    - water temperature,

- pools,
- abundance of spawning gravel,
- quality of spawning gravel,
- dissolved oxygen levels,
- prey abundance,
- competition with other species,
- turbidity, or
- harvest.

The factors discussed in the section are actually deviations from natural conditions which may (or may not) be affecting fish productivity. Ecologically, a limiting factor is the component in an animal's life history which is the bottleneck in productivity. For instance, if there is enough spawning habitat to support the hatching of 100,000 fish but only enough rearing habitat to support 50,000 fish, rearing habitat is limiting the population. Further evaluation can identify what component of the rearing habitat is limiting. For instance, it may be lethal temperatures, lack of pools, lack of prey, etc. In most cases, a population does not have more that one limiting factor.

5) Include a discussion of the importance of the estuary for rearing fish (including anadromous and saltwater species) and the role that reduction in flood events has on forming the estuary habitats in existing information, impacts and study plans.

6) Identify essential fish habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act, and estimate potential impacts and integration into study design.

7) Include an estimate of the current quantity and quality of spawning habitat upstream (have linear estimate) and downstream of the proposed dam (at least to the next major tributary).

8) Include fish production estimates – native, exotic, stream, reservoir.

4.2 Species Covered

9) The fish species that are discussed in the existing information need to be broadened to include other species. There should be a focused effort to include information on representative species that reflect values related to commercial, sport, cultural (subsistence and spiritual uses), and ecosystem resources (e.g. biodiversity and threatened and endangered). This could also include invertebrate species such as freshwater mussels and macroinvertebrates.

10) Provide a description of all Federal and state listed rare, threatened and endangered, candidate or special species that may be in the Project area, potential impacts and integration into study plans including a list of Federal and state-listed or proposed to be listed, threatened and endangered species known to be present in the project vicinity. Examples of aquatic animals not included in the scoping report are:

    - Bull trout

- Northern red legged frog
- Pacific lamprey
- Olympic mudminnow
- Newcomb's Littorine snail
- Western Ridged Mussel

Information about the species should include identification of habitat requirements, references to any known biological opinion, status reports, or recovery plan pertaining to the listed species, extent and location of any federally-designated critical habitat, or known other habitat for listed species in the project area, and temporal and spatial distribution of the listed species within the project vicinity and especially in relation to project-induced changes.

4.3 Preliminary Impact Identification

11) Provide existing information (perhaps from example projects), on impacts and a study design for examination of fish passage needs for each project.

12) Provide existing information, potential impacts and study plans related to potential temperature/dissolved oxygen interactions that can affect fish in the reservoir and the waters downstream of the outfall. Colder, low DO water tends to form in the bottom of reservoirs and warm, higher DO water tends to be present in the top of most reservoirs. In some cases, the reservoirs stratify strongly. When the top portion of the reservoir becomes too warm to support fish and the bottom portion develops extreme low DO situations, fish kills often occur. The interaction needs to be assessed.

13) Incorporate information, estimated potential impacts into study plans that examine changes in sediment transport as described above under water resources.

14) Incorporate information, estimated impacts into study plans that examine the changes in groundwater recharge and subsurface flows on peripheral habitats as described above under water resources. Include an evaluation that includes the additional summer flow in the mainstem in relation to potential reduced flows in peripheral habitats.

15) Include how changes in flow and the reduction in the transport of large woody debris may affect the quantity and quality of spawning habitat downstream of the facilities.

5 Proposed Draft Studies

This section of the scoping report does not provide sufficient information to be considered as proposed draft studies. The scoping report (especially for fisheries) appears to be a brief summary of a list of studies from a Work Group kickoff meeting. They consist of extremely broad topic areas (e.g. Fish Species Composition and Abundance Study) with a few bullets that may or may not have any connection to the project, regulatory framework or other reasons for the information request. As described above, scoping is a critical component to an effective and useful process and providing guidance for study development is the ultimate product for this scoping exercise. Basic information for study development must have several basic components as summarized below.

- **Study connection to project effects** – As described above, existing spatial and temporal information on the project influence and aquatic resources are compared and used to estimate potential impacts. Potential project impacts should be the focus of the studies. Normally, studies can be grouped by the environmental project setting making the organization and coordination with other studies easier. Table 1 is an example of how geographic setting is used (e.g. below the dam, at the dam, inundation area, or upstream of reservoir) to identify key areas of concern and in doing so help focus the research effort toward results that will support the permitting process.
- **Regulatory nexus** – The main reason for doing the studies (in addition to informing prudent public investment that regulatory requirements are designed to promote) will eventually be to satisfy the regulatory requirements under Federal and state statutes. An incomplete list of such regulatory requirements should be developed to again help focus on the proposed study effort and maximize the usefulness of the information gathered. Table 1 provides an example of a way to structure the regulatory requirements, issues, and potential impact identification in a way that will be useful in identifying the purpose and need of future studies.
- **Purpose of the study** – a concise statement of purpose for the study is essential. The scientific method for developing studies normally uses a structured process that includes a goal statement, listing of objectives needed to meet the goal and a description of tasks required to reach objectives. These are the basic components of a basic study design.
- **Study design** – We understand that a full study plan is not the intent of the scoping document. Although, it is important to provide some basic study design information (basic scope of the study). This should include, where practical, a data needs summary, general tasks for collecting and reporting the information, suggested methodologies, schedule, coordination with related studies and what is the basic deliverable (content of the report).

1) Consider adding components to each study that would provide initial ideas on potential impacts and what mitigation measures may be needed for project impacts. This would be extremely helpful in future cost-benefit discussions

2) Consider adding several initial information development tasks (studies) that would feed into the core studies including alternatives analyses described below in missing information, an analysis of various operational alternatives for the facilities and identification of representative species and habitats that are important, etc.

Table 1 – Example Method of Relating Project Influence, Aquatic Resources, Regulatory Requirements, and Impact Assessment to Study Needs

Environmental Setting	Potential Project Impact	FERC Requirements and State/Federal Management Objectives	Assessment Purpose	Proposed Studies
Dam, downstream to estuary	Project will alter flow regimes downstream of facilities and may alter sediment transport regimes. There is potential for changes in sediment transport to a degree that may affect anadromous and resident fish habitat. The effects could be found in the mainstem, peripheral habitats and estuarine areas.	➢ 18 CFR 4.51 (f)(3) ➢ 18 CFR Section 10 (j) ➢ Washington State's Water Quality Standards, Chapter 173-201A WAC and Tribal Water Quality Standards ➢ Washington State's Water Pollution Control Act, 90.48 RCW ➢ Essential Fish Habitat **(**MSA §3) ➢ Section 7 Endangered Species Act ➢ Tribal fish production plans ➢ State and federal watershed management plans	Information is needed on channel morphology, and flow regimes. Some information exists for habitat types, fish distribution and abundance/habitat use, below the dams but several areas need further investigation, especially rearing in the lower X miles of river. Some information is available on the relationship between sediment transport, channel morphology, and downstream fish habitat but existing information will need to be extrapolated from other systems and local data collected in representative reaches below the dams.	Review existing information and studies to determine if previously collected data on channel characteristics can be compared to current conditions. Investigate and find aerial photography, lidar and other tools for spatial interpretation Use remote interpretation to collect channel and sediment data from representative reaches below the dams. Correlate and provide input to studies for inventory of aquatic habitat types and fish distribution and abundance. Review present day and historical aerial photography, lidar, etc. to evaluate channel changes in important spawning, rearing and passage reaches. Coordinate with geomorphology / geotechnical studies on hydrology, hydraulics, geomorphology and sediment transport regimes.

6 Summary and Recommendations

Scoping can be an invaluable part of your early project planning and can lay a firm foundation for the rest of the decision making process. If the scoping document can be relied upon to include necessary information for formulating the studies and making rational choices, the resource managers will be better able to make a sound and prompt decisions. Your main interest is in getting a proposal through the review process. This interest is best advanced by finding out early where the problems are with the proposal, where the affected resources are, and providing guidance for studies that include impact assessment and form the basis for accurate identification of mitigation needs. In addition, if it is clear that all reasonable alternatives are being seriously considered, stakeholders and the public will usually be more satisfied with the preferred choice among alternatives.

6.1 Summary of Comments and Significance Level

In a peer-review process, comments are often paired with a determination of the level of significance to help the original authors in prioritizing their response to the comments. For example, in response to the National Research Council report titled "Review Procedures for Water Resources Project Planning," (NRC, 2002), the OMB Peer Review Bulletin (OMB, 2004), and other peer review guidance documents, the US Army Corps of Engineers recommends that peer reviewers indicate the significance of their concern, with respect to "its potential impact on the plan selection, recommended plan components, efficiency (cost), effectiveness (function/outputs)" etc. (USACE, 2008), In an effort to provide a similar indication of the importance level of the comments provided in this review, the ENVIRON review team has adopted a significance determination for all of the comments presented in Sections 2 through 5 of this review. The following descriptions of a High, Medium, and Low level of significance are modified from Independent External Peer Review services currently being provided to the US Army Corps of Engineers by Battelle Inc.:

- **High -** Describes a fundamental problem with the document that could affect the recommendations or conclusions of the report.
- **Medium -** Affects the completeness or understanding of the report
- **Low -** Affects the technical quality of the reports, but will not affect the recommendation of the project.

Using these determinations of significance, the comments provided in the preceding chapters have been compiled in Table 2, along with a significance determination to guide and facilitate a focused revision of the report on the part of the Authority and EESC. Out of a total of 47 comments, 11 comments were assessed at a significance level of "high," suggesting fundamental problems with the quality of the document that should be addressed. In the USACE process, all such concerns are either resolved between review team members and project team members, or else referred to USACE headquarters for expert review.

Table 2 Summary of Comments with Significance Determination

Report Section	Comment Number	Comment/Recommendation	Significance Level	Notes/Comments
2 - General Comments	No Number	Document needs a clearly stated purpose	High	
	No Number	Studies should be focused on an impact analysis	High	
	No Number	Alternatives need to be defined in order to study potential impacts	Medium	
	1)	Executive Summary needs to be revised	Medium	
	2)	Introduction should agree with Executive Summary and report contents	Medium	
	3)	Put this report into the context of the related documents	Medium	
	4)	Show proposed reservoirs on Figure 1	Medium	
	5)	State the primary purpose of the water retention projects	High	
	6)	Provide a justification for the proposed project sizes based on stated purpose	Medium	
	7)	Include a description of the project	Medium	
	8)	Provide a summary of contacts with agencies, tribes, stakeholders	Medium	
3 - Water Resources	1)	Interpret water quality information in relation to state standards	Medium	
	2)	Describe narrative classes for all tributaries	Medium	
	3)	Identify sections of the river that are on the 303(d) list	Medium	

Report Section	Comment Number	Comment/Recommendation	Significance Level	Notes/Comments
3 -Water Resources	4)	Summarize targets and action items related to TMDLs	Medium	
	5)	Map water quantity and quality information in correlation with proposed project facilities	Low	
	6)	Update figures with other gages	Low	
	7)	Include a description of design flow of the proposed system	Medium	
	8)	Provide monthly flow duration curves	Medium	
	9)	Summarize existing water uses	Low	
	10)	Provide an estimate of the frequency of dredging	Medium	
	11)	Include estimates of surface area, etc for downstream reaches	Medium	
	12)	Describe the information on sediment transport with respect to placement of the reservoirs	High	
	13)	Describe the potential impacts on the lacustrine habitat	Medium	
	14)	Include information on the effects of climate change on carbonic acid cycle	Medium	
	15)	Describe potential impacts from pesticide liberation	Medium	
	16)	Describe potential impacts on wetlands	Medium	
	17)	Describe potential impacts on groundwater recharge	High	
	18)	Describe impacts in relation to Project influence	Medium	
4 - Fishery and Aquatic Resources	1)	Additional existing information should be reviewed	High	

Report Section	Comment Number	Comment/Recommendation	Significance Level	Notes/Comments
4 - Fishery and Aquatic Resources	2)	Fish distribution maps are needed	Medium	
	3)	Provide specific limiting factor information	Medium	
	4)	Include significant limiting factor for each species	Medium	
	5)	Include a discussion of the estuary for rearing fish	Medium	.
	6)	Identify essential fish habitat as defined under the Magnuson-Stevens Fishery Act	Medium	
	7)	Include an estimate of the upstream and downstream habitat	Medium	
	8)	Studies should include fish production estimates	Medium	
	9)	Include a discussion of other potentially affected species of cultural, recreational, or other value	Medium	
	10)	Describe all federal and state listed rare, threatened, or endangered species and their critical habitat	High	
	11)	Provide information on fish passage study needs	High	
	12)	Incorporate information on potential impacts resulting from temperature changes	Medium	
	13)	Incorporate information on potential impacts from changes in sediment transport	High	
	14)	Incorporate information on potential fisheries impacts related to groundwater supplies	High	
	15)	Provide information about how changes in flow and transport of large woody debris may affect spawning habitat	Medium	

Report Section	Comment Number	Comment/Recommendation	Significance Level	Notes/Comments
5 – Proposed Draft Studies	No Number	Connect study requests to anticipated project impacts, regulatory nexus, and study purpose	High	
	1)	Consider developing information that may be used to develop mitigation options	Medium	
	2)	Consider recommending studies that will develop consistent information on a topic that will then feed into "core" studies more focused on understanding impacts	Medium	

6.2 Summary of Recommendations

1) Ensure and document that reasonable alternative water retention facilities have been examined. If a defensible analysis of all alternatives has not been completed, then the research will be of little use to the project
2) Use alternatives examined in the Phase I report or develop other reasonable alternatives and provide project descriptions for each so that an alternative analysis can be completed for different locations and sized facilities.
3) Revise the Existing Information section to include the important information described. Include information on the Project footprint and influence and consistent spatial and temporal information on the important aquatic resources.
4) Estimate potential impacts from the project on aquatic resources by overlaying the project information on the aquatic resource information. Include temporal and spatial aspects and use representative species to reflect commercial, sport, cultural and ecological values, as described above.
5) Use the estimated potential impacts as a basis for developing the essential components of studies described above.
6) Ensure that a net environmental benefits analysis is part of the study plans so that alternatives can be compared.
7) Do not go forward with the aquatic studies until appropriate scoping has been completed. The integration of complete scoping information and basic study design input will ensure cost-effective studies with increased value for making future decisions and forming a base for regulatory compliance.

The review team understands that the Authority is on a short time-line for completing the needed fishery resources research. In light of this consideration, ENVIRON recommends a phased approach to moving forward with the research. If the recommendations in this review are addressed, it is likely critical studies will be identified in the process that will be instrumental in expediting a successful regulatory review. At the same time, some studies are known to be needed, and will require seasonal data collection begin as soon as possible. If a phased approach to the draft studies is adopted, Phase A could include the studies with known parameters that require year-round data collection. These could begin as soon as possible, while a Phase B might comprise critical studies to be identified after a more thorough scoping document has been completed.

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